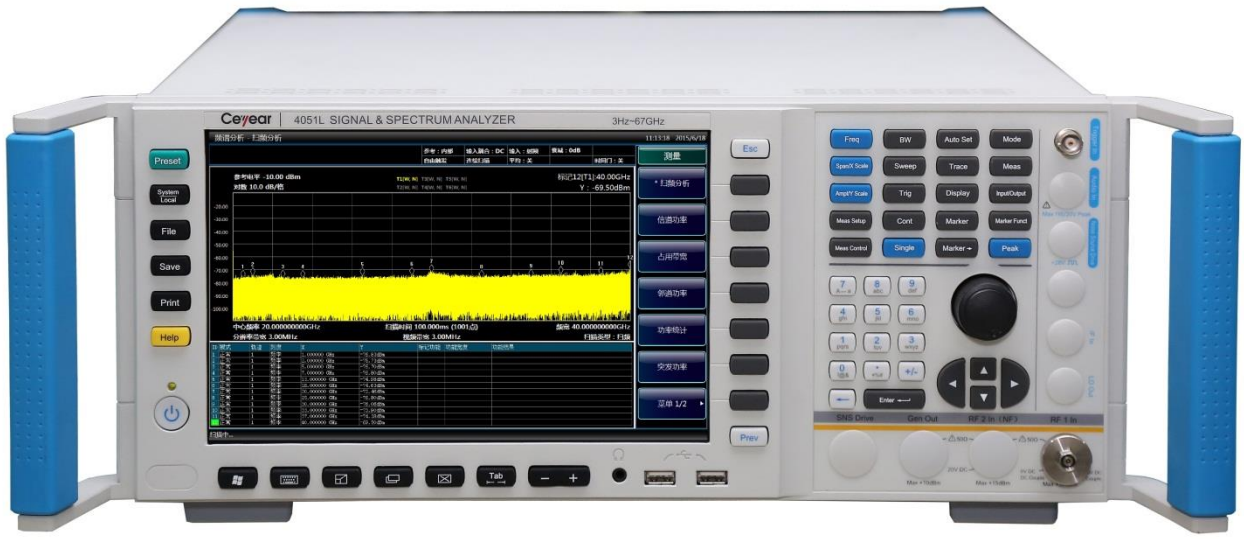
4051 Series Signal/Spectrum Analyzer
Programming Manual



Ceyear Technologies Co. Ltd

The manual applies to the signal/spectrum analyzers of the following models:

- 4051A signal/spectrum analyzer (3 Hz-4 GHz).
- 4051B signal/spectrum analyzer (3 Hz-9 GHz).
- 4051C signal/spectrum analyzer (3 Hz-13.2 GHz).
- 4051D signal/spectrum analyzer (3 Hz-18 GHz).
- 4051E signal/spectrum analyzer (3 Hz-26.5 GHz).
- 4051F signal/spectrum analyzer (3 Hz-40 GHz).
- 4051G signal/spectrum analyzer (3 Hz-45 GHz).
- 4051H signal/spectrum analyzer (3 Hz-50 GHz).
- 4051L Series Signal/Spectrum Analyzer (3Hz-67GHz).
- 4051A-S signal/spectrum analyzer (3 Hz-4 GHz).
- 4051B-S signal/spectrum analyzer (3 Hz-9 GHz).
- 4051C-S signal/spectrum analyzer (3 Hz-13.2 GHz).
- 4051D-S signal/spectrum analyzer (3 Hz-18 GHz).
- 4051E-S signal/spectrum analyzer (3 Hz-26.5 GHz).

Options of the 4051 series signal/spectrum analyzer in addition to standard accessories:

- 4051-H01, Back RF input: To post position the RF signal input interface.
- 4051-H02, High IF Output : Output frequency range is 275MHz ~ 475MHz. Provide 30dB gain, 1dB step.
- 4051-H03, IF output: Output third IF signal, output frequency range is 10MHz ~ 160MHz, steps resolution is 1Hz.Provide 4 automatic gain positions to control level.
- 4051-H04A, Reconstruct IF/Video Signal Output: To realize arbitrary IF, AM/FM or I/Q signal output in form of digital reconstruction, the bandwidth upper limit is 40MHz.
- 4051-H04B, Wide band Reconstruct IF/Video Signal Output: To realize arbitrary IF, AM/FM or I/Q signal output in form of digital reconstruction, bandwidth range is 50MHz~100MHz.
- 4051-H08, Wide Log Detect Output: To output the logarithm wave-detection signal which can reflect the input signal level characteristics.
- 4051-H12A, 40MHz bandwidth digital interface: To output real-time broadband collecting data through optical fiber, support max. 40MHz bandwidth signal data output.
- 4051-H12B, 200MHz bandwidth digital interface: To output real-time broadband collecting data through optical fiber, support max. 200MHz bandwidth signal data output.
- 4051-H15, +24V DC power supply: +24V DC power supply.
- 4051-H22A, 4711 Data Recorder: Configured with SSD Data Recorder (have same interface characteristics) to realize real-time large-capacity recording of signal data.
- 4051-H22B, 4712 Data Recorder: Configured with HDD Data Recorder (have same interface characteristics) to realize real-time large-capacity recording of signal data.
- 4051-H33, Electronic Attenuator: The upper limit of frequency is 4GHz, attenuation range: 0~30dB, 1dB steps.
- 4051-H34-04/4051-H34-09/4051-H34-13/4051-H34-18/4051-H34-26/4051-H34-40/4051-H34-45/4051-H34-50, Low-noise Preamplifier: Optional low-band PreAmplifier or all-band amplifier. The maximum frequency of all-band amplifier is up to 50GHz (4051L exception). If an all-band PreAmplifier is adopted, a noise optimization path of at least 4GHz frequency band should be provided.

- 4051-H36, Preselector Bypass: The tracking preselector in the bypass receiving channel.
- 4051-H38A, 40MHz Analysis Bandwidth: Support 10Hz-40 MHz analysis bandwidth.
- 4051-H38B, 200 MHz Analysis Bandwidth: Support 10Hz-200 MHz analysis bandwidth.
- 4051-H38C, 550 MHz Analysis Bandwidth: Support 10Hz-550 MHz analysis bandwidth.
- 4051-H39, Audio Analyzer: Realize audio frequency signal parameter measurement, distortion measurement and waveform analysis
- 4051-H40, External Mixer: To extend the frequency range using external frequency mixing method. This option provides LO output and IF input, as well as signal recognition ability.
- 4051-H41，Real-time Spectrum Analyzer: Pprovide digital phosphor spectrum and seamless waterfall, including frequency template trigger, which can support real-time spectrum analysis of 200MHz bandwidth.
- 4051-H48，Noise Figure: Noise source drive and noise figure measurement function (4051L exception).
- 4051-S04, Phase Noise Measurement: Provide SSB phase noise curve and single point phase noise measurement.
- 4051-S09, Analog Demodulation Analyzer: Provide modulation characteristics and distortion characteristics analysis of AM, FM, ΦM signals.
- 4051-S10, Transient Analyzer: To realize the measurement & analysis of transient parameters, spectrum, and time-varying characteristics of signals, support playback of the recorded data.
- 4051-S12，Vector Signal Analyzer: This option provides flexible demodulation functions of multiple single-carrier digital modulation signals. It can provide vector charts, constellation diagrams, eye diagrams, spectrum diagrams, etc., to analyze the characteristics of the modulation signal. The modulation error of the signal can be obtained by demodulation, which helps to judge the cause of the signal error.
- 4051-S13, Pulse Signal Analyzer: Automatic measurement on time, level and modulation parameters of pulse waveform and statistical analysis of pulse sequence.
- 4051-H97, Mounting suit: Handles and accessories for 4051 mounting on standard racks.
- 4051-H98, English options: English panels, user manual, operation interface, and operation system. Power supply: AC 100~240V：50~60Hz.
- 4051-H99, Aluminum transportation case: High-strength lightweight aluminum transportation case, with handle and roller, convenient for transportation.

Options of the 4051-S series signal/spectrum analyzer in addition to standard accessories:

- 4051-H03, IF output: Output third IF signal, output frequency range is 10MHz ~ 160MHz, steps resolution is 1Hz.Provide 4 automatic gain positions to control level.
- 4051-H08, Wide Log Detect Output: To output the logarithm wave-detection signal which can reflect the input signal level characteristics.
- 4051-H34-04/4051-H34-09/4051-H34-13/4051-H34-18/4051-H34-26/4051-H34-40/4051-H34-45/4051-H34-50, Low-noise Preamplifier: Optional low-band PreAmplifier or all-band amplifier. The maximum frequency of all-band amplifier is up to 50GHz (4051L exception). If an all-band PreAmplifier is adopted, a noise optimization path of at least 4GHz frequency band should be provided.
- 4051-S04, Phase Noise Measurement: Provide SSB phase noise curve and single point phase noise measurement.
- 4051-H97, Mounting suit: Handles and accessories for 4051 mounting on standard racks.
- 4051-H98, English options: English panels, user manual, operation interface, and operation system. Power supply: AC 100~240V：50~60Hz.
- 4051-H99, Aluminum transportation case: High-strength lightweight aluminum transportation case, with handle and roller, convenient for transportation.

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DECLARATION-ДЕКЛАРАЦИЯ-宣言-DÉCLARATION-선언-إعلان

Declaration of Conformity

Certificate No.	:	CTL1608153120-EC
Applicant	:	The 41st Institute of China Electronics Technology Group Corporation
Address	:	No.98 Xiangjiang Rd. QingDao Economy and Technology Development Zone, QingDao city, China
Product	:	SIGNAL & SPECTRUM ANALYZER
Trademark	:	EI
Model(s)	:	AV4051A, AV4051B, AV4051C, AV4051D, AV4051E, AV4051F, AV4051G, AV4051H, AV4051A-S, AV4051B-S, AV4051C-S, AV4051D-S, AV4051E–S
Manufacturer	:	The 41st Institute of China Electronics Technology Group Corporation
Address	:	No.98 Xiangjiang Rd. QingDao Economy and Technology Development Zone, QingDao city, China
Test Report	:	CTL1608153120-E

Complies with the requirements of the

EC EMC directive 2014/30/EU with amendments.

Test Standards:

EN 61326-1: 2013
EN 61000-3-2: 2014
EN 61000-3-3: 2013

Remarks:

The **CE** markings as shown below can be affixed on the product after preparation of necessary conformity documentation, as stipulated in article 10 of the Council Directive **93/68/EEC.**

CE

For Chief Executive
Aug. 18, 2016

华检检测 CTL certification Shenzhen CTL Testing Technology Co., Ltd.

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DECLARATION-ДЕКЛАРАЦИЯ-宣言-DÉCLARATION-선언-إعلان

Declaration of Conformity

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Address	:	No.98 Xiangjiang Rd. QingDao Economy and Technology Development Zone, QingDao city, China
Product	:	SIGNAL/SPECTRUM ANALYZER
Trademark	:	EI/依爱
Model(s)	:	AV4051A, AV4051B, AV4051C, AV4051D, AV4051E, AV4051F, AV4051G, AV4051H, AV4051A-S, AV4051B-S, AV4051C-S, AV4051D-S, AV4051E-S
Manufacturer	:	The 41st Institute of China Electronics Technology Group Corporation
Address	:	No.98 Xiangjiang Rd. QingDao Economy and Technology Development Zone, QingDao city, China
Test Report	:	CTL1608153120-S

Complies with the requirements of the
EC LVD directive 2014/35/EU with amendments.
Test Standards:

EN 61010-1:2010

Remarks:
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CE

For Chief Executive
August 18, 2016

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DECLARATION-ДЕКЛАРАЦИЯ-宣言-DÉCLARATION-선언-إعلان

Declaration of Conformity

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Applicant	:	The 41st Institute of China Electronics Technology Group Corporation
Address	:	No.98 Xiangjiang Rd. QingDao Economy and Technology Development Zone, QingDao city,China
Product	:	SIGNAL & SPECTRUM ANALYZER
Trademark	:	EI/依爱
Model(s)	:	AV4051A, AV4051B, AV4051C, AV4051D, AV4051E, AV4051F, AV4051G, AV4051H, AV4051A-S, AV4051B-S, AV4051C-S, AV4051D-S, AV4051E–S
Manufacturer	:	The 41st Institute of China Electronics Technology Group Corporation
Address	:	No.98 Xiangjiang Rd. QingDao Economy and Technology Development Zone, QingDao city,China
Test Report	:	CTL1608153120-R

Complies with the requirements of the

EC RoHS directive 2011/65/EU with amendments.

Test Standards:

IEC 62321: 2008
IEC 62321-4:2013
IEC 62321-5:2013

Remarks:

This Certificate is issued in accordance with the RoHS Directive **2011/65/EU** .

RoHS

For Chief Executive
Aug. 18, 2016

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Preface

Thanks for choosing the 4051 series signal/spectrum developed and produced by Ceyear Technologies Co. Ltd.

We devote ourselves to meeting your demands, providing you high-quality measuring instrument and the best after-sales service. We persist with "superior quality and considerate service", and are committed to offering satisfactory products and service for our clients.

Manual No.

AV2.732.1000SC

Version

C.2 2018.03

Ceyear Technologies Co. Ltd.

Manual Authorization

The information contained in this User Manual is subject to change without notice. The power to interpret the contents of and terms used in this Manual rests with Ceyear Technologies Co. Ltd.

Ceyear Technologies Co. Ltd. owns the copyright of this User Manual which should not be modified or tampered by any organization or individual, or reproduced or transmitted for the purpose of making profit without its prior permission, otherwise Ceyear Technologies Co. Ltd. will reserve the right to investigate and affix legal liability of infringement.

Product Quality Assurance

The warranty period of this product is 18 months from the date of delivery. The instrument manufacturer will repair or replace damaged parts according to the actual situation within the warranty period. The user should return the product to the manufacturer and prepay mailing costs. The manufacturer will return the product and such costs to the user after maintenance.

Product Quality Certificate

The product meets the indicator requirements of the manual at the time of delivery. Calibration and measurement are completed by the measuring organization with qualifications specified by the state, and relevant data are provided for reference.

Quality/Environment Management

Research, development, manufacturing and testing of the product comply with the requirements of the quality and environmental management system. Ceyear Technologies Co. Ltd. has the qualifications and ISO 9001 and ISO 14001 management system certificates.

Precautions

Attention

“Attention” indicates important prompts but no danger. It reminds the user to pay attention to a certain operation process, operation method or similar situations. Noncompliance with the rules or improper operation may result in damage to the instrument or loss of important data. You must fully understand the caution and all the conditions in it shall be met before the next step.

Prompt

“Prompt” indicates information of the instruction and operation. It reminds the user to pay attention to the instrument, a certain operation process, operation method or similar situations. It aims to guide the instrument operator to properly use the instrument.

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1. Manual Guide

This chapter describes the functions, chapter composition and main contents of the Remote Control Manual of 4051 series signal/spectrum analyzer, and the instrument-related documents for the user.

1.1 About the Manual

This Manual describes the application methods of remote control and SCPI commands of 4051 series signal/spectrum analyzer. In order to help the user rapidly master the programming method, this Manual lists the programming examples and describes basic concepts of the I/O function library. For the convenience of operation, please carefully read the manual before operating the instrument, and properly operating it according to the guidance in the manual.

SCPI (Standard Commands for Programmable Instruments) defines the standards and methods of remote control of the instrument, and is also a programming language of program-controlled electronic testing and measuring instruments. The SCPI standard is based on the IEEE-488.2 standard and form. For details, visit http://www.scpiconsortium.org. The Manual describes 4051 remote control commands in detail.

The Program Control Manual includes the following sections:

- **Remote control**

This section outlines the remote control of the instrument, so that the user can rapidly get to know how to remotely control the instrument. It is divided into three sections: the program control basics describe the concepts related to program control, software configuration, program-controlled port, SCPI commands, etc.; instrument port configuration describes the connection and software configuration of the program-controlled port of 4051 signal/spectrum analyzer; and I/O function library describes the basic concepts of the instrument drive and the basic installation and configuration requirements of the IVI-COM/IVI-C drive.

- **Program control commands**

This section describes common commands, instrument commands and compatible commands, and also the functions, parameters and examples of SCPI commands one by one.

- **Programming examples**

This section provides the basic and advanced programming examples with texts and example codes, to help the user rapidly master the programming method for remote control of the signal/spectrum analyzer.

- **Error illustration**

Include error information description and repair methods.

- **Appendix**

This section provides necessary reference information on remote control of 4051 series signal/spectrum analyzer, including SCPI command look-up table and error information look-up table.

1.2 Related Documents

The documents related to 4051 series signal/spectrum analyzer include:

- User Manual
- Remote Control Manual
- Quick Start Guide
- Online help

1.2 Related Documents

User Manual

This manual introduces the functions and operation methods of the instrument in details, including configuration, measurement, program control, maintenance, etc. It aims to guide the user to comprehensively understand the functional characteristics and common test methods of the instrument. It mainly includes the following chapters:

- Manual Guide
- Overview
- Introduction to Use
- Operation Instruction
- Menu
- Remote control
- Fault diagnosis and repair
- Specifications and test methods
- Appendix

Remote Control Manual

This manual introduces the remote programming basis, SCPI basis, SCPI commands, programming examples, I/O drive function library, etc. It aims to guide the user to rapidly and comprehensively know the program control commands and methods of the instrument. It mainly includes the following chapters:

- Manual Guide
- Remote control
- Remote Command
- Programming examples
- Error illustration
- Appendix

Quick Start Guide

This manual introduces the basic operations of configuration, start-up and measurement of the instrument, aiming to help the user rapidly know the characteristics of the instrument and understand basic settings and operations. It mainly includes the following chapters:

- Manual Guide
- Preparation for use
- Typical application
- Help

Online help

Online help is integrated in the instrument to provide rapid text navigation help and facilitate local and remote operation. Hard keys on the front panel of the instrument and tool bars of the user interface can be activated with corresponding shortcut keys. Main chapters are the same as those in the user manual.

2 Remote Control

This chapter describes the remote control basis, remote control interface and configuration method of 4051 series signal/spectrum analyzer, and also briefly describes the concepts and categories of I/O instrument drive libraries to help the user perform remote control. Specific contents include: Specific contents include:

2.1 Basis of Remote Control

2.1.1 Remote Control Interface

The 4051 series signal/spectrum analyzer supports two kinds of remote control interfaces: LAN and GPIB. The remote control interfaces and associated VISA addressing character strings are shown in the following table:

Table 2.1 Types and VISA Addressing Character Strings of Remote Control Interfaces

Remote Control Interface	VISA Addressing Character String	Description
LAN *(Local Area Network)*	Original socket protocol: TCPIP::host_address::port::SOCKET	Remote control can be realized by the connecting the instrument through the network port on the rear panel of the instrument. For details, refer to: "2.1.1.1 LAN Interface".
GPIB *(IEC/IEEE Bus Interface)*	GPIB::primary address[::INSTR]	Remote control can be realized by the connecting the instrument through the port on the rear panel of the instrument. Comply with the bus interface standards of IEC 625.1/IEEE 418. For details, refer to: "2.1.1.2 GPIB Interface".

2.1.1.1 LAN Interface

The signal/spectrum analyzer can be controlled remotely by the 10 Base-T and 100 Base-T LAN computer. Various instruments in the LAN are combined into a system for unified control with the computer in the network. In order to realize the remote control within LAN, the signal/spectrum analyzer should be configured with a port connector, network card, relevant network protocol and network service in advance. At the same time, the controlling computer in the network should be configured with the instrument control software and VISA library in advance.

The network interface adapter installed in the analyzer has three operating modes, including:

- 10 Mbit/s Ethernet IEEE802.3;
- 100 Mbit/s Ethernet IEEE802.3 u;
- 1 Gbit/s Ethernet IEEE802.3ab.

Connect the controlling computer and signal/spectrum analyzer to a common TCP/IP protocol network through the network ports. Use the RJ45 commercial cable (shielded or non-shielded Class 5 twisted pair) between the computer and the signal/spectrum analyzer. Use the packet transmission mode in data transmission, as the speed of LAN transmission is high. In general, the cable between the computer and the signal/spectrum analyzer should not be longer than 100 m (100 Base-T and 10 Base-T). For details about LAN communication, visit http://www.ieee.org. The LAN interface will be described below in detail: LAN interfaces are introduced below.

2.1 Basis of Remote Control

1) IP address

Ensure that the physical connection is smooth for remote control of the signal/spectrum analyzer by LAN. Through the "Local IP" command of the signal/spectrum analyzer, set the address to the subnet where the controlling computer is located. Example: If the IP address of the master control computer is 192.168.12.0, the IP address of the signal/spectrum analyzer should be set as 192.168.12.XXX, in which, XXX is a value between 1 and 255.

Only the IP address is required to establish the network connector. The VISA addressing character string is as follows:

TCPIP::host address::port::SOCKET

Where:

- TCPIP refers to the applied network protocol.
- "Host address" refers to the IP address or host name of the instrument, used to identify and control the instrument to be controlled.
- "port" refers to the socket port number of the 4051 signal/spectrum analyzer;
- SOCKET refers to the original network socket resource class.

Example:

If the instrument IP address is 192.1.2.3:

"TCPIP::192.1.2.3::5000::SOCKET" can be used for establishing the original socket connection.

Prompt

Identification of multiple instrument in remote control system

If multiple instruments are connected in the network, distinguish them with the separate IP address and associated resource string. The respective VISA resource string is used by the master control computer to identify the instrument.

2) Socket communication

TCP/IP protocol can be networked with the signal generator using LAN socket. Socket is a basic approach used in computer network programming, which enables network communication among applications employing different hardware and operating systems. In this method, the signal/spectrum analyzer is connected to the computer through the port for two-way communication.

Socket is a kind of software specially programmed and has defined the information necessary for network communication such as IP address and device port number and integrated some basic operations of network programming. Socket can be used as long as the packaged libraries are installed in the OS. Berkeley Socket Library applied in UNIX and Winsock Library applied in Windows constitute the two common socket libraries.

The socket of the signal/spectrum analyzer is compatible with the Berkeley socket and Winsock through the application program interface (API). Besides, it is also compatible with other standard socket API. The command will be sent by the socket program to control the signal/spectrum analyzer through SCPI commands. Before you use LAN socket, you must set the port number of the socket of the signal/spectrum analyzer. The port of the 4051 signal/spectrum analyzer is 5000.

2.1.1.2 GPIB Interface

The GPIB is a kind of remote control interface which is widely applied at present. Various kinds of instruments can be connected through GPIB cables to form a test system with the master control computer. In order to realize remote control, the master control computer should be configured with the GPIB bus card, drive program and VISA library in advance. In the communication process, the controlled instrument is

addressed by the master control computer according to the GPIB bus address, and the user can set the GPIB address and ID query string. The default GPIB communication language is SCPI command.

Refer to ANSI/IEEE 488.1-1987 and ANSI/IEEE 488.2-1992 for detailed definitions and descriptions on GPIB and relevant interface operations. For details, visit the IEEE website http://www.ieee.org.

The byte is used in information processing of GPIB. The data transmission rate can reach 8 MBps. Therefore, the speed of data transmission of GPIB is high. The data transmission speed is limited by the distance between the equipment/system and computer, pay attention to the following items in GPIB connection.

- At most 15 instruments can be connected through GPIB interfaces;
- The total length of the transmission cable must not exceed 15 m or twice of the number of instruments in the system. Generally, the maximum length of the transmission cable between devices must not exceed 2 m.
- For parallel connection of instruments, use “or” connecting lines.
- Connect the terminal of the IEC bus cable to the instrument or controlling computer.

2.1.2 Message

Messages transmitted through the data lines are divided into the following two types.

1) Interface message

The low attention line should be installed for communication between the instrument and master control computer, and then interface messages can be transmitted to the instrument through the data line. Interface messages must be transmitted by the instrument with the GPIB bus function.

2) Instrument message

For the structure and grammar of instrument messages, refer to “5.1.4 SCPI Commands”. According to the transmission direction, instrument messages can be divided into the command and instrument response. Unless otherwise specified, the same method should be applied for use of instrument messages with the remote control interface.

a) Commands:

The command (programming message) is a kind of message transmitted by the master control computer to the instrument, used for remote control of the instrument function and query of the status information. Commands are divided into the following two types:

- According to the influence on the instrument:
  - Setting command: change the instrument setting status, such as resetting, frequency setting, etc.
  - Query command: inquire and return data, such as instrument identification or parameter query. The query command ends with a suffix question mark.
- According to the definition in the standard:
  - General command: the function and grammar are defined in the IEEE488.2 standard, and this kind of command is suitable for all kinds of instruments, and if possible, used for standard status register management, resetting, automatic testing, etc.
  - Instrument control command: a kind of instrument characteristic command, used to realize the instrument functions. Example: frequency setting. The grammar should comply with the SCPI specifications.

b) Instrument response:

The instrument response (response message and service request) is a kind of query result message transmitted by the instrument to the computer. This kind of message includes the measurement result, instrument status, etc.

2.1.3 SCPI Command

2.1.3.1 SCPI Command Introduction

SCPI (Standard Commands for Programmable Instruments) is a command set, which is established based on the IEEE488.2 Standard and suitable for all instrument. It mainly aims to apply the same programmed commands for the same functions to realize the universality of programmed commands.

The SCPI command is composed of the command head and one or more parameter(s), which are separated by spaces. The command head includes one or more key field(s). The command with the suffix question mark is the query command. The command can be divided into general command and special command of different grammatical structures. The SCPI command has the following features:

1) Programmed commands are applicable to the test function, but not for instrument description.
2) Programmed commands can help to reduce the repetition of similar test functions and ensure the program compatibility.
3) Programmed messages are defined in the layer which is not related to the hardware of the physical layer in communication.
4) Programmed messages are not related to the programming method and language. The SCPI test program is easy to transplant.
5) Programmed commands are scalable to adapt to measurement control of various scales.
6) The extendibility of SCPI enables it to be “live” standard.

For more SCPI details, refer to:

- IEEE Standard 488.1-1987, IEEE Standard Digital Interface forProgrammable Instrumentation. New York, NY, 1998.
- IEEE Standard 488.2-1987, IEEE Standard Codes, Formats, Protocols and Comment Commands for Use with ANSI/IEEE Std488.1-1987. New York, NY, 1998.
- Standard Commands for Programmable Instruments (SCPI) VERSION 1999.0.

For details of the remote command set, classification and specifications of 4051 series signal/spectrum analyzer, refer to:

1) “3 Remote Commands” of this manual;
2) “Appendix A: SCPI Command Index” of this manual.

2.1.3.2 SCPI Command Specifications

1) General terms

The following terms are applicable to this section. In order to better understand the contents, you should know the exact definitions of such terms.

Controller

Any computer used to communicate with SCPI devices. The PC, minicomputer or card in a card cage can be used as the controller. Also, some intelligent devices can be used as controller.

Equipment

Any device supporting SCPI. The majority of devices are electrical measurement or excitation devices for communication through the GPIB interface.

Program Message:

A combination of one or more properly formatted SCPI commands. Programming messages instruct a device how to measure and output signals.

Response Message

A combination of data in specified SCPI formats. Response messages are always transmitted from a device to a controller or monitor. Response messages inform the controller of the internal status or measured values of a device.

Command

Any command compliant with SCPI standard. Messages control the combination of device commands. Generally, the commands consist of keyword, parameter and punctuation.

Event Command

Some commands are events and cannot be queried. Generally, there is no front panel key corresponding to the event command. The event command is used to trigger an event at the specific time.

Query

A special type of command. For query of control equipment, return to the response message conforming to the controller grammar requirements. Query string always end with a question mark.

2) Command type

The SCPI command is divided into two types: general command and special instrument command. Figure 2.1 shows the differences of two types of commands. Common commands are sued to manage macros, status registers, synchronization and data storage, and are defined by IEEE 488.2. It can be easily identified with the star mark in front of the command. For example, "*IDN?", "*OPC" and "*RST" are general commands. The general command is not the special instrument command and can be explained in the same method, regardless of the current path setting.

The special instrument command is easy to identify with the colon (:). The colon is used at the beginning of a command statement and between keywords, as in: FREQuency:CENTer?. Based on the internal functional modules of the instrument, special instrument commands are divided into corresponding subsystem command subsets. For example, the power subsystem (:POWer) includes relevant power commands, and the status subsystem (:STATus) includes the status control register commands.

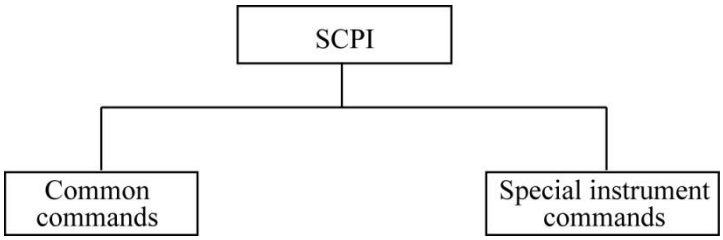

Fig. 2.1 Types of SCPI Commands

3) Grammar of special instrument command

A typical command is made up of keywords prefixed with colons (:). The keywords are followed by parameters. The following is an example syntax statement:

[:SOURce]:POWer[:LEVel] -10 dBm

In the above example, ":POWer" is followed by [:LEVel], with no space. "-10 dBm" behind [:LEVel] is the parameter part. A space is used between the command and parameter. For the other parts of the grammar expression, see Table 2.2 and 2.3.

2.1 Basis of Remote Control

Table 2.2 Special Characters of Command Grammar

Symbol	Meaning	Examples
|	The vertical line between the keyword and parameter means a variety of options.	[:SOURce]:AM: SOURce EXTernal|INTernal EXTernal and INTernal are optional.
[]	The square brackets means that the included keywords or parameters are optional in the command. Even if the included keywords or parameters are ignored, the command will be executed.	[:SOURce]:AM[:DEPTh]:EXPon ential? SOURce and DEPTh are optional.
< >	The part in the angle brackets must not be used according to the literal meaning in the command. The angle brackets mean the necessary part.	[:SOURce]:FREQ:STOP <val><unit> In this command, <val> and <unit> must be replaced with the actual frequency and unit. Example: ":FREQ:STOP 3.5 GHz"
{ }	The braces mean that the parameter is optional.	[:SOURce]:LIST:POWer <val>{,<val>} Example: "LIST:POWer 5"

Table 2.3 Command Grammar

Character, Keyword and Grammar	Examples
Upper-case lettering indicates the minimum set of characters required to execute the command.	[:SOURce]:FREQuency[:CW]?, FREQ is the part in short format of the command.
The lowercase character part of the command is optional. This flexible format is knows as "flexible listening". For more information, refer to the "Command Parameter and Response" section.	:FREQuency: Either "FREQ,:FREQuency" or ":FREQUENCY" is correct.
If a colon is applied between two command mnemonics, the current path in the command tree will be moved to next layer. Refer to "Command Tree" for more information on command paths.	:TRIGger:OUTPut:POLarity? TRIGger is the keyword of the top layer of the command.
Adjacent parameters in the command should be separated with commas. The parameters have no influence on the path layer and do not belong to the command path part.	[:SOURce]:LIST:DWELl <val>{,<val>}
The semicolon is used to separate two adjacent commands, with no influence on the current command path.	:FREQ 2.5 GHZ; :POW 10 DBM
White space characters, such as <space> and <tab>, are generally ignored as long as they do not occur within or between keywords. However, you must use the blank character to separate the command and parameter, with no influence on the current path.	:FREQ uency or :POWer :LEVel6.2 is not allowed. ":LEVel" and "6.2" must be separated with the space. E.g. POWer:LEVel 6.2

4) Command tree

Special instrument commands are used in most of remote control programs. To analyze this kind of command, the SCPI structure should be similar to the file system, known as the command tree, as shown in Fig. 2.2.

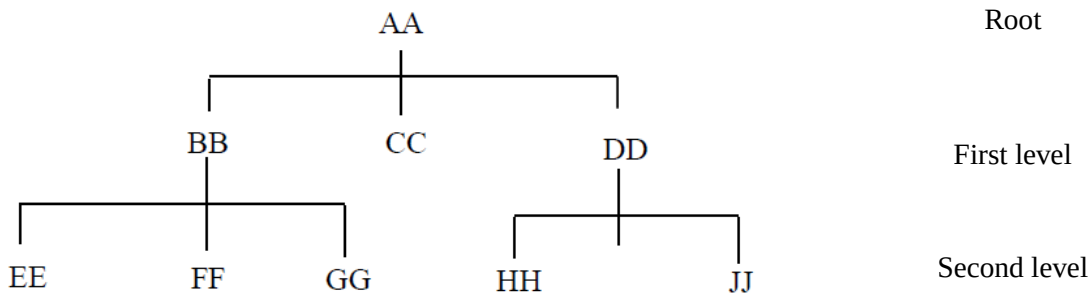

Fig. 2.2 Command tree

The top command is the root command, referred to as the "root". Follow the specific path of the tree structure to next layer in command analysis. Example: :POWer:ALC:SOURce？ Where, ":POWer" refers to AA, ":ALC" refers to BB, and ":SOURce" refers to GG. The whole command path is (:AA:BB:GG).

The command interpreter, a module of the instrument software, is dedicated to analysis of each received SCPI command. It is used to divide the command into separate command elements according to a series of rules to distinguish command tree paths. The current command should be kept unchanged after analysis, so as to analyze the subsequent command more rapidly and efficiently as the same command keyword may be used in various paths. The current command path should be set as the root after the instrument is started or reset (*RST).

5) Command parameter and response

SCPI defines different data formats for use in program and response messages. It does this to accommodate the principle of forgiving listening and precise talking. Refer to IEEE488.2 for more information. Forgiving listening means the command and parameter formats are flexible.

For example, the signal/spectrum analyzer is set with a frequency offset status command: FREQuency:OFFSet:STATe ON|OFF|1|0. The following command formats are to turn on the frequency offset mode:

:FREQuency:OFFSet:STATe ON, :FREQuency:OFFSet:STATe 1,

:FREQ:OFFS:STAT ON, :FREQ:OFFS:STAT 1.

Various parameter types correspond to one or more response data type(s). The numeric type of the parameter will change into the data type in query. Response data are accurate, strictly referred to as "accurate telling".

For example, if you query the power status (:POWer:ALC:STATe?) when it is on, the response is always 1, regardless of whether you previously sent :POWer:ALC:STATe1 or :POWer:ALC:STATe ON.

Table 2.4 SCPI Command Parameters and Response Types

Parameter type	Response Data Types
Numeric	Real or integer
Extended Numeric	Integer
Discrete	Discrete
Boolean	Numeric Boolean
String	String
Block	Block with definite length
	Block of uncertain length
Non-decimal Numeric	Hexadecimal system
	Octal system
	Binary system

2.1 Basis of Remote Control

Numeric parameter

Special instrument commands and general commands can be expressed as numeric parameters. All kinds of common decimal counting can be applied for reception of numeric parameters, including the plus or minus, decimal and scientific counting methods. If one device can only receive the specific numeric type, such as the integer, the received numeric parameter will be automatically rounded.

The following are examples of numeric parameters:

no decimal point required
fractional digits optional
leading signs allowed
space allowed after the E in exponential
use either E or e in exponential
leading + allowed
digits left of decimal point optional

Extended Numeric Parameters

The numeric parameter is extended to specify the physical quantity in the majority of measurements related to special instrument commands. Extended numeric parameters accept all numeric parameter values and other special values as well. The extended numeric parameters include the MAXimum and MINimum. Other special values, such as UP and DOWN, are received depending on the analysis capability of the instrument. All effective parameters are listed in the SCPI command table.

Note: The extended numeric parameters are not applicable to general commands or STATus subsystem commands.

The following are examples of extended numeric parameters:

101	Numeric parameter
1.2 GHz	GHz can be used for exponential (E009)
200 MHz	MHz can be used for exponential (E006)
-100 mV	negative 100 millivolts
10 DEG	10 degree
MAXimum	sets parameter to largest possible value
MINimum	sets parameter to smallest possible value
UP	a stepper up
DOWN	a stepper down

Discrete Parameters

Discrete parameters are used to identify a limited number of parameters to be set. Discrete parameters use mnemonics to represent each valid setting. Similar to the programmed command mnemonics, discrete parameter mnemonics are divided into long type, short type and uppercase/lowercase mixed type.

Discrete parameters and commands are used together in the following examples.

:TRIGger[:SEQuence]:SOURce BUS|IMMediate|EXTernal

BUS	GPIB,LAN,RS-232 triggering
IMMediate	immediate trigger
EXTernal	external triggering

Boolean Parameters

The Boolean parameter represents one true or false binary condition, and only four possible values can be applied.

The following are examples of Boolean parameters:

ON	boolean true
OFF	boolean false
1	boolean true
0	boolean false

String Parameters

For the character string type, the ASCII character string is allowed to be transmitted as the parameter. Single and double quotes are used as delimiters.

The following are examples of string parameters:

'This is Valid' "This is also Valid" 'SO IS THIS'

Real Response Data

Most test data are real data that represent decimal numbers in either fixed decimal or scientific notation. Most high-level programming languages support such two formats. Example of real response data:

Integer Response Data

Integer response data are decimal representations of integer values including signs. For status register query, integer response data will be returned in most cases.

The following are examples of integer response data:

0	Signs are optional
+100	leading + allowed
-100	leading - allowed
256	never any decimal point

Discrete Response Data

Discrete response data are similar to discrete parameters. The main difference is that discrete response data only returns the short form of a particular mnemonic in all upper case letters.

Example of discrete response data:

INTernal	power leveled internally
EXTernal	power leveled externally
MMHead	power leveled by millimeter wave source module

Numeric Boolean Response

Numeric Boolean response data returns a binary numeric value of 1 or 0.

String Response Data

String response data are similar to string parameters. The main difference is that the double quotation marks instead of single quotation marks must be used as the separator of the string response data. Double quotation marks are allowed to be embedded in the string response data, with no character.

The following are examples of string response data:

“This is a string”

“one double quote inside brackets: (“”)”

6) Binary, decimal, hexadecimal, and octal formats

2.1 Basis of Remote Control

The command value can be entered in the binary, decimal, hexadecimal or octal format. An appropriate identifier should be applied in front of the value in the binary, hexadecimal or octal format. Identifiers are not required for decimal system (which is the default format),

The device will make sure the format is default format if there is no identifier in front of the input value. The following list shows the identifiers for the formats that require them:

- #B means that the figure is a binary value;
- #H means that the figure is a hexadecimal value;
- #Q means that the figure is an octal value.

The following are examples of SCPI command values and identifiers for the decimal value 45:

#B101101

#H2D

#Q55

In the following example, the hexadecimal value 00A is used to set the RF output power as 10 dBm (or equivalent to the value in the selected unit, such as DBUV or DBUVEMF).

:POW #H000A

In the non-decimal format, the measurement unit such as DBM or mV is not used together with the value.

7) Command line structure

One command line may include multiple SCPI commands. The following methods can be applied to end the current command line:

- Enter;
- Enter key and EOI;
- EOI and the last byte.

Commands in the command line are separated by semicolons. Commands of different subsystems begin with the colon. For example:

MMEM:COPY "Test1", "MeasurementXY";:HCOP:ITEM ALL

This command line includes two commands, the first of which is the MMEM subsystem command and the second of which is the HCOP subsystem command. If adjacent commands belong to the same subsystem and the command paths are subject to partial overlapping, the commands can be abbreviated. For example:

HCOP:ITEM ALL;:HCOP:IMM

This command line includes tow commands which belong to the same level of the HCOP subsystem. The second command is started at the level lower than the HCOP command, and the colon at the beginning of the command can be omitted. The command line can be abbreviated as follows:

HCOP:ITEM ALL;IMM

2.1.4 Command Sequence and Synchronization

IEEE488.2 defines the difference of the overlapping command and continuous command.

- The continuous command refers to the command sequence to be executed continuously. Generally, the speed of command execution is high.
- The overlapping command refers the command which is not executed automatically before execution of next command. The processing time of the overlapping command is generally long. The program is allowed to process other events synchronously.

Even if one command line includes multiple setting commands, commands may not be executed according to the reception sequence. In order to execute each command according to a certain sequence, all the commands must be transmitted as a separate command line.

Example: command line including setting and query commands.

If one command line includes query commands, query results are unpredictable. The returned value will be fixed if the following command is entered:

:FREQ:STAR 1 GHZ;SPAN 100;:FREQ:STAR?

Returned value: 1000000000 (1GHz)

The returned value will not be fixed if the following command is entered:

:FREQ:STAR 1 GHz;STAR?;SPAN 1000000

The returned result may be the current starting frequency, as the command execution by means of the host program will be postponed. The returned result may be 1 GHz in the case of execution after the commands are received by the host program.

Prompt

Setting commands and query commands are sent separately.

General rules: setting commands and query commands should be sent in different program messages in order to ensure that the returned results of query commands are correct.

2.1.4.1 Prevention of Overlapping Execution of Commands

In order to prevent overlapping execution of commands, multiple threads or commands can be applied, including *OPC, *OPC? or *WAI. The three commands cannot be executed until the hardware is set. The computer may be forced to wait for a certain period to synchronize certain events in the programming process. The above methods are described below.

- **Use multiple threads in the control program.**

Multiple threads are used to complete waiting commands and synchronize the user interface and program, that is, the command "*OPC?" is executed in each single thread, with no blockage of GUI or program threads.

- The use of three commands in synchronous execution is shown in the following table.

Table 2.5 Command Grammar

Method	Execution Action	Programming Method
*OPC	After command execution, set the operation completion bit in the ESR register.	Set ESE BIT0; Set SRE BIT5; Send the overlapping command and *OPC; Wait for the service request signal (SRQ). The service request signal means that the overlapping command has been executed.
*OPC?	Stop executing the current command and return to 1. Only when the operation completion bit in the ESR register is set, the command will be returned, indicating that the previous command has been processed.	End the current command processing before executing other commands. Directly send the command after processing of the current command.
*WAI	Before executing *WAI, wait for sending of all commands. Then process the uncompleted commands.	End the current command processing before executing other commands. Directly send the command after processing of the current command.

2.1 Basis of Remote Control

If the processing time of overlapping commands is short, the command "*WAI" or "*OPC" will be applied for synchronization after execution of overlapping commands. In order to execute other tasks synchronously when the computer or instrument waits for execution of overlapping commands, the following synchronization technology can be applied.

- **OPC and service request**

1) Set the OPC mask bit (bit0) of ESE: *ESE 1;
2) Set bit5 of SRE: *SRE 32, to enable ESB service request;
3) Send the overlapping command and *OPC;
4) Wait for a service request.

The service request signal means that the overlapping command has been executed.

- **OPC? and service request**

1) Set bit4 of SRE: *SRE 16, to enable the MAV service request;
2) Send the overlapping command and *OPC? ;
3) Wait for a service request.

The service request signal means that the overlapping command has been executed.

- **Event status register (ESE)**

1) Set the OPC mask bit (bit0) of ESE: *ESE 1;
2) Only send the overlapping command. Do not send *OPC, *OPC or *WAI;
3) Send "*OPC;*ESR?" in the timer to cyclically inquire the operation status.

If the returned value (LSB) is 1, it indicates that the overlapping command has been executed.

- ***OPC? and short timeout**

1) Only send the overlapping command. Do not send *OPC, *OPC or *WAI;
2) Send "<short timeout>; *OPC?" in the timer to cyclically inquire the operation status.
3) If the returned value (LSB) is 1, it indicates that the overlapping command has been executed. The operation will be executed in the case of timeout.
4) Reset the timeout value to the original value;
5) Send the command "SYStem:ERRor?" to clear the error queue, and delete the "-410, Query interruption" information.

If the returned value (LSB) is 1, it indicates that the overlapping command has been executed.

2.1.5 Status Report System

The status report system is used to save all the current operation status information, including the error information. The operation status information and error information are respectively saved in the status register and error queue and can be inquired through the programmed interface.

2.1.5.1 Structure of Status Register Organization

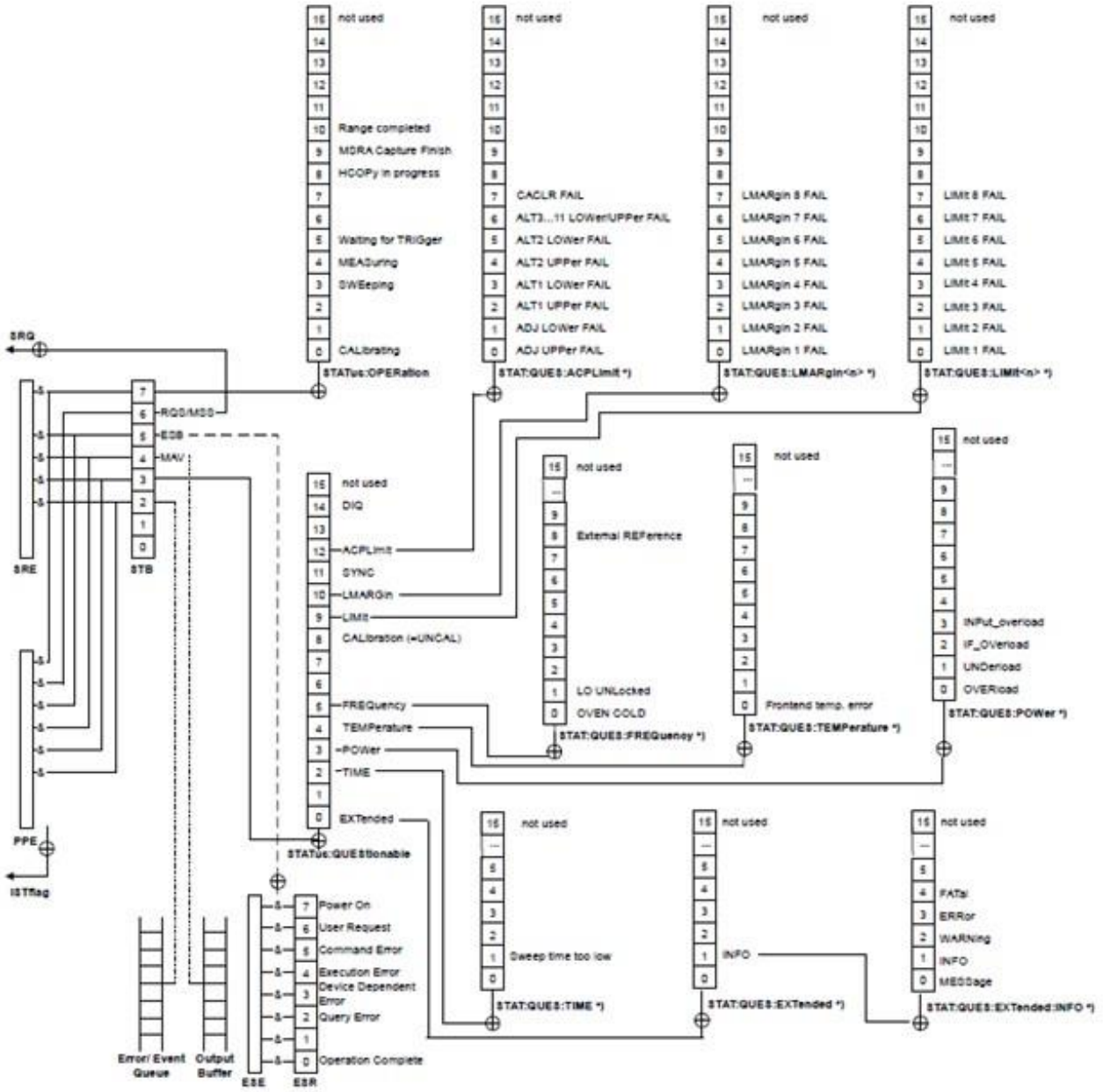

Fig. 2.3 Hierarchical Structure of Status Register

Register categories are as follows:

1) STB, SRE

The top register of the status report system is composed of the status byte (STB) and associated shielding register, i.e. service request enabling register (SRE). STB is used to collect the information of registers of the lower layers and save the general working conditions of the instrument.

2) ESR and SCPI status register

STB is used to receive the following register information:

- Relevant values of event status registers and event status enabling (ESE) shielding registers.
- SCPI status registers, such as STATus:OPERation and STATus:QUEStionable registers (defined by the SCPI standard), including specific operations of the instrument. All the SCPI status registers have the

same internal structure (refer to "2.1.3.3 Structure of SCPI Status Register" of the program control manual).

3) IST, PPE

The separate bit of SRQ and IST sign ("IndividualSTatus") is composed of the combination of all statuses of the instrument. The STB data bit for the IST sign depends on the associated Parallel Poll Enable (PPE) Register.

4) Output buffer zone

The output buffer zone is used to save messages returned by the instrument to the controller. It does not belong to the status report system, but is decisive to the MAV bit of STB.

For details of the above registers, refer to "2.1.5 Status Report System" of the program control manual.

Prompt

SRE and ESE

The Service Request Enable (SRE) register is used as the enabling part of STB. Similarly, ESE can be used as the enabling part of ESR.

2.1.5.2 Structure of SCPI Status Register

Each standard SCPI register includes 5 parts. Each part includes 16 data bits and has independent functions. E.g. one data bit is distributed to each hardware status and valid for five parts of the register. If the Bit15 is set as 0, it indicates that the register value is a positive integer.

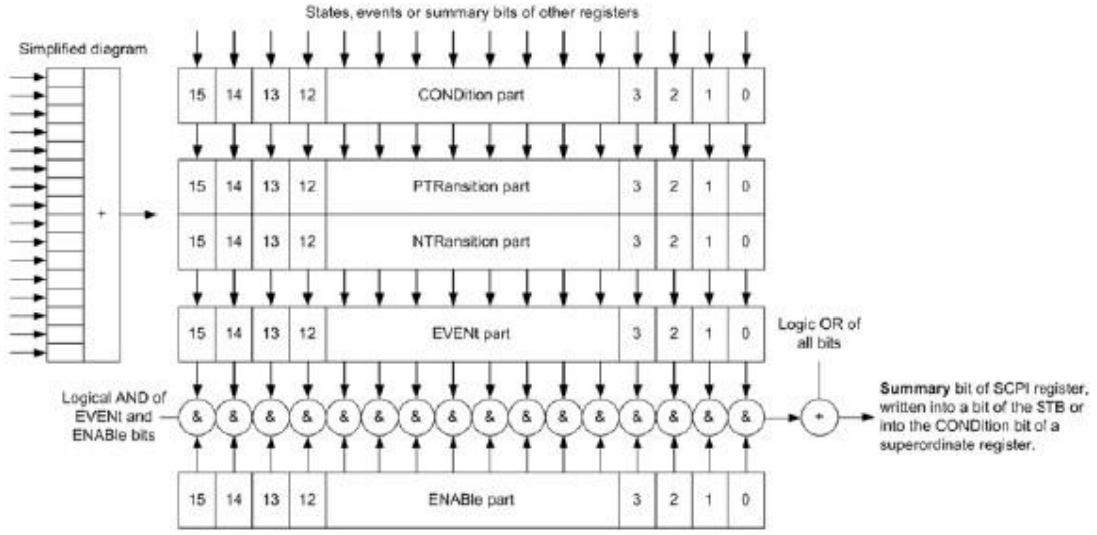

Fig. 2.4 Structure of Status Register

As shown in the above figure, the status register is composed of 5 parts, which are described as follows.

- **Condition register**

This part is directly written with the hardware or bits of the register of lower level, and reflects the current working status of the instrument. This register is of read-only type. It is used for reading but not clearly the value.

➢ **Positive-negative conversion register**

The two transition registers define which status transition of the condition register is stored in the event register.

The positive transition register is similar to a transition filter. When a bit of the condition register is changed from 0 to 1, the relevant associated PTR bit decides whether the event bit is set to 1, as shown below:

— PTR bit=1: the event bit is set.

— PTR bit=0: the event bit is not set.

The positive transition register can be written into and read. Its values are not cleared by reading.

The negative transition register is similar to a transition filter. When a bit of the condition register is changed from 1 to 0, the relevant associated NTR bit decides whether the event bit is set to 1, as shown below:

— NTR bit=1: the event bit is set.

— NTR bit=0: the event bit is not set.

The positive transition register can be written into and read. Its values are not cleared by reading.

➢ **Event register**

This part indicates whether the event occurs after previous reading. The contents of the condition register are saved in the event register. The event register only represents the events transferred by the transfer register, and can only be changed by the instrument. The value can be read by the user and will be cleared after reading. The value is equal to that of the whole register.

➢ **Enabling register**

This part determines whether the associated event acts on the final data sum. The data bit of each enabled part has an "AND" relationship to the associated enabled part. The logic operation result of this part has an "OR" relationship to the data sum bit.

— Enabled bit=0: the associated event does not contribute to the sum bit.

— Enabled bit=1: the associated event contributes to the sum bit

This part can be written into and read. Its values are not cleared by reading.

➢ **Sum bit**

The data sum bit of each register is composed of the event and enabled part. The result is saved in the condition part of the high-order register. The data sum bit of each register is generally automatically by the instrument, therefore, service requests at various levels will be caused by the event.

2.1.5.3 Description of Status Register

Status registers are introduced below in details.

1) Status byte (STB) and service request Enable (SRE) register

STB is defined in IEEE488.2, and the instrument status can be reflected roughly by collecting the information of the low-order register. "bit6" refers to the data sum of other status bytes. The STB can thus be compared with the condition part of an SCPI register and assumes the highest level within the SCPI hierarchy. The status byte value can be read by the command "*STB?" or by means of series poll.

The status byte is connected to the SRE register. Each data bit of the status byte corresponds to one bit of the SRE register. "bit6" of the SRE register will be ignored. If one data bit in the SRE register is set, and the associated STB bit changes from 0 to 1, one service request queue (SRQ) will be produced. The general command "*SRE" is used for setting the SRE register, and "*SRE?" is used for reading the value of the SRE register. The status bytes are described as follows.

Table 2.6 Description of Status Bytes

Data bit	Meaning
0..1	Not used
2	Error queue not empty The bit is set when an entry is made in the error queue. If this bit is enabled by the associated SRE, each entry of the error queue generates a service request. Thus an error can be recognized and inquired, which considerably reduces the problems involved with remote control.
3	Sum bit of the QUEStionable status register data This bit is set if an event bit is set in the QUEStionable status register and the associated ENABle bit is set to 1. A set bit indicates a questionable instrument status, which can be specified in greater detail by polling the QUEStionable status register.
4	MAV bit (message available) The bit is set if a message is available in the output buffer which can be read. This bit can be used when the controller queries instrument information.
5	ESB bit Sum bit of the event status register. It is set if one of the bits in the event status register is set and enabled in the event status enable register. Setting of this bit as 1 indicates a serious error which can be specified in greater detail by querying the event status register.
6	MSS bit (master status summary bit) The bit is set if the instrument triggers a service request.
7	Sum bit of the operation status register data This bit is set if an event bit is set in the operation status register and the associated enable bit is set to 1. A set bit indicates that the instrument is just performing an action. The type of action can be obtained by querying the operation status register.

2) IST flag and parallel poll enable (PPE) register

The IST combines the entire status information in a single bit. It can be obtained by means of a parallel poll or by sending command "*IST?". The STB data bit for the IST sign depends on the associated Parallel Poll Enable (PPE) Register. The bits of the STB are ANDed with the corresponding bits of the PPE, with bit6 being used as well in contrast to the SRE. The IST flag results from the ORing of all results. The PPE can be set through the command "*PRE" and be read through the command "*PRE?".

3) Event status register (ESR) and event status enable (ESE) register

The ESR is defined in IEEE 488.2. The event status register (ESR) can be read out using command "*ESR?". The ESE corresponds to the enable part of a SCPI register. If a bit is set in the ESE and the associated bit in the ESR changes from 0 to 1, the ESB bit in the STB is set. The ESE register can be set using the command "*ESE" and read using the command "*ESE?".

Table 2.7 Description of Event Status Bytes

Data bit	Meaning
0	Operation complete This bit is set on receipt of the command *OPC when all previous commands have been executed.
1	Not used
2	Query error This bit is set if either the controller wants to read data from the instrument without having sent a query, or if it does not read requested data and sends new command. It indicates that query cannot be executed due to error query.
3	Device-dependent error This bit is set if a device-dependent error occurs. Error code scope: -300 - -399. Or a positive error code. For details of error information, query the error queue.
4	Execution error

	This bit is set if a received command is syntactically correct but cannot be executed. At the same time, an error with a number between -200 and -300 is generated in the error queue.
5	Command error This bit is set if a command that is syntactically incorrect is received. Error code range: -100~-200, for details of error message, query the error queue.
6	User request This bit is set when the instrument is switched over to Auto OFF control.
7	Power on This bit is set when the instrument is switched on.

2.1.6 Error queue

Each error status of the instrument corresponds to one entry of the error queue. Specific error texts can be viewed in the error log or queried by remote commands: SYSTem:ERRor[:NEXT]? or SYSTem:ERRor:ALL?. If no error exists in the error queue, the returned value of query is 0, indicating "no error".

The error queue should be queried during handling of the controller service request, as more accurate error causes them those of the status register can be obtained. Particularly, the error queue should be queried frequently in the controller program test to determine the error command records sent by the controller to the instrument.

2.1.6.1 Reset Status Report System

The following list shows the commands and events of the reset status report system. Except the command "*RST" and "SYSTem:PRESet", the other commands cannot be applied to change the functional settings of the instrument. Similarly, the instrument settings cannot be changed by DCL. Details are as follows:

Table 2.8 Reset Status Report System

Event effect	Power switch **(clear in the ON state)**		DCL and SDC (device clear, selected device clear)	*RST or SYSTem: **PRESet**	**STATus: PRESet**	***CLS**
	0	**1**				
Clear STB and ESR	—	Yes	—	—	—	Yes
Clear SRE and ESE	—	Yes	—	—	—	—
Clear PPE	—	Yes	—	—	—	—
Clear the event part of the register	—	Yes	—	—	—	Yes
Clear the enabled part of the operation and query register Fill 1 in the enabled parts of other registers	—	Yes	—	—	Yes	—
Fill 1 in the positive transfer part. Clear the negative transfer part.	—	Yes	—	—	Yes	—
Clear the error queue	Yes	Yes	—	—	—	Yes
Clear the output buffer	Yes	Yes	Yes	—	—	—
Clear the command processing and input buffer	Yes	Yes	Yes	—	—	—

2.1.7 Programming Precautions

1) Initialize the instrument status before changing the setting.

For instrument setting of remote control, initialize the instrument status (sending "*RST", etc.) and then set the required status.

2) Command sequence

Generally, the setting command and query command should be transmitted separately. Otherwise, the returned value of the query command will change according to the current instrument operation sequence.

3) Fault response

The service request must be sent by the instrument. The controller of the test system should be programmed to guide the instrument to actively send the service request if required, so as to enable the corresponding service interruption program.

4) Error queue

The error queue instead of the status register should be inquired once the service request is processed by the controller program, so as to find more accurate causes. The queue should be always inquired in the controller program test phase to obtain the commands sent by the controller to the instrument.

2.2 Programmed Port and Configuration of Instrument

2.2.1 LAN

The programmed LAN (Local Area Network) system is configured with SICL-LAN to control 4051 series signal/spectrum analyzer.

Attention

Use of USB master control port connector of the front panel:

The Type-A connector of the front panel is a USB master control port connector. In the 4051 series signal/spectrum analyzer, this port is connected to the flash disc with USB1.1 interface to update the software in the instrument. It can also be connected to the USB keyboard and mouse to control the signal/spectrum analyzer. However, this port cannot be used for remotely control the instrument.

2.2.1.1 Establish Connection

Connect the 4051 series signal/spectrum analyzer and external controller (computer) to LAN through cables.

2.2.1.2 Interface Configuration

Ensure that the physical connection is smooth for remote control of the signal/spectrum analyzer by LAN. As the DHCP, domain name access and WAN are not supported, the network programming of the signal/spectrum analyzer is simple. In the menu shown in Fig. 2.5, set the "IP address", "Subnet mask" and "Default gateway" into the subnet in which the host controller is connected by pressing 【System】 [Interface Config>>] [Internet Config>>].

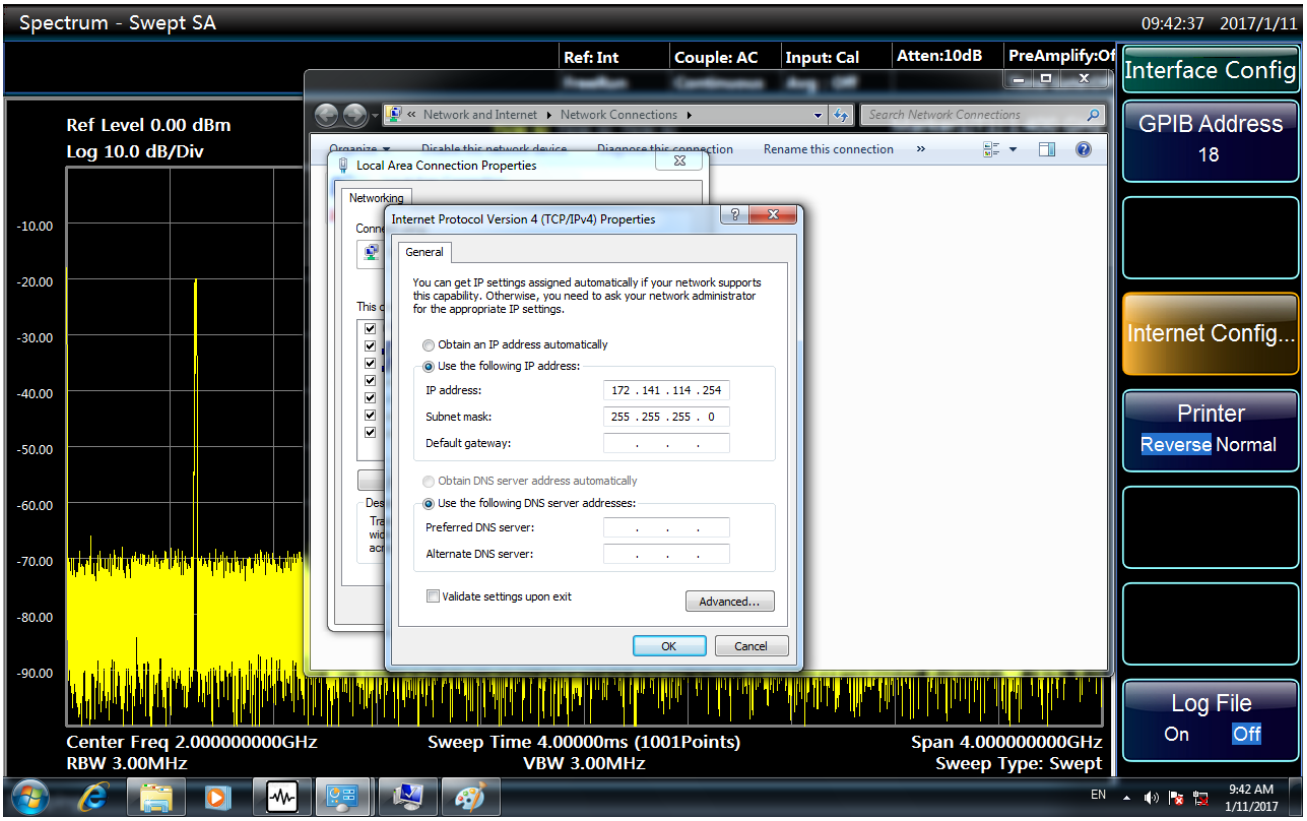

Fig. 2.5 LAN Interface Setting

Attention

Ensure that the signal/spectrum analyzer is in proper physical connection via 10 Base-T LAN or 100 Base-T LAN cable.

The signal/spectrum analyzer only supports the establishment of one LAN control system and static IP address setting, and does not support DHCP or access to the host through the DNS and domain name server. Therefore, it is not required to modify the subnet mask. The subnet mask of the instrument should be set as the fixed value 253.353.355.0.

2.2.2 GPIB

2.2.2.1 Establish Connection

Connect the 4051 series signal/spectrum analyzer and external controller (computer) to LAN through GPIB cables.

2.2.2.2 Interface Configuration

The user may need to modify the GPIB address in system building. The default GPIB address of the signal/spectrum analyzer is 18. Change the GPIB address as follows:

2.3 I/O Library

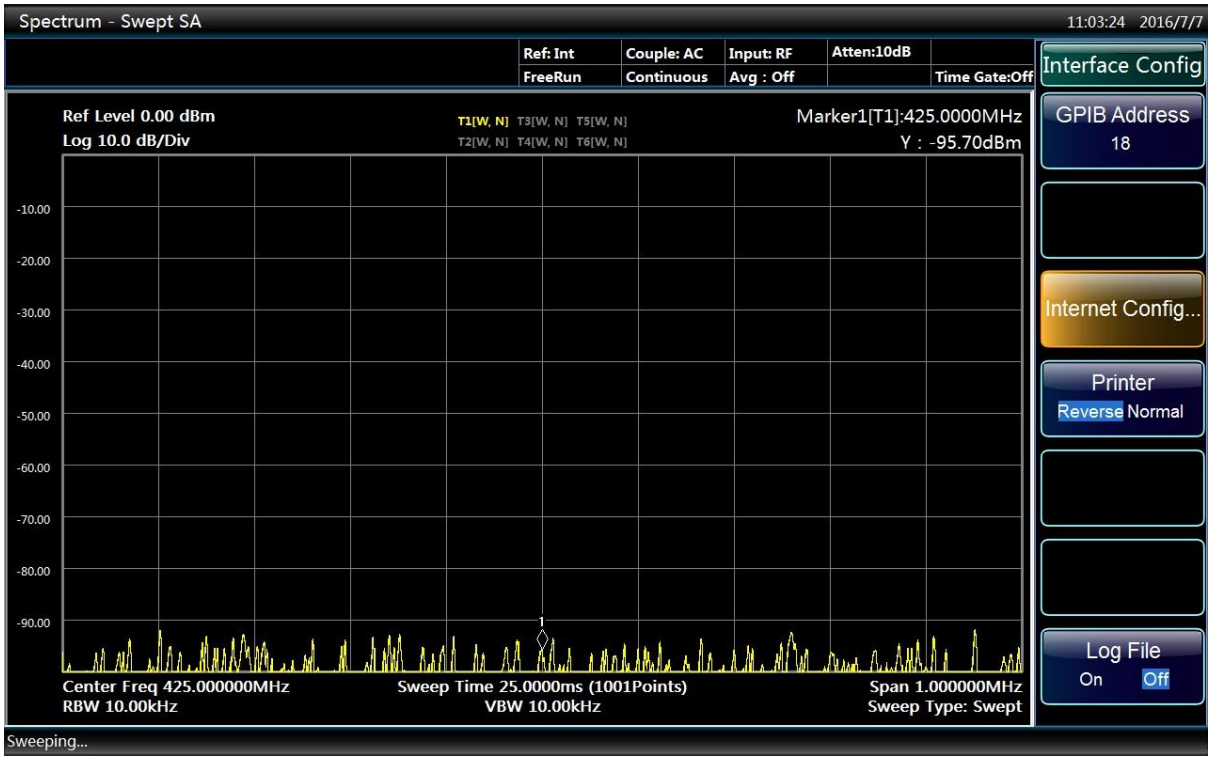

Fig. 2.6 GPIB Interface Setting

Press 【System】 [Interface Config>>] [GPIB Address] to enter the interface shown in Fig. 2.6. Modify the GPIB address in the local GPIB address input box through the number keys of the front panel.

2.3 I/O Library

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2.3.1 Overview of I/O Library

The I/O library is a library of pre-written software programs for the instrument, known as the instrument drive program, i.e. instrument driver. It is an intermediate software layer between the computer and instrument hardware equipment. It is composed of the function library, utility program, tool kit, etc., and is a set of software code modules. This set corresponds to a series of planned operations, such as instrument configuration, reading, writing, triggering, etc. It is installed the computer and used as a connecting bridge and link between the computer and instrument. With the easy-to-program high-level modular library, the user does not need to the complex special low-level programming protocol for the specific instrument. It is key to use the instrument driver to rapidly develop the test measurement application.

From the functional perspective, one general instrument driver is composed of five parts: functional body, interactive developer interface, program developer interface, subprogram interface and I/O interface, as shown in Fig. 2.12.

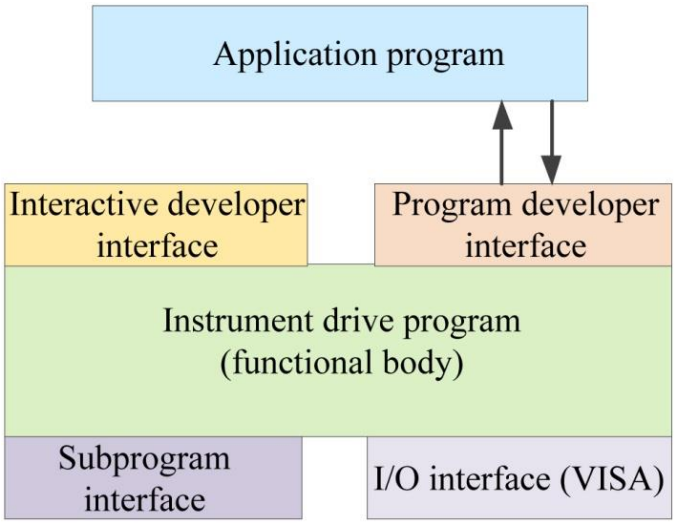

Fig. 2.12 Instrument Driver Structure Model

Details are as follows:

1) Functional body. This is the main functional part of the instrument driver and can be understood as the framework program of the instrument driver.

2) Interactive developer interface To facilitate use, the graphical interactive developer interface is generally set in the application environment supporting instrument driver development. For example, the function panel of Labwindows/CVI is a kind of interactive development interface. Each parameter of the instrument driver function in the function panel is expressed in the graphical control form.

3) Programming developer interface This is a software interface for the application program to call the instrument driver function, such as the dynamic link library file of instrument driver.dll in the Windows system.

4) I/O interface It is used for actual communication between the instrument driver and instrument. It is allowed to use the special bus I/O software, such as GPIB and RS-232, or the general standard I/O software (VISAI/O) to be used over multiple buses.

5) Subprogram interface It is a software interface for the instrument driver to visit other supporting libraries, such as the data library, FFT function, etc. It will be used when other software modules, operating systems, program code libraries and analysis function libraries are called by the instrument driver after completion of tasks.

2.3.2 I/O Library Installation and Configuration

With applications in the test field, the I/O library has experienced various development phases from the traditional instrument to virtual instrument. In order ensure the instrument interchangeability in the automatic test system and the reusability of the test program, the instrument drive program has also experienced various development phases. At present, the popular universal driver is an IVI (Interchangeable Virtual Instruments) instrument driver. Based on the IVI specification, the new instrument programming interface, inserted drive program and VPP architecture on VISA are defined, so that the test application program is fully independent of the instrument hardware. In addition, the unique functions of instrument simulation, range detection and status caching are added to improve the system operating efficiency and truly realize the instrument interchangeability.

IVI drives are divided into two types: IVI-C and IVI-COM. The IVI-COM drive is based on the Microsoft component object model (COM) technology and of COM API form. The IVI-C drive is based on the ANSI C technology and of C API form. The two types of drivers are designed in accordance with the instrument categories defined in the IVI specifications. The application development environments are the same, including Visual Studio, Visual Basic, Agilent VEE, LabVIEW, CVI/LabWindows, etc.

2.3 I/O Library

In order to meet user requirements in different development environments, two types of drivers are needed at present. The IVI drive of the signal/spectrum analyzer is developed with Nimbus Driver Studio, and the IVI-COM and IVI-C drive and program installation package is generated directly. For specific installation configuration, refer to the accompanying data of the control card and I/O library.

The installed IVI driver is divided into the IVI inherent function group and instrument function group (basic function group and extended function group). For specific functional classification, functions and attribute details, refer to the help file of the driver.

Prompt

Port configuration and I/O library installation:

Before controlling the signal/spectrum analyzer with a computer, check whether the necessary port and I/O library are properly installed and configured.

Prompt

Use of I/O library:

If the accompanying IVI-COM/C drive program installation package is installed, the function panel, help file and drive function example programs will be installed automatically to facilitate development and integration of the programmed functions.

3 Remote Command

3.1 Command Description

This section provides the detailed command reference information to facilitate remote control. Specific contents include:

- Command commands;
- Instrument Commands;
- Detailed functional description and associated command introduction;
- Supported command formats (setting or query);
- Parameter description, including the data type, value range and default value (unit);
- Unless otherwise noted, the current command is only applicable to 4051.
- Other description.

3.2 Common Commands

General commands are applied to control the instrument status register, status report, synchronization, data storage and other general functions. The usages and functions of general commands are applicable to various instruments. All common commands can be identified by the first "*". Refer to IEEE488.2 for the detailed definitions of such common commands.

The following are the explanations and descriptions of IEEE488.2 common commands.

Prompt

Command use:

Unless otherwise noted, the commands are suitable for setting or query.

The command which is only suitable for setting or query or initiation of one event is separately described in the command introduction section.

***CLS**

Function description: clear the status. Set the event of the status byte (STB) register, standard event register (ESR) and improper operation register is zero. This command cannot be applied to change the value of the shielding and transfer register or clear the output buffer zone.

Note: only for setting.

***ESE<Value>**

Function description: set the event status enable register.

Parameter description: range [0, 255]

***ESE?**

Function description: query the event status enable register and return decimal value.

***ESR?**

Function description: read the decimal value of the event status register and set the register value as zero.

Note: only for query.

3.2 Common Commands

***IDN?**

Function description: return the instrument identification.

Return value:

<ID> “manufacturer, <instrument model>, <string number>, <firmware version number>”

Examples: CETC41,4051,1312.8000K26/100005,1.30

Note: only for query.

***OPC**

Function description: complete the operation. After execution of all commands to be processed, set the bit0 of the event status register. This bit is applicable to start of the service request. After all commands are executed, 1 will be written as the command query format in the buffer zone, in order to realize command synchronization.

***OPC?**

Function description: hold off subsequent commands and return a “1” after all the current commands are completed. Then the program continues. This command can also be used to synchronize operations of the instrument.

***RST**

Function description: Reset most signal generator functions to a factory-defined state.

Note: only for setting.

***SRE<Value>**

Function description: Set values in the Service Request Enable register.

Parameter description: range [0, 255]

***SRE?**

Function description: Return values in the Service Request Enable register.

Returned value: range: 0-63 or 128-191.

***STB?**

Function description: query status byte.

Returned value: range [0, 255]

***WAI**

Function description: wait until all blocked operations have completed before executing subsequent commands.

Note: only for setting.

***TRG**

Function description: trigger the commands.

Note: only for setting.

3.3 Instrument Commands

3.3.1 General

[GPIB Address]

Set GPIB address. that is 18 by default.

Program control commands:

:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess <integer>

:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess?

Examples:

:SYST:COMM:GPIB:ADDR 20

[Error List ▶]

Pop up a list of current apparatus error. When the apparatus has an error, the error information bar at the lower part of screen will give error message.

Program control commands:

:SYSTem:ERRor[:NEXT]?

Examples:

:SYST:ERR?

[Preset Fact User]

This command is used to select the factory preset or user preset by user in case of preset operation by [Preset] on front panel. By default, the apparatus implements the user preset. If the user fails to save the user preset state, the apparatus will keep invariable the current state.

Program control commands:

:SYSTem:PRESet:USER

Examples:

:SYST:PRES:USER

[Save UserPreset]

This command is used to save the current working state of apparatus as user preset state. When the user in [Preset Factory User] menu is selected and the preset operation is done by using [Preset] on front panel, the apparatus working sate will automatically recover to the user preset state.

Program control commands:

:SYSTem:PRESet:USER:SAVE

Examples:

:SYST:PRES:USER:SAVE

[Align All]

3.3 Instrument Commands

Align all parameters of signal/spectrum analyzer. One align often expends several minutes.

Program control commands:

:CALibration[:ALL]

:CALibration[:ALL]?

Examples:

:CAL

:CAL?

[Auto Align

On Off]

Control the automatic align On or Off. By default, this function is set On. The signal/spectrum analyzer will determine alignment or not upon the boot time and test apparatus internal temperature change. When [Auto Align On Off] is On, the auto alignment will be done within 15 minutes after starting. If the apparatus finds the internal temperature change greater than 10℃ within 15 minutes, the apparatus will stop the current test immediately for auto alignment. After alignment, the measurement will continue. When the internal temperature change exceeds 10℃, the auto alignment will be done. If you don't interrupt your normal measurement due to auto alignment, you can set [Auto Align On Off] as Off. However, if the internal temperature change of apparatus is large or the auto alignment is not done for long, the measuring result will be affected.

Program control commands:

:CALibration:AUTO OFF|ON

:CALibration:AUTO?

Examples:

:CAL:AUTO OFF

[Log File

On Off]

Write some information of operating apparatus into file, including the program control command input. The log file will automatically generate under the directory of Factdir/Log in program operating directory when startup. By default, this switch is Off.

Program control commands:

:SYSTem:CLOGging ON|OFF

:SYSTem:CLOGging?

Examples:

:SYST:CLOG ON

:SYST:CLOG?

3.3.1.1 Mode

Select the measurement mode of signal/spectrum analyzer. Under standard configuration, besides spectrum analysis mode, IQ analysis mode is also provided. After purchase of options and updating of licenses, vector analysis, analog demodulation, pulse analysis, multi-domain analysis, audio analysis, phase noise, noise factor are provided.

[Spectrum]

Control the signal/spectrum analyzer to get access to the swept analysis mode.

Program control commands:

:INSTrument SA

Examples:

:INST SA

[IQ Analyzer]

Control the signal/spectrum analyzer to get access to the IQ Analysis mode.

Program control commands:

:INSTrument BASIC

Examples:

:INST BASIC

[Analog Demod]

Control the signal/spectrum analyzer to get access to the analog demodulation mode.

Program control commands:

:INSTrument ADEMOD

Examples:

:INST ADEMOD

[Phase Noise]

Control the signal/spectrum analyzer to get access to the phase noise mode.

Program control commands:

:INSTrument PNOISE

Examples:

:INST PNOISE

3.3.1.2 Measure

Under the spectrum analysis mode, select the measurement function and set the radio communication standard and equipment state. Under the spectrum analysis mode, the measurement menu includes: [Swept SA]、[Channel Power]、[Occupied BW]、[ACP]、[Power Stat

CCDF]、[Burst Power]、[Harmonics]、[TOI]、[Spurious Emission]、[Spectrum Emission Mask]、[Radio Std None ▸]、[Radio Device BTS ▸]。

[Swept SA]

Control the signal/spectrum analyzer into scan frequency analysis and measurement function.

Program control commands:

:CONFigure:SANalyzer

3.3 Instrument Commands

:CONFigure?

Examples:

:CONF:SAN

[Channel Power]

Control the signal/spectrum analyzer into Channel Power measurement function.

Program control commands:

:CONFigure:CHPower

Examples:

:CONF:CHP

[Occupied BW]

Control the signal/spectrum analyzer into Occupied BW measurement function.

Program control commands:

:CONFigure:OBWidth

Examples:

:CONF:OBW

[ACP]

Control the signal/spectrum analyzer into ACP measurement function.

Program control commands:

:CONFigure:ACPower

Examples:

:CONF:ACP

[Power Stat

CCDF]

Control the signal/spectrum analyzer into Power Stat CCDF measurement function.

Program control commands:

:CONFigure:PSTatistic

Examples:

:CONF:PST

[Burst Power]

Control the signal/spectrum analyzer into Burst Power measurement function.

Program control commands:

:CONFigure:TXPower

Examples:

:CONF:TXP

[Harmonics]

Control the signal/spectrum analyzer into Harmonics measurement function.

Program control commands:

:CONFigure:HARMonics

Examples:

:CONF:HARM

[TOI]

Control the signal/spectrum analyzer into TOI measurement function.

Program control commands:

:CONFigure:TOI

Examples:

:CONF:TOI

[Spurious Emission]

Control the signal/spectrum analyzer into Spurious Emission measurement function.

Program control commands:

:CONFigure:SPURious

Examples:

:CONF:SPUR

[Spectrum Emission Mask]

Control the signal/spectrum analyzer into Spectrum Emission Mask measurement function.

Program control commands:

:CONFigure:SEMask

Examples:

:CONF:SEM

[Radio Std None ▸]

Set the radio communication standard selected by the measuring function under the spectrum analysis mode. The table below includes the description whether the measuring function under each radio communication standard is available or not.

Table 3.1 Relationship between measuring function and radio standard

3.3 Instrument Commands

	CDMA IS95A	CDMA J-STD008	CDMA IS95C	W-CDMA 3GPP	cdma2000	NADC	PDC	TETRA	GSM	TD-SCDMA	W-LAN 802.11a	W-LAN 802.11b	W-LAN 802.11g
信道功率	•	•	•	•	•	•	•	•		•	•	•	•
占用带宽	•	•	•	•	•	•	•			•	•	•	•
邻道功率	•	•	•	•	•	•	•	•		•	•	•	•
功率统计	•	•	•	•	•	•	•		•	•			
突发功率	•	•		•	•	•	•		•	•			
频谱发射模板				•									
杂散发射													
谐波失真													
三阶交调													

Program control commands:

[:SENSe]:RADio:STANdard[:SELect] NONE|JSTD|IS95A|IS95C|W3GPP|C2000|NADC|PDC|TETRA|GSM|TDSCDMA|WL802DOT11A|WL802DOT11B|WL802DOT11G

[:SENSe]:RADio:STANdard[:SELect]?

Examples:

:RADio:STANdard W3GPP

:RADio:STANdard?

[Radio Device BTS ▸]

Set the type of radio communication device selected under the spectrum analysis mode, including Base Transceiver Station (BTS) and Mobile Station (MS).

Program control commands:

[:SENSe]:RADio:STANdard:DEVice BTS|MS

[:SENSe]:RADio:STANdard:DEVice?

Examples:

:RADio:STANdard:DEVice MS

:RADio:STANdard:DEVice?

3.3.1.3 File

The popup menus in relation to file include [Save…], [Load…], [Save Type State▸], [Load Type State▸] and [Exit]

[Save⋯]

It is allowed to the following two steps to save file:

a) Firs select the type of file to be saved: press the menus [File] , [Save Type State ▸] in turn to select the type to be saved; by default, the save type is selected as "State", namely, the current working state of apparatus.

b) While pressing the menu [Save…], pop up a Windows standard file save dialog box. Select a file directory, enter the name of file to be saved, and press the save key to complete the save operation. If you don't want to save the file, please press the cancel button to end the file save operation.***Program control commands:***

:MMEMory:STORe:STATe <filename>

:MMEMory:STORe:SCReen <filename>

Examples:

:MMEM:STOR:STAT 1.sta

:MMEM:STOR:SCR 1.bmp

[Load…]

It is allowed to the following two steps to load file:

a) Firs select the type of file to be loaded: press the menus [File] , [Load Type State ▸] in turn to select the type to be loaded; by default, the load type is selected as "State", namely, the saved working state of apparatus.

b) While pressing the menu [Load…], pop up a Windows standard file dialog box. Select the directory and name of the file to be loaded, and press the open button to complete the fire load operation If you don't want to load the file, please press the cancel button to end the file load operation.***Program control commands:***

:MMEMory:LOAD:STATe <filename>

Examples:

:MMEM:LOAD:STAT 1.sta

3.3.1.4 Print

The key [Print] on front panel has no relevant menu. When pressing the key [Print] on front panel, it is allowed to control the signal/spectrum analyzer for screen snapshooting and print.

Program control commands:

:HCOPy[:IMMediate]

Examples:

:HCOP

3.3.2 Swept Analysis

3.3.2.1 Frequency

The frequency command corresponds to the 【Frequency】 key on the front panel.

This command is used to set parameters related to the signal/spectrum analyzer frequency, including [Center Freq], [Start Freq], [Stop Freq], [CF Step Auto Man], [Freq Offset], [Auto Tune], [Signal Track ON OFF].The User can configure the frequency measure scope through the [Start Freq] and [Stop Freq], or through the [Center Freq] and [Span].

[Center Freq]

Program control commands:

[:SENSe]:FREQuency:CENTer <frequency> [:SENSe]:FREQuency:CENTer?

Command description: to set the center frequency of the signal/spectrum analyzer. If the set center frequency is inconsistent with the current span, the latter will automatically change to the value best suitable for desired frequency.

Key path:【Frequency】, [Center Freq] on the front panel.

Setting range: Min.: 0 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT 5 GHz

[Start Freq]

Program control commands:

[:SENSe]:FREQuency:STARt <freq>

[:SENSe]:FREQuency:STARt?

Command description: to set start frequency of the signal/spectrum analyzer. In changing the start frequency, if the selected start frequency is larger than the stop frequency, the latter one will automatically increase till equaling to the sum of start frequency plus minimum span (100 Hz multiply N, where, N is the harmonic order of local oscillator).

Key Entry: 【Frequency】, [Start Freq] on the front panel.

Setting range: Min.: -100 MHz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:STAR 200 MHz

[Stop Freq]

Program control commands:

[:SENSe]:FREQuency:STOP <frequency>

[:SENSe]:FREQuency:STOP?

Command description: to set stop frequency of the signal/spectrum analyzer. In changing stop frequency, if the selected stop frequency is less than the start frequency, the latter one will automatically decrease till equaling to the difference of stop frequency minus minimum span (100 Hz multiply N, where, N is the harmonic order of local oscillator).

Key path: 【Frequency】, [Stop Freq] on the front panel.

Setting range: Min.: 0 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:STOP 1600 MHz

[Step Freq]

Program control commands:

[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>

[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?

[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:CENTer:STEP:AUTO?

Command description: to change the step size of the [Center Freq] , start frequency or [Stop Freq]. When it is under [Auto Mode], and when the center frequency is active, press the step key, the [CF Step] changes by 1, 2, 5 and 10. When it is under Auto Off mode, use the number keys, stepping keys or knob for change. At this time, reactivate the [Center Freq], and press the step key, the center freq will change by set step size.

Key path: 【Frequency】, [CF Step Auto Man] on the front panel.

Setting range: Min.: 1Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT:STEP 100 MHz

:FREQ:CENT:STEP:AUTO ON

[Freq Offset]

Program control commands:

[:SENSe]:FREQuency:OFFSet <freq>

[:SENSe]:FREQuency:OFFSet?

Command description: to add the set frequency offset to the displayed frequency value, including marker frequency value, but this does not affect the signal display position.

Key path: 【Frequency】, [Freq Offset] on the front panel.

Setting range: Min.:-500 GHz, Max.: +500 GHz.

Default unit: Hz

Examples:

:FREQ:OFFS 10 MHz

[Auto Tune]

Program control commands:

[:SENSe]:FREQuency:TUNE:IMMediate

Command description: the instrument automatically sets parameters like center frequency, span and reference level based on input signal characteristics.

Key path: 【Frequency】, [Auto Tune] on the front panel.

Examples:

:FREQ:TUNE:IMM

[Signal Track On Off]

Program control commands:

:CALCulate:MARKer:TRCKing[:STATe] OFF|ON|0|1

:CALCulate:MARKer:TRCKing[:STATe]?

Command description: to enable or disable the signal tracking function. The enabling marker is on the signal peak point, and the peak frequency is set as the center frequency. In each sweep, perform this function and place the marker at the center frequency.

3.3 Instrument Commands

Key path: 【Frequency】, [Signal Track On Off] on the front panel.

Examples:

:CALC:MARK:TRCK ON

:CALC:MARK:TRCK?

3.3.2.2 Ampld/YScale

The Amplitude/Y Axis command corresponds to the 【Ampld/YScale】 key on the front panel.

[Ref Level]

Program control commands:

:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel <real>

:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel?

Command description: to set the reference level. The reference level corresponds to the top of the coordinate top. Measure signal at reference level position to get highest accuracy. The input attenuator of the signal/spectrum analyzer is coupled to the reference level, which can be automatically changed to avoid compression of input signal.

Key path: 【Ampld/YScale】, [RefLevel] on the front panel.

Setting range: Min.: -170 dBm, Max.: 30 dBm.

Default unit: set based on Y Axis scale unit.

Examples:

:DISP:WIND:TRAC:Y:RLEV 20 dBm

[Attenuation>>]

Adjust the mechanical attenuator, mechanical attenuator step, maximum mixer level. When the electronic attenuator options are configured correctly, it can be used for switching on or off the electronic attenuator and setting its attenuation. including [Mech Atten Auto Man], [Mech Atten Step 2 dB 10 dB], [Electronic Attenuator On Off], [Electronic Attenuator 0.00 dB] and [Max Mixer Level].

[Mech Atten Auto Man]

Program control commands:

[:SENSe]:POWer[:RF]:ATTenuation <rel_power>

[:SENSe]:POWer[:RF]:ATTenuation?

[:SENSe]:POWer[:RF]:ATTenuation:AUTO OFF|ON|0|1

[:SENSe]:POWer[:RF]:ATTenuation:AUTO?

Command description: Under Auto ON mode, the mechanical attenuator is coupled to the reference level. Under Auto OFF Mode, set attenuation of the attenuator.

Key path: 【Amplitude/Y Axis】, [Attenuation>>], [Mech Atten Auto Man] on the front panel.

Setting range: Min.:0 dB, Max.: 70 dB.

Default unit: dB.

Examples:

:POW:ATT 30 dB

:POW:ATT:AUTO ON

Other instructions:

The mechanical attenuator, in general, is set as Auto ON mode. When the reference level changes, the attenuation will automatically change, but this does not change the reference level. This change aims to ensure that the maximum signal amplitude of the input mixer is less than or equals to -10 dBm. For example, if the reference level is +23 dBm and the mixer input level is -17 dBm, the mixer is 40 dB (23- 40= -17). The final purpose is to prevent signal compression. When the mechanical atten is under Auto Off mode, press the [Mech Atten Auto Man], couple the attenuation to the reflevel again.

Note: the maximum input signal amplitude of the input attenuator (at least 10 dB input attenuation) is +30 dBm, otherwise, this power signal will damage the mechanical attenuator or the input mixer.

[Preamplifier ON OFF]

Program control commands:

[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1

[:SENSe]:POWer[:RF]:GAIN[:STATe]?

Command description: to control the on/off of the preamplifier. This command is only active when the preamplifier options are configured.

Key path: 【Amplitude/Y Axis】, [Preamplifier ON OFF] on the front panel.

Examples:

:POW:GAIN OFF

:POW:GAIN?

[Mech Atten Step 2 dB 10 dB]

Program control commands:

[:SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement] 10 dB | 2 dB

[:SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement]?

Command description: to control the mechanical attenuator step size. The step size can only be increased or decreased by 10 dB or 2 dB. For 2 dB step, the input mixer level can be set based on input signal optimization to improve measurement dynamic scope.

Key path: 【Amplitude/Y Axis】, [Attenuation>>], [Mech Atten Step 2 dB 10 dB] on the front panel.

Examples:

:POW:ATT:STEP 10 dB

:POW:ATT:STEP?

[Max Mixer Level]

Program control commands:

[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer] <power>

[:SENSe]:POWer[:RF]:MIXer:RANGe[UPPer]?

Command description: To set the input maximum mixer level. This level is used as the maximum level limit of the input mixer for assignment of reference level. The level is equivalent to reference level value minus the attenuator decrement when the reference level changes, the mechanical attenuator also changes to ensure that

the signal display on the reference level will not be larger than the maximum mixer level. If the maximum mixer level decreases, the instrument will automatically optimize the distortion performance under default measurement mode. If the maximum mixer level increases, the mixer may be damaged by excessive input signal. This parameter cannot be changed unless the user has a good knowledge of the signal analyzer.

Key path: 【Amplitude/Y Axis】, [Attenuation>>], [Max Mixer Level] on the front panel.

Setting range: Min.: -50 dBm, Max.: -10 dBm.

Default unit: dBm.

Examples:

:POW:MIX:RANG -15 dBm

[Electronic Attenuation On Off]

Program control commands:

[:SENSe]:POWer[:RF]:EATTenuation:STATe OFF|ON|0|1

[:SENSe]:POWer[:RF]:EATTenuation:STATe?

Command description: this command is active only when the electronic attenuator options are configured. It is used to switch on or off the electronic attenuator. The electronic attenuator is only active when measuring signal with frequency between 3 Hz and 4 GHz.

Key path: 【Amplitude/Y Axis】, [Attenuation>>], [Enable Electronic Attenuation ON OFF] on the front panel.

Examples:

:POW:EATT:STAT ON

[Electronic Attenuation 0.00 dB]

Program control commands:

[:SENSe]:POWer[:RF]:EATTenuation <rel_ampl>

[:SENSe]:POWer[:RF]:EATTenuation?

Command description: this command is active only when the electronic attenuator options are configured. It is used to manually set the attenuation of electronic attenuator. The electronic attenuator is only active when measuring signal with frequency between 3 Hz and 4 GHz.

Key path: 【Amplitude/Y Axis】, [Attenuation>>], [Electronic Attenuation 0.00 dB] on the front panel.

Setting range: Min: 0 dB, Max: 30 dB.

Examples:

:POW:EATT 24 dB

[Scale Type Logarithm Linear]

Program control commands:

:DISPlay:WINDow[1]:TRACe:Y:[SCALe]:SPACing LINear|LOGarithmic

:DISPlay:WINDow[1]:TRACe:Y:[SCALe]:SPACing?

Command description: to select the Y Axis or linear scale. In general, the logarithm scale unit is dBm and the linear scale unit is mV. Other unit types will be manually selected through the Y axis scale.

Key path: 【Amplitude/Y Axis】, [Scale Type Log Line] on the front panel.

Examples:

:DISP:WIND:TRAC:Y:SPAC LOG

[Scale/Div]

Program control commands:

:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:PDIVision <rel_ampl>

:DISPlay:WINDow[1]: TRACe:Y[:SCALe]:PDIVision?

Command description: to select the scale/division from 0.1dB/division to 20 dB/division. This command is only valid when the scale type is logarithm.

Key path: 【Amplitude/Y Axis】, [Scale/Div] on the front panel.

Setting range: Min.: 0.1 dB, Max.: 20 dBm.

Examples:

DISP:WIND:TRAC:Y:PDIV 5 DB

[Auto Scale]

Program control commands:

[:SENSe]:ADJust:LEVel

Command description: the instrument automatically sets parameters like reference level and scale/division based on input signal sizes. When this command is sent, the instrument performs one auto scaling. Setting rule for auto scaling: when the Auto Scale command is set, firstly obtain the maximum value and the minimum value based on current measurement trace data. Based on the maximum value, place on the 80% graticule of the screen trace Y axis for auto setting of reference level and scale/division.

Key path: 【Amplitude/Y Axis】, [Auto Scale] on the front panel.

Examples:

:ADJ:LEV

[Y Axis Unit]

Program control commands:

:UNIT:POWer DBM|DBMV|DBMA|V|W|A|DBUV|DBUA|DBUVM|DBUAM|DBPT|DBG

:UNIT:POWer?

Command description: to select the Y Axis unit from [dBm], [dBmV], [dBmA], [W], [V], [A], [dBμV] and [dBμA]. The instrument will automatically calculate the trace data and marker readout based on the Y axis scale unit.

Key path: 【Amplitude/Y Axis】, [More 1/2>>], [Y Axis Unit] on the front panel.

Examples:

:UNIT:POW dBmV

:UNIT:POW?

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[Ref Level Offset]

Program control commands:

:DISPlay:WINDow[1]:TRACe:Y:[SCALe]:RLEVel:OFFSet <rel_power>

:DISPlay:WINDow[1]:TRACe:Y:[SCALe]:RLEVel:OFFSet?

Command description: to introduce offset for all amplitude readout (e.g, reference level and marker amplitude). It will not change the trace position on the screen. This offset unit is dB and is not affected by the scale and unit.

Key path: 【Amplitude/Y Axis】, [More 1/2>>], [Ref Level Offset] on the front panel.

Setting range: Min.: -1000dB, Max.:1000dB.

Examples:

:DISP:WIND1:TRAC:Y:RLEV:OFFS 12.7

[Select Correction]

Program control commands:

[:SENSe]:CORRection:CSET[1]|2|3|4|5|6[:STATe] ON|OFF|1|0

[:SENSe]:CORRection:CSET[1]|2|3|4|5|6[:STATe]?

Command description: to select correction to be edited or applied, including [Correction 1], [Correction 2], [Correction 3], [Correction 4], [Correction 5], [Correction 6].

Key path: 【Amplitude/Y Axis】,[More1/2>>], [Ampl Cor], [Select Correction] on the front panel.

Examples:

:SENS:CORR:CSET1 ON

[Delete]

Program control commands:

[:SENSe]:CORRection:CSET[1]|2|3|4|5|6:DELete

Command description: to erase all correction values under editing.

Examples:

:CORR:CSET:DEL

[Apply All Correction ON OFF]

Program control commands:

[:SENSe]:CORRection:CSET:ALL[:STATe] ON|OFF|1|0

[:SENSe]:CORRection:CSET:ALL[:STATe]?

Command description: to apply all edited or called correction data on current measurement trace.

Examples:

:SENS:CORR:CSET:ALL OFF

[Delete All Corrections]

Program control commands:

[:SENSe]:CORRection:CSET:ALL:DELete

Command description: to erase all edited correction values.

Examples:

: CORR:CSET:ALL:DEL

3.3.2.3 Span/X Axis

This command corresponds to the 【Span/X Axis】 on the front panel. It enables the span function and sets the signal/spectrum analyzer into Center Freq/Span Mode.

[Span]

Program control commands:

[:SENSe]:FREQuency:SPAN <frequency>

[:SENSe]:FREQuency:SPAN?

Command description: to set the span value.

Key path: 【Span/X Axis】, [Span] on the front panel.

Setting range: Min.: 0 Hz (for non-zero span, Min.: 10 Hz); Max.: related to the maximum working frequency limit of the instrument.

Examples:

:FREQ:SPAN 22 GHz

[Full Span]

Program control commands:

[:SENSe]:FREQuency:SPAN:FULL

Command description: to set the signal/spectrum analyzer into the center frequency/span mode. Set the span as maximum value.

Examples:

:FREQ:SPAN:FULL

[Zero Span]

Program control commands:

[:SENSe]:FREQ:SPAN 0 Hz

Command description: to set the span as 0 Hz. It is good for observing signal at time domain, in particular, good for observation of modulating signal.

[Last Span]

Program control commands:

[:SENSe]:FREQuency:SPAN:PREVious

Command description: to set the signal/spectrum analyzer back to the previous span.

Examples:

:FREQ:SPAN:PREV

3.3.2.4 Bandwidth

This command sets Res BW and video bandwidth, including: [Res BW Auto Man], [Video BW Auto Man], [VBW/RBW Auto Man], [Span/RBW Auto Man], [Filter Type] and [Filter Bandwidth].

[Res BW]

Program control commands:

[:SENSe]:BANDwidth|BWIDth[:RESolution] <freq>

[:SENSe]:BANDwidth|BWIDth[:RESolution]?

[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO OFF|ON|0|1

[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO?

Command description: to change the swept analysis Res BW, ranging from 1 Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5 MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step.

Key path: 【BW】, [Res BW Auto Man] on the front panel.

Setting range: Min.:1 Hz, Max.: 20 MHz.

Default unit: Hz

Examples: BAND 1 kHz BWID:AUTO On

[Video BW]

Program control commands:

[:SENSe]:BANDwidth|BWIDth:VIDeo <freq>

[:SENSe]:BANDwidth|BWIDth:VIDeo?

[:SENSe]:BANDwidth|BWIDth:VIDeo:AUTO OFF|ON|0|1

[:SENSe]:BANDwidth|BWIDth:VIDeo:AUTO?

Command description: to change the video bandwidth displayed on the active function zone ranging from 1 Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5 MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step.

Key path: 【BW】, [Video BW Auto Man] on the front panel.

Setting range: Min.:1 Hz, Max.: 20 MHz.

Default unit: Hz

Examples:

:BAND:VID 1 kHz

:BWID:VID:AUTO ON

[VBW/RBW]

Program control commands:

[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio <number>

[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio?

Command description: to set the ratio between the current video bandwidth and Res BW with the default value as 1. As the Res BW changes, the video bandwidth changes to maintain this ratio. The ratio should be displayed on the input area and used for the coupling mode of those two kinds of bandwidth. When a new ratio is selected, change the video bandwidth to meet this new ratio and the Res BW should remain unchanged.

Key path: 【BW】, [VBW/RBW Auto Man] on the front panel.

Setting range: Min.:0.0001, Max.: 300000.

Examples:

:BAND:VID:RAT 2

[Span/RBW]

Program control commands:

[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio <integer>

[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio?

[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO?

Command description: to set the ratio between the current span and Res BW and display it in the input area. This ratio is used in coupling mode of the Res BW.

Key path: 【BW】, [Span RBW Auto Man] on the front panel.

Setting range: Min.:2, Max.: 10000.

Examples:

:FREQ:SPAN:BAND:RAT 20

[Filter Type]

Program control commands:

[:SENSe]:BANDwidth|BWIDth:SHAPe GAUSsian|FLATtop

[:SENSe]:BANDwidth|BWIDth:SHAPe?

Command description: comprising [Gaussian] and [Flattop]. In general, the signal/spectrum analyzer uses Gaussian filter, i.e., use filter approximate to the Gaussian shape to complete filtering of [Res BW]. If the flat top filter is used, the signal/spectrum analyzer adopts filter approximate to the rectangular shape to complete filtering of Res BW. The response time of flat top filter is about 3 times of that of the Gaussian filter. The sweep speed of the flat top filter is smaller than that of the Gaussian filter. The flat top filter has better selectivity than the Gaussian filter and therefore is more capable of distinguishing two signals with unequal amplitude.

Key path: 【BW】, [Filter Type] on the front panel.

Examples:

:BAND:SHAP GAUS

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[Filter BW]

Program control commands:

[:SENSe]:BANDwidth|BWIDth:TYPE DB3|DB6

[:SENSe]:BANDwidth|BWIDth:TYPE?

Command description: if Gaussian filter is used for the signal/spectrum analyzer, set the Res BW as 3 dB, 6 dB, pulse bandwidth or equivalent noise bandwidth. When this parameter is changed, the Res BW filter is fixed, and the bandwidth value in the information display zone changes.

Key path: 【BW】, [Filter BW] on the front panel.

Examples:

:BAND:TYPE NOIS

3.3.2.5 Auto Setting

This part corresponds to coupling menu. Except [Couple All], it is a shortcut for all related menus. For related remote commands, refer to command instructions of related menu.

[Couple All]

Program control commands:

:COUPle ALL|NONE

Command description: to set the sweep mode, Res BW, sweep time, mechanical attenuator and frequency step as auto coupling mode. The signal/spectrum analyzer will select most suitable values for those functions based on set frequency and bandwidth (or start frequency and stop frequency). These values will be set based on span and coupling ratio saved under [VBW/RBW] or the [Span/RBW]. If no ratio is pre-saved, use default ratio.

Key path: 【Auto Set】, [Couple All] on the front panel.

Examples:

:COUP ALL

3.3.2.6 Trace

This part corresponds to the 【Trace】 key on the front panel, including [Select Trace>>], [Clear Write], [Trace Average], [Max. Hold], [Min. Hold], [View/Blank], [Menu 1/2>>], [Detector >>], [Trace Math >>], [Copy>>], [Clear All Traces].

[Select Trace>> Trace 1]

Program control commands:

:TRACe<1|2|3|4|5|6>:TYPE WRITe|AVERage|MAXHold|MINHold

:TRACe<1|2|3|4|5|6>:TYPE?

Command description: to select trace. The signal/spectrum analyzer provides six trace lines including Trace 1, Trace 2, Trace 3, Trace 4, Trace 5 and Trace 6. The selected trace number will be marked in the menu, and the trace processing method, display method and detector type will be displayed on the screen top. After one trace is selected, the corresponding command trace processing, display method and detector typesetting are only active for the selected trace.

Key path: 【Trace】, [Select Trace>>] on the front panel.

Examples:

:TRAC:TYPE WRIT

[Clear Write]

Program control commands:

:TRACe<1|2|3|4|5|6>:TYPE WRITe

Command description: to set the current trace processing as Refresh, i.e., clear all data of displayed trace and continue the signal trace receipt under sweep status.

Key path: 【Trace】, [Select Trace>>], [Clear Write] on the front panel.

Examples:

:TRAC1:TYPE WRIT

[AverageTrace Average]

Program control commands:

:TRACe<1|2|3|4|5|6>:TYPE AVERage

Command description: to set the current trace processing method as Average, i.e., based on the average count N set in the 【Meas Setup】, update trace after averaging the performance index of the measurement trace.

Detailed algorithm:

New trace = ((K-1) previous trace + current measurement trace)/K

where, K is accumulated average count.

Under continuous measurement, when K is accumulated to the average count N set in the 【Meas Setup】, the K will always equal to N. Under single measurement status, when K is accumulated to the average count N set in the 【Meas Setup】, the measurement will stop.

Key path: 【Trace】, [Select Trace>>], [Trace Average] on the front panel.

Examples:

:TRAC1:TYPE AVER

[Max Hold]

Program control commands:

:TRACe<1|2|3|4|5|6>:TYPE MAXHold

Command description: to set the current trace processing method as maximum hold, i.e., the new trace data will be assigned with maximum value of previous measured trace data

Key path: 【Trace】, [Select Trace>>], [Max Hold] on the front panel.

Examples:

:TRAC1:TYPE MAX

[Min Hold]

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Program control commands:

:TRACe<1|2|3|4|5|6>:TYPE MINHold

Command description: to set the current trace processing method as minimum hold, i.e., the new trace data will be assigned with minimum value of previous measured trace data.

Key path: 【Trace】, [Select Trace>>], [Min Hold] on the front panel.

Examples:

:TRAC1:TYPE MIN

[View/Blank>>]

Program control commands:

:TRACe<1|2|3|4|5|6>:DISPlay[:STATe] ON|OFF|0|1

:TRACe<1|2|3|4|5|6>:DISPlay[:STATe]?

:TRACe<1|2|3|4|5|6>:UPDate[:STATe] ON|OFF|0|1

:TRACe<1|2|3|4|5|6>:UPDate[:STATe]?

Command description: to set display method for the selected trace from Refresh Display, Static Display, Backstage Refresh and Display OFF, which are completed through combination of the above four commands. Examples:

“Refresh” requires the combined commands below:

:TRACe<1|2|3|4|5|6>:DISPlay[:STATe] ON and :TRACe<1|2|3|4|5|6>:UPDate[:STATe] ON

“Display OFF” requires the combined commands below:

:TRACe<1|2|3|4|5|6>:DISPlay[:STATe] OFF and :TRACe<1|2|3|4|5|6>:UPDate[:STATe] OFF

“Static Display” requires the combined commands below:

:TRACe<1|2|3|4|5|6>:DISPlay[:STATe] ON and :TRACe<1|2|3|4|5|6>:UPDate[:STATe] OFF

“Backstage Refresh” requires the combined commands below:

:TRACe<1|2|3|4|5|6>:DISPlay[:STATe] OFF and :TRACe<1|2|3|4|5|6>:UPDate[:STATe] ON

Key path: 【Trace】, [Select Trace>>], [View/Blank]>>] on the front panel.

Examples:

:TRACe1:DISP ON

:TRACe1:DISP?

[Detector>>]

Set the detector command for the currently selected trace, including [Auto], [Normal], [Peak], [Sample], [Negative Peak], [Average>>], where, the average detector type includes video average, power average and voltage average.

[Auto]

Program control commands:

[:SENSe]:DETector:AUTO ON|OFF|1|0

[:SENSe]:DETector:AUTO?

Command description: to set the detector command for the currently selected trace as Auto. That means, the signal/spectrum analyzer will automatically select most suitable detector based on the parameter setting of currently selected trace, including trace processing method, trace average type, noise marker function, etc.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Auto] on the front panel.

Examples:

:DET:AUTO ON

[Normal]

Program control commands: [:SENSe]:DETector[:FUNCtion] NORMal [:SENSe]:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Normal, i.e., display the measurement results of positive peak and negative peak at the same time to achieve display effect similar to the analog instrument.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Normal] on the front panel.

Examples:

:DETector NORM

:DETector?

[Peak]

Program control commands: [:SENSe]:DETector[:FUNCtion] POSitive [:SENSe]:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Positive Peak, i.e., take the maximum value from sampling data assigned to each trace point.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Peak] on the front panel.

Examples:

:DETector POS

:DETector?

[Sample]

Program control commands: [:SENSe]:DETector[:FUNCtion] SAMPle [:SENSe]:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Sample, i.e., take the last value from sampling data assigned to each trace point.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Sample] on the front panel.

Examples:

:DETector SAMP

:DETector?

[Negative Peak]

Program control commands:

[:SENSe]:DETector[:FUNCtion] NEGative

[:SENSe]:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Negative Peak, i.e., take the minimum value from sampling data assigned to each trace point.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Negative Peak] on the front panel.

Examples:

:DETector NEG

:DETector?

[Average>> Video Average]

Program control commands:

[:SENSe]:DETector[:FUNCtion] AVERage

[:SENSe]:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Video Average. Also called Logarithm Power Average Detector, i.e., take the logarithm power average value for all data assigned to each trace point; earlier signal/spectrum analyzer generally displays the measurement trace of logarithm scale, and all filtering and averaging are based on the logarithm power data; the trace is generally called as video signal. After digital IF processing is adopted, to make measurement results same as the earlier signal/spectrum analyzer, the video average detector function is added.

Key path: 【Trace】, [Select Trace>>], [More 1/2▸], [Detector>>], [Average>>], [Log-Pwr Avg] on the front panel.

Examples:

:DETector AVER

:DETector?

[Average>> Log-Pwr Avg]

Program control commands: [:SENSe]:DETector[:FUNCtion] RMS [:SENSe]:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Power Average. Also called root mean square (RMS) detector. Calculate the root mean square of all sampling data assigned to each trace point; the 4051signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After square these voltage values, take sum and divide the count of sampling data points corresponding to each trace point. Finally, take square root. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those RMS values are trace data.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Average>>], [Pwr Avg] on the front panel.

Examples:

:DETector RMS

:DETector?

[Average>> Pwr Avg]

Program control commands:

[:SENSe]:DETector[:FUNCtion] SCALar

[:SENSe]:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Voltage Average. Also called average (AVG) detector. Take linear average for all sampling data assigned to each trace point; the 4051 signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After summing those voltage values, divide the number of sampling data points corresponding to each trace point. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those average values are trace data.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Average>>], [-Pwr Avg] on the front panel.

Examples:

:DETector SCAL

:DETector?

[Math>>]

Program control commands:

:CALCulate:MATH:MODE <LINear|LOGarithmic|POWer>

:CALCulate:MATH TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6PDIFference|PSUM|LOFFset|LDIFference|OFFTRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6<real><real>

:CALCulate:MATH? TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6

Command description: to start up trace mathematical operation and set the methods and rules , including: [Op1+Op2->Op2], [Op1-Op2->Op2], [Off], [Operand1], [Operand2], [Math Rule>>].

The signal/spectrum analyzer can take mathematical operation for any two traces from the active 6 ones, and save the results to the update data of the second trace. The mathematical operation includes addition and subtraction.

The math rule is used for specifying the data type of two traces under processing, including logarithmic power, linear voltage (current) or linear power. For specific operations, refer to 4.1.3.1 Trace Detector and Trace Math.

Key path: 【Trace】, [More 1/2>>], [Math>>] on the front panel.

Examples:

:CALC:MATH:MODE LINear

[Copy >>]

Program control commands:

:TRACe:COPY

TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6

:TRACe:COPY?

Command description: to copy the data for the selected trace to the other trace, including: [Operand 1->Operand 2], [Operand 1 Select>>], [Operand 2 Select>>].

Note that Copy Trace is only an operation rather than parameter setting; therefore, it is only performed once and not for every sweep and measurement. For details, refer to 4.1.3.1 Trace Detector and Trace Math.

Examples:

:TRACe:COPY TRACE1

[Clear All Traces]

Program control commands:

:TRACe:PRESet:ALL

Command description: to recover all current traces back to the default status, including trace processing method, display method and detector type.

Note that Reset All Traces is only an operation rather than parameter setting; therefore, it is only performed once and not for every sweep and measurement.

Key path: 【Trace】, [More 1/2>>], [Clear All Traces] on the front panel.

Examples:

:TRAC:PRES:ALL

3.3.2.7 Sweep

Set related sweep parameters, including [Sweep Time Auto Man], [Sweep Single Cont], [Sweep Setup>>], [Gate>>], [Sweep points].

[Sweep Time]

Program control commands:

[:SENSe]:SWEep:TIME <seconds>

[:SENSe]:SWEep:TIME?

[:SENSe]:SWEep:TIME:AUTO OFF|ON|0|1

[:SENSe]:SWEep:TIME:AUTO?

Command description: to change the sweep time of signal/spectrum analyzer. When it is under auto status, the sweep time will be automatically coupled based on Res BW, span and video bandwidth.

Under Swept type, when the swept time is limited within the minimum sweep time, it can be set from 1 ms to 6000 s. Under zero span, the sweep time can be 1μs at minimum. When the sweep type is FFT, the sweep time is mainly used to meet the requirements of FFT sampling and processing time.

The sweep time is coupled with the sweep type, Res BW, video bandwidth and span. Changing those parameters will result in change of the sweep time or triggering of the limit setting of sweep time.

Key path: 【Sweep】, [Sweep Time Auto Man] on the front panel.

Setting range: Under Sweep type, when the sweep time is limited within the minimum sweep time, Min.: 1 ms and Max.: 6000 s (for non-zero span); and Min.:1 us, Max.: 6000 s (for zero span).

Default unit: s

Examples:

:SWE:TIME 500 ms

:SWE:TIME:AUTO OFF

[Sweep Single Cont]

Program control commands:

:INITiate:CONTinuous OFF|ON|0|1

:INITiate:CONTinuous?

Command description: to set continuous sweep OFF or ON.

Key path: 【Sweep】, [Sweep Single Cont] on the front panel.

Examples:

:INIT:CONT OFF

[Sweep Setup>>]

Set commands related to sweep type, including [Sweep Type Auto ON OFFMan], [Sweep Type Rules Auto Man], [FFT Width Auto Man].

[Sweep Type>> Auto Man]

Program control commands:

[:SENSe]:SWEep:TYPE FFT|SWEep

[:SENSe]:SWEep:TYPE?

[:SENSe]:SWEep:TYPE:AUTO OFF|ON|0|1

[:SENSe]:SWEep:TYPE:AUTO?

Command description: to set sweep type. to determine whether Swept or FFT is adopted for frequency spectrum measurement. Also set the FFT step bandwidth for FFT sweep , including [Auto], [Swept] and [FFT]. When under Auto ON mode, the signal/spectrum analyzer will automatically select the sweep type based on sweep type rules.

Key path: 【Sweep】, [Sweep Setup>>] and [Sweep Type Auto Man] on the front panel.

Examples:

:SWE:TYPE FFT

[Swp Type Rules **Auto Man]**

Program control commands:

[:SENSe]:SWEep:TYPE:AUTO:RULes SPEed|DRANge

[:SENSe]:SWEep:TYPE:AUTO:RULes?

[:SENSe]:SWEep:TYPE:AUTO:RULes:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:SWEep:TYPE:AUTO:RULes:AUTO[:STATe]?

Command description: to set rules for auto sweep type. While the sweep type rules include “Best Dynamic Range” and “ Best Speed”.

“Best Dynamic Range” rules: when RBW is or larger than 1 kHz, the sweep type is Swept; when RBW is less than 1 kHz, the sweep type is FFT.

“Best Speed” rules: when RBW is or larger than 30 kHz, the sweep type is Swept; when RBW is less than 30 kHz, the sweep type is FFT.

Key path: 【Sweep】, [Sweep Setup>>] and [Sweep Type Rules Auto Man] on the front panel.

Examples:

:SWE:TYPE:AUTO:RUL DRAN

[FFT Width Auto Man]

Program control commands:

[:SENSe]:SWEep:FFT:WIDTh <real>

[:SENSe]:SWEep:FFT:WIDTh?

[:SENSe]:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1

[:SENSe]:SWEep:FFT:WIDTh:AUTO?

Command description: to set FFT Width. The FFT width includes [Auto], [<100 kHz], [<3 MHz], [<13 MHz], [<=Max.]. FFT width is only active when the FFT sweep type is selected. Under Auto type, when the signal/spectrum analyzer performs FFT spectrum measurement, the maximum Res BW is 30 kHz. To guarantee best dynamic measurement range, the signal/spectrum analyzer automatically optimizes the FFT width within 100 kHz. The larger is the FFT width, the faster is FFT spectrum measurement, but the dynamic range performance will be affected.

Under FFT sweep, the FFT width setup limits the maximum value for center frequency step of each tune. For example, if [<100 Hz] is selected, the maximum value for center freq step of each tune is 100 Hz. As the FFT width gets larger, the count of instrument center frequencies get smaller when performing measurement of same frequency scope, and the response measurement gets faster. Therefore, to improve measurement speed, you can manually change the FFT width.

Key path: 【Sweep】, [Sweep Setup>>], [FFT Width>>] on the front panel.

Examples:

:SWE:FFT:WIDT 167 kHz

[Gate▸]

Pop up soft menu related to gate, including [Gate ON OFF], [Gate View ON OFF], [Gate View Sweep Time], [Gate Setup▸] and [Gate Sources▸] items.

[Gate On Off]

Program control commands:

[:SENSe]:SWEep:EGATe[:STATe] OFF|ON|0|1

[:SENSe]:SWEep:EGATe[:STATe]?

Command description: to turn on or off Gate. When the Gate function is on, the signal/spectrum analyzer will sweep and refresh traces based on the set Gate Method in combination with related gate parameters and Gate Source signals. Not all types of gating are available for all measurements.

The Gate function is unavailable (grayed out) when: the FFT Sweep Type is manually selected; the Gate Method is LO or Video; Sweep is manually selected; and the Marker Count is ON.

The Gate ON/OFF status is displayed on the status zone at top right corner of the window.

Key path: 【Sweep】, [Gate▸], [Gate ON OFF] on the front panel.

Examples:

:SWE:EGAT OFF

:SWE:EGAT OFF

[Gate View On Off]

Program control commands:

[:SENSe]:SWEep:EGATe:VIEW ON|OFF|1|0

[:SENSe]:SWEep:EGATe:VIEW?

Command description: to turn on or off Gate View. It is realized by Swept Analysis under Zero Span. At this time, the trigger source is the Gate Source.

When the Gate View is on, the Sweep Setting and the Sweep Time menus are unavailable (grayed out). The analyzer automatically switches to the sweep frequency under Zero Span. At this time, the current span is Zero Span. When the Sweep Time is selected as the Gate View time, the Gate ON OFF function is unavailable; when the Gate View is OFF, the Sweep Time menu, Sweep Setting menu and Span recover to the status before the View is ON. The Gate ON or OFF is determined by the current menu status.

When the Gate View is ON, if the Span is as non-zero, the Gate View will turn off.

Key path: 【Sweep】, [Gate▸], [Gate View ON OFF] on the front panel.

Examples:

:SWE:EGAT:VIEW ON

:SWE:EGAT:VIEW?

[Gate View Sweep Time]

Program control commands:

[:SENSe]:SWEep:EGATe:TIME <time>

[:SENSe]:SWEep:EGATe:TIME?

Command description: to set the sweep time in the Gate View.

Key path: 【Sweep】, [Gate▸], [Gate View Sweep Time] on the front panel.

Examples:

:SWE:EGAT:TIME 10 ms

:SWE:EGAT:TIME?

[Gate setup▸]

Pop up soft menus related to gate setup, including [Gate Delay], [Gate Length], [Gate Method ▸], [Control Edge Level] and [Gate Holdoff ON OFF] items.

[Gate Delay]

Program control commands:

[:SENSe]:SWEep:EGATe:DELay <time>

[:SENSe]:SWEep:EGATe:DELay?

Command description: to set gate delay time. and control the length of time from the time when the gate signal is TRUE until the gate is turned on.

3.3 Instrument Commands

Key path: 【Sweep】, [Gate▸], [Gate Setup▸], [Gate Delay] on the front panel.

Examples:

:SWE:EGAT:DEL 1 ms

:SWE:EGAT:DEL?

[Gate Length]

Program control commands:

[:SENSe]:SWEep:EGATe:LENGth <time>

[:SENSe]:SWEep:EGATe:LENGth?

Command description: to set the gate length. and control the length of time that the gate is on after it opens.

Key path: 【Sweep】, [Gate▸], [Gate Setup▸], [Gate Length] on the front panel.

Examples:

:SWE:EGAT:LENGth 5 ms

:SWE:EGAT:LENGth?

[Gate Method▸]

Pop up soft More for selecting gate methods, including [LO], [Video], [FFT] items. Not all types of gating are available for all measurements.

[LO]

Program control commands:

[:SENSe]:SWEep:EGATe:METHod LO

[:SENSe]:SWEep:EGATe:METHod?

Command description: to set the gate method as LO.

LO is a smart way for gating. It only sweeps LO when Gate is ON and passes through signal. The Gate signal controls when the sweep generator scans and when it passes through or shields signal. This enables that the signal/spectrum analyzer only sweeps when Gate is ON, that means, the Gate LO only sweeps LO and passes through signal when Gate is ON.

When set to Gate ON, the LO sweeps whenever the specified gate parameters are satisfied. This form of gating is more sophisticated, and results in faster measurements. With Gated LO, the analyzer only sweeps while the specified gate parameters are satisfied. This means that a sweep could take place over several gate events. It would start when the gate signal goes TRUE and stop when it goes FALSE, then continue when it goes TRUE again. But since the LO is sweeping as long as the gate conditions are satisfied, the sweep typically finishes much more quickly than with Gated Video.

When in zero span, there is no actual sweep performed. But data is only taken while the gate conditions are satisfied. So even though there is no sweep, the gate settings will still function when data is acquired.

Key path: 【Sweep】, [Gate▸], [Gate Setup▸], [Gate Method▸], [LO] on the front panel.

Examples:

:SWE:EGAT:METH LO

:SWE:EGAT:METH?

[Video]

Program control commands:

[:SENSe]:SWEep:EGATe:METHod VIDeo

[:SENSe]:SWEep:EGATe:METHod?

Command description: to set the gate method as Video.

This form of gating may be thought of as a simple switch, which connects the input signal to the signal/spectrum analyzer. When the switch is ON (Gate ON), the video signal is allowed to pass through; and the switch is off (Gate OFF), the signal is blocked. Under Gated Video, whether the gate is ON or OFF, the signal/spectrum analyzer measures signals and never stops sweeping. The Gate Switch is between the signal pathway envelope detector and video filter, therefore is called as Gated Video. Since the Gate Switch is behind the envelope detector, whether the Gate is on or off, the signal/spectrum analyzer measurement path will respond to the input signal; therefore, it is necessary to reduce the sweep speed to the extent that the signal/spectrum analyzer can measure input signal during Gate ON period, which results in certain limits for applying Gated Video measurements. For this reason, in general, Video method results in slower measurement compared with Gated LO and FFT.

Key path: 【Sweep】, [Gate▸], [Gate Setup▸], [Gate Method▸], [Video] on the front panel.

Examples:

:SWE:EGAT:METH VID

:SWE:EGAT:METH?

[FFT]

Program control commands:

[:SENSe]:SWEep:EGATe:METHod FFT

[:SENSe]:SWEep:EGATe:METHod?

Command description: to the gate method as Gated FFT.

the way of FFT spectrum measurement if the trigger conditions are satisfied, which is called as the gated FFT. The FFT spectrum is the input signal spectrum through FFT calculation from a time domain waveform during collection. The time for collecting the domain waveform is similar to the gate length. The time for collecting the domain waveform is similar to the gate length. Different from the Sweep Time Gate, under Gated FFT, the gate length is determined by the currently set Res BW and cannot be set and modified through menu. When the Span is less than 10 MHz, in particular for small Res BW, the FFT measurement is faster than the Sweep measurement; therefore, for a given signal period, compared with Gated LO, the Gated FFT gets higher frequency resolution.

When set to Gate ON, an FFT is performed whenever the specified gate conditions are satisfied. This is an FFT measurement which begins when the predefined conditions are satisfied. Since the time period of an FFT is approximately 2.57/RBW, you get a measurement which starts under predefined conditions and takes place over a predefined period. So, in essence, this is a gated measurement.

Gated FFT cannot be done in zero span. So in zero span, the Gated LO and Video methods are used. Data is still only taken while the specified gate parameters are satisfied, so the gate settings do impact when data is acquired.

Key path: 【Sweep】, [Gate▸], [Gate Setup▸], [Gate Method▸], [FFT] on the front panel.

Examples:

:SWE:EGAT:METH FFT

:SWE:EGAT:METH?

[Control Edge Level]

Program control commands:

[:SENSe]:SWEep:EGATe:CONTrol EDGE|LEVel

[:SENSe]:SWEep:EGATe:CONTrol?

Menu description: set the method of controlling the gating function.

— ***Edge***

when the selected edge (positive or negative edge) of the trigger signal arrives, whether the Gate is ON is determined by the subsequent gate delay and gate length (both can be set by the menu). The Gate is ON whenever the trigger event arrives and the gate delay time has passed. During the gate length, the signal passes through; when the gate length ends, the signal is blocked. In general, for edge triggering, the trigger signal is an TTL periodic signal, whose positive and negative edges are synchronous with those of the measured pulse signal. Gate delay time refers to the time during which the signal/spectrum analyzer needs to wait from the trigger event to Gate ON.

— ***Level***

When the gate signal has achieved a certain level (high level or low level. In signal/spectrum analyzer, positive polarity indicates high level; and negative polarity indicates low level), the signal passes through; and when the gate signal fails to achieve specified level, the signal is blocked. In Level triggering, the Gate Delay and Gate Length parameters are void.

Key path: 【Sweep】, [Gate▸], [Gate Setup▸], [Control Edge Level] on the front panel.

Examples:

:SWE:EGAT:CONT EDGE

:SWE:EGAT:CONT?

[Gate Holdoff On Off]

Program control commands:

[:SENSe]:SWEep:EGATe:HOLDoff <time>

[:SENSe]:SWEep:EGATe:HOLDoff?

[:SENSe]:SWEep:EGATe:HOLDoff:AUTO OFF|ON|0|1

[:SENSe]:SWEep:EGATe:HOLDoff:AUTO?

Command description: to increase or decrease the wait time after a gate event ends before the signal/spectrum analyzer will respond to the next gate signal.

When Method is set to LO, after any gate event finishes, the signal/spectrum analyzer must wait for the sweep status reset before it can respond to another gate signal. When the Gate Holdoff is ON, the user can adjust the wait time; shortening holdoff period can improve speed, but it may reduce measurement accuracy; if accuracy is insufficient, the user may consider extending holdoff period.

When Method is set to Video or FFT, the Gate Holdoff function still functions and has no effect on measurement accuracy.

Key path: 【Sweep】, [Gate▸], [Gate Setup▸], [Gate Holdoff On Off] on the front panel.

Examples:

:SWE:EGAT:HOLD 100 ms

:SWE:EGAT:HOLD?

:SWE:EGAT:HOLD:AUTO OFF

:SWE:EGAT:HOLD:AUTO?

[Gate Source▸]

Pop up soft menu related to the Gate Source, including: [Power Trigger▸], [External 1▸], [External 2▸], [RF Burst ▸] and [Periodic Timer▸] items.

[Line▸]

Program control commands:

[:SENSe]:SWEep:EGATe:SOURce LINE

[:SENSe]:SWEep:EGATe:SOURce?

Command description: to set the Gate Source as Power Trigger. The soft menu is [Gate Source Polarity Pos Neg].

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [**Line▸**] on the front panel.

Status saved: saved in the instrument status.

Examples:

:SWE:EGAT:SOUR LINE

:SWE:EGAT:SOUR?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:LINE:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:LINE:SLOPe?

Command description: to set the Gate Source Polarity ON OFF of Power Trigger.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [Line▸] [Trig Slope Pos Neg]on the front panel.

Examples:

:TRIG:LINE:SLOP POS

:TRIG:LINE:SLOP?

[External 1]

Program control commands:

[:SENSe]:SWEep:EGATe:SOURce EXTernal1

[:SENSe]:SWEep:EGATe:SOURce?

Command description: to set the Gate Source as External Trigger Signal 1. The soft menus are [Trigger Level], [Trig Slope Pos Neg].

Examples:

:SWE:EGAT:SOUR EXT1

:SWE:EGAT:SOUR?

[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:EXTernal1:LEVel <level>

:TRIGger[:SEQuence]:EXTernal1:LEVel?

Command description: to set the Trigger Level Threshold of the External Trigger Signal 1.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [External 1▸], [Trigger Level] on the front panel.

Examples:

:TRIG:EXT1:LEV 1.2V

:TRIG:EXT1:LEV?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:EXTernal1:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:EXTernal1:SLOPe?

Command description: to set the Gate Source Polarity of the External Trigger Signal 1.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [External 1▸], [Trig Slope Pos Neg] on the front panel.

Examples:

:TRIG:EXT1:SLOP POS

:TRIG:EXT1:SLOP?

[External 2▸]

Program control commands:

[:SENSe]:SWEep:EGATe:SOURce EXTernal2

[:SENSe]:SWEep:EGATe:SOURce?

Command description: to set the Gate Source as External Trigger Signal 2. The soft menus are [Trigger Level], [Trig Slope Pos Neg].

Examples:

:SWE:EGAT:SOUR EXT2

:SWE:EGAT:SOUR?

[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:EXTernal2:LEVel <level>

:TRIGger[:SEQuence]:EXTernal2:LEVel?

Command description: to set the Trigger Level Threshold of the External Trigger Signal 2.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [External 2▸], [Trigger Level] on the front panel.

Examples:

:TRIG:EXT2:LEV 1.2V

:TRIG:EXT2:LEV?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:EXTernal2:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:EXTernal2:SLOPe?

Command description: to set the Gate Source Polarity of the External Trigger Signal 2.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [External 2▸], [Trig Slope Pos Neg] on the front panel.

Examples:

:TRIG:EXT2:SLOP POS

:TRIG:EXT2:SLOP?

[RF Burst▸]

Program control commands:

[:SENSe]:SWEep:EGATe:SOURce RFBurst

[:SENSe]:SWEep:EGATe:SOURce?

Command description: to set the Gate Source as Burst Signal Trigger. The soft menus are [Trigger Level], [Trig Slope Pos Neg].

Examples:

:SWE:EGAT:SOUR RFB

:SWE:EGAT:SOUR?

[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute <ampl>

:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute?

Command description: to set the Trigger Level Threshold of the burst signal.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [RF Burst▸], [Trigger Level] on the front panel.

Examples:

:TRIG:RFB:LEV:ABS -20 dBm

:TRIG:RFB:LEV:ABS?

[Trig Slope Pos Ne]

Program control commands:

:TRIGger[:SEQuence]:RFBurst:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:RFBurst:SLOPe?

Command description: to set the trigger polarity of the Burst Signal Trigger.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [RF RF Burst▸], [Trig Slope Pos Neg]] on the front panel.

Examples:

:TRIG:RFB:SLOP POS

:TRIG:RFB:SLOP?

[Periodic Timer▸]

Program control commands:

:TRIG:SOUR FRAM

Command description: to set the Gate Source as Timer Trigger. The soft More include [Sync Source ▸], [Period], [Offset], [Ttrig Holdoff].

[Sync Source▸]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:SYNC EXTernal1|EXTernal2|RFBurst|OFF

:TRIGger[:SEQuence]:FRAMe:SYNC?

Command description: to select and set the Timer Sync Source parameters. The soft More include [Off], [External 1▸], [External 2▸], [RF Burst▸]. OFF means that the timer is not synchronous.

[External 1▸]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:SYNC EXTernal1

Command description: to set the Timer Sync Source as External Trigger Signal 1. The soft menus are [Trigger Level], [[Trig Slope Pos Neg].

Examples:

:TRIG:FRAM:SYNC EXT1

:TRIG:FRAM:SYNC?

[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:EXTernal1:LEVel <level>

:TRIGger[:SEQuence]:EXTernal1:LEVel?

Command description: to set the Trigger Level Threshold of the External Trigger Signal 1.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [Periodic Timer▸], [Sync Source▸], [External 1▸], [Trigger Level] on the front panel.

Examples:

:TRIG:EXT1:LEV 1.2V

:TRIG:EXT1:LEV?

[Trig Slope Positive Negative]

Program control commands:

:TRIGger[:SEQuence]:EXTernal1:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:EXTernal1:SLOPe?

Command description: to set the trigger polarity of the External Trigger Signal 1.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [Periodic Timer▸], [Sync Source▸], [External 1▸], [Sync Source Polarity Pos Neg] on the front panel.

Examples:

:TRIG:EXT1:SLOP

:TRIG:EXT1:SLOP?

[External 2▸]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:SYNC EXTernal2

Command description: to set the Sync Source as External Trigger Signal 2. The soft menus are [Trigger Level], [[Trig Slope Pos Neg].

Examples:

:TRIG:FRAM:SYNC EXT2

[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:EXTernal2:LEVel <level>

:TRIGger[:SEQuence]:EXTernal2:LEVel?

Command description: to set the Trigger Level Threshold of the External Trigger Signal 2.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [Periodic Timer▸], [Sync Source▸], [External 2▸], [Trigger Level] on the front panel.

Examples:

:TRIG:EXT2:LEV 1.2V

:TRIG:EXT2:LEV?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:EXTernal2:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:EXTernal2:SLOPe?

Command description: to set the trigger polarity of the External Trigger Signal 2.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [Periodic Timer▸], [Sync Source▸], [External 2▸], [Trig Slope Pos Neg] on the front panel.

Examples:

:TRIG:EXT2:SLOP POS

:TRIG:EXT2:SLOP?

[RF Burst▸]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:SYNC RFBurst

Command description: set the Timer Sync Source as Burst Signal. The soft menus are [Trigger Level], [[Trig Slope Pos Neg].

Examples:

:TRIG:FRAM:SYNC RFB

[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute <ampl>

:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute?

Command description: to set the Trigger Level Threshold of the burst signal.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [Periodic Timer▸], [Sync Source▸], [RF Burst▸], [Trigger Level] on the front panel.

Examples:

:TRIG:RFB:LEV:ABS -20 dBm

:TRIG:RFB:LEV:ABS?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:RFBurst:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:RFBurst:SLOPe?

Command description: to set the trigger polarity of the burst signal.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [Periodic Timer▸], [Sync Source▸], [RF Burst▸], [Trig Slope Pos Neg] on the front panel.

Examples:

:TRIG:RFBurst:SLOP POS

:TRIG:RFBurst:SLOP?

[Period]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:PERiod <time>

:TRIGger[:SEQuence]:FRAMe:PERiod?

Command description: to set the Trigger Mode as Timer Period.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [periodic Timer▸], [period] on the front panel.

Examples:

:TRIG:FRAM:PER 100 ms

:TRIG:FRAM:PER?

[Offset]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:OFFSet <time>

:TRIGger[:SEQuence]:FRAMe:OFFSet?

Command description: to set the Trigger Mode as Timer Offset, which is not more than the Timer Period.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [Periodic Timer▸], [Offset] on the front panel.

Examples:

:TRIG:FRAM:OFFS 100 ms

:TRIG:FRAM:OFFS?

[Trig Holdoff]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:SYNC:HOLDoff <time>

:TRIGger[:SEQuence]:FRAMe:SYNC:HOLDoff?

Command description: to set the Trigger Mode as Sync Holdoff.

Key path: 【Sweep】, [Gate▸], [Gate Source▸], [Periodic Timer▸], [Trig Holdoff] on the front panel.

Examples:

:TRIG:FRAM:SYNC:HOLD 100 ms

:TRIG:FRAM:SYNC:HOLD?

[Sweep points]

Program control commands:

[:SENSe]:SWEep:POINts <integer>

[:SENSe]:SWEep:POINts?

Command description: to set the trace points.

Key path: 【Sweep】, [Sweep Points] on the front panel.

Setting range: 101-30001.

Examples:

:SWE:POIN 2001

:SWE:POIN?

3.3.2.8 Single

Program control commands:

:INITiate

Command description: the 【Single】 key on the front panel. has no corresponding soft menu. This function is mainly used for manual trigger of a sweep. When the [Log-Pwr Avg] is ON, this function performs the sweeps at the count specified by the Average Num.

In remote control programming and system establishment, this function combined with *WAI can effectively synchronize the sweep process and enable the trace data obtained after the *WAI finishes directly correspond to the sweep process one by one.

Examples:

:INIT

3.3.2.9 Continuous

Set through :INITiate:CONTinuous ON.

3.3.2.10 Trigger

Select the trigger method of sweep or measurement, including [Free Run], [Video >>], [Line >>], [External 1>>], [External 2>>], [RF Burst>>], [Periodic Timer >>], [Trig Holdoff ON OFF]. Different triggers will be expressed in different ways on the parameter zone of the screen.

[Free Run]

Program control commands:

:TRIG:SOUR IMM

Command description: when the previous single or continuous sweep finishes, the next sweep or measurement is automatically triggered.

[Video >>]

Program control commands:

:TRIG:SOUR VID

Command description: to set the Trigger Mode as Video Trigger.

[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:VIDeo:LEVel <ampl>

:TRIGger[:SEQuence]:VIDeo:LEVel?

Command description: to set the Trigger Level Threshold of the Video Trigger.

Key path: 【Trigger】, [Video>>], [Trigger Level] on the front panel.

Setting range: -270 dBm ~ 30 dBm.

Default unit: dBm.

Examples:

:TRIG:VID:LEV -25 dBm

:TRIG:VID:LEV?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:VIDeo:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:VIDeo:SLOPe?

Command description: to set the trigger polarity of the Video Trigger, where Positive means positive edge trigger, and Negative means negative edge trigger.

Key path: 【Trigger】, [Video>>], [Trigger Slope Pos Neg] on the front panel.

Examples:

:TRIG:VID:SLOP POS

:TRIG:VID:SLOP?

[Trig Delay On Off]

Program control commands:

:TRIGger[:SEQuence]:VIDeo:DELay <time>

:TRIGger[:SEQuence]:VIDeo:DELay?

:TRIGger[:SEQuence]:VIDeo:DELay:STATe OFF|ON|0|1

:TRIGger[:SEQuence]:VIDeo:DELay:STATe?

Command description: to set the Video Trigger delay ON or OFF and delay time.

Key path: 【Trigger】, [Video>>], [Trig Delay ON OFF] on the front panel.

Setting range: 20 ns-60 s.

Default unit: s.

Examples:

:TRIG:VID:DEL 100 ms

:TRIG:VID:DEL?

[Line>>]

Program control commands:

:TRIG:SOUR LINE

Command description: to set the Trigger Mode as Power Trigger. The soft menus are [Trig Slope Pos Neg], [Trig Delay ON OFF].

Key path: 【Trigger】, [**Line**>>], [Trigger Source Polarity Pos Neg] on the front panel.

Examples:

:TRIG:SOUR LINE

[Trig Delay On Off]

Program control commands:

:TRIGger[:SEQuence]:LINE:DELay <time>

:TRIGger[:SEQuence]:LINE:DELay?

:TRIGger[:SEQuence]:LINE:DELay:STATe OFF|ON|0|1

:TRIGger[:SEQuence]:LINE:DELay:STATe?

Command description: to set the trigger delay ON or OFF of the Power Trigger and trigger delay time.

Key path: 【Trigger】 [**Line**>>], [Trig Delay ON OFF] on the front panel.

Setting range: 20 ns-60 s.

Default unit: s.

Examples:

:TRIG:LINE:DEL 10 ms

:TRIG:LINE:DEL?

:TRIG:LINE:DEL:STAT OFF

:TRIG:LINE:DEL:STAT?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:LINE:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:LINE:SLOPe?

Command description: to set the trigger polarity of Power Trigger.

Key path: 【Trigger】, [Line>>], [Trig Slop Pos Neg] on the front panel.

Examples:

:TRIG:LINE:SLOP POS

:TRIG:LINE:SLOP?

[External 1>>]

Program control commands:

:TRIG:SOUR EXT1

Command description: to set the Trigger Mode as External Trigger Signal 1.

[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:EXTernal1:LEVel <level>

:TRIGger[:SEQuence]:EXTernal1:LEVel?

Command description: to set the Trigger Level Threshold of the External Trigger Signal 1.

Key path:【Trigger】, [External 1>>], [Trigger Level] on the front panel.

Setting range:-5 V-5 V.

Default unit: V

Examples:

:TRIG:EXT1:LEV 0 V

:TRIG:EXT1:LEV?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:EXTernal1:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:EXTernal1:SLOPe?

Command description: to set the trigger polarity of the External Trigger Signal 1.

Key path: 【Trigger】, [External 1>>], [Trig Slop Pos Neg] on the front panel.

Examples:

:TRIG:EXT1:SLOP POS

:TRIG:EXT1:SLOP?

[Trig Delay On Off]

Program control commands:

:TRIGger[:SEQuence]:EXTernal1:DELay <time>

:TRIGger[:SEQuence]:EXTernal1:DELay?

:TRIGger[:SEQuence]:EXTernal1:DELay:STATe OFF|ON|0|1

:TRIGger[:SEQuence]:EXTernal1:DELay:STATe?

Command description: to set the trigger delay ON or OFF of the External Trigger 1 and trigger delay time.

Key path: 【Trigger】, [External 1>>], [Trig Delay ON OFF] on the front panel.

Setting range: 20 ns-60 s.

Default unit: s.

Examples:

:TRIG:EXT1:DEL 10 ms

:TRIG:EXT1:DEL?

[External 2>>]

Program control commands:

:TRIG:SOUR EXT2

Command description: to set the Trigger Mode as External Trigger Signal 2.

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[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:EXTernal2:LEVel <level>

:TRIGger[:SEQuence]:EXTernal2:LEVel?

Command description: to set the Trigger Level Threshold of the External Trigger Signal 2.

Key path: 【Trigger】, [External 2>>], [Trigger Level] on the front panel.

Setting range: -5V ~ 5V.

Default unit: V

Examples:

:TRIG:EXT2:LEV 0 V

:TRIG:EXT2:LEV?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:EXTernal2:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:EXTernal2:SLOPe?

Command description: to set the trigger polarity of the External Trigger Signal 2.

Key path:【Trigger】, [External 2>>], [Trig Slop Pos Neg] on the front panel.

Examples:

:TRIG:EXT2:SLOP POS

:TRIG:EXT2:SLOP?

[Trig Delay On Off]

Program control commands:

:TRIGger[:SEQuence]:EXTernal2:DELay <time>

:TRIGger[:SEQuence]:EXTernal2:DELay?

:TRIGger[:SEQuence]:EXTernal2:DELay:STATe OFF|ON|0|1

:TRIGger[:SEQuence]:EXTernal2:DELay:STATe?

Command description: to set the trigger delay ON or OFF of the External Trigger 2 and trigger delay time.

Key path: 【Trigger】, [External 2>>], [Trig Delay ON OFF] on the front panel.

Setting range: 20 ns-60 s.

Default unit: s.

Examples:

:TRIG:EXT2:DEL 10 ms

:TRIG:EXT2:DEL?

[RF Burst >>]

Program control commands:

:TRIG:SOUR RFB

Command description: to set the Trigger Mode as Burst Signal 2, including [Trigger Level], [Trig Slope Pos Neg], [Trig Delay ON OFF].

[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute <ampl>

:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute?

Command description: to set the Trigger Level Threshold of the burst signal.

Key path: 【Trigger】, [RF Burst>>], [Trigger Level] on the front panel.

Setting range: -270 dBm ~ 30 dBm.

Default unit: dBm.

Examples:

:TRIG:RFB:LEV:ABS -10 dBm

:TRIG:RFB:LEV:ABS?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:RFBurst:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:RFBurst:SLOPe?

Command description: to set the trigger polarity of the Burst Signal Trigger.

Key path: 【Trigger】, [RF Burst>>], [Trig Slop Pos Neg] on the front panel.

Examples:

:TRIG:RFB:SLOP POS

:TRIG:RFB:SLOP?

[Trig Delay On Off]

Program control commands:

:TRIGger[:SEQuence]:RFBurst:DELay <time>

:TRIGger[:SEQuence]:RFBurst:DELay?

:TRIGger[:SEQuence]:RFBurst:DELay:STATe OFF|ON|0|1

:TRIGger[:SEQuence]:RFBurst:DELay:STATe?

Command description: to set the trigger delay ON or OFF of Burst Signal Trigger and the trigger delay time.

Key path: 【Trigger】, [RF Burst>>], [Trig Delay On Off] on the front panel.

Setting range: trigger delay time range: 20 ns-60 s.

Default unit: s.

Examples:

:TRIG:RFB:DEL 10 ms

:TRIG:RFB:DEL?

[Periodic Timer>>]

Program control commands:

:TRIG:SOUR FRAM

Command description: to set the Trigger Mode as Timer Trigger. When the setting parameters of Timer Trigger change, the setting parameters of timer trigger in the Gate Source also change.

[Sync Source>>]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:SYNC EXTernal1|EXTernal2|RFBurst|OFF

:TRIGger[:SEQuence]:FRAMe:SYNC?

Command description: to select and set the Timer Sync Source parameters. including [OFF], [External 1>>], [External 2>>], [Burst Signal>>]. OFF means that the timer is not synchronous.

Examples:

:TRIG:FRAM:SYNC EXT1

:TRIG:FRAM:SYNC?

[External 1>>]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:SYNC EXTernal1

Command description: to set the Timer Sync Source as External Trigger Signal 1. including [Trigger Level], Pos Neg] [Trig Slope Pos Neg].

Examples:

:TRIG:FRAM:SYNC EXT1

[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:EXTernal1:LEVel <level>

:TRIGger[:SEQuence]:EXTernal1:LEVel?

Command description: to set the Trigger Level Threshold of the External Trigger Signal 1.

Key path: 【Trigger】, [periodic Timer>>], [Sync Source>>], [External 1>>], [Trigger Level] on the front panel.

Setting range:-5 V-5 V.

Default unit: V

Examples:

:TRIG:EXT1:LEV 0V

:TRIG:EXT1:LEV?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:EXTernal1:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:EXTernal1:SLOPe?

Command description: to set the trigger polarity of the External Trigger Signal 1.

Key path:【Trigger】, [Periodic Timer>>], [Sync Source>>], [External 1>>], Pos Neg] [Trig Slope Pos Neg] on the front panel.

Examples:

:TRIG:EXT1:SLOP POS

:TRIG:EXT1:SLOP?

[External 2>>]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:SYNC EXTernal2

Set the Sync Source as External Trigger Signal 2. including [Trigger Level], Pos Neg][Trig Slope Pos Neg].

Examples:

:TRIG:FRAM:SYNC EXT2

[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:EXTernal2:LEVel <level>

:TRIGger[:SEQuence]:EXTernal2:LEVel?

Command description: to set the Trigger Level Threshold of the External Trigger Signal 2.

Key path:【Trigger】, [periodic Timer>>], [Sync Source>>], [External 2>>], [Trigger Level] on the front panel.

Setting range: -5V ~ 5V.

Default unit: V

Examples:

:TRIG:EXT2:LEV 0 V

:TRIG:EXT2:LEV?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:EXTernal2:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:EXTernal2:SLOPe?

Command description: to set the trigger polarity of the External Trigger Signal 2.

Key path:【Trigger】, [Periodic Timer>>], [Sync Source>>], [External 2>>], Pos Neg][Trig Slope Pos Neg] on the front panel.

Examples:

:TRIG:EXT2:SLOP POS

:TRIG:EXT2:SLOP?

[RF Burst>>]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:SYNC RFBurst

Set the Timer Sync Source as Burst Signal.

Examples:

:TRIG:FRAM:SYNC RFB

[Trigger level]

Program control commands:

:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute <ampl>

:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute?

Command description: to set the Trigger Level Threshold of the burst signal.

Key path:【Trigger】, [Periodic Timer>>], [Sync Source>>], [RF Burst>>], [Trigger Level] on the front panel.

Setting range: -270 dBm ~ 30 dBm.

Default unit: dBm.

Examples:

:TRIG:RFB:LEV:ABS -10 dBm

:TRIG:RFB:LEV:ABS?

[Trig Slope Pos Neg]

Program control commands:

:TRIGger[:SEQuence]:RFBurst:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:RFBurst:SLOPe?

Command description: to set the trigger polarity of the burst signal.

Key path:【Trigger】, [Periodic Timer>>], [Sync Source>>], [RF Burst>>], Pos Neg][Trig Slope Pos Neg] on the front panel.

Examples:

:TRIG:RFB:SLOP POS

:TRIG:RFB:SLOP?

[Period]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:PERiod <time>

:TRIGger[:SEQuence]:FRAMe:PERiod?

Command description: to set the Trigger Mode as Timer Period.

Key path:【Trigger】, [Periodic Timer>>], [Period] on the front panel.

Setting range: 100 ns-20 s.

Default unit: s

Examples:

:TRIG:FRAMe:PER 10 ms

:TRIG:FRAMe:PER?

[Offset]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:OFFSet <time>

:TRIGger[:SEQuence]:FRAMe:OFFSet?

Command description: to set the Trigger Mode as Timer Offset, which is not more than the Timer Period.

Key path: 【Trig】, [Periodic Timer>>], [Offset] on the front panel.

Setting range: 10 ns-20 s.

Default unit: s

Examples:

:TRIG:FRAM:OFFS 10 ms

:TRIG:FRAM:OFFS?

[Trig Holdoff]

Program control commands:

:TRIGger[:SEQuence]:FRAMe:SYNC:HOLDoff <time>

:TRIGger[:SEQuence]:FRAMe:SYNC:HOLDoff?

Command description: to set the Trigger Mode as Sync Holdoff.

Key path: 【Trigger】, [Periodic Timer>>], [Trig Holdoff] on the front panel.

Setting range: 100 ns-20 s.

Default unit: s

Examples:

:TRIG:FRAM:SYNC:HOLD 10 ms

:TRIG:FRAM:SYNC:HOLD?

[Trig Holdoff On Off]

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Program control commands:

[:SENSe]:LIST:TRIGger:HOLDoff <time>

[:SENSe]:LIST:TRIGger:HOLDoff?

[:SENSe]:LIST:TRIGger:HOLDoff:STATe OFF|ON|0|1

[:SENSe]:LIST:TRIGger:HOLDoff:STATe?

Command description: to set the holdoff time and ON OFF status of the trigger.

Key path: 【Trigger】, [More1/2>>], [Trig Holdoff ON OFF] on the front panel.

Setting range: Trigger Holdoff time range: 100 ns-20 s.

Default unit: s

Examples:

:LIST:TRIG:HOLD 10 ms

:LIST:TRIG:HOLD?

:LIST:TRIG:HOLD:STAT OFF

:LIST:TRIG:HOLD:STAT?

3.3.2.11 Display

Pop up menus related to display, including [Display Line ON OFF], [Display Config>>].

[Display Line On Off]

Program control commands:

:DISPlay:WINDow:TRACe:Y:DLINe <ampl>

:DISPlay:WINDow:TRACe:Y:DLINe?

:DISPlay:WINDow:TRACe:Y:DLINe:STATe OFF|ON|0|1

:DISPlay:WINDow:TRACe:Y:DLINe:STATe?

Command description: when this command is ON, it activates an adjustable horizontal reference line, Which indicates an amplitude value corresponding to the reference level. The value of the display line can be adjusted using the stepping keys, knob or number keys. The unit of the Display Line is determined by the [Y Axis Unit] setting under 【Amplitude】.

Key path:【Display】, [Display Line ON OFF] on the front panel.

Setting range: -200 dBm ~ 30 dBm.

Default unit: dBm.

Examples:

:DISP:WIND:TRAC:Y:DLIN -30 dBm

:DISP:WIND:TRAC:Y:DLIN?

:DISP:WIND:TRAC:Y:DLIN:STAT OFF

:DISP:WIND:TRAC:Y:DLIN:STAT?

[Display Config>>]

It is used for configurations of interface language, status area display ON OFF related to interface display, , including [Language 中文

English], [Graticule ON OFF], [Status Display ON OFF], [Freq Info Disp ON OFF].

[Language 中文 English]

Command description: to select the display language as Chinese or English.

Key path:【Display】, [Display Config], [Language 中文 English] on the front panel.

Program control commands:

This command has no corresponding remote commands, and is mainly for local usage.

[Graticule On Off]

Program control commands:

:DISPlay:WINDow:TRACe:GRATicule:GRID[:STATe] OFF|ON|0|1

:DISPlay:WINDow:TRACe:GRATicule:GRID[:STATe]?

Command description: to select whether to display the graticule in the screen trace area.

Key path:【Display】, [Display Config], [Graticule ON OFF] on the front panel.

Examples:

:DISP:WIND:TRAC:GRAT:GRID OFF

:DISP:WIND:TRAC:GRAT:GRID?

[Status Display On Off]

Program control commands:

:DISPlay:WINDow:ANNotation[:ALL] OFF|ON|0|1

:DISPlay:WINDow:ANNotation[:ALL]?

Command description: to select whether to display the status area information.

Key path:【Display】, [Display Config] , [Status Display ON/OFF] on the front panel.

Examples:

:DISP:WIND:ANN OFF

:DISP:WIND:ANN?

[Freq Info Disp On Off]

Program control commands:

:DISPlay:ANNotation:FREQuency OFF|ON|0|1

:DISPlay:ANNotation:FREQuency?

Command description: to select whether to display the frequency information in the status area.

Key path:【Display】, [Display Config], [Freq Info Disp ON OFF] on the front panel.

Examples:

:DISP:ANN:FREQ OFF

:DISP:ANN:FREQ?

3.3.2.12 Measurement Setting

Pop up the soft menu related to measurement setting, including [Average Num], [Average Type Auto ON OFF], [Limit Line>>], [PhNoise Opt] , [Low Noise Path ON OFF], [Preselector Preselecting Bypass], [RF Gain>>], [ADC Dither Auto Man].

[Average Num]

Program control commands:

[:SENSe]:AVERage:COUNt <integer>

[:SENSe]:AVERage:COUNt?

[:SENSe]:AVERage:CLEar

Command description: to define the average count for trace averaging. This Average Num is only effective when the Average is selected in the 【Trace】 command.

Key path: 【Meas Setup】, [Average Num] on the front panel.

Setting range: 1-10000.

Examples:

:AVER:COUN 100

:AVER:COUN?

:AVER:CLE

[Average Type>> Auto Man]

Program control commands:

[:SENSe]:AVERage:TYPE:AUTO OFF|ON|0|1

[:SENSe]:AVERage:TYPE:AUTO?

Command description: to set the average type of the trace averaging, including [Auto], [Log-Pwr Avg], [Pwr Avg], [Voltage Avg].

Key path: 【Meas Setup】, [Average Type Auto Man] on the front panel.

Examples:

:AVER:TYPE:AUTO OFF

:AVER:TYPE:AUTO?

[Log-Pwr Avg]

Program control commands:

[:SENSe]:AVERage:TYPE LOG

Command description: to set the trace average type as Video Average.

Key path: 【Meas Setup】, [Average Type Auto Man], [Log-Pwr Avg] on the front panel.

Examples:

:AVER:TYPE LOG

[Pwr Avg]

Program control commands:

[:SENSe]:AVERage:TYPE RMS

Command description: to set the trace average type as Power Average.

Key path: 【Meas Setup】, [Average Type Auto Man], [Pwr Avg] the front panel.

Examples:

:AVER:TYPE RMS

[Voltage Avg]

Program control commands:

[:SENSe]:AVERage:TYPE SCALar

Command description: to set the trace average type as Voltage Average.

Key path: 【Meas Setup】, [Average Type Auto Man], [Voltage Avg] on the front panel.

Examples:

:AVER:TYPE SCAL

[Limit Line>>]

Pop up the soft menu related to editing and applying the limit lines, including [Select Limit Line>>], [Limit Line ON OFF], [Properties>>], [Margin ON OFF], [Edit>>], [Delete Limit Line], [TestLimits ON OFF], [X Axis Units Freq Time], [Delete All Limits], [Save Limit Line…], [Recall Limit…].

[Select Limit >>]

Command description: to select and apply Limit Line. The signal/spectrum analyzer has 6 limit lines for selection and application.

Key path: 【Meas Setup】, [Limit Line>>], [Select Limit >>]

[Limit ON OFF]

Program control commands:

:CALCulate:LLINe<1|2|3|4|5|6>:DISPlay OFF|ON|0|1

:CALCulate:LLINe<1|2|3|4|5|6>:DISPlay?

:CALCulate:LIMit<1|2|3|4|5|6>:FAIL?

Command description: to turn on or off Limit Line Display.

Key path:【Meas Setup】, [Limit Line>>], [Limit Line ON OFF]

Examples:

:CALC:LLIN1:DISP OFF

:CALC:LLIN1:DISP?

[Properties>>]

Set the properties for currently selected limit line, including [Test Trace], [Type Upper Lower], [Interpolation >>], [Fixed/Relative>>].

[Test Trace]

Program control commands:

:CALCulate:LLINe<1|2|3|4|5|6>:TRACe 1|2|3|4|5|6

:CALCulate:LLINe<1|2|3|4|5|6>:TRACe?

Command description: to designate the trace which currently selected limit line will be applied. There are 6 traces for selection, including [Trace 1], [Trace 2],[Trace 3],[Trace 4],[Trace 5], [Trace 6].

Key path:【Meas Setup】, [Limit Line>>], [Properties>>], [Test Trace] on the front panel.

Examples:

:CALC:LLIN1:TRAC 1

:CALC:LLIN1:TRAC?

[Type Upper Lower]

Program control commands:

:CALCulate:LLINe<1|2|3|4|5|6>:TYPE UPPer|LOWer

:CALCulate:LLINe<1|2|3|4|5|6>:TYPE?

Command description: to specify when the test trace data, higher or lower than the limit line, will FAIL. Upper means that the limit line fails as long as one data in the test trace is higher than the limit; and Lower means that the limit line fails as long as one data in the test trace is lower than the limit.

Key path: 【Meas Setup】, [Limit Line>>], [Properties>>], [Type Upper/Lower] on the front panel.

Examples:

:CALC:LLIN1:TYPE UPP

:CALC:LLIN1:TYPE?

[Interpolation >>]

Program control commands:

:CALCulate:LLINe<1|2|3|4|5|6>:AMPLitude:INTerpolate:TYPE LOGarithmic|LINear

:CALCulate:LLINe<1|2|3|4|5|6>:AMPLitude:INTerpolate:TYPE?

:CALCulate:LLINe<1|2|3|4|5|6>:CONTrol:INTerpolate:TYPE LOGarithmic|LINear

:CALCulate:LLINe<1|2|3|4|5|6>:CONTrol:INTerpolate:TYPE?

Command description: to select the interpolation rules on which the data are based during edit of the currently selected limit line. Including [Frequency Log Line], [Amplitude Log Line]

Key path: 【Meas Setup】, [Limit Line>>], [Properties>>], [Interpolation >>] on the front panel.

Examples:

:CALC:LLIN1:AMPL:INT:TYPE LOG

:CALC:LLIN1:AMPL:INT:TYPE?

[Frequency Log Line]

Program control commands:

:CALCulate:LLINe<1|2|3|4|5|6>:CONTrol:INTerpolate:TYPE LOGarithmic|LINear

:CALCulate:LLINe<1|2|3|4|5|6>:CONTrol:INTerpolate:TYPE?

Command description: to select the interpolation rules on which data interpolation by the frequency axis is based during edit of the currently selected limit line. logarithmic rules or linear rules can be used.

Key path:【Meas Setup】, [Limit Line>>], [Property>>], [Interpolation Rules>>], [[Frequency Log Line]] on the front panel.

Examples:

:CALC:LLIN1:CONT:INT:TYPE LOG

:CALC:LLIN1:CONT:INT:TYPE?

[Amplitude Log Line]

Program control commands:

:CALCulate:LLINe<1|2|3|4|5|6>:AMPLitude:INTerpolate:TYPE LOGarithmic|LINear

:CALCulate:LLINe<1|2|3|4|5|6>:AMPLitude:INTerpolate:TYPE?

Command description: to select the interpolation rules on which data interpolation by the amplitude axis is based during edit of the currently selected limit line. logarithmic rules or linear rules can be used.

Key path: 【Meas Setup】, [Limit Line>>], [Properties>>], [Interpolation Rules>>], [[Amplitude Log Line]] on the front panel.

Examples:

:CALC:LLIN1:AMPL:INT:TYPE LOG

:CALC:LLIN1:AMPL:INT:TYPE?

[Fixed/Relative>>]

Program control commands:

:CALCulate:LLINe<1|2|3|4|5|6>:FREQuency:CMODe:RELative ON|OFF|1|0

:CALCulate:LLINe<1|2|3|4|5|6>:FREQuency:CMODe:RELative?

Command description: to specify whether the X and Y axis data are absolute or relative during edit of the currently selected limit line , including [X Axis Relative to Center Freq On Off], [Y Axis Relative to RefLevel On Off].

Key path:【Meas Setup】, [Limit Line>>], [Properties>>], [Fixed/Relative>>] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALC:LLIN1:FREQ:CMOD:REL ON

:CALC:LLIN1:FREQ:CMOD:REL?

[Relative to CF On Off]

Program control commands:

:CALCulate:LLINe<1|2|3|4|5|6>:FREQuency:CMODe:RELative ON|OFF|1|0

:CALCulate:LLINe<1|2|3|4|5|6>:FREQuency:CMODe:RELative?

Command description: to specify whether the X axis data are absolute or relative when editing the currently selected limit line.

Key path:【Meas Setup】, [Limit Line>>], [Properties>>], [Fixed/Relative>>] [X Rel CF ON/OFF] on the front panel.

Examples:

:CALC:LLIN1:FREQ:CMOD:REL ON

:CALC:LLIN1:FREQ:CMOD:REL?

[Y Relative to Ref On Off]

Program control commands:

:CALCulate:LLINe<1|2|3|4|5|6>:AMPLitude:CMODe:RELative ON|OFF|1|0

:CALCulate:LLINe<1|2|3|4|5|6>:AMPLitude:CMODe:RELative?

Command description: to specify whether the Y axis data are absolute or relative when editing the currently selected limit line.

Key path: 【Meas Setup】, [Limit Line>>], [Properties>>], [Fixed/Relative>>], [Y Axis Rel Relative to Ref ON/OFF] on the front panel.

Examples:

:CALC:LLIN1:AMPL:CMOD:REL ON

:CALC:LLIN1:AMPL:CMOD:REL?

[Margin ON OFF]

Program control commands:

:CALCulate:LLINe<1|2|3|4|5|6>:MARGin <rel_ampl>

:CALCulate:LLINe<1|2|3|4|5|6>:MARGin?

:CALCulate:LLINe<1|2|3|4|5|6>:MARGin:STATe OFF|ON|0|1

:CALCulate:LLINe<1|2|3|4|5|6>:MARGin:STATe?

Command description: to specify a limit line margin dB which will cause the amplitude data exceed the limit when testing the currently selected limit line.

Key path:【Meas Setup】, [Limit Line>>], [Margin ON OFF] on the front panel.

Setting range: -40 dB ~ 40 dB.

Default unit: dB.

Examples:

:CALC:LLIN1:MARG 10 dB

:CALC:LLIN1:MARG?

[Test Limits On Off]

Program control commands:

:CALCulate:LLINe:TEST OFF|ON|0|1

:CALCulate:LLINe:TEST?

Command description: to specify the limit line test ON or OFF.

Key path:【Meas Setup】, [Limit Line>>], [More 1/2], [Test Limits ON OFF] on the front panel.

Examples:

:CALC:LLIN:TEST OFF

:CALC:LLIN:TEST?

[X Axis Units Freq Time]

Program control commands:

:CALCulate:LLINe:CONTrol:DOMain FREQuency|TIME

:CALCulate:LLINe:CONTrol:DOMain?

Command description: to specify that the X Axis unit of the Limit Line is set to Frequency or Time.

Key path:【Meas Setup】, [Limit Line>>], [More 1/2], [X Axis Units Freq Time] on the front panel.

Examples:

:CALC:LLIN:CONT:DOM FREQ

:CALC:LLIN:CONT:DOM?

[Delete All Limits]

Program control commands:

:CALCulate:LLINe:ALL:DELete

Command description: to clear all limit line data.

Key path:【Meas Setup】, [Limit Line>>], [More 1/2], [Delete All Limits] on the front panel.

Examples:

:CALC:LLIN:ALL:DEL

[Save Limit Line…]

Program control commands:

:MMEMory:STORe:LIMit LLINE1|LLINE2,<filename>

Command description: to save the currently edited limit line data as files. The file name is a relative file name excluding path that is suffixed with ".lim". The file save path is under Factdir fold.

Key path:【Meas Setup】, [Limit Line>>], [More 1/2], [Save Limit Line…] on the front panel.

Examples:

:MMEMory:STORe:LIMit LLINE1,"limitline.lim"

[Recall Limit]

Program control commands:

:MMEMory:LOAD:LIMit LLINE1|LLINE2,<filename>

Command description: to apply the limit line file data saved under Factdir for the currently selected limit line. The file should be suffixed with ".lim".

Key path:【Meas Setup】, [Limit Line>>], [More 1/2], [**Recall Limit**] on the front panel.

Examples:

:MMEMory:LOAD:LIMit LLINE2,"limitline.lim"

[Noise Correction

On Off]

Program control commands:

[:SENSe]:CORRection:NOISe:FLOor ON|OFF|1|0

[:SENSe]:CORRection:NOISe:FLOor?

Command description: Activate or deactivate the noise correction function. When the noise correction function is activated, 4051 first implements the noise correction under the current apparatus state to obtain the correction data and then deletes the apparatus background noise from measuring result so as to improve the measuring flexibility and dynamic range. When the measuring state of apparatus changes, such as resolution bandwidth, frequency width, center frequency and so on, 4051 will implement the noise correction under the new measuring state.

It should be noted that the implementation of noise correction will often change the mechanical attenuator in apparatus to reduce the service life of attenuator. It is not recommended to keep the noise correction switch at the position On for long.

Key path:【Meas Setup】、[More 1/2▸]、 [Noise Correction On Off] on the front panel.

Examples:

:CORR:NOIS:FLO ON

:CORR:NOIS:FLO?

[PhNoise Opt>> Auto Man**]**

Program control commands:

[:SENSe]:FREQuency:SYNThesis:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:FREQuency:SYNThesis:AUTO[:STATe]?

[:SENSe]:FREQuency:SYNThesis:[:STATe] OFF|ON|0|1

[:SENSe]:FREQuency:SYNThesis:[:STATe]?

Pop up the soft menu related to phase noise optimization, including [Auto], [ON] and [OFF]. If Auto is selected, the signal/spectrum analyzer will automatically control the LO circuit parameters and phase noise optimization based on current span, center frequency, RF Gain ON OFF. In principle, Phase Noise Optimization is defaulted as Auto mode.

Examples:

:FREQ:SYNT:AUTO ON

:FREQ:SYNT:AUTO?

:FREQ:SYNT: OFF

:FREQ:SYNT:?

[Low Noise Path On Off]

Program control commands:

[:SENSe]:POWer[:RF]:MW:PATH STD|LNPath

[:SENSe]:POWer[:RF]:MW:PATH?

Command description: this command is only available after the H34 option is provided (Low Noise Preamplifier). When the preamplifier is ON, the Low Noise Path is OFF and this command is grayed out; when the preamplifier is OFF, this command lights on and is switchable.

Key path:【Meas Setup】, [More 1/2], [Low Noise Path ON OFF] on the front panel.

Examples:

:POW:MW:PATH STD

:POW:MW:PATH?

[Preselector Preselecting Bypass]

Program control commands:

INPut:FILTer:YIG[:STATe] OFF|ON|0|1

INPut:FILTer:YIG[:STATe]?

Command description: this command is only available after the H36 option is purchased. It is used for setting whether to bypass the front-end preselector of the signal/spectrum analyzer. In analyzing bandwidth signal, bypass is usually required.

Key path:【Meas Setup】, [More 1/2>>], [Preselector Preselecting Bypass] on the front panel.

Examples:

INP:FILT:YIG OFF INP:FILT:YIG?

[RF Gain>>]

[Auto]

Program control commands:

[:SENSe]:RF:GAIN:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:RF:GAIN:AUTO[:STATe]?

Command description: to set the RF Gain distribution algorithm to Auto. In this case, the RF Gain distribution is “Best Dynamic Range”.

Key path:【Meas Setup】, [More 1/2>>], [RF Gain>>], [Auto] on the front panel.

Examples:

:RF:GAIN:AUTO OFF

:RF:GAIN:AUTO?

3.3 Instrument Commands

[Best for Dynamic Range]

Program control commands:

[:SENSe]:RF:GAIN:AUTO:RULes RANGE

[:SENSe]:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Dynamic Range. In this case, the RF Gain is switched to "Auto OFF"

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best Dynamic Range] on the front panel.

Examples:

:RF:GAIN:AUTO:RUL RANGE

[Best for Sensitivity]

Program control commands:

[:SENSe]:RF:GAIN:AUTO:RULes SENSITIVITY

[:SENSe]:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Sensitivity. In this case, the RF Gain is switched to "Auto OFF"

Key path:【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best for Sensibility] on the front panel.

Examples:

:RF:GAIN:AUTO:RUL SENSITIVITY

[ADC Dither Auto Man]

Program control commands:

[:SENSe]:ADC:DITHer[:STATe] OFF|ON|HIGH

[:SENSe]:ADC:DITHer[:STATe]?

[:SENSe]:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:ADC:DITHer:AUTO[:STATe]?

Command description: to control opening/closing of ADC dither of the frequency acquisition circuit in the analyzer. Under default mode, the signal/spectrum analyzer will automatically control whether the ADC Dither is ON based on current working condition. When the ADC Dither is under Auto mode, the ON or OFF status depends on the span, Res BW and sweep type (continuous swept or step sweep); when it is continuous swept, the ADC Dither status will force to switch to Auto and turns off; when it is step sweep, under Auto mode, if the span is 2 MHz or below, the ADC Dither is ON; if the span is below 2 MHz, the ADC Dither is OFF. Under Auto OFF mode, if the span is above 2 MHz, turning on the ADC Dither may affect the measurement results based on selected dither status. You can access the submenu for manual control.

Key path:【Meas Setup】, [More 1/2>>], [ADC Dither Auto Man] on the front panel.

Examples:

:ADC:DITH OFF

:ADC:DITH?

:ADC:DITH:AUTO OFF

:ADC:DITH:AUTO?

3.3.2.13 Measurement Control

Pop up commands related to measurement control, including [Restart] and [Pause/Resume].

[Restart]

Program control commands:

:INITiate:REST

Command description: to stop current measurement and restart measurement for the signal/spectrum analyzer.

Key path:【Meas Control】, [Restart] on the front panel

Examples:

:INIT:REST

[Pause/Resume]

Program control commands:

:INITiate:PAUS

:INITiate:RES

Command description: when the signal/spectrum analyzer is in operation, this command is used for pausing current measurement; when in Paused status, this command is used for continuing measurement.

Key path:【Meas Control】, [Pause] on the front panel.

Examples:

:INIT:PAUS

:INIT:RES

3.3.2.14 Input Output

Pop up commands related to external input and output interfaces of the signal/spectrum analyzer, including [Freq Ref Int ext],[Input Couple AC DC], [Input Port RF CAL], [Cal Port>>], [HF IF Output ON OFF], [IF Output>>], [Log Detector Output ON OFF], [Ext Mixer…], [Input Impedance 50 Ω 75 Ω].

[Freq Ref Int Ext]

Program control commands:

[:SENSe]:ROSCillator:SOURce INTernal|EXTernal

[:SENSe]:ROSCillator:SOURce?

Command description: to select internal or external frequency reference. The external frequency reference should be 10 MHz±100 Hz and amplitude 0 dBm (Limit range: -2 dBm~+10 dBm). The external frequency reference should be input through the "10 MHz Reference Input" interface on the rear panel. In selecting external reference, the information prompt area will display "Reference: External".

Key path:【Input/output】, [Freq Ref Int Ext] on the front panel.

Examples:

:ROSC:SOUR INT

:ROSC:SOUR?

[Input Couple AC DC]

Program control commands:

:INPut:COUPling AC|DC

:INPut:COUPling?

Command description: to select the coupling method of the input interface of the signal/spectrum analyzer as DC or AC coupling. The DC coupling is useful for measuring input signal less than 10 MHz. However, the external input DC signal may damage the instrument. AC coupling prevents external DC signal from entering the instrument, and is suitable for measuring RF signal larger than 10 MHz.

Key path:【Input/output】, [Input Couple] on the front panel.

Examples:

:INP:COUP AC

:INP:COUP?

[Input Port RF CAL]

Program control commands:

[:SENSe]:FEED RF|AREFerence

[:SENSe]:FEED?

Command description: to select the input interface type as RF input signal or internal calibration signal.

Key path:【Input/output】, [Input Port RF CAL] on the front panel.

Examples:

:FEED RF

:FEED?

[Cal Port>>]

Program control commands:

[:SENSe]:FEED:AREFerence REF500|REFCOMB|REF4800|OFF

[:SENSe]:FEED:AREFerence?

Select internal calibration signal for the signal/spectrum analyzer. When setting the input interface to Calibration, you can measure those calibration signals through screen measurement, including [OFF], [500 MHz], [Comb Wave], [4800 MHz].

Examples:

:FEED:AREF REF500

:FEED:AREF?

[HF/IF Output On Off**]**

Program control commands:

:OUTPut:AUX SIF|AIF| OFF

:OUTPut:AUX?

:OUTPut:AUX:SIF <value>

:OUTPut:AUX:SIF?

Command description: the HF/IF Output is only available when H02 option is purchased. This function can output IF signal between 275 MHz and 475 MHz, Which can be set by the knob, number keys or stepping keys on the front panel.

Key path:【Input/output】, [HF/IF Output ON OFF] on the front panel.

Setting range: 275 MHz ~ 475 MHz.

Default unit: Hz.

Examples:

:OUTP:AUX SIF

:OUTP:AUX?

[IF Output>>]

The IF Output is only available after H03 option is purchased. It is used for controlling the IF output frequency and gain. including [IF Output ON OFF], [IF Frequency], [Auto Gain ON OFF], [Auto Gain Level>>].

[IF Output On Off]

Program control commands:

:OUTPut:AUX SIF|AIF| OFF

:OUTPut:AUX?

Command description: to turn on or off IF Output. When the IF Output is on, the front panel may display no or incorrect trace.

Key path: 【Input/output】, [IF Output>>], [IF Output ON OFF] on the front panel.

Examples:

:OUTP:AUX AIF

:OUTP:AUX?

[IF Frequency]

Program control commands:

:OUTPut:AUX:AIF <value>

:OUTPut:AUX:AIF?

Command description: to set frequency of IF output. Which can be set by the knob, number keys or stepping keys on the front panel.

Key path:【Input/output】, [IF Output>>], [IF Frequency] on the front panel.

Setting range: 10 MHz-160 MHz.

Default unit: MHz.

Examples:

:OUTP:AUX:AIF 100 MHz

:OUTP:AUX:AIF?

[Auto Gain On Off]

Program control commands:

[:SENSe]:IF:GAIN:AUTO OFF|ON|0|1

[:SENSe]:IF:GAIN:AUTO?

Command description: to turn on or off IF Output Auto Gain.

Key path:【Input/output】, [IF Output>>], [Auto Gain ON OFF] on the front panel.

Examples:

:IF:GAIN:AUTO OFF

:IF:GAIN:AUTO?

[Auto Gain Level>>]

Program control commands:

[:SENSe]:IF:GAIN:AUTO:LEVEL 5|0|-5|-10

[:SENSe]:IF:GAIN:AUTO:LEVEL?

Command description: to set the Auto Gain Level. including +5 dBm, 0dBm, -5 dBm and -10 dBm.

Key path:【Input/output】, [IF Output>>], [Auto Gain Level>>] on the front panel.

Examples:

:IF:GAIN:AUTO:LEVEL 5

:IF:GAIN:AUTO:LEVEL?

[Ext Mixer…]

Command description: the Ext Mixer is only available after the H40 option is purchased. Press this command to pop up the parameter setting dialogs for external mixer test. For details, refer to other related manuals.

Key path:【Input/output】, [More 1/2], [Ext Mixer…] on the front panel.

Status saved: not saved in instrument status.

3.3.2.15 Marker

Pop up the soft menu related to markers, including [Select Marker >>], [Normal], [Delta], [Fixed], [OFF], [Properties>>], [Marker ON/OFF], [Couple Markers ON/OFF], and [All Markers OFF].

[Normal]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE POSition

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Normal Marker.

Key path:【Marker】, [Select Marker>>], [Normal] on the front panel.

Examples:

:CALC:MARK1:MODE POS

:CALC:MARK1:MODE?

[Delta]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE DELTa

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Delta Marker. Display the amplitude difference and frequency difference (or time difference, when span is zero) between two markers at the marker display area at the top right corner of the screen. If there exists a single marker, a [Delta Marker] operation will generate a Ref marker in the active marker position. Move the active marker through the knob, stepping keys or number keys. The display amplitude difference unit is dB.

Key path:【Marker】, [Select Marker>>], [Delta] on the front panel.

Examples:

:CALC:MARK1:MODE DELT

:CALC:MARK1:MODE?

[Fixed]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE FIX

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Fixed Marker. The X Axis and Y Axis positions of the fixed marker are fixed. The Fixed Marker can be used as reference marker.

Key path:【Marker】, [Select Marker>>], [Fixed] on the front panel.

Examples:

:CALC:MARK1:MODE FIX

:CALC:MARK1:MODE?

[Off]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE OFF

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to turn off the selected marker.

Key path:【Marker】, [Select Marker>>], [OFF] on the front panel.

Examples:

:CALC:MARK1:MODE OFF

:CALC:MARK1:MODE?

[Properties>>]

Pop up commands related to property setting of currently selected marker, including [Relative To>>], [X Axis Scale Auto Man], [Marker Trace>>] and [Marker Display Line ON OFF].

[Relative To>>]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence<integer>

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence?

Command description: to select the reference marker for the currently selected marker. It can be any one from 11 markers except the currently selected marker.

Key path:【Marker】, [Select Marker>>], [Properties>>], [Relative To>>] on the front panel.

Examples:

:CALC:MARK1:REF 2

:CALC:MARK1:REF?

[X Axis Scale>> Auto Man]

Command description: to set the X Axis (horizontal axis) data of current marker, including [Auto], [Frequency], [Period], [Time], [Inverse Time].

Key path: 【Marker】, [Select Marker >>], [Properties>>], [X Axis Scale Auto Man] on the front panel.

[Auto]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:X:READout:AUTO ON|OFF|1|0

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:X:READout:AUTO?

Command description: to set the X Axis (horizontal axis) data type as Auto for the current marker. When the current marker trace is time waveform data, the X Axis scale automatically sets as Time; when spectrum data, the marker X axis scale automatically sets as Frequency.

Key path: 【Marker】, [Select Marker >>], [Properties>>], [X Axis Scale Auto Man], [Auto] on the front panel.

Examples:

:CALC:MARK1:X:READ:AUTO ON

:CALC:MARK1:X:READ:AUTO?

[Frequency]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:X:READout FREQuency

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:X:READout?

Command description: to set the marker X Axis (horizontal axis) data type as Frequency.

Key path:【Marker】, [Select Marker >>], [Properties>>], [X Axis Scale Auto Man], [Frequency] on the front panel.

Examples:

:CALC:MARK1:X:READ FREQ

:CALC:MARK1:X:READ?

[Period]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:X:READout PERiod

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:X:READout?

Command description: to set the marker X Axis (horizontal axis) data type as Period.

Key path:【Marker】, [Select Marker>>], [Properties>>], [X Axis Scale Auto Man], [Period] on the front panel.

Examples:

:CALC:MARK1:X:READ PER

:CALC:MARK1:X:READ?

[Time]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:X:READout TIME

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:X:READout?

Command description: to set the marker X Axis (horizontal axis) data type as Time.

Key path:【Marker】, [Select Marker >>], [Properties>>], [X Axis Scale Auto Man], [Time] on the front panel.

Examples:

:CALC:MARK1:X:READ TIME

:CALC:MARK1:X:READ?

[Inverse Time]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:X:READout ITIMe

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:X:READout?

Command description: to set the marker X Axis (horizontal axis) data type as Inverse Time.

Key path:【Marker】, [Select Marker>>], [Properties>>], [X Axis Scale Auto Man], [Inverse Time] on the front panel.

Examples:

:CALC:MARK1:X:READ ITIM

:CALC:MARK1:X:READ?

[Marker Trace>>]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:TRACe 1|2|3|4|5|6

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:TRACe?

Command description: to select the trace data of current marker. The marker trace can be any active trace.

Key path:【Marker】, [Select Marker >>], [Properties>>], [Marker Trace>>] on the front panel.

Examples:

:CALC1:MARK1:TRAC 1

:CALC1:MARK1:TRAC?

[Lines>> On Off]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe] OFF|ON|0|1

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe]?

Command description: to set whether the current marker is displayed as a line on the screen, which is good for observation.

Key path: 【Marker】, [Select Marker >>], [Properties>>] and [Lines On/Off].

Examples:

:CALC:MARK1:LIN OFF

:CALC:MARK1:LIN?

[Marker Table On Off]

Program control commands:

:CALCulate:MARKer:TABLe[:STATe] OFF|ON|0|1

:CALCulate:MARKer:TABLe[:STATe]?

Command description: to turn on marker table display. When there are many markers, it is convenient for data measurement.

Key path:【Marker】, [More 1/2>>], [Marker Table ON OFF] on the front panel.

Examples:

:CALC:MARK:TABL OFF

:CALC:MARK:TABL?

[Couple Markers On Off]

Program control commands:

:CALCulate:MARKer:COUPle[:STATe] OFF|ON|0|1

:CALCulate:MARKer:COUPle[:STATe]?

Command description: to turn on or off Marker Couple. When it is ON, moving any marker horizontal axis position will cause an equal movement of horizontal axis position of every other marker which is ON. When the marker is moved to less than Start Frequency or larger than Stop Frequency, the marker is limited to the value of the Start Frequency or the Stop Frequency; when the span is zero, the minimum value is limited as 0, and the maximum value is limited as the Sweep Time.

Key path:【Marker】, [More 1/2>>], [Couple Markers ON OFF] on the front panel.

Examples:

:CALC:MARK:COUP OFF

:CALC:MARK:COUP?

[Marker All Off]

Program control commands:

:CALCulate:MARKer:AOFF

Command description: to turn off all current markers which are ON and related soft keys, e.g, [Noise Marker].

Key path: 【Marker】, [More 1/2>>], [All Markers OFF] on the front panel.

Examples:

:CALC:MARK:AOFF

3.3.2.16 Maker->

Pop up commands related to Marker->Function. Those commands are related to the frequency, span and marker type (Normal or Delta Marker):

Table 5.1 Relationship between Span and Marker->Function

Span > 0Hz	Span = 0Hz
[Marker → Center Freq] [Marker → CF Step] [Marker → Start Freq] [Marker → Stop Freq] [Delta Marker →Span] [Delta Marker → CF] [Marker → RefLevel]	[Marker → RefLevel]

Those marker functions allow the user to change the signal/spectrum analyzer positions using markers as reference.

[Marker → Center Freq]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12][:SET]:CENTer

Command description: to set the Center Frequency equal to the Marker Frequency. It can quickly move the signal to the center position of the screen.

Key path:【Mkr->】, [Marker → Center Freq] on the front panel.

Examples:

:CALC:MARK1:CENT

[Marker → CF Step]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12][:SET]:STEP

Command description: to set the Frequency Step equal to the Marker Frequency. The command changes the value of frequency step.

Key path:【Mkr->】, [Marker → CF Step] on the front panel.

Examples:

:CALC:MARK1:STEP

[Marker → Start Freq]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12][:SET]:STARt

Command description: to set the Start Frequency equal to the Marker Frequency. It changes the Start Frequency.

Key path: 【Mkr->】, [Marker →Start Freq] on the front panel.

Examples:

:CALC:MARK1:STAR

[Marker → Stop Freq]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12][:SET]:STOP

Command description: to set the Stop Frequency equal to the Marker Frequency. The command changes the value of stop frequency.

Key path:【Mkr->】, [Marker →Stop Freq] on the front panel.

Examples:

:CALC:MARK1:STOP

[Delta Marker →Span]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12][:SET]:DELTa:SPAN

Command description: to set the Span equaling to frequency difference of the Delta Marker. The command changes the value of stop.

Key path:【Mkr->】, [Delta Marker → Span] on the front panel.

Examples:

:CALC:MARK1:DELT:SPAN

[Delta Marker → CF]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12][:SET]:DELTa:CENTer

Command description: to set the Center Frequency equal to frequency difference of the Delta Marker. The command changes the value of center frequency.

Key path:【Mkr->】, [Delta Marker→ CF] on the front panel.

Examples:

:CALC:MARK1:DELT:CENT

[Marker → RefLevel]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12][:SET]:RLEVel

Command description: to set the Reference Level equal to the Marker Amplitude. The command changes the value of reference level.

Key path:【Mkr->】, [Marker →RefLevel] on the front panel.

Examples:

:CALC:MARK1:DELT:RLEV

3.3.2.17 Marker Function

The 【Marker Func】 key on the front panel. is used for turning on the control instrument marker functions. The Marker Function performs post-processing on the marker data, including [Marker Count>>], [Audio Demulation], [Noise Marker ON OFF], [N dB Points ON OFF], [Band/Interval Power ON OFF], [Band/Interval Density ON OFF], [Band Adjust>>].

[Marker Count>>]

Command description: to turn on the Marker Count command, including [Marker Count ON OFF], [Counter Gate].

[Marker Count On Off]

Program control commands:

:CALCulate:MARKer:FCOunt[:STATe] OFF|ON|0|1

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FCOunt[:STATe]?

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FCOunt:X?

Command description: to turn on or off Marker Count. If there is no active marker, enabling this function will activate an active marker at the center of screen. The Marker Count readout is not affected by the Frequency Offset. When this function is ON, the Time Gate is disabled. To facilitate normal function of Marker Count, the SPAN/RBW should be less than 500.

In Zero Span, the Marker Count continues operation and counts the signals close to the Center Frequency of the signal/spectrum analyzer.

Key path:【Marker Func】, [Marker Count], [Marker Count ON OFF] on the front panel.

Examples:

CALC:MARK2:FCO ON

CALC:MARK2:FCO:X?

Attention

Marker Count

The Marker Count should not be ON if the Time Gate or Audio Demodulation is ON!

[Counter Gate Auto Man]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FCOunt:GATetime <time>

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FCOunt:GATetime?

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FCOunt:GATetime:AUTO OFF|ON|0|1

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FCOunt:GATetime:AUTO?

Command description: to control the length of time during which the Marker Count measures the signal frequency. Gate time of 500 ms or longer allows for less than 0.1 Hz count accuracy. However, the longer is the gate time, the slower is the key response.

Key path: 【Marker Func】, [Marker Count], [Counter Gate ON OFF] on the front panel.

Setting range: Min.:1.0 E-3 s, Max.: 8 s.

Default unit: s.

Examples:

CALC:MARK:FCO:GAT:AUTO On

CALC:MARK:FCO:GAT 1e-2

[Audio Demulation]

Command description: to turn on the Audio Demodulation, including [Dem Type>>], [Dem Mode Inter Cont], [Dem Time].

[Dem Type>> Close]

Program control commands:

:DEMod AM|FM|OFF

:DEMod?

:DEMod:STATe OFF|ON|0|1

:DEMod:STATe?

Command description: to turn on the Demodulation Mode. You can turn off demodulation or select AM Demodulation or FM Demodulation.

Key path:【Marker Func】, [Audio **Demulation**>>], [OFF], [AM], [FM] on the front panel.

Examples:

:DEM AM

:DEM?

:DEM:STAT OFF

:DEM:STAT?

[Dem Mode Inter Cont]

Program control commands:

[:SENSe]:DEMod:STATe:MODE INTER|CONT

[:SENSe]:DEMod:STATe:MODE?

Command description: to select the Demodulation Mode as Inter or Cont.

Key path:【Marker Func】, [Audio **Demulation**>>], [Dem Mode Inter Cont] on the front panel.

Examples:

:DEM:STAT:MODE INTER

:DEM:STAT:MODE?

[DemTime 1.0000 s]

Program control commands:

:DEMod:TIME <time>

:DEMod:TIME?

Command description: to control the length of time of the Audio Demodulation.

Key path:【Marker Func】, [Audio **Demulation**>>], [Dem Time] on the front panel.

Setting range: Min.:0.01 s, Max.: 100 s.

Default unit: s.

Examples:

:DEM:TIME 1 s

:DEM:TIME?

[Noise Marker On Off**]**

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FUNCtion NOISe

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FUNCtion?

Menu description: when it is ON, activate the Noise Marker. Read out the noise power that normalizes the noise into 1 Hz bandwidth near the active marker. At that time, the detector is under Sample Detector mode. The Noise Marker averages the values of the 32 data points (including 16 at the left side and 15 on and at the right of marker) near the frequency axis or time axis. In measuring the ratio between the signal and noise, place the marker on the signal peak and select the Delta Marker mode. Place the active marker to the noise to be measured with number keys or knob. Then select the [Noise Marker ON OFF]. At that time, the display value unit at the marker display area is dBc/Hz.

Key path: 【Marker Func】, [Noise Marker ON OFF] on the front panel.

Examples:

:CALC:MARK1:FUNC NOIS

:CALC:MARK1:FUNC?

[N dB Points On Off]

Program control commands:

:CALCulate:BWIDth|BANDwidth:NDB <rel_ampl>

:CALCulate:BWIDth|BANDwidth:NDB?

:CALCulate:BWIDth|BANDwidth[:STATe] OFF|ON|0|1

:CALCulate:BWIDth|BANDwidth[:STATe]?

:CALCulate:BWIDth|BANDwidth:RESult?

Command description: to turn on or off the NdB measurement of bandwidth values descending from signal peak point. You can input the NdB value to be measured from the front panel.

Key path: 【Marker Func】, [N dB Points 3.00 dB ON OFF] on the front panel.

Setting range: Min.:1.0, Max.: 60.0.

Examples:

:CALC:BWID:NDB 3

:CALC:BWID:NDB?

:CALC:BWID OFF

:CALC:BWID?

:CALC:BWID:RES?

[Band/Interval Power On Off]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FUNCtion BPOWer

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FUNCtion?

Command description: to turn on or off Bandwidth Power. Initialize the Bandwidth Power width as 5% of the total span.

Key path: 【Marker Func】, [Band/Interval Power ON OFF] on the front panel.

Examples:

:CALC:MARK1:FUNC BPOW

:CALC:MARK1:FUNC?

[Band/Interval Density On Off]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FUNCtion BDENsity

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FUNCtion?

Command description: to turn on or off Bandwidth Density. Initialize the Bandwidth Density width as 5% of the total span.

Key path:【Marker Func】, [Band/Interval Density ON OFF] on the front panel.

Examples:

:CALC:MARK1:FUNC BDEN

:CALC:MARK1:FUNC?

[Band/Interval Span]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FUNCtion:BAND:SPAN <freq>

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FUNCtion:BAND:SPAN?

Command description: to set the Band Span of the Bandwidth Power and Bandwidth Density Marker functions. This menu is only active when the Bandwidth Power or Bandwidth Density function is ON. In adjusting the Band Span, the current Band Left and Band Right will change. When the Band Left equals to the difference of marker frequency minus current band span/2, the minimum value is current start frequency. When the Band Right equals to the sum of Marker Frequency plus Band Span/2, the maximum value is the current stop frequency.

Key path:【Marker Func】, [Band Adjust], [Band/**Interval** Span] on the front panel.

Setting range: Min.:0.0, Max.: current span.

Default unit: Hz

Examples:

:CALC:MARK1:FUNC:BAND:SPAN 2 MHz

:CALC:MARK1:FUNC:BAND:SPAN?

[Band/Interval Left]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FUNCtion:BAND:LEFT <freq>

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FUNCtion:BAND:LEFT?

Command description: to set the Band Left of the Bandwidth Power and Bandwidth Density Marker functions. This menu is only active when the Bandwidth Power or Bandwidth Density function is ON. When adjusting the Band Left, the current marker frequency information and band span will change. The Marker Frequency is always at the center between the Band Left and the Band Right. Band span equals to the difference of the Band Right minus the currently set Band Left.

Key path:【Marker Func】, [Band Adjust], [Band/Interval Left] on the front panel.

Setting range: Min.: currently set Band Left; Max.: currently set Band Right.

Default unit: Hz

Examples:

:CALC:MARK1:FUNC:BAND:LEFT 2 MHz

:CALC:MARK1:FUNC:BAND:LEFT?

3.3 Instrument Commands

[Band/Interval Right]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FUNCtion:BAND:RIGHt <freq>

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:FUNCtion:BAND:RIGHt?

Command description: to set the Band Right of the Bandwidth Power and Bandwidth Density Marker functions. This menu is only active when the Bandwidth Power or Bandwidth Density function is ON. When adjusting the Band Right, the current marker frequency information and band span will change. The Marker Frequency is always at the center between the Band Left and the Band Right. Band span equals to the difference of the Band Right minus the currently set Band Left.

Key path:【Marker Func】, [Band Adjust],

[Band/Interval Right]

Position: on the front panel.

Setting range: Min.: currently set Band Left; Max.: currently set Band Right.

Default unit: Hz

Examples:

:CALC:MARK1:FUNC:BAND:RIGH 2 MHz

:CALC:MARK1:FUNC:BAND:RIGH?

3.3.2.18 Peak Search

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum

The 【Peak Search】 key on the front panel is used to turn on the peak search for traces by the control instrument and turn on marker for display, including [Next Peak], [Next Pk Right], [Next Pk Left], [Marker Delta], [Mkr->CF], [Mkr->Ref Lvl], [Peak Criteria>>] , [Peak Table>>], [Peak Track ON OFF], [Pk-pk Search], [Min Search].

[Next Peak]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:NEXT

Command description: Taking the Amplitude of the point where the current marker is located, search for the next peak of current test trace.

Key path: 【Peak Search】, [Next Peak] on the front panel.

Examples:

:CALC:MARK1:MAX:NEXT

[Next Pk Right]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:RIGHt

Command description: to search for the peak to the right of the current test trace marker position.

Key path:【Peak Search】, [Next Pk Right] on the front panel.

Examples:

:CALC:MARK1:MAX:RIGH

[Next Peak Left]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:LEFT

Command description: to search for the peak to the left of the current test trace marker position.

Key path:【Peak Search】, [Next Pk Left] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALC:MARK1:MAX:LEFT

[Marker Delta]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE DELTa

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Delta Marker. Display the amplitude difference and frequency difference (or time difference, when span is zero) between two markers at the marker display area at the top right corner of the screen. If there exists a single marker, a [Delta Marker] operation will generate a Ref marker in the active marker position. Move the active marker through the knob, stepping keys or number keys. The display amplitude difference unit is dB.

Key path:【Peak Search】, [Marker **Delta**] on the front panel.

Examples:

:CALC:MARK1:MODE DELT

:CALC:MARK1:MODE?

[Mkr → CF]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12][:SET]:CENTer

Command description: to set the Center Frequency equal to the Marker Frequency. It can quickly move the signal to the center position of the screen.

Key path:【Peak Search】, [Mkr → CF] on the front panel.

Examples:

:CALC:MARK1:CENT

[Mkr → Ref Lvl]

3.3 Instrument Commands

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12][:SET]:RLEVel

Command description: to set the Reference Level equal to the Marker Amplitude. The command changes the value of reference level.

Key path:【Peak Search】, [Mkr → Ref Lvl] on the front panel.

Examples:

:CALC:MARK1:RLEV

[Peak Criteria>>]

Pop up criteria for peak search, including [Pk Excursion ON OFF], [Pk Threshold ON OFF], [Pk Threshold Line ON OFF].

[Peak Excursion On Off]

Program control commands:

:CALCulate:MARKer:PEAK:EXCursion <rel_ampl>

:CALCulate:MARKer:PEAK:EXCursion?

:CALCulate:MARKer:PEAK:EXCursion:STATe OFF|ON|0|1

:CALCulate:MARKer:PEAK:EXCursion:STATe?

Command description: to define the value (dB) than which the rise or fall edge time is larger required for a peak point identified as signal peak in defining the peak search.

Key path:【Peak Search】, [More 1/2 >>] , [Peak Criteria>>], [Pk Excursion ON OFF] on the front panel.

Setting range: Min.:0 dB, Max.: 100 dB.

Examples:

:CALC:MARK:PEAK:EXC 6 dB

:CALC:MARK:PEAK:EXC?

[Pk Threshold On Off]

Program control commands:

:CALCulate:MARKer:PEAK:THReshold <ampl>

:CALCulate:MARKer:PEAK:THReshold?

:CALCulate:MARKer:PEAK:THReshold:STATe OFF|ON|0|1

:CALCulate:MARKer:PEAK:THReshold:STATe?

Command description: to define the value than which the signal peak value is larger (dBm) required a peak to be identified.

Key path:【Peak Search】, [More 1/2 >>] , [Peak Criteria>>], [Pk Threshold ON OFF] on the front panel.

Setting range: Min.:-200 dBm, Max.: Reference Level.

Examples:

:CALC:MARK:PEAK:THR -100 dBm

:CALC:MARK:PEAK:THR?

[Peak Table>>]

Pop up commands related to peak table, including [Peak Table ON OFF], [Peak Sort Freq Amplitude], [Peak Readout>>].

[Peak Table On Off]

Program control commands:

:CALCulate:MARKer:PEAK:TABLe:STATe OFF|ON|0|1

:CALCulate:MARKer:PEAK:TABLe:STATe?

Command description: to turn on or off Peak Table.

Key path:【Peak Search】, [More 1/2 >>] , [Peak Table>>], [Peak Table ON OFF] on the front panel.

Examples:

:CALC:MARK:PEAK:TABL:STAT OFF

:CALC:MARK:PEAK:TABL:STAT?

[Peak Sort Freq Amptd]

Program control commands:

:CALCulate:MARKer:PEAK:SORT FREQuency|AMPLitude

:CALCulate:MARKer:PEAK:SORT?

Command description: to set the peak lists in the Peak Table in order of ascending frequency or descending amplitude.

Key path:【Peak Search】, [More 1/2 >>] , [Peak Table>>], [Peak Sort **Freq Amptd**] on the front panel.

Examples:

:CALC:MARK:PEAK:SORT FREQ

:CALC:MARK:PEAK:SORT?

[Peak Readout>> All]

Program control commands:

:CALCulate:MARKer:PEAK:TABLe:READout ALL|GTDLine|LTDLine

:CALCulate:MARKer:PEAK:TABLe:READout?

Command description: to show up the peak lists in the Peak Table by Above Display Line or Below Display Line or All.

Key path:【Peak Search】, [More 1/2 >>] , [Peak Table>>], [Peak Readout>>] on the front panel.

Examples:

:CALC:MARK:PEAK:TABL:READ ALL

:CALC:MARK:PEAK:TABL:READ?

[Peak Track On Off]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:CPSearch[:STATe] ON|OFF|1|0

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:CPSearch[:STATe]?

Command description: when Continuous Peak Search is ON, the current marker will perform one Peak Search after each sweep. If the Continuous Peak Search is OFF, no operation is made.

Key path:【Peak Search】, [More 1/2>>], [Peak Track ON OFF] on the front panel.

Examples:

:CALC:MARK1:CPS ON

:CALC:MARK1:CPS?

[Pk-pk Search]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:PTPeak

Command description: to turn on the Peak-peak Search.

Key path:【Peak Search】, [Pk-Pk Search] on the front panel.

Examples:

:CALC:MARK1:PTP

[Min Search]

Program control commands:

:CALCulate:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MINimum

Command description: to turn on the Min Search.

Key path:【Peak Search】, [Min Search] on the front panel.

Examples:

:CALC:MARK1:MIN

3.3.3 Channel power

Measure the power and power spectral density under specified channel bandwidth. A pair of markers displayed indicates the edges of the channel. The user can self-define the center frequency, reference level, channel bandwidth and other parameters. Such measurement can be accessed via the following commands to obtain measurement results:

Program control commands:

:CONFigure:CHPower

FETCh:CHPower[n]?

MEASure:CHPower[n]?

READ:CHPower[n]?

n = 1, return the channel power and floating number type within the integration bandwidth.

n = 2, return the trace data and floating number type within the span.

FETCh:CHPower:CHPower?

MEASure:CHPower:CHPower?

READ:CHPower:CHPower?

Return channel power result in dBm

FETCh:CHPower:DENSity?

MEASure:CHPower:DENSity?

READ:CHPower:DENSity?

Return power spectral density result in dBm/Hz.

3.3.3.1 Frequency

Set parameters related to frequency of the signal/spectrum analyzer, including [Center Freq], [CF Step Auto Man], [Freq Offset], etc.

[Center Freq]

Program control commands:

[:SENSe]:FREQuency:CENTer <frequency>

[:SENSe]:FREQuency:CENTer?

Command description: to set the center frequency of the signal/spectrum analyzer. If the set center frequency is inconsistent with the current span, the latter will automatically change to the value best suitable for desired frequency.

Key path:【Frequency】, [Center Freq] on the front panel.

Setting range: Min.: 0 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT 5 GHz

[CF Step Auto Man]

Program control commands:

[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>

[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?

[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:CENTer:STEP:AUTO?

Command description: to change the step size of the [Center Freq] , start frequency or [Stop Freq]. When it is under [Auto Mode], and when the center frequency is active, press the step key, the [CF Step] changes by 1, 2, 5 and 10. When it is under Auto Off mode, use the number keys, stepping keys or knob for change. At this time, reactivate the [Center Freq], and press the step key, the center freq will change by set step size.

Key path: 【Frequency】, [CF Step Auto Man] on the front panel.

Setting range: Min.: 1Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT:STEP 100 MHz

:FREQ:CENT:STEP:AUTO ON

[Freq Offset]

Program control commands:

[:SENSe]:FREQuency:OFFSet <freq> [:SENSe]:FREQuency:OFFSet?

Command description: to add the set frequency offset to the displayed frequency value, including marker frequency value, but this does not affect the signal display position.

Key path:【Frequency】, [Freq Offset] on the front panel.

Setting range: Min.:-500 GHz, Max.: +500 GHz.

Default unit: Hz

Examples:

:FREQ:OFFS 10 MHz

3.3.3.2 Amplitude/Y Axis

Amplitude/Y Axis parameter settings include [RefLevel], [Attenuation>>], [Preamplifier ON OFF], [Scale/Division], [Auto Scale], [More 1/2>>], [[Y Axis Unit] and [Ref Level Offset].

[RefLevel]

Program control commands:

:DISPlay:CHPower:VIEW:WINDow:TRACe:Y:RLEVel <real>

:DISPlay:CHPower:VIEW:WINDow:TRACe:Y:RLEVel?

Command description: to enable the Reference Level function. The reference level corresponds to the top of the coordinate top. Measure signal at reference level position to get highest accuracy. The input attenuator of the signal/spectrum analyzer is coupled to the reference level, which can be automatically changed to avoid compression of input signal.

Key path:【Amplitude/Y Axis】, [RefLevel] on the front panel.

Setting range: Min.: -170 dBm, Max.: 30 dBm.

Default unit: set based on Y Axis scale unit.

Examples:

:DISPlay:CHPower:VIEW:WINDow:TRACe:Y:RLEVel 20 dBm

[Attenuation>>]

Adjust the attenuation of the signal/spectrum analyzer. The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Preamplifier On Off]

Program control commands:

[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1

[:SENSe]:POWer[:RF]:GAIN[:STATe]?

The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】[Preamplifier ON OFF>>] for more details.

Key path: 【Amplitude/Y Axis】, [Preamplifier ON OFF] on the front panel.

Examples:

:POW:GAIN OFF

:POW:GAIN?

[Scale/Div]

Program control commands:

:DISPlay:CHPower:VIEW:WINDow:TRACe:Y:PDIVision <rel_ampl>

:DISPlay:CHPower:VIEW:WINDow:TRACe:Y:PDIVision?

Command description: to select the scale/division from 0.1 dB/division to 20 dB/division. This command is only valid when the scale type is logarithm.

Key path: 【Amplitude/Y Axis】, [Scale/Div] on the front panel.

Setting range: Min.: 0.1 dB, Max.: 20 dBm.

Examples:

:DISPlay:CHPower:VIEW:WINDow:TRACe:Y:PDIVision 5 dB

[Auto Scale]

Program control commands:

:CHPower:ADJust:LEVel

Command description: the instrument automatically sets parameters like reference level and scale/division based on input signal sizes. Setting rule for auto scaling: firstly obtain the maximum value and the minimum value based on current measurement trace data. Based on the maximum value, place on the 80% graticule of the screen trace Y axis for auto setting of reference level and scale/division.

Key path: 【Amplitude/Y Axis】, [Auto Scale] on the front panel.

[Y Axis Unit]

Program control commands:

:UNIT:CHPower:POWer DBM|DBMV|DBMA|V|W|A|DBUV|DBUA

:UNIT:CHPower:POWer?

Command description: to select the Y Axis unit from [dBm], [dBmV], [dBmA], [W], [V], [A], [dBμV] and [dBμA]. The instrument will automatically calculate the trace data and marker readout based on the Y axis scale unit.

Key path: 【Amplitude/Y Axis】, [More 1/2>>], [Y Axis Unit] on the front panel.

Examples:

:UNIT:CHPower:POWer DBMV

[Ref Level Offset]

Program control commands:

:DISPlay:CHPower:WINDow:TRACe:Y:RLEVel:OFFSet <rel_ampl>

:DISPlay:CHPower:WINDow:TRACe:Y:RLEVel:OFFSet?

Command description: to introduce offset for all amplitude readout (e.g, reference level and marker amplitude). It will not change the trace position on the screen. This offset unit is dB and is not affected by the scale and unit.

Key path:【Amplitude/Y Axis】, [More 1/2>>], [Ref Level Offset] on the front panel.

Setting range: Min.: -1000 dB, Max.:1000 dB.

Examples:

:DISPlay:CHPower:WINDow:TRACe:Y:RLEVel:OFFSet 12

3.3.3.3 Span/X Axis

Set the frequency information of the signal/spectrum analyzer.

[Span]

Program control commands:

[:SENSe]:CHPower:FREQuency:SPAN <freq> [:SENSe]:CHPower:FREQuency:SPAN?

Command description: to set the span value.

Key path:【Span/X Axis】, [Span] on the front panel.

Setting range: Min.: not less than current integration bandwidth value; Max.: related to the maximum working frequency limit of the instrument.

Default unit: Hz.

Examples:

:CHPower:FREQuency:SPAN 10 MHz

[Full Span]

Program control commands:

[:SENSe]:CHPower:FREQuency:SPAN:FULL

Command description: to set the span as maximum value.

Examples:

:CHP:FREQ:SPAN:FULL

[Last Span]

Program control commands:

[:SENSe]:CHPower:FREQuency:SPAN:PREVious

Command description: to set the signal/spectrum analyzer back to the previous span.

Examples:

:CHP:FREQ:SPAN:PREV

3.3.3.4 Bandwidth

Set Res BW and video bandwidth, including [Res BW Auto Man], [Video BW Auto Man] and [Filter Type].

[Res BW Auto Man]

Program control commands:

[:SENSe]:CHPower:BANDwidth[:RESolution] <bandwidth>

[:SENSe]:CHPower:BANDwidth[:RESolution]?

[:SENSe]:CHPower:BANDwidth[:RESolution]:AUTO ON|OFF|1|0

[:SENSe]:CHPower:BANDwidth[:RESolution]::AUTO?

Command description: to change the swept analysis Res BW, ranging from 1 Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5 MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step.

Key path: [BW], [Res BW Auto Man] on the front panel.

Setting range: Min.:1 Hz, Max.: 20 MHz.

Default unit: Hz

Examples:

:CHPower:BANDwidth 1 kHz

:CHPower:BANDwidth:AUTO ON

[Video BWBW Auto Man]

Program control commands:

[:SENSe]:CHPower:BANDwidth:VIDeo <bandwidth>

[:SENSe]:CHPower:BANDwidth:VIDeo?

[:SENSe]:CHPower:BANDwidth:VIDeo:AUTO ON|OFF|1|0

[:SENSe]:CHPower:BANDwidth:VIDeo:AUTO?

Command description: to change the video bandwidth displayed on the active function zone ranging from 1 Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5 MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step.

Key path: [BW], [Video BWBW Auto Man] on the front panel.

Setting range: Min.:1 Hz, Max.: 20 MHz.

Default unit: Hz

Examples:

:CHPower:BANDwidth:VIDeo 1 kHz

:CHPower:BANDwidth:VIDeo:AUTO ON

[Filter Type]

Program control commands:

[:SENSe]:CHPower:BANDwidth:SHAPe GAUSsian|FLATtop

[:SENSe]:CHPower:BANDwidth:SHAPe?

Command description: comprising [Gaussian] and [Flattop]. In general, the signal/spectrum analyzer uses Gaussian filter, i.e., use filter approximate to the Gaussian shape to complete filtering of [Res BW]. If the flat top filter is used, the signal/spectrum analyzer adopts filter approximate to the rectangular shape to complete filtering of Res BW. The response time of flat top filter is about 3 times of that of the Gaussian filter. The sweep speed of the flat top filter is smaller than that of the Gaussian filter. The flat top filter has better selectivity than the Gaussian filter and therefore is more capable of distinguishing two signals with unequal amplitude.

Key path: [BW], [Filter Type] on the front panel.

3.3.3.5 Auto Setting

Pop up the menus related to automatic setup, including [Couple All], [Mech Atten Auto Man], [Res BW Auto Man], [Video BW Auto Man], [VBW/RBW Auto Man], [Span/RBW Auto Man], [Sweep Time Auto Man] and [CF Step Auto Man].

[Couple All]

Program control commands:

:COUPle ALL

Command description: to set the Res BW, video bandwidth, sweep time, mechanical attenuator and frequency step as auto coupling mode.

Key path:【Auto Set】, [Couple All] on the front panel.

[Mech Atten Auto MAN]

See the description of 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Res BW Auto MAN]

See description of [BW] [Res BW Auto MAN] for more details.

[Video BW Auto MAN]

See description of [BW][Video BW Auto MAN] for more details.

[Sweep Time Auto MAN]

See description of 【Sweep】 [Sweep Time Auto MAN] for more details.

[CF Step Auto MAN]

See description of 【Frequency】 [CF Step Auto MAN] for more details.

3.3.3.6 Trace

Commands related to trace, including [Clear Write], [Trace Average], [Max. Hold], [Min. Hold], [View/Blank] [More 1/2>>] and [Detector>>].

[Clear Write]

Program control commands:

:TRACe:CHPower:TYPE WRITe

:TRACe:CHPower:TYPE?

Command description: to set the current trace processing as Refresh, i.e., clear all data of displayed trace and continue the signal trace receipt under sweep status.

Key path:【Trace】, [Clear Wire] on the front panel.

Examples:

:TRAC:CHP:TYPE WRIT

[AverageTrace Average]

Program control commands:

:TRACe:CHPower:TYPE AVERage

:TRACe:CHPower:TYPE?

Command description: to set the current trace processing method as Average, i.e., based on the average count N set in the 【Meas Setup】, update trace after averaging the performance index of the measurement trace.

Key path:【Trace】, [Trace Average] on the front panel.

Examples:

:TRAC:CHP:TYPE AVER

[Max Hold]

Program control commands:

:TRACe:CHPower:TYPE MAXHold

:TRACe:CHPower:TYPE?

Command description: to set the current trace processing method as maximum hold, i.e., the new trace data will be assigned with maximum value of previous measured trace data

Key path:【Trace】, [Max. Hold] on the front panel.

Examples:

:TRAC:CHP:TYPE MAXH

[Min Hold]

Program control commands:

:TRACe:CHPower:TYPE MINHold

:TRACe:CHPower:TYPE?

Command description: to set the current trace processing method as minimum hold, i.e., the new trace data will be assigned with minimum value of previous measured trace data.

Key path: 【Trace】, [Min. Hold] on the front panel.

Examples:

:TRAC:CHP:TYPE MINH

[View/Blank>> Refresh Display]

3.3 Instrument Commands

Program control commands:

:TRACe:CHPower:DISPlay[:STATe] ON|OFF|0|1

:TRACe:CHPower:DISPlay[:STATe]?

:TRACe:CHPower:UPDate[:STATe] ON|OFF|0|1

:TRACe:CHPower:UPDate[:STATe]?

Command description: to set the display method for the selected trace from [Trace On], [View], [Background] and [Blank]. Four statuses are completed through combination of the above four commands.

Key path:【Trace】, [View/Blank>>] on the front panel.

Examples:

:TRACe:CHPower:DISPlay ON

:TRACe:CHPower:UPDate OFF

[Trace On]

Program control commands:

:TRACe:CHPower:DISPlay[:STATe] ON

:TRACe:CHPower:UPDate[:STATe] ON

Command description: to set the display of currently selected trace as [Refresh Display].

Key path:【Trace】, [View/Blank>>], [Trace On]] on the front panel.

Examples:

:TRACe:CHPower:DISPlay ON

:TRACe:CHPower:UPDate ON

[View]

Program control commands:

:TRACe:CHPower:DISPlay[:STATe] ON

:TRACe:CHPower:UPDate[:STATe] OFF

Command description: to set the display of currently selected trace as Static Display.

Key path:【Trace】, [View/Blank>>], [View] on the front panel.

Examples:

:TRACe:CHPower:DISPlay ON

:TRACe:CHPower:UPDate OFF

[Background]

Program control commands:

:TRACe:CHPower:DISPlay[:STATe] OFF

:TRACe:CHPower:UPDate[:STATe] ON

Command description: to set the display of currently selected trace as Backstage Refresh.

Key path:【Trace】, [View/Blank>>], [Background] on the front panel.

Examples:

:TRACe:CHPower:DISPlay OFF

:TRACe:CHPower:UPDate ON

[Blank]

Program control commands:

:TRACe:CHPower:DISPlay[:STATe] OFF

:TRACe:CHPower:UPDate[:STATe] OFF

Command description: to set the display of currently selected trace as Display OFF.

Key path:【Trace】, [View/Blank>>], [Blank] on the front panel.

Examples:

:TRACe:CHPower:DISPlay OFF

:TRACe:CHPower:UPDate OFF

[Detector>>]

Set the detector command for the currently selected trace, including [Auto], [Normal], [Peak], [Sample], [Negative Peak], [Average>>], where, the average detector type includes video average, power average and voltage average.

Program control commands:

[:SENSe]:CHPower:DETector:AUTO ON|OFF|1|0 [:SENSe]:CHPower:DETector:AUTO?

[:SENSe]:CHPower:DETector[:FUNCtion] NORMal|POSitive|SAMPle|NEGative

|AVERage|RMS|LOG|SCALar

[:SENSe]:CHPower:DETector[:FUNCtion]?

[Auto]

Program control commands:

[:SENSe]:CHPower:DETector:AUTO ON|OFF|1|0 [:SENSe]:CHPower:DETector:AUTO?

Command description: to set the detector command for the currently selected trace as Auto. That means, the signal/spectrum analyzer will perform based on the parameter setting of currently selected trace.

Key path:【Trace】, [More 1/2>>], [Detector>>], [Auto] on the front panel.

Examples:

:CHPower:DETector:AUTO ON

[Normal]

Program control commands:

[:SENSe]:CHPower:DETector[:FUNCtion] NORMal

[:SENSe]:CHPower:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Normal, i.e., display the measurement results of positive peak and negative peak at the same time to achieve display effect similar to the analog instrument.

Key path:【Trace】, [More 1/2>>], [Detector>>], [Normal] on the front panel.

Examples:

:CHPower:DETector NORMal

:CHPower:DETector?

[Peak]

Program control commands:

[:SENSe]:CHPower:DETector[:FUNCtion] POSitive

[:SENSe]:CHPower:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Positive Peak, i.e., take the maximum value from sampling data assigned to each trace point.

Key path:【Trace】, [More 1/2>>], [Detector>>], [Peak] on the front panel.

Examples:

:CHPower:DETector POSitive

:CHPower:DETector?

[Sample]

Program control commands:

[:SENSe]:CHPower:DETector[:FUNCtion] SAMPle

[:SENSe]:CHPower:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Sample, i.e., take the last value from sampling data assigned to each trace point.

Key path:【Trace】, [More 1/2>>], [Detector>>], [Sample] on the front panel.

Examples:

:CHPower:DETector SAMPle

:CHPower:DETector?

[Negative Peak]

Program control commands:

[:SENSe]:CHPower:DETector[:FUNCtion] NEGative

[:SENSe]:CHPower:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Negative Peak, i.e., take the minimum value from sampling data assigned to each trace point.

Key path:【Trace】, [More 1/2>>], [Detector>>], [Negative Peak] on the front panel.

Examples:

:CHPower:DETector NEGative

:CHPower:DETector?

[Average>> Log-Pwr Avg]

Program control commands:

[:SENSe]:CHPower:DETector[:FUNCtion] LOG

[:SENSe]:CHPower:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Video Average. Also called Logarithm Power Average Detector, i.e., take the logarithm power average value for all data assigned to each trace point; earlier signal/spectrum analyzer generally displays the measurement trace of logarithm scale, and all filtering and averaging are based on the logarithm power data; the trace is generally called as video signal. After digital IF processing is adopted, to make measurement results same as the earlier signal/spectrum analyzer, the video average detector function is added.

Key path:【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Log-Pwr Avg] on the front panel.

Examples:

:CHPower:DETector LOG

:CHPower:DETector?

[Average>> Pwr Avg]

Program control commands:

[:SENSe]:CHPower:DETector[:FUNCtion] AVERage or

[:SENSe]:CHPower:DETector[:FUNCtion] RMS

[:SENSe]:CHPower:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Power Average. Also called root mean square (RMS) detector. Calculate the root mean square of all sampling data assigned to each trace point; the 4051signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After square these voltage values, take sum and divide the count of sampling data points corresponding to each trace point. Finally, take square root. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those RMS values are trace data.

Key path:【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Pwr Avg] on the front panel.

Examples:

:CHPower:DETector RMS

:CHPower:DETector?

[Average>> Voltage Avg]

Program control commands:

[:SENSe]:CHPower:DETector[:FUNCtion] SCALar

[:SENSe]:CHPower:DETector[:FUNCtion]?

Command description: to set the detector command for the currently selected trace as Voltage Average. Also called average (AVG) detector. Take linear average for all sampling data assigned to each trace point; the 4051 signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After summing those voltage values, divide the number of sampling data points corresponding to each trace point.

When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those average values are trace data.

Key path:【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Voltage Avg] on the front panel.

Examples:

:CHPower:DETector SCALar

:CHPower:DETector?

3.3.3.7 Sweep

Set commands related to sweep parameters, including [Sweep Time Auto MAN], [Sweep Setup>>], [Sweep Points].

[Sweep Time Auto MAN]

Program control commands:

[:SENSe]:CHPower:SWEep:TIME <time>

[:SENSe]:CHPower:SWEep:TIME?

[:SENSe]:CHPower:SWEep:TIME:AUTO OFF|ON|0|1

[:SENSe]:CHPower:SWEep:TIME:AUTO?

Command description: to change the sweep time of signal/spectrum analyzer. When it is under auto status, the sweep time will be automatically coupled based on Res BW, span and video bandwidth.

Key path:【Sweep】, [Sweep Time Auto MAN] on the front panel.

Setting range: Min.: 1 ms, Max.: 6000 s.

Default unit: s

Examples:

:CHPower:SWEep:TIME 500 ms

:CHPower:SWEep:TIME:AUTO OFF

[Sweep Setup>>]

Set commands related to sweep type, including [Sweep Type Auto MAN], [Sweep Type Rules Auto MAN] and [FFT Width Auto MAN].

[Sweep Type>> Auto MAN]

Program control commands:

[:SENSe]:CHPower:SWEep:TYPE FFT|SWEep

[:SENSe]:CHPower:SWEep:TYPE?

[:SENSe]:CHPower:SWEep:TYPE:AUTO OFF|ON|0|1

[:SENSe]:CHPower:SWEep:TYPE:AUTO?

Command description: to set sweep type. to determine whether Swept or FFT is adopted for frequency spectrum measurement. Also set the FFT step bandwidth for FFT sweep

Key path:【Sweep】, [Sweep Setup>>], [Sweep Type Auto MAN] on the front panel.

Examples:

:CHPower:SWEep:TYPE FFT

:CHPower:SWEep:TYPE:AUTO ON

[Sweep Type Rules Auto MAN]

Program control commands:

[:SENSe]:CHPower:SWEep:TYPE:AUTO:RULes SPEed|DRANge

[:SENSe]:CHPower:SWEep:TYPE:AUTO:RULes?

[:SENSe]:CHPower:SWEep:TYPE:AUTO:RULes:AUTO OFF|ON|0|1

[:SENSe]:CHPower:SWEep:TYPE:AUTO:RULes:AUTO?

Command description: to set rules for auto sweep type. While the sweep type rules include “Best Dynamic Range” and “ Best Speed”.

“Best Dynamic Range” rules: when RBW is or larger than 1 kHz, the sweep type is Swept; when RBW is less than 1 kHz, the sweep type is FFT.

“Best Speed” rules: when RBW is or larger than 30 kHz, the sweep type is Swept; when RBW is less than 30 kHz, the sweep type is FFT.

Key path:【Sweep】, [Sweep Setup>>], [Sweep Type Rules Auto MAN] on the front panel.

Examples:

:CHPower:SWEep:TYPE:AUTO:RULes SPEed

:CHPower:SWEep:TYPE:AUTO:RULes:AUTO ON

[FFT Width Auto MAN]

Program control commands:

[:SENSe]:CHPower:SWEep:FFT:WIDTh <real>

[:SENSe]:CHPower:SWEep:FFT:WIDTh?

[:SENSe]:CHPower:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1

[:SENSe]:CHPower:SWEep:FFT:WIDTh:AUTO?

Command description: to set FFT Width. The FFT width includes [Auto], [<100 kHz], [<3 MHz], [<13 MHz], [<=Max.]. FFT width is only active when the FFT sweep type is selected. Under Auto type, when the signal/spectrum analyzer performs FFT spectrum measurement, the maximum Res BW is 30 kHz. To guarantee best dynamic measurement range, the signal/spectrum analyzer automatically optimizes the FFT width within 100 kHz. The larger is the FFT width, the faster is FFT spectrum measurement, but the dynamic range performance will be affected.

Under FFT sweep, the FFT width setup limits the maximum value for center frequency step of each tune. For example, if [<100 Hz] is selected, the maximum value for center freq step of each tune is 100 Hz. As the FFT width gets larger, the count of instrument center frequencies get smaller when performing measurement of same frequency scope, and the response measurement gets faster. Therefore, to improve measurement speed, you can manually change the FFT width.

Key path:【Sweep】, [Sweep Setup>>], [FFT Width>>] on the front panel.

Examples:

:CHPower:SWEep:FFT:WIDTh 2

:CHPower:SWEep:FFT:WIDTh:AUTO ON

[Sweep points]

Program control commands:

[:SENSe]:CHPower:SWEep:POINts <integer>

[:SENSe]:CHPower:SWEep:POINts?

Command description: to set the trace points.

Key path:【Sweep】, [Sweep Points] on the front panel.

Setting range: 101-30001.

Examples:

:CHPower:SWEep: POINts 1001

:CHPower:SWEep: POINts?

3.3.3.8 Single

Program control commands:

:INITiate:CHPower

Command description: the 【Single】 key on the front panel has no corresponding soft menu. This function is mainly used for manual trigger of a measurment. When the Average is ON, this function performs the measurements at the count specified by the Average Num.

In remote control programming and system establishment, this function combined with *WAI can effectively synchronize the measurement process and enable the trace data obtained after the *WAI finishes directly correspond to the measurement process one by one.

3.3.3.9 Continuous

Program control commands:

:INITiate:CONTinuous ON

Command description: Continuous ON is mainly used for changing the Continuous OFF into Continuous ON; if the current measurement is Continuous ON, the instrument performs no operation.

3.3.3.10 Trigger

See description of Swept SA 【Trigger】 for more details.

3.3.3.11 Display

Setups related to display, including [Display Line ON OFF], [Bar Graph ON OFF], [Display Config>>].

[Display Line On Off]

See description of Swept SA 【Display】 [Display Line ON OFF] for more details.

[Display Config>>]

It is used for configurations of interface language, status area display ON OFF related to interface display, , including [Language 中文 English], [Graticule ON OFF], [Status Area Display ON OFF], [ON OFF]. See description of Swept SA 【Display】 [Display Config>>] for more details.

[Bar Graph On Off]

Program control commands:

:DISPlay:CHPower:VIEW:WINDow:BGRaph ON|OFF|1|0

:DISPlay:CHPower:VIEW:WINDow:BGRaph?

Command description: to turn on or off Bar Graph Display.

Key path:【Display】on the front panel.

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:DISPlay:CHPower:VIEW:WINDow:BGRaph ON

3.3.3.12 Input Output

See description of Swept SA 【Input/output】 for more details.

3.3.3.13 Marker

Commands related to marker, including [Select Marker >>], [Normal], [Delta], [Fixed], [OFF], [Properties>>], [Couple Markers ON OFF], and [All Markers OFF].

[Normal]

Program control commands:

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE POSition

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Normal Marker.

Key path:【Marker】, [Select Marker>>], [Normal] on the front panel.

Examples:

:CALC:CHP:MARK1:MODE POS

:CALC:CHP:MARK1:MODE?

[Delta Marker]

Program control commands:

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE DELTa

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Delta Marker. Display the amplitude difference and frequency difference (or time difference, when span is zero) between two markers at the marker display area at the top right corner of the screen. If there exists a single marker, a [Delta Marker] operation will generate a Ref marker in the active marker position. The display amplitude difference unit is dB.

Key path:【Marker】, [Select Marker>>], [Delta] on the front panel.

Examples:

:CALC:CHP:MARK1:MODE DELTa

:CALC:CHP:MARK1:MODE?

3.3 Instrument Commands

[Fixed]

Program control commands:

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE FIXed

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Fixed Marker. The X Axis and Y Axis positions of the fixed marker are fixed. The Fixed Marker can be used as reference marker.

Key path:【Marker】, [Select Marker>>], [Fixed] on the front panel.

Examples:

:CALC:CHP:MARK1:MODE FIXed

:CALC:CHP:MARK1:MODE?

[Off]

Program control commands:

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE OFF

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to turn off the selected marker.

Key path:【Marker】, [Select Marker>>], [OFF] on the front panel.

Examples:

:CALC:CHP:MARK1:MODE OFF

:CALC:CHP:MARK1:MODE?

[Properties>>]

Commands related to property setting of currently selected marker, including [Relative To>>], [X Axis Scale Auto ON OFFMan], [Marker Trace>>] and [Lines ON OFF].

[Relative To>>]

Program control commands:

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence <integer>

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence?

Command description: to select the reference marker for the currently selected marker. It can be any one from 11 markers except the currently selected marker.

Key path:【Marker】, [Select Marker >>],[Properties>>], [Relative Tor>>] on the front panel.

Examples:

:CALC:CHP:MARK1:REF 1

:CALC:CHP:MARK1:REF?

[Lines>> On Off]

Program control commands:

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe] OFF|ON|0|1

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe]?

Command description: to set whether the current marker is displayed as a line on the screen, which is good for observation.

Key path:【Marker】, [Select Marker >>], [Properties>>], [Lines ON **OFF**] on the front panel.

Examples:

:CALC:CHP:MARK1:LIN ON

:CALC:CHP:MARK1:LIN?

[Couple Markers On Off]

Program control commands:

:CALCulate:CHPower:MARKer:COUPle[:STATe] ON|OFF|1|0

:CALCulate:CHPower:MARKer:COUPle[:STATe]?

Command description: to turn on or off Marker Couple. When it is ON, moving any marker horizontal axis position will cause an equal movement of horizontal axis position of every other marker which is ON. When the marker is moved to less than Start Frequency or larger than Stop Frequency, the marker is limited to the value of the Start Frequency or the Stop Frequency; when the span is zero, the minimum value is limited as 0, and the maximum value is limited as the Sweep Time.

Key path:【Marker】, [More 1/2>>], [Couple Markers ON OFF] on the front panel.

Examples:

:CALC:CHP:MARK1:COUP ON

:CALC:CHP:MARK1:COUP?

[Marker All Off]

Program control commands:

:CALCulate:CHPower:MARKer:AOFF

Command description: to turn off all current markers which are ON and related marker functions.

Key path:【Marker】, [More 1/2>>], [All Markers OFF] on the front panel.

Examples:

:CALC:CHP:MARK:AOFF

3.3.3.14 Maker->

This key has no soft menu.

3.3.3.15 Marker Function

This key has no soft menu.

3.3.3.16 Peak Search

Program control commands:

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum

3.3 Instrument Commands

Command description: to turn on the peak search for traces by the control instrument and turn on marker for display, including [Next Peak], [Next Pk Right], [Next Pk Left].

Examples:

:CALC:CHP:MARK1:MAX

[Next Peak]

Program control commands:

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:NEXT

Command description: Taking the Amplitude of the point where the current marker is located, search for the next peak of current test trace.

Key path:【Peak Search】, [Next Peak] on the front panel.

Examples:

:CALC:CHP:MARK1:MAX:NEXT

[Next Pk Right]

Program control commands:

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:RIGHt

Command description: to search for the peak to the right of the current test trace marker position.

Key path:【Peak Search】, [Next Peak Right] on the front panel.

Examples:

:CALC:CHP:MARK1:MAX:RIGH

[Next Peak Left]

Program control commands:

:CALCulate:CHPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:LEFT

Command description: to search for the peak to the left of the current test trace marker position.

Key path:【Peak Search】, [Next Peak Left] on the front panel.

Examples:

:CALC:CHP:MARK1:MAX:LEFT

3.3.3.17 Measurement Setting

Commands related to measurement setting, including [Average Num ON OFF], [Average Mode Exponential Repeat], [Integration Bandwidth], [RRC Filter ON OFF], [Filter Bandwidth], [Filter Factor a], [Phase Noise Opt], [Low Noise Path ON OFF], [Preselector Preselecting Bypass], [RF Gain>>], [ADC Dither Auto ON OFFMan] and [Meas Preset].

[Average Num On Off]

Program control commands:

[:SENSe]:CHPower:AVERage:COUNt <integer>

[:SENSe]:CHPower:AVERage:COUNt?

[:SENSe]:CHPower:AVERage[:STATe] ON|OFF|1|0

[:SENSe]:CHPower:AVERage[:STATe]?

Command description:to turn on or off Average. When Average Count is ON, the user can specify the average count required for measurement.

Key path:【Meas Setup】 and [Average Num ON OFF] on the front panel.

Setting range: 1 ~ 10000

Examples:

:CHPower:AVERage:COUNt 10

:CHPower:AVERage:COUNt?

:CHPower:AVERage ON

:CHPower:AVERage?

[Average Mode Exponential Repeat]

Program control commands:

[:SENSe]:CHPower:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:CHPower:AVERage:TCONtrol?

Command description: when Average Count is ON, the user can select Average State required for measurement.

Exponential - Different from Linear Average, in Exponential State, the weight of new data is larger than that of old data. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases.

Repeat - Similarly, it takes exponential averaging. However, when the average count is met, clear all previous results, restart average till the set average count and repeat this process.

Key path: 【Meas Setup】, [Average Mode Exponential Repeat] on the front panel.

Examples:

:CHPower:AVERage:TCONtrol REPeat

:CHPower:AVERage:TCONtrol?

[Integration BW]

Program control commands:

[:SENSe]:CHPower:BANDwidth:INTegration <bandwidth>

[:SENSe]:CHPower:BANDwidth:INTegration?

Command description: to designate the bandwidth integration range for calculating power within the channel. The integration bandwidth is displayed in the trace window and indicated with a pair of vertical lines connected with arrows. It ensures that the set instrument span is not less than the integral bandwidth.

Key path:【Meas Setup】, [Integration BW] on the front panel.

Status saved: saved in the instrument status.

Setting range: 100 Hz - 1.0 GHz.

Default unit: Hz

Examples:

:CHPower:BANDwidth:INTegration 3 MHz

:CHPower:BANDwidth:INTegration?

[RRC Filter On Off]

Program control commands:

[:SENSe]:CHPower:FILTer[:RRC][:STATe] OFF|ON|0|1

[:SENSe]:CHPower:FILTer[:RRC][:STATe]?

Command description: to turn on or off RRC Filter. When RRC Filter is ON, the influence factor of RRC Filter will be considered in calculating the measurement result.

Key path:【Meas Setup】, [More 1/3>>] , [RRC Filter ON **OFF**] on the front panel.

Examples:

:CHPower:FILTer |ON

:CHPower:FILTer?

[Filter BW]

Program control commands:

[:SENSe]:CHPower:FILTer[:RRC]:BANDwidth <real>

[:SENSe]:CHPower:FILTer[:RRC]:BANDwidth?

Command description: to set bandwidth value for the RRC Filter. When RRC Filter is ON, the influence factor of RRC Filter will be considered in calculating the measurement result.

Key path:【Meas Setup】, [Menu 1/3>>] , [Filter BW] on the front panel.

Setting range: 100 Hz ~ 100 MHz.

Default unit: Hz

Examples:

:CHPower:FILTer:BANDwidth 2 MHz

:CHPower:FILTer:BANDwidth?

[Filter Factor a]

Program control commands:

[:SENSe]:CHPower:FILTer[:RRC]:ALPHa <real>

[:SENSe]:CHPower:FILTer[:RRC]:ALPHa?

Command description: to turn on or off RRC Filter. When RRC Filter is ON, the influence factor of RRC Filter will be considered in calculating the measurement result.

Key path: 【Meas Setup】, [More 1/3>>] , [Filter Factor a] on the front panel.

Default unit: none

Examples:

:CHPower:FILTer:ALPHa 0.1

:CHPower:FILTer:ALPHa?

[Quick Tune]

Program control commands:

:CHPower:FREQuency:SYNThesis 3

Command description: to select Quick Tune to increase sweep speed but decreases phase noise performance.

Key path:【Meas Setup】, [Phase Noise Optimization Auto Manual],ON OFF [Quick Tune] on the front panel.

[Low Noise Path ON OFF]

Program control commands:

[:SENSe]:CHPower:POWer:MW:PATH STD|LNPath

[:SENSe]:CHPower:POWer:MW:PATH?

Command description: this command is only available after the H34 option is provided (Low Noise Preamplifier).

Key path:【Meas Setup】, [More 1/3>>], [More 2/3>>], [Low Noise Path ON OFF] on the front panel.

[Preselector Preselecting Bypass]

Program control commands:

:INPut:CHPower:FILTer:YIG[:STATe] OFF|ON|0|1

:INPut:CHPower:FILTer:YIG[:STATe]?

Command description: this menu is only available after the H36 option is purchased. It is used for setting whether to bypass the front-end preselector of the signal/spectrum analyzer. In analyzing bandwidth signal, bypass is usually required.

Key path:【Meas Setup】, [More 1/3>>], [More 2/3 >>], [Preselector Preselecting Bypass] on the front panel.

Examples:

:INPut:CHPower:FILTer:YIG ON

:INPut:CHPower:FILTer:YIG?

[RF Gain>>]

Set the Auto ON OFF of the RF Gain and best allocation algorithm for RF Gain, including [Auto], [Best Dynamic Range] and [Best for Sensitivity].

Key path:【Meas Setup】, [More 1/3>>], [More 2/3>>], [RF Gain] on the front panel.

[Auto]

Program control commands:

[:SENSe]:CHPower:RF:GAIN:AUTO OFF|ON|0|1

[:SENSe]:CHPower:RF:GAIN:AUTO?

Command description: to set the RF Gain distribution algorithm to Auto. In this case, the RF Gain distribution is "Best Dynamic Range".

Key path:【Meas Setup】, [More 1/3>>], [More 2/3>>], [RF Gain>>], [Auto] on the front panel.

Examples:

:CHPower:RF:GAIN:AUTO ON

:CHPower:RF:GAIN:AUTO?

[Best for Dynamic Range]

Program control commands:

[:SENSe]:CHPower:RF:GAIN:AUTO:RULes RANGE

[:SENSe]:CHPower:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Dynamic Range. In this case, the RF Gain is switched to "Auto OFF"

Key path:【Meas Setup】, [More 1/3>>], [More 2/3>>], [RF Gain>>], [Best for Dynamic Range] on the front panel.

Examples:

CHPower:RF:GAIN:AUTO:RULes RANGE

:CHPower:RF:GAIN:AUTO:RULes?

[Best for Sensitivity]

Program control commands:

[:SENSe]:CHPower:RF:GAIN:AUTO:RULes SENSITIVITY

[:SENSe]:CHPower:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Sensitivity. In this case, the RF Gain is switched to "Auto OFF"

Key path: 【Meas Setup】, [More 1/3>>], [More 2/3>>], [RF Gain>>], [Best for Sensitivity] on the front panel.

Examples:

:CHPower:RF:GAIN:AUTO:RULes SENSITIVITY

:CHPower:RF:GAIN:AUTO:RULes?

[ADC Dither Auto ON OFF]

Program control commands:

[:SENSe]:CHPower:ADC:DITHer[:STATe] OFF|ON|HIGH

[:SENSe]:CHPower:ADC:DITHer[:STATe]?

[:SENSe]:CHPower:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:CHPower:ADC:DITHer:AUTO[:STATe]?

Command description: to control opening/closing of ADC dither of the frequency acquisition circuit in the analyzer. Under default mode, the signal/spectrum analyzer will automatically control whether the ADC Dither is ON based on current working condition. When the ADC Dither is under Auto mode, the ON or OFF status depends on the span, Res BW and sweep type (continuous swept or step sweep); when it is continuous swept, the ADC Dither status will force to switch to Auto and turns off; when it is step sweep, under Auto mode, if the span is 2 MHz or below, the ADC Dither is ON; if the span is below 2 MHz, the ADC Dither is OFF. Under Auto OFF mode, if the span is above 2 MHz, turning on the ADC Dither may affect the measurement results based on selected dither status. You can access the submenu for manual control.

Key path:【Meas Setup】, [More 1/3>>], [More 2/3>>], [ADC Dither Auto ON OFF] on the front panel.

Examples:

:CHPower:ADC:DITHer OFF

:CHPower:ADC:DITHer?

:CHPower:ADC:DITHer:AUTO ON

:CHPower:ADC:DITHer:AUTO?

[Meas Preset]

Program control commands:

:CONFigure:CHPower

Command description: to use *RST command for reset. Reset the measurement parameters to the factory preset status or user saved parameter status.

Key path:【Meas Setup】, [More 1/3>>], [More 2/3>>], [Meas Preset] on the front panel.

Examples:

:CONFigure:CHPower

3.3.3.18 Measurement Control

Commands related to measurement control, including [Meas Single Cont] [Restart] and [Pause/Resume].

[Measure Continuous ON OFF]

Program control commands:

:INITiate:CONTinuous OFF|ON|0|1

:INITiate:CONTinuous?

Command description: to set continuous measurement OFF or ON.

Key path:【Meas Control】, [Meas Single Cont] on the front panel.

Examples:

:INIT:CONT OFF

[Restart]

Program control commands:

:INITiate:REST

Command description: to stop current measurement and restart measurement for the signal/spectrum analyzer.

Key path:【Meas Control】, [Restart] on the front panel

Examples:

:INIT:REST

[Pause]

Program control commands:

:INITiate:PAUS

:INITiate:RES

Command description: when the signal/spectrum analyzer is in operation, this command is used for pausing current measurement; when in Paused status, this command is used for continuing measurement.

Key path: 【Meas Control】, [Pause] on the front panel.

Examples:

:INIT:PAUS

:INIT:RES

3.3.4 Occupied Bandwidth

Occupied Bandwidth Integration display of spectrum power, including marker setting at frequency containing certain power part. Such measurement can be accessed via the following commands to obtain measurement results:

Program control commands:

:CONFigure:OBWidth

:FETCh:OBWidth[n]?

:MEASure:OBWidth[n]?

:READ:OBWidth[n]?

n = 1, return occupied bandwidth Hz,

total power dBm,

Span Hz,

Trace points,

Res BW Hz,

Frequency error Hz,

x dB Bandwidth Hz

n = 2, return trace data.

:FETCh:OBWidth:OBWidth?

:MEASure:OBWidth:OBWidth?

:READ:OBWidth:OBWidth?

return occupied results.

:FETCh:OBWidth:FERRor?

:MEASure:OBWidth:FERRor?

:READ:OBWidth:FERRor?

return frequency error results

:FETCh:OBWidth:XDB?

:MEASure:OBWidth:XDB?

:READ:OBWidth:XDB?

return xdB bandwidth results.

3.3.4.1 Frequency

Set parameters related to frequency of the signal/spectrum analyzer, including [Center Freq], [CF Step Auto ON OFFMan], [Freq Offset], etc.

[Center Freq]

Program control commands:

[:SENSe]:FREQuency:CENTer <frequency>

[:SENSe]:FREQuency:CENTer?

Command description: to set the center frequency of the signal/spectrum analyzer. If the set center frequency is inconsistent with the current span, the latter will automatically change to the value best suitable for desired frequency.

Key path:【Frequency】, [Center Freq] on the front panel.

Setting range: Min.: 0 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT 5 GHz

[CF Step Auto ON OFF]

Program control commands:

[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>

[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?

[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:CENTer:STEP:AUTO?

Command description: to change the step size of the [Center Freq] , start frequency or [Stop Freq]. When it is under [Auto Mode], and when the center frequency is active, press the step key, the [CF Step] changes by 1, 2, 5 and 10. When it is under Auto Off mode, use the number keys, stepping keys or knob for change. At this time, reactivate the [Center Freq], and press the step key, the center freq will change by set step size.

Key path:【Frequency】, [CF Step Auto Man] on the front panel.

Setting range: Min.: 1 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT:STEP 100 MHz

:FREQ:CENT:STEP:AUTO ON

[Freq Offset]

Program control commands:

[:SENSe]:FREQuency:OFFSet <freq>

[:SENSe]:FREQuency:OFFSet?

Command description: to add the set frequency offset to the displayed frequency value, including marker frequency value, but this does not affect the signal display position.

Key path: 【Frequency】, [Freq Offset] on the front panel.

Setting range: Min.:-500 GHz, Max.: +500 GHz.

Default unit: Hz

Examples:

:FREQ:OFFS 10 MHz

3.3.4.2 Amplitude/Y Axis

Amplitude/Y Axis parameter settings include [RefLevel], [Attenuation>>], [Preamplifier ON OFF], [Scale/Division], [Auto Scale], [More 1/2>>], [[Y Axis Unit] and [Ref Level Offset].

[RefLevel]

Program control commands:

:DISPlay:OBWidth:VIEW:WINDow:TRACe:Y:RLEVel <real>

:DISPlay:OBWidth:VIEW:WINDow:TRACe:Y:RLEVel?

Command description: to set the reference level. Measure signal at reference level position to get highest accuracy. The input attenuator of the signal/spectrum analyzer is coupled to the reference level, which can be automatically changed to avoid compression of input signal.

Key path:【Amplitude/Y Axis】, [RefLevel] on the front panel.

Setting range: Min.: -170 dBm, Max.: 30 dBm.

Default unit: set based on Y Axis scale unit.

Examples:

:DISPlay:OBWidth:VIEW:WINDow:TRACe:Y:RLEVel 20 dBm

[Attenuation>>]

Adjust the attenuation of the signal/spectrum analyzer. The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Preamplifier On Off]

Program control commands:

[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1

[:SENSe]:POWer[:RF]:GAIN[:STATe]?

The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】 [Preamplifier ON OFF>>] for more details.

Examples:

:POW:GAIN OFF

:POW:GAIN?

[Scale/Div]

Program control commands:

:DISPlay:OBWidth:VIEW:WINDow:TRACe:Y:PDIVision <rel_ampl>

:DISPlay:OBWidth:VIEW:WINDow:TRACe:Y:PDIVision?

Command description: to select the scale/division from 0.1 dB/division to 20 dB/division. This menu is only valid when the scale type is logarithm.

Key path:【Amplitude/Y Axis】, [Scale/Div] on the front panel.

Setting range: Min.: 0.1 dB, Max.: 20 dBm.

Examples:

:DISPlay:OBWidth:VIEW:WINDow:TRACe:Y:PDIVision 5 dB

[Auto Scale]

Program control commands:

:OBWidth:ADJust:LEVel

Command description: the instrument automatically sets parameters like reference level and scale/division based on input signal sizes. When this soft menu key is pressed, the instrument performs one auto scaling. Setting rule for auto scaling: firstly obtain the maximum value and the minimum value based on current measurement trace data. Based on the maximum value, place on the 80% graticule of the screen trace Y axis for auto setting of reference level and scale/division.

Key path:【Amplitude/Y Axis】, [Auto Scale] on the front panel.

[Y Axis Unit]

Program control commands:

:UNIT:OBWidth:POWer DBM|DBMV|DBMA|V|W|A|DBUV|DBUA

:UNIT:OBWidth:POWer?

Command description: to select the Y Axis unit from [dBm], [dBmV], [dBmA], [W], [V], [A], [dBμV] and [dBμA]. The instrument will automatically calculate the trace data and marker readout based on the Y axis scale unit.

Key path:【Amplitude/Y Axis】, [More 1/2>>], [Y Axis Unit] on the front panel.

Examples:

:UNIT:OBWidth:POWer |DBMV

:UNIT:OBWidth:POWer?

[Ref Level Offset]

Program control commands:

:DISPlay:OBWidth:WINDow:TRACe:Y:RLEVel:OFFSet <rel_ampl>

:DISPlay:OBWidth:WINDow:TRACe:Y:RLEVel:OFFSet?

Command description: to introduce offset for all amplitude readout (e.g, reference level and marker amplitude). It will not change the trace position on the screen. This offset unit is dB and is not affected by the scale and unit.

Key path:【Amplitude/Y Axis】, [More 1/2>>], [Ref Level Offset] on the front panel.

Setting range: Min.: -1000 dB, Max.:1000 dB.

Examples:

:DISPlay:OBWidth:WINDow:TRACe:Y:RLEVel:OFFSet 12

3.3.4.3 Span/X Axis

Set the frequency information of the signal/spectrum analyzer.

[Span]

Program control commands:

[:SENSe]:OBWidth:FREQuency:SPAN <freq>

[:SENSe]:OBWidth:FREQuency:SPAN?

Command description: to set the span value.

Key path:【Span/X Axis】, [Span] on the front panel.

Setting range: Min.: 10 Hz, Max.: related to the maximum working frequency limit of the instrument.

Examples:

:OBWidth:FREQuency:SPAN 10 MHz

[Full Span]

Program control commands:

[:SENSe]:OBWidth:FREQuency:SPAN:FULL

Command description: to set the signal/spectrum analyzer into the center frequency/span mode. Set the span as maximum value.

Examples:

:OBW:FREQ:SPAN:FULL

[Last Span]

Program control commands:

[:SENSe]:OBWidth:FREQuency:SPAN:PREVious

Command description: to set the signal/spectrum analyzer back to the previous span.

Examples:

:OBW:FREQ:SPAN:PREV

3.3.4.4 Bandwidth

Commands for setting resolution bandwidth and video bandwidth, including [Res BW Auto Man], [Video BW Auto Man] and [Filter Type] options.

[Res BW Auto MAN]

Program control commands:

[:SENSe]:OBWidth:BANDwidth <bandwidth>

[:SENSe]:OBWidth:BANDwidth?

[:SENSe]:OBWidth:BANDwidth:AUTO ON|OFF|1|0

[:SENSe]:OBWidth:BANDwidth:AUTO?

Command description: to change the Res BW, ranging from 1 Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5 MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step.

Key path:【Bandwith】, [Res BW Auto MAN] on the front panel.

Setting range: Min.:1 Hz, Max.: 20 MHz.

Default unit: Hz

Examples:

:OBWidth:BANDwidth 1 kHz

:OBWidth:BANDwidth:AUTO ON

[Video BW Auto MAN]

Program control commands:

[:SENSe]:OBWidth:BANDwidth:VIDeo <bandwidth>

[:SENSe]:OBWidth:BANDwidth:VIDeo?

[:SENSe]:OBWidth:BANDwidth:VIDeo:AUTO ON|OFF|1|0

[:SENSe]:OBWidth:BANDwidth:VIDeo:AUTO?

Command description: to change the video bandwidth displayed on the active function zone ranging from 1 Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5 MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step.

Key path:【Bandwith】, [Video BW Auto MAN] on the front panel.

Setting range: Min.:1 Hz, Max.: 20 MHz.

Default unit: Hz

Examples:

:OBWidth:BANDwidth:VIDeo 1 kHz

:OBWidth:BANDwidth:VIDeo:AUTO ON

[Filter Type]

Program control commands:

[:SENSe]:OBWidth:BANDwidth:SHAPe GAUSsian|FLATtop

[:SENSe]:OBWidth:BANDwidth:SHAPe?

Command description: comprising [Gaussian] and [Flattop]. In general, the signal/spectrum analyzer uses Gaussian filter, i.e., use filter approximate to the Gaussian shape to complete filtering of [Res BW]. If the flat top filter is used, the signal/spectrum analyzer adopts filter approximate to the rectangular shape to complete filtering of Res BW. The response time of flat top filter is about 3 times of that of the Gaussian filter. The sweep speed of the flat top filter is smaller than that of the Gaussian filter. The flat top filter has better

selectivity than the Gaussian filter and therefore is more capable of distinguishing two signals with unequal amplitude.

Key path:【Bandwith】, [Filter Type] on the front panel.

Examples:

:OBWidth:BANDwidth:SHAPe FLATtop

:OBWidth:BANDwidth:SHAPe?

3.3.4.5 Auto Setting

Pop up the menus related to automatic setup, including [Couple All], [Mech Atten Auto Man], [Res BW Auto Man], [Video BW Auto Man], [VBW/RBW Auto Man], [Span/RBW Auto Man], [Sweep Time Auto Man] and [CF Step Auto Man].

[Couple All]

Program control commands:

:COUPle ALL

Command description: to set the Res BW, video bandwidth, sweep time, mechanical attenuator and frequency step as auto coupling mode.

Key path:【Auto Set】, [Couple All] on the front panel.

Examples:

:COUPle ALL

[Mech Atten Auto MAN]

See the description of 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Res BW Auto MAN]

See description of 【Bandwith】[Res BW Auto MAN] for more details.

[Video BW Auto MAN]

See description of 【Bandwith】[Video BW Auto MAN] for more details.

[Sweep Time Auto MAN]

See description of 【Sweep】 [Sweep Time Auto MAN] for more details.

[CF Step Auto Man]

See description of【Frequency】 [CF Step Auto MAN] for more details.

3.3.4.6 Trace

Commands related to trace, including [Clear Write], [Trace Average], [More 1/2>>] and [Detector>>].

[Clear Write]

Program control commands:

:TRACe:OBWidth:TYPE WRITe|AVERage|MAXHold|MINHold

:TRACe:OBWidth:TYPE?

Command description: to set the current trace processing as Refresh, i.e., clear all data of displayed trace and continue the signal trace receipt under sweep status.

Key path:【Trace】, [Clear Write] on the front panel.

Examples:

:TRAC:OBWidth:TYPE WRIT

[Trace Average]

Program control commands:

:TRACe:OBWidth:TYPE WRITe|AVERage|MAXHold|MINHold

:TRACe:OBWidth:TYPE?

Command description: to set the current trace processing method as Average, i.e., based on the average count N set in the [Meas Setup], update trace after averaging the performance index of the measurement trace.

Key path:【Trace】, [Trace Average] on the front panel.

Examples:

:TRAC:OBWidth:TYPE AVER

[Max Hold]

Program control commands:

:TRACe:OBWidth:TYPE WRITe|AVERage|MAXHold|MINHold

:TRACe:OBWidth:TYPE?

Command description: to set the current trace processing method as maximum hold, i.e., the new trace data will be assigned with maximum value of previous measured trace data

Key path: 【Trace】, [Max Hold] on the front panel.

Examples:

:TRAC:OBWidth:TYPE MAXH

[Min Hold]

Program control commands:

:TRACe:OBWidth:TYPE WRITe|AVERage|MAXHold|MINHold

:TRACe:OBWidth:TYPE?

Command description: to set the current trace processing method as minimum hold, i.e., the new trace data will be assigned with minimum value of previous measured trace data.

Key path: 【Trace】, [Min Hold] on the front panel.

Examples:

:TRAC:OBWidth:TYPE MINH

3.3 Instrument Commands

[View/Blank>> Trace On]

Program control commands:

:TRACe:OBWidth:DISPlay[:STATe] ON|OFF|0|1

:TRACe:OBWidth:DISPlay[:STATe]?

:TRACe:OBWidth:UPDate[:STATe] ON|OFF|0|1

:TRACe:OBWidth:UPDate[:STATe]?

Command description: to set the display method for the selected trace from Trace On], [View], [Background] and [Blank]. Four statuses are completed through combination of the above four commands.

Key path:【Trace】, [View/Blank>>] on the front panel.

Examples:

:TRACe:OBWidth:DISPlay ON

:TRACe:OBWidth:DISPlay?

:TRACe:OBWidth:UPDate ON

:TRACe:OBWidth:UPDate?

[Trace On]

Program control commands:

:TRACe:OBWidth:DISPlay[:STATe] ON

:TRACe:OBWidth:UPDate[:STATe] ON

Command description: to set the display of currently selected trace as [**Trace On**].

Key path:【Trace】, [View/Blank>>], [**Trace On**] on the front panel.

Examples:

:TRACe:OBWidth:DISPlay ON

:TRACe:OBWidth:UPDate ON

[View]

Program control commands:

:TRACe:OBWidth:DISPlay[:STATe] ON

:TRACe:OBWidth:UPDate[:STATe] OFF

Command description: to set the display of currently selected trace as Static Display.

Key path:【Trace】, [View/Blank>>], [View] on the front panel.

Examples:

:TRACe:OBWidth:DISPlay ON

:TRACe:OBWidth:UPDate OFF

[Background]

Program control commands:

:TRACe:OBWidth:DISPlay[:STATe] OFF

:TRACe:OBWidth:UPDate[:STATe] ON

Command description: to set the display of currently selected trace as Backstage Refresh.

Key path:【Trace】, [View/Blank>>], [Background] on the front panel.

Examples:

:TRACe:OBWidth:DISPlay OFF

:TRACe:OBWidth:UPDate ON

[Blank]

Program control commands:

:TRACe:OBWidth:DISPlay[:STATe] OFF

:TRACe:OBWidth:UPDate[:STATe] OFF

Command description: to set the display of currently selected trace as Display OFF.

Key path:【Trace】, [View/Blank>>], [Blank] on the front panel.

Examples:

:TRACe:OBWidth:DISPlay OFF

:TRACe:OBWidth:UPDate OFF

[Detector>>]

Set the detector command for the currently selected trace, including [Auto], [Normal], [Peak], [Sample], [Negative Peak], [Average>>], where, the average detector type includes video average, power average and voltage average.

Program control commands:

[:SENSe]:OBWidth:DETector:AUTO ON|OFF|1|0

[:SENSe]:OBWidth:DETector:AUTO?

[:SENSe]:OBWidth:DETector[:FUNCtion]

NORMal|POSitive|SAMPle|NEGative|AVERage|RMS|LOG|SCALar

[:SENSe]:OBWidth:DETector[:FUNCtion]?

[Auto]

Program control commands:

:OBWidth:DETector:AUTO ON|OFF|1|0

:OBWidth:DETector:AUTO?

Command description: to set the detector command for the currently selected trace as Auto. That means, the signal/spectrum analyzer will perform based on the parameter setting of currently selected trace.

Key path:【Trace】, [More 1/2>>], [Detector>>], [Auto] on the front panel.

Examples:

:OBWidth:DETector:AUTO ON

[Normal]

Program control commands:

:OBWidth:DETector NORMal

:OBWidth:DETector?

Command description: to set the detector command for the currently selected trace as Normal, i.e., display the measurement results of positive peak and negative peak at the same time to achieve display effect similar to the analog instrument.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Normal] on the front panel.

Examples:

:OBWidth:DETector NORMal

[Peak]

Program control commands:

:OBWidth:DETector POSitive

:OBWidth:DETector?

Command description: to set the detector command for the currently selected trace as Positive Peak, i.e., take the maximum value from sampling data assigned to each trace point.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Peak] on the front panel.

Examples:

:OBWidth:DETector POSitive

[Sample]

Program control commands:

:OBWidth:DETector SAMPle

:OBWidth:DETector?

Command description: to set the detector command for the currently selected trace as Sample, i.e., take the last value from sampling data assigned to each trace point.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Sample] on the front panel.

Examples:

:OBWidth:DETector SAMPle

[Negative Peak]

Program control commands:

:OBWidth:DETector NEGative

:OBWidth:DETector?

Command description: to set the detector command for the currently selected trace as Negative Peak, i.e., take the minimum value from sampling data assigned to each trace point.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Negative Peak] on the front panel.

Examples:

:OBWidth:DETector NEGative

[Average>> Log-Pwr Avg]

Program control commands:

:OBWidth:DETector LOG

:OBWidth:DETector?

Command description: to set the detector command for the currently selected trace as Video Average. Also called Logarithm Power Average Detector, i.e., take the logarithm power average value for all data assigned to each trace point; earlier signal/spectrum analyzer generally displays the measurement trace of logarithm scale, and all filtering and averaging are based on the logarithm power data; the trace is generally called as video signal. After digital IF processing is adopted, to make measurement results same as the earlier signal/spectrum analyzer, the video average detector function is added.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Log-Pwr Avg] on the front panel.

Examples:

:OBWidth:DETector LOG

[Average>> Pwr Avg]

Program control commands:

:OBWidth:DETector AVERage Or

:OBWidth:DETector RMS

:OBWidth:DETector?

Command description: to set the detector command for the currently selected trace as Power Average. Also called root mean square (RMS) detector. Calculate the root mean square of all sampling data assigned to each trace point; the 4051signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After square these voltage values, take sum and divide the count of sampling data points corresponding to each trace point. Finally, take square root. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those RMS values are trace data.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Pwr Avg] on the front panel.

Examples: :OBWidth:DETector RMS

[Average>> Voltage Avg]

Program control commands:

:OBWidth:DETector SCALar

:OBWidth:DETector?

Command description: to set the detector command for the currently selected trace as Voltage Average. Take linear average for all sampling data assigned to each trace point; the 4051 signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After summing those voltage values, divide the number of sampling data points corresponding to each trace point. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those average values are trace data.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Voltage Avg] on the front panel.

Examples:

:OBWidth:DETector SCALar

3.3.4.7 Sweep

Set commands related to sweep parameters, including [Sweep Time Auto MAN], [Sweep Setup>>], [Sweep Points].

[Sweep Time Auto MAN]

Program control commands:

[:SENSe]:OBWidth:SWEep:TIME <time>

[:SENSe]:OBWidth:SWEep:TIME?

[:SENSe]:OBWidth:SWEep:TIME:AUTO OFF|ON|0|1

[:SENSe]:OBWidth:SWEep:TIME:AUTO?

Command description: to change the sweep time of signal/spectrum analyzer. When it is under auto status, the sweep time will be automatically coupled based on Res BW, span and video bandwidth.

Key path: [Sweep Time Auto MAN] on the front panel.

Setting range: Min.: 1 ms, Max.: 6000 s.

Default unit: s

Examples:

:OBWidth:SWEep:TIME 500 ms

:OBWidth:SWEep:TIME:AUTO OFF

[Sweep Setup>>]

Set commands related to sweep type, including [Sweep Type Auto MAN], [Swp Type Rules Auto MAN] and [FFT Width Auto MAN].

[Sweep Type>> Auto MAN]

Program control commands:

[:SENSe]:OBWidth:SWEep:TYPE FFT|SWEep

[:SENSe]:OBWidth:SWEep:TYPE?

[:SENSe]:OBWidth:SWEep:TYPE:AUTO OFF|ON|0|1

[:SENSe]:OBWidth:SWEep:TYPE:AUTO?

Command description: to set sweep type. to determine whether Swept or FFT is adopted for frequency spectrum measurement. Also set the FFT step bandwidth for FFT sweep The soft More include [Auto], [Swept] and [FFT]. When under Auto ON mode, the signal/spectrum analyzer will automatically select the sweep type based on sweep type rules.

Key path: 【Sweep】, [Sweep Setup>>], [Sweep Type Auto MAN] on the front panel.

Examples:

:OBWidth:SWEep:TYPE FFT

:OBWidth:SWEep:TYPE?

:OBWidth:SWEep:TYPE:AUTO ON

:OBWidth:SWEep:TYPE:AUTO?

[Sweep Type Rules Auto MAN]

Program control commands:

[:SENSe]:OBWidth:SWEep:TYPE:AUTO:RULes SPEed|DRANge

[:SENSe]:OBWidth:SWEep:TYPE:AUTO:RULes?

[:SENSe]:OBWidth:SWEep:TYPE:AUTO:RULes:AUTO OFF|ON|0|1

[:SENSe]:OBWidth:SWEep:TYPE:AUTO:RULes:AUTO?

Command description: to set rules for auto sweep type. While the sweep type rules include “Best Dynamic Range” and “ Best Speed”.

“Best Dynamic Range” rules: when RBW is or larger than 1 kHz, the sweep type is Swept; when RBW is less than 1 kHz, the sweep type is FFT.

“Best Speed” rules: when RBW is or larger than 30 kHz, the sweep type is Swept; when RBW is less than 30 kHz, the sweep type is FFT.

Key path: 【Sweep】, [Sweep Setup>>], [Sweep Type Rules Auto MAN] on the front panel.

Examples:

:OBWidth:SWEep:TYPE:AUTO:RULes SPEed

:OBWidth:SWEep:TYPE:AUTO:RULes?

:OBWidth:SWEep:TYPE:AUTO:RULes:AUTO ON

:OBWidth:SWEep:TYPE:AUTO:RULes:AUTO?

[FFT Width Auto MAN]

Program control commands:

[:SENSe]:OBWidth:SWEep:FFT:WIDTh <real>

[:SENSe]:OBWidth:SWEep:FFT:WIDTh?

[:SENSe]:OBWidth:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1

[:SENSe]:OBWidth:SWEep:FFT:WIDTh:AUTO?

Command description: to set FFT Width. The FFT width includes [Auto], [<100 kHz], [<3 MHz], [<13 MHz], [<=Max.]. FFT width is only active when the FFT sweep type is selected. Under Auto type, when the signal/spectrum analyzer performs FFT spectrum measurement, the maximum Res BW is 30 kHz. To guarantee best dynamic measurement range, the signal/spectrum analyzer automatically optimizes the FFT width within 100 kHz. The larger is the FFT width, the faster is FFT spectrum measurement, but the dynamic range performance will be affected.

Under FFT sweep, the FFT width setup limits the maximum value for center frequency step of each tune. For example, if [<100 Hz] is selected, the maximum value for center freq step of each tune is 100 Hz. As the FFT width gets larger, the count of instrument center frequencies get smaller when performing measurement of same frequency scope, and the response measurement gets faster. Therefore, to improve measurement speed, you can manually change the FFT width.

Key path: 【Sweep】, [Sweep Setup>>], [FFT Width>>] on the front panel.

Examples:

:OBWidth:SWEep:FFT:WIDTh 2

:OBWidth:SWEep:FFT:WIDTh?

:OBWidth:SWEep:FFT:WIDTh:AUTO OFF

:OBWidth:SWEep:FFT:WIDTh:AUTO?

[Sweep points]

Program control commands:

[:SENSe]:OBWidth:SWEep:POINts <integer>

[:SENSe]:OBWidth:SWEep:POINts?

Command description: to set the trace points.

Key path: 【Sweep】, [Sweep Points] on the front panel.

Factory preset: 1001.

Setting range: 101-30001.

Examples:

:OBWidth:SWEep:POINts 1001

3.3.4.8 Single

Program control commands:

:INITiate:OBWidth

Command description: the 【Single】key on the front panel has no corresponding soft menu. This function is mainly used for manual trigger of a measurment. When the Average is ON, this function performs the measurements at the count specified by the Average Num.

In remote control programming and system establishment, this function combined with *WAI can effectively synchronize the measurement process and enable the trace data obtained after the *WAI finishes directly correspond to the measurement process one by one.

Examples:

:INITiate:OBWidth

3.3.4.9 Continuous

Program control commands:

:INITiate:CONTinuous ON

Command description: Continuous ON is mainly used for changing the Continuous OFF into Continuous ON; if the current measurement is Continuous ON, the instrument performs no operation.

Examples:

:INITiate:CONTinuous ON

3.3.4.10 Trigger

See description of Swept SA 【Trigger】for more details.

3.3.4.11 Display

Setups related to display, including [Display Line MAN], [Bar Graph], [Display Config>>].

[Display Line Man]

See description of Swept SA 【Display】[Display Line MAN] for more details.

[Display Config>>]

It is used for configurations of interface language, status area display MAN related to interface display, , including [Language 中文 English], [Graticule MAN], [Status Display MAN], [Freq Info Disp MAN]. See description of Swept SA【Display】 [Display Config>>] for more details.

3.3.4.12 Input Output

See description of Swept SA 【Input/output】 for more details.

3.3.4.13 Marker

Commands related to marker, including [Select Marker >>], [Normal], [Delta], [Fixed [OFF], [Properties>>], [Marker Couple MAN], and [All Markers OFF].

[Normal]

Program control commands:

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE POSition

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Normal Marker.

Key path: 【Marker】, [Select >>], [Normal] on the front panel.

Examples:

:CALCulate:OBWidth:MARKer1:MODE POS

:CALCulate:OBWidth:MARKer1:MODE?

[Delta]

Program control commands:

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE DELTa

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Delta Marker. Display the amplitude difference and frequency difference (or time difference, when span is zero) between two markers at the marker display area at the top right corner of the screen. If there exists a single marker, a [Delta] operation will generate a Ref marker in the active marker position. The display amplitude difference unit is dB.

Key path: 【Marker】, [Select Marker>>], [Delta] on the front panel.

Examples:

:CALCulate:OBWidth:MARKer1:MODE DELTa

:CALCulate:OBWidth:MARKer1:MODE?

[Fixed]

Program control commands:

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE FIXed

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Fixed Marker. The X Axis and Y Axis positions of the fixed marker are fixed. The Fixed Marker can be used as reference marker.

Key path: 【Marker】, [Select >>], [Fixed] on the front panel.

Examples:

:CALCulate:OBWidth:MARKer1:MODE FIXed

:CALCulate:OBWidth:MARKer1:MODE?

[Off]

Program control commands:

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE OFF

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to turn off the selected marker.

Key path: 【Marker】, [Select Marker>>], [OFF] on the front panel.

Examples:

:CALCulate:OBWidth:MARKer1:MODE OFF

:CALCulate:OBWidth:MARKer1:MODE?

[Properties>>]

Commands related to property setting of currently selected marker, including [Relative To>>], [X Axis Scale Auto MAN], [Marker Trace>>] and [Lines MAN].

[Relative To>>]

Program control commands:

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence <integer>

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence?

Command description: to select the reference marker for the currently selected marker. It can be any one from 11 markers except the currently selected marker.

Key path: 【Marker】, [Select Marker >>], [Properties>>], [Relative To>>] on the front panel.

Examples:

:CALCulate:OBWidth:MARKer1:REFerence 2

:CALCulate:OBWidth:MARKer1:REFerence?

[Lines>> On Off]

Program control commands:

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe] OFF|ON|0|1

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe]?

Command description: to set whether the current marker is displayed as a line on the screen, which is good for observation.

Key path: 【Marker】, [Select Marker >>], [Properties>>] and [Select On/Off].

Examples:

:CALCulate:OBWidth:MARKer1:LINes ON

:CALCulate:OBWidth:MARKer1:LINes?

[Couple Markers On Off]

Program control commands:

:CALCulate:OBWidth:MARKer:COUPle[:STATe] ON|OFF|1|0

:CALCulate:OBWidth:MARKer:COUPle[:STATe]?

Command description: to turn on or off Marker Couple. When it is ON, moving any marker horizontal axis position will cause an equal movement of horizontal axis position of every other marker which is ON. When the marker is moved to less than Start Frequency or larger than Stop Frequency, the marker is limited to the value of the Start Frequency or the Stop Frequency; when the span is zero, the minimum value is limited as 0, and the maximum value is limited as the Sweep Time.

Key path: 【Marker】, [More 1/2>>], [**Couple Markers** ON OFF] on the front panel.

Examples:

:CALCulate:OBWidth:MARKer:COUPle ON

:CALCulate:OBWidth:MARKer:COUPle?

[Marker All Off]

Program control commands:

:CALCulate:OBWidth:MARKer:AOFF

Command description: to turn off all current markers which are ON and related marker functions.

Key path: 【Marker】, [More 1/2>>], [All Markers OFF] on the front panel.

Examples:

:CALCulate:OBWidth:MARKer:AOFF

3.3.4.14 Maker->

None.

3.3.4.15 Marker Function

None.

3.3.4.16 Peak Search

Program control commands:

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum

Command description: to turn on the peak search for traces by the control instrument and turn on marker for display, including [Next Peak], [Next Pk Right], [Next Pk Left].

Examples:

:CALCulate:OBWidth:MARKer:MAXimum

[Next Peak]

Program control commands:

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:NEXT

Command description: Taking the Amplitude of the point where the current marker is located, search for the next peak of current test trace.

Key path: 【Peak Search】, [Next Peak] on the front panel.

Examples:

:CALCulate:OBWidth:MARKer:MAXimum:NEXT

[Next Pk Right]

Program control commands:

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:RIGHt

Command description: to search for the peak to the right of the current test trace marker position.

Key path: 【Peak Search】, [Next Pk Right] on the front panel.

Examples:

:CALCulate:OBWidth:MARKer:MAXimum:RIGHt

[Next Pk Left]

Program control commands:

:CALCulate:OBWidth:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:LEFT

Command description: to search for the peak to the left of the current test trace marker position.

Key path: 【Peak Search】, [Next Pk Left] on the front panel.

Examples:

:CALCulate:OBWidth:MARKer:MAXimum:LEFT

3.3.4.17 Measurement Setting

Commands related to measurement setting, including [Average Num ON OFF], [Average Mode Exponential Repeat], [Occ BW% Pwr], [x dB], [Limit BW ON OFF] [PhNoise Opt], [Low Noise Path ON OFF], [Preselector Preselecting Bypass], [RF Gain>>], [ADC Dither Auto MAN] and [Measurement Reset].

[Average Num On Off]

Program control commands:

[:SENSe]:OBWidth:AVERage:COUNt <integer>

[:SENSe]:OBWidth:AVERage:COUNt?

[:SENSe]:OBWidth:AVERage[:STATe] ON|OFF|1|0

[:SENSe]:OBWidth:AVERage[:STATe]?

Command description: to turn on or off Average. When Average Count is ON, the user can specify the average count required for measurement.

Key path: 【Meas Setup】, [Average Num ON OFF] on the front panel.

Setting range: 1~10000

Default unit: none

Examples:

:OBWidth:AVERage:COUNt 10

:OBWidth:AVERage:COUNt?

:OBWidth:AVERage ON

:OBWidth:AVERage?

[Average Mode Exponential Repeat]

Program control commands:

[:SENSe]:OBWidth:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:OBWidth:AVERage:TCONtrol?

Command description: when Average Count is ON, the user can select Average State required for measurement.

Exponential - Different from Linear Average, in Exponential State, the weight of new data is larger than that of old data. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases.

Repeat - Similarly, it takes exponential averaging. However, when the average count is met, clear all previous results, restart average till the set average count and repeat this process.

Key path: 【Meas Setup】, [Average Mode Exponential Repeat] on the front panel.

Examples:

:OBWidth:AVERage:TCONtrol EXPonential

:OBWidth:AVERage:TCONtrol?

[Occ BW% Pwr]

Program control commands:

[:SENSe]:OBWidth:PERCent <real> [:SENSe]:OBWidth:PERCent?

Command description: to set the signal power percentage that determines the occupied bandwidth.

Key path: 【Meas Setup】 on the front panel.

Setting range: 10% - 99.99%

Default unit: %

Examples:

:OBWidth:PERCent 90

:OBWidth:PERCent?

3.3 Instrument Commands

[x dB]

Program control commands:

[:SENSe]:OBWidth:XDB <rel_ampl> [:SENSe]:OBWidth:XDB?

Command description: to designate the power level that determines the transmission bandwidth within the range of occupied bandwidth and frequency span. The value is the decreased dB value at the signal peak point P. This function is independent from the occupied bandwidth calculation. x dB bandwidth is also called as the transmission bandwidth, which sets the arrow marker pair based on specified decreased dB value at the maximum power point and calculates the total power between two markers. x dB bandwidth is also called as the transmission bandwidth, which sets the arrow marker pair based on specified decreased dB value at the maximum power point and calculates the total power between two markers.

Key path: 【Meas Setup】, [x dB] on the front panel.

Setting range: -100.0 dB -0.1 dB

Default unit: dB.

Examples:

:OBWidth:XDB -10 dB

:OBWidth:XDB?

[Limit BW On Off]

Program control commands:

:CALCulate:OBWidth:LIMit:FBLimit <freq>

:CALCulate:OBWidth:LIMit:FBLimit?

:CALCulate:OBWidth:LIMit[:TEST] ON|OFF|1|0

:CALCulate:OBWidth:LIMit[:TEST]?

Command description: to turn on or off the limit test for occupied bandwidth. When it is ON, take the set limit bandwidth as reference, and judge whether the measured occupied bandwidth value exceeds the limit. If so, F indicates that the test fails. Use number keys, stepping keys or knob to change the Limit Bandwidth.

Key path: 【Meas Setup】, [Limit BW ON OFF] on the front panel.

Setting range: 1.0 kHz - 100.0 MHz.

Default unit: Hz

Examples:

:CALCulate:OBWidth:LIMit:FBLimit 5 MHz

:CALCulate:OBWidth:LIMit:FBLimit?

:CALCulate:OBWidth:LIMit ON

:CALCulate:OBWidth:LIMit?

[Low Noise Path On Off]

Program control commands:

[:SENSe]:OBWidth:POWer:MW:PATH STD|LNPath

[:SENSe]:OBWidth:POWer:MW:PATH?

Command description: this command is only available when the H34 option (Low Noise Preamplifier) is purchased.

Key path: 【Meas Setup】, [More 1/2], [Low Noise Path ON OFF] on the front panel.

Examples:

:OBWidth:POWer:MW:PATH LNPath

:OBWidth:POWer:MW:PATH?

[Preselector Preselecting Bypass]

Program control commands:

:INPut:OBWidth:FILTer:YIG[:STATe] OFF|ON|0|1

:INPut:OBWidth:FILTer:YIG[:STATe]?

Command description: this menu is only available after the H36 option is purchased. It is used for setting whether to bypass the front-end preselector of the signal/spectrum analyzer. In analyzing bandwidth signal, bypass is usually required.

Key path: 【Meas Setup】, [More 1/2>>], [Preselector Preselecting Bypass] on the front panel.

Status saved: saved in the instrument status.

Examples:

:INPut:OBWidth:FILTer:YIG ON

:INPut:OBWidth:FILTer:YIG?

[RF Gain>>]

Set the Auto MAN of the RF Gain and best allocation algorithm for RF Gain, including [Auto], [Best Dynamic Range] and [Best for Sensitivity].

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain] on the front panel.

[Auto]

Program control commands:

[:SENSe]:OBWidth:RF:GAIN:AUTO OFF|ON|0|1

[:SENSe]:OBWidth:RF:GAIN:AUTO?

Command description: to set the RF Gain distribution algorithm to Auto. In this case, the RF Gain distribution is “Best Dynamic Range”.

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Auto] on the front panel.

Examples:

:OBWidth:RF:GAIN:AUTO ON

:OBWidth:RF:GAIN:AUTO?

[Best for Dynamic Range]

Program control commands:

[:SENSe]:OBWidth:RF:GAIN:AUTO:RULes RANGE

[:SENSe]:OBWidth:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Dynamic Range. In this case, the RF Gain is switched to "Auto OFF"

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best for Dynamic Range] on the front panel.

Examples:

:OBWidth:RF:GAIN:AUTO:RULes RANGE

:OBWidth:RF:GAIN:AUTO:RULes?

[Best for Sensitivity]

Program control commands:

[:SENSe]:OBWidth:RF:GAIN:AUTO:RULes SENSITIVITY [:SENSe]:OBWidth:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Sensitivity. In this case, the RF Gain is switched to "Auto OFF"

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best for Sensibility] on the front panel.

Examples:

:OBWidth:RF:GAIN:AUTO:RULes SENSITIVITY

:OBWidth:RF:GAIN:AUTO:RULes?

[ADC Dither Auto MAN]

Program control commands:

[:SENSe]:OBWidth:ADC:DITHer[:STATe] OFF|ON|HIGH

[:SENSe]:OBWidth:ADC:DITHer[:STATe]?

[:SENSe]:OBWidth:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:OBWidth:ADC:DITHer:AUTO[:STATe]?

Command description: to control opening/closing of ADC dither of the frequency acquisition circuit in the analyzer. Under default mode, the signal/spectrum analyzer will automatically control whether the ADC Dither is ON based on current working condition. When the ADC Dither is under Auto mode, the ON or OFF status depends on the span, Res BW and sweep type (continuous swept or step sweep); when it is continuous swept, the ADC Dither status will force to switch to Auto and turns off; when it is step sweep, under Auto mode, if the span is 2 MHz or below, the ADC Dither is ON; if the span is below 2 MHz, the ADC Dither is OFF. Under Auto OFF mode, if the span is above 2 MHz, turning on the ADC Dither may affect the measurement results based on selected dither status. You can access the submenu for manual control.

Key path: 【Meas Setup】, [More 1/2>>], [ADC Dither Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto.

Examples:

:OBWidth:ADC:DITHer HIGH

:OBWidth:ADC:DITHer?

:OBWidth:ADC:DITHer:AUTO ON

:OBWidth:ADC:DITHer:AUTO?

[Meas Preset]

Program control commands:

:CONFigure:OBWidth

Command description: to use *rst command for reset. Reset the measurement parameters to the factory preset status or user saved parameter status.

Key path: 【Meas Setup】, [Meas Preset] on the front panel.

Factory preset: factory reset.

Examples:

:CONFigure:OBWidth

3.3.4.18 Measurement Control

Commands related to measurement control, including [Meas Single Cont] [Restart] and [Pause].

[Measure Continuous ON OFF]

Program control commands:

:INITiate:CONTinuous OFF|ON|0|1

:INITiate:CONTinuous?

Command description: to set continuous measurement OFF or ON.

Key path: [Meas Control], [Meas Single Cont] on the front panel.

Examples:

:INIT:CONT OFF

[Restart]

Program control commands:

:INITiate:REST

Command description: to stop current measurement and restart measurement for the signal/spectrum analyzer.

Key path: [Meas Control], [Restart] on the front panel

Examples:

:INITiate:REST

[Pause]

Program control commands:

:INITiate:PAUS

:INITiate:RES

Command description: when the signal/spectrum analyzer is in operation, this command is used for pausing current measurement; when in Paused status, this command is used for continuing measurement.

Key path: [Meas Control], [Pause] on the front panel.

Examples:

:INITiate:PAUS

:INITiate:RES

3.3.5 Adjacent Channel Power

Adjacent Channel Power (ACP) indicates the power leaked to the adjacent channels. Such measurement can be accessed via the following commands to obtain measurement results:

Program control commands:

:CONFigure:ACPower

:FETCh:ACPower[n]?

:MEASure:ACPower[n]?

:READ:ACPower[n]?

Reference types of total power:

n = 1 Total power dBm,

Reference power dBm,

Lower offset A relative power dB,

Lower offset A absolute power dBm,

Upper offset A relative power dB,

Upper offset A absolute power dBm,

Lower offset B relative power dB,

Lower offset B absolute power dBm,

Upper offset B relative power dB,

Upper offset B absolute power dBm,

……,

Lower offset F relative power dB,

Lower offset F absolute power dBm,

Upper offset F relative power dB,

Upper offset F absolute power dBm

If the results are void, -999.0 is returned.

n = 2 Total power dBm,

Reference power dBm,

Carrier channel 1 relative power dB,

Carrier channel 1 absolute power dBm,

Carrier channel 2 relative power dB,

Carrier channel 2 absolute power dBm,

……,

Carrier channel 12 relative power dB,

Carrier channel 12 absolute power dBm,

Lower offset A relative power dB,
Lower offset A absolute power dBm,
Upper offset A relative power dB,
Upper offset A absolute power dBm,
Lower offset B relative power dB,
Lower offset B absolute power dBm,
Upper offset B relative power dB,
Upper offset B absolute power dBm,
...
Lower offset F relative power dB,
Lower offset F absolute power dBm,
Upper offset F relative power dB,
Upper offset F absolute power dBm,
If the results are void, -999.0 is returned.

n = 3
Lower offset A limit result,
Upper offset A limit result,
Lower offset B limit result,
Upper offset B limit result,
……,
Lower offset F limit result,
Upper offset F limit result

Reference type of power spectrum density:
n = 1 Total power dBm/Hz,
Reference power dBm/Hz,
Lower offset A relative power dB,
Lower offset A absolute power dBm/Hz,
Upper offset A relative power dB,
Upper offset A absolute power dBm/Hz,
Lower offset B relative power dB,
Lower offset B absolute power dBm/Hz,
Upper offset B relative power dB,
Upper offset B absolute power dBm/Hz,
……,
Lower offset F relative power dB,

Lower offset F absolute power dBm/Hz,
Upper offset F relative power dB,
Upper offset F absolute power dBm/Hz,
If the results are void, -999.0 is returned.

n = 2 Total power dBm/Hz,
Reference power dBm/Hz,
Carrier channel 1 relative power dB,
Carrier channel 1 absolute power dBm/Hz,
Carrier channel 2 relative power dB,
Carrier channel 2 absolute power dBm/Hz,
……,
Carrier channel 12 relative power dB,
Carrier channel 12 absolute power dBm/Hz,
Lower offset A relative power dB,
Lower offset A absolute power dBm/Hz,
Upper offset A relative power dB,
Upper offset A absolute power dBm/Hz,
Lower offset B relative power dB,
Lower offset B absolute power dBm/Hz,
Upper offset B relative power dB,
Upper offset B absolute power dBm/Hz,
……,
Lower offset F relative power dB,
Lower offset F absolute power dBm/Hz,
Upper offset F relative power dB,
Upper offset F absolute power dBm/Hz,
If the results are void, -999.0 is returned.

n = 3
Lower offset A limit result,
Upper offset A limit result,
Lower offset B limit result,
Upper offset B limit result,
……,
Lower offset F limit result,
Upper offset F limit result,

n = 4 return number points, representing the values in Trace 1

n = 5 return number points, representing the values in Trace 2

n = 6 return number points, representing the values in Trace 3

3.3.5.1 Frequency

Set parameters related to frequency of the signal/spectrum analyzer, including [Center Freq], [CF Step Auto MAN], [Freq Offset], etc.

[Center Freq]

Program control commands:

[:SENSe]:FREQuency:CENTer <frequency>

[:SENSe]:FREQuency:CENTer?

Command description: to set the center frequency of the signal/spectrum analyzer. If the set center frequency is inconsistent with the current span, the latter will automatically change to the value best suitable for desired frequency.

Key path: 【Frequency】[Center Freq] on the front panel.

Setting range: Min.: 0 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT 5 GHz

[CF Step Auto MAN]

Program control commands:

[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>

[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?

[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:CENTer:STEP:AUTO?

Command description: to change the step size of the [Center Freq] , start frequency or [Stop Freq]. When it is under [Auto Mode], and when the center frequency is active, press the step key, the [CF Step] changes by 1, 2, 5 and 10. When it is under Auto Off mode, use the number keys, stepping keys or knob for change. At this time, reactivate the [Center Freq], and press the step key, the center freq will change by set step size.

Key path: 【Frequency】, [CF Step Auto On/Off] on the front panel.

Setting range: Min.: 1 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT:STEP 100 MHz

:FREQ:CENT:STEP:AUTO ON

[Freq Offset]

Program control commands:

[:SENSe]:FREQuency:OFFSet <freq>

[:SENSe]:FREQuency:OFFSet?

Command description: to add the set frequency offset to the displayed frequency value, including marker frequency value, but this does not affect the signal display position.

Key path: 【Frequency】, [Freq Offset] on the front panel.

Setting range: Min.:-500 GHz, Max.: +500 GHz.

Default unit: Hz

Examples:

:FREQ:OFFS 10 MHz

3.3.5.2 Amplitude/Y Axis

Amplitude/Y Axis parameter settings include [Ref Level], [Attenuation>>], [Preamplifier ON OFF], [Scale/Div], [Auto Scale], [More 1/2>>], [[Y Axis Unit] and [Ref Level Offset].

[RefLevel]

Program control commands:

:DISPlay:ACPower:VIEW:WINDow:TRACe:Y:RLEVel <real>

:DISPlay:ACPower:VIEW:WINDow:TRACe:Y:RLEVel?

Command description: to set the reference level. Measure signal at reference level position to get highest accuracy. The input attenuator of the signal/spectrum analyzer is coupled to the reference level, which can be automatically changed to avoid compression of input signal.

Key path: 【Amplitude/Y Axis】, [Ref Level] on the front panel.

Setting range: Min.: -170 dBm, Max.: 30 dBm.

Default unit: set based on Y Axis scale unit.

Examples:

:DISPlay:ACPower:VIEW:WINDow:TRACe:Y:RLEVel20 dBm

[Attenuation>>]

Adjust the attenuation of the signal/spectrum analyzer. The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Preamplifier On Off]

Program control commands:

[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1

[:SENSe]:POWer[:RF]:GAIN[:STATe]?

The commands are same as the Swept SA. See description of Swept SA 【Amplitude/Y Axis】 [Preamplifier MAN>>] for more details.

Examples:

:POW:GAIN OFF

:POW:GAIN?

[Scale/Div]

Program control commands:

:DISPlay:ACPower:VIEW:WINDow:TRACe:Y:PDIVision <rel_ampl>

:DISPlay:ACPower:VIEW:WINDow:TRACe:Y:PDIVision?

Command description: to select the scale/division from 0.1 dB/division to 20 dB/division. This menu is only valid when the scale type is logarithm.

Key path: 【Amplitude/Y Axis】, [Scale/Div] on the front panel.

Setting range: Min.: 0.1 dB, Max.: 20 dBm.

Examples:

:DISPlay:ACPower:VIEW:WINDow:TRACe:Y:PDIVision 5 dB

[Auto Scale]

Program control commands:

:ACPower:ADJust:LEVel

Command description: the instrument automatically sets parameters like reference level and scale/division based on input signal sizes. When this soft menu key is pressed, the instrument performs one auto scaling. Setting rule for auto scaling: firstly obtain the maximum value and the minimum value based on current measurement trace data. Based on the maximum value, place on the 80% graticule of the screen trace Y axis for auto setting of reference level and scale/division.

Key path: 【Amplitude/Y Axis】, [Auto Scale] on the front panel.

[Y Axis Unit]

Program control commands:

:UNIT:ACPower:POWer DBM|DBMV|DBMA|V|W|A|DBUV|DBUA

:UNIT:ACPower:POWer?

Command description: to select the Y Axis unit from [dBm], [dBmV], [dBmA], [W], [V], [A], [dBμV] and [dBμA]. The instrument will automatically calculate the trace data and marker readout based on the Y axis scale unit.

Key path: 【Amplitude/Y Axis】, [More 1/2>>], [Y Axis Unit] on the front panel.

Examples:

:UNIT:ACPower:POWer DBM

:UNIT:ACPower:POWer?

[Ref Level Offset]

Program control commands:

:DISPlay:ACPower:WINDow:TRACe:Y:RLEVel:OFFSet <rel_ampl>

:DISPlay:ACPower:WINDow:TRACe:Y:RLEVel:OFFSet?

Command description: to introduce offset for all amplitude readout (e.g, reference level and marker amplitude). It will not change the trace position on the screen. This offset unit is dB and is not affected by the scale and unit.

Key path: 【Amplitude/Y Axis】, [More 1/2>>], [Ref Level Offset] on the front panel.

Setting range: Min.: -1000 dB, Max.:1000 dB.

Examples:

:DISPlay:ACPower:WINDow:TRACe:Y:RLEVel:OFFSet 12

3.3.5.3 Span/X Axis

Press the 【Span/X Axis】 on the front panel to enable the span function and set the signal/spectrum analyzer into center frequency/span mode. Press the【Span】 key to pop up [Span], [Full Span] and [Last Span].

[Span]

Program control commands:

:ACPower:FREQuency:SPAN <freq>

:ACPower:FREQuency:SPAN?

Command description: the span can be set by number keys, stepping keys or knob. Use number keys or select [Zero Span] to set the span as zero.

Key path: 【Span/X Axis】, [Span] on the front panel.

Status saved: saved in the instrument status.

Factory preset: maximum frequency limit - start frequency.

Setting range: Min.: 10 Hz, Max.: related to the maximum working frequency limit of the instrument.

Knob increment: in increase, the knob increment is 1/10 of the most significant bit; in decrease, the knob increment is 1/100 of the most significant bit.

Stepping key increment: 1-2-5-10 step.

Examples:

:ACPower:FREQuency:SPAN 10 MHz

[Full Span]

Program control commands:

:ACPower:FREQuency:SPAN:FULL

Command description: to set the signal/spectrum analyzer into the center frequency/span mode. Set the span as maximum value.

Examples:

:ACPower:FREQ:SPAN:FULL

[Last Span]

Program control commands:

:ACPower:FREQuency:SPAN:PREVious

Command description: to set the signal/spectrum analyzer back to the previous span.

Examples:

:ACPower:FREQ:SPAN:PREV

3.3.5.4 Bandwidth

Pop up the soft More for setting Res BW and Video BW, including [Res BW Auto Man], [Video BW Auto Man] and [Filter Type].

[Res BW Auto MAN]

Program control commands:

[:SENSe]:ACPower:BANDwidth <bandwidth>

[:SENSe]:ACPower:BANDwidth?

[:SENSe]:ACPower:BANDwidth:AUTO ON|OFF|1|0

[:SENSe]:ACPower:BANDwidth:AUTO?

Command description: to change the swept analysis Res BW, ranging from 1 Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5 MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step. The Res BW can be changed with the number keys, step keys and knob. The shaded character indicates the currently selected mode.

Key path: 【Bandwith】, [Res BW Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto

Setting range: Min.:1 Hz, Max.: 20 MHz.

Stepping key increment: 1-2-3-5-10 step.

Default unit: Hz

Examples:

:ACPower:BANDwidth 1 kHz

:ACPower:BANDwidth:AUTO ON

[Video BW Auto MAN]

Program control commands:

[:SENSe]:ACPower:BANDwidth:VIDeo <bandwidth>

[:SENSe]:ACPower:BANDwidth:VIDeo?

[:SENSe]:ACPower:BANDwidth:VIDeo:AUTO ON|OFF|1|0

[:SENSe]:ACPower:BANDwidth:VIDeo:AUTO?

Command description: to change the video bandwidth displayed on the active function zone ranging from 1Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5 MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step. Use number keys, stepping keys or knob to change The mode with a underline is the current mode. When set as Auto Off, press [Video BW Auto Man] to select Auto On and return to auto mode.

Key path: 【Bandwith】, [Video BW Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto, same as the Res BW setting.

Setting range: Min.:1 Hz, Max.: 20 MHz.

Stepping key increment: 1-2-3-5-10 step.

Default unit: Hz

Examples:

:ACPower:BANDwidth:VIDeo 1 kHz

:ACPower:BANDwidth:VIDeo:AUTO ON

[Filter Type]

Program control commands:

[:SENSe]:ACPower:BANDwidth:SHAPe GAUSsian|FLATtop

[:SENSe]:ACPower:BANDwidth:SHAPe?

Command description: comprising [Gaussian] and [Flattop]. In general, the signal/spectrum analyzer uses Gaussian filter, i.e., use filter approximate to the Gaussian shape to complete filtering of [Res BW]. If the flat top filter is used, the signal/spectrum analyzer adopts filter approximate to the rectangular shape to complete filtering of Res BW. The response time of flat top filter is about 3 times of that of the Gaussian filter. The sweep speed of the flat top filter is smaller than that of the Gaussian filter. The flat top filter has better selectivity than the Gaussian filter and therefore is more capable of distinguishing two signals with unequal amplitude.

Key path: 【Bandwith】, [Filter Type] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Gaussian.

Examples:

:ACPower:BANDwidth:SHAPe FLATtop

:ACPower:BANDwidth:SHAPe?

3.3.5.5 Auto Setting

Pop up the soft menu related to auto setting including [Couple All], [Mech Atten Auto Man], [Res BW Auto Man], [Video BW Auto Man], [VBW/RBW Auto Man], [Span/RBW Auto Man], [Sweep Time Auto Man] and [CF Step Auto Man].

[Couple All]

Program control commands:

:COUPle ALL

Command description: to set the Res BW, video bandwidth, sweep time, mechanical attenuator and frequency step as auto coupling mode. The signal/spectrum analyzer will select most suitable values for those functions based on set frequency and bandwidth (or start frequency and stop frequency). If no ratio is pre-saved, use default ratio.

Key path:【Auto Set】, [Couple All] on the front panel.

Status saved: not saved in instrument status.

Factory preset: Couple All.

Examples:

:COUPle ALL

[Mech Atten Auto MAN]

See the description of 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Res BW Auto MAN]

See description of 【Bandwith】 [Res BW Auto MAN] for more details.

[Video BW Auto MAN]

See description of 【Bandwith】 [Video BW Auto MAN] for more details.

[Sweep Time Auto MAN]

See description of 【Sweep】 [Sweep Time Auto MAN] for more details.

[CF Step Auto MAN]

See description of 【Frequency】 [CF Step Auto MAN] for more details.

3.3.5.6 Trace

Press 【Trace】 key on the front panel to pop up corresponding soft menu including [Clear Write], [Trace Average], [More 1/2>>] and [Detector>>].

[Clear Write**]**

Program control commands:

:TRACe:ACPower:TYPE WRITe

:TRACe:ACPower:TYPE?

Command description: to set the current trace processing as Refresh, i.e., clear all data of displayed trace and continue the signal trace receipt under sweep status.

Key path: 【Trace】, [Select Trace>>], [Clear Write] on the front panel.

Status saved: saved in the instrument status.

Factory preset: after all traces are selected, the trace mode is defaulted as Refresh.

Examples:

:TRACe:ACPower:TYPE WRITe

:TRACe:ACPower:TYPE?

[Trace Average]

Program control commands:

:TRACe:ACPower:TYPE AVERage

:TRACe:ACPower:TYPE?

Command description: to set the current trace processing method as Average, i.e., based on the average count N set in the 【Meas Setup】, update trace after averaging the performance index of the measurement trace.

Key path: 【Trace】, [Select Trace>>], [Trace Average] on the front panel.

Status saved: saved in the instrument status.

Factory preset: all trace modes are defaulted as Refresh.

Examples:

:TRACe:ACPower:TYPE AVERage

:TRACe:ACPower:TYPE?

[Max Hold]

Program control commands:

:TRACe:ACPower:TYPE MAXHold

:TRACe:ACPower:TYPE?

Command description: to set the current trace processing method as maximum hold, i.e., the new trace data will be assigned with maximum value of previous measured trace data

Key path: 【Trace】, [Select Trace>>], [Max Hold] on the front panel.

Status saved: saved in the instrument status.

Factory preset: all trace modes are defaulted as Refresh.

Examples:

:TRACe:ACPower:TYPE MAXHold

:TRACe:ACPower:TYPE?

[Min Hold]

Program control commands:

:TRACe:ACPower:TYPE MINHold

:TRACe:ACPower:TYPE?

Command description: to set the current trace processing method as minimum hold, i.e., the new trace data will be assigned with minimum value of previous measured trace data.

Key path: 【Trace】, [Select Trace>>], [Min Hold] on the front panel.

Status saved: saved in the instrument status.

Factory preset: all trace modes are defaulted as Refresh.

Examples:

:TRACe:ACPower:TYPE MINHold

:TRACe:ACPower:TYPE?

[View/Blank>> Trace On]

Program control commands:

:TRACe:ACPower:DISPlay[:STATe] ON|OFF|0|1

:TRACe:ACPower:DISPlay[:STATe]?

:TRACe:ACPower:UPDate[:STATe] ON|OFF|0|1

:TRACe:ACPower:UPDate[:STATe]?

Command description: to set the display method for the selected trace from [Trace On], [View], [Background] and [Blank]. Four statuses are completed through combination of the above four commands.

Key path: 【Trace】, [Select Trace>>], [View/Blank]>>] on the front panel.

Examples:

:TRACe:ACPower:DISPlay ON

:TRACe:ACPower:DISPlay?

:TRACe:ACPower:UPDate ON

:TRACe:ACPower:UPDate?

[Trace On]

Program control commands:

:TRACe:ACPower:DISPlay[:STATe] ON

:TRACe:ACPower:UPDate[:STATe] ON

Command description: to set the display of currently selected trace as [**Trace On**].

Key path: 【Trace】, [View/Blank>>], [Refresh Display] on the front panel.

Examples:

:TRACe:ACPower:DISPlay ON

:TRACe:ACPower:UPDate ON

[View]

Program control commands:

:TRACe:ACPower:DISPlay[:STATe] ON

:TRACe:ACPower:UPDate[:STATe] OFF

Command description: to set the display of currently selected trace as Static Display.

Key path: 【Trace】, [View/Blank>>], [View] on the front panel.

Examples:

:TRACe:ACPower:DISPlay ON

:TRACe:ACPower:UPDate OFF

[Background]

Program control commands:

:TRACe:ACPower:DISPlay[:STATe] OFF

:TRACe:ACPower:UPDate[:STATe] ON

Command description: to set the display of currently selected trace as Backstage Refresh.

Key path: 【Trace】, [View/Blank>>], [Background] on the front panel.

Examples:

:TRACe:ACPower:DISPlay OFF

:TRACe:ACPower:UPDate ON

[Blank]

3.3 Instrument Commands

Program control commands:

:TRACe:ACPower:DISPlay[:STATe] OFF

:TRACe:ACPower:UPDate[:STATe] OFF

Command description: to set the display of currently selected trace as Display OFF.

Key path: 【Trace】, [View/Blank>>], [Blank] on the front panel.

Examples:

:TRACe:ACPower:DISPlay OFF

:TRACe:ACPower:UPDate OFF

[Detector>>]

Pop up soft menus related to setting the detector type for the currently selected trace, including [Auto], [Normal], [Peak], [Sample], [Negative Peak], [Average>>], where, the average detector type includes [Log-Pwr Avg], [Pwr Avg] and [Voltage Avg].

Program control commands:

[:SENSe]:ACPower:DETector:AUTO ON|OFF|1|0

[:SENSe]:ACPower:DETector:AUTO?

[:SENSe]:ACPower:DETector[:FUNCtion]NORMal|POSitive|SAMPle|NEGative|AVERage

[:SENSe]:ACPower:DETector[:FUNCtion]?

[Auto]

Program control commands:

:ACPower:DETector:AUTO ON|OFF|1|0

:ACPower:DETector:AUTO?

Command description: to set the detector command for the currently selected trace as Auto. That means, the signal/spectrum analyzer will perform based on the parameter setting of currently selected trace.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Auto] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:ACPower:DETector:AUTO ON

:ACPower:DETector:AUTO?

[Normal]

Program control commands:

:ACPower:DETector NORMal

:ACPower:DETector?

Command description: to set the detector command for the currently selected trace as Normal, i.e., display the measurement results of positive peak and negative peak at the same time to achieve display effect similar to the analog instrument.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Normal] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:ACPower:DETector NORMal

:ACPower:DETector?

[Peak]

Program control commands:

:ACPower:DETector POSitive

:ACPower:DETector?

Command description: to set the detector command for the currently selected trace as Positive Peak, i.e., take the maximum value from sampling data assigned to each trace point.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Peak] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:ACPower:DETector POSitive

:ACPower:DETector?

[Sample]

Program control commands:

:ACPower:DETector SAMPle

:ACPower:DETector?

Command description: to set the detector command for the currently selected trace as Sample, i.e., take the last value from sampling data assigned to each trace point.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Sample] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:ACPower:DETector SAMPle

:ACPower:DETector?

[Negative Peak]

Program control commands:

:ACPower:DETector NEGative

:ACPower:DETector?

Command description: to set the detector command for the currently selected trace as Negative Peak, i.e., take the minimum value from sampling data assigned to each trace point.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Negative Peak] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:ACPower:DETector NEGative

:ACPower:DETector?

[Average>> Log-Pwr Avg]

Program control commands:

:ACPower:DETector LOG

:ACPower:DETector?

Command description: to set the detector command for the currently selected trace as Video Average. Also called Logarithm Power Average Detector, i.e., take the logarithm power average value for all data assigned to each trace point; earlier signal/spectrum analyzer generally displays the measurement trace of logarithm scale, and all filtering and averaging are based on the logarithm power data; the trace is generally called as video signal. After digital IF processing is adopted,

After digital IF processing is adopted, to make measurement results same as the earlier signal/spectrum analyzer, the video average detector function is added.

Key path: 【Trace】, [Select Trace>>], [More 1/2▸], [Detector>>], [Average>>], [Log-Pwr Avg] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:ACPower:DETector LOG

:ACPower:DETector?

[Average>> Pwr Avg]

Program control commands:

:ACPower:DETector AVERage or

:ACPower:DETector RMS

:ACPower:DETector?

Command description: to set the detector command for the currently selected trace as Power Average. Also called root mean square (RMS) detector. Calculate the root mean square of all sampling data assigned to each trace point; the 4051signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After square these voltage values, take sum and divide the count of sampling data points corresponding to each trace point. Finally, take square root. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those RMS values are trace data.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Average>>], [Pwr Avg] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:ACPower:DETector RMS

:ACPower:DETector?

[Average>> Voltage Avg]

Program control commands:

:ACPower:DETector SCALar

:ACPower:DETector?

Command description: to set the detector command for the currently selected trace as Voltage Average. Take linear average for all sampling data assigned to each trace point; the 4051 signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After summing those voltage values, divide the number of sampling data points corresponding to each trace point. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those average values are trace data.

Key path: 【Trace】, [Select Trace>>], [More 1/2>>], [Detector>>], [Average>>], [Voltage Avg] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:ACPower:DETector SCALar

:ACPower:DETector?

3.3.5.7 Sweep

Enable sweep-related parameter setup function to pop up corresponding soft menu, including [Sweep Time Auto MAN], [Sweep Setup>>] and [Sweep Points].

[Sweep Time Auto MAN]

Program control commands:

[:SENSe]:ACPower:SWEep:TIME <time>

[:SENSe]:ACPower:SWEep:TIME?

[:SENSe]:ACPower:SWEep:TIME:AUTO OFF|ON|0|1

[:SENSe]:ACPower:SWEep:TIME:AUTO?

Command description: to change the sweep time of signal/spectrum analyzer. Use the number keys, step keys or knob to adjust the sweep time. If “Man” is underlined, the sweep time can be set manually. If “Auto” is underlined, the sweep time will be automatically associated according to the Res BW, frequency bandwidth and video bandwidth.

Key path: 【Sweep】, [Sweep Time Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: sweep time Auto.

Setting range: Min.: 1 ms, Max.: 6000 s.

Knob increment: in increasing sweep time, the knob increment is 1/10 of the most significant bit; in decreasing sweep time, the knob increment is 1/100 of the most significant bit.

Stepping key increment: 1-2-5-10 step.

Default unit: s

Examples:

:ACPower:SWEep:TIME 500 ms

:ACPower:SWEep:TIME:AUTO OFF

[Sweep Setup>>]

Pop up the soft More related to Sweep type, including [Sweep Type Auto Man], [Sweep Type Rules Auto Man] and [FFT Width Auto Man].

[Sweep Type>> Auto MAN]

Program control commands:

[:SENSe]:ACPower:SWEep:TYPE FFT|SWEep

[:SENSe]:ACPower:SWEep:TYPE?

[:SENSe]:ACPower:SWEep:TYPE:AUTO OFF|ON|0|1

[:SENSe]:ACPower:SWEep:TYPE:AUTO?

Command description: to set sweep type. Command description: to set the sweep type to determine whether Swept or FFT is adopted for frequency spectrum measurement .

Also set the FFT step bandwidth for FFT sweep. The soft More include [Auto], [Swept] and [FFT]. When under Auto ON mode, the signal/spectrum analyzer will automatically select the sweep type based on sweep type rules.

Key path: 【Sweep】, [Sweep Setup>>], [Sweep Type Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: sweep type: Auto.

Examples:

:ACPower:SWEep:TYPE FFT

:ACPower:SWEep:TYPE?

:ACPower:SWEep:TYPE:AUTO OFF

:ACPower:SWEep:TYPE:AUTO?

[Sweep Type Rules Auto MAN]

Program control commands:

[:SENSe]:ACPower:SWEep:TYPE:AUTO:RULes SPEed|DRANge

[:SENSe]:ACPower:SWEep:TYPE:AUTO:RULes?

[:SENSe]:ACPower:SWEep:TYPE:AUTO:RULes:AUTO OFF|ON|0|1

[:SENSe]:ACPower:SWEep:TYPE:AUTO:RULes:AUTO?

Command description: to set rules for auto sweep type. While the sweep type rules include “Best Dynamic Range” and “ Best Speed”.

“Best Dynamic Range” rules: when RBW is or larger than 1 kHz, the sweep type is Swept; when RBW is less than 1 kHz, the sweep type is FFT.

“Best Speed” rules: when RBW is or larger than 30 kHz, the sweep type is Swept; when RBW is less than 30 kHz, the sweep type is FFT.

Key path: 【Sweep】, [Sweep Setup>>], [Sweep Type Rules Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the sweep type rules are automatically set as “Best Dynamic Range”.

Examples:

:ACPower:SWEep:TYPE:AUTO:RULes SPEed

:ACPower:SWEep:TYPE:AUTO:RULes?

:ACPower:SWEep:TYPE:AUTO:RULes:AUTO OFF

:ACPower:SWEep:TYPE:AUTO:RULes:AUTO?

[FFT Width Auto MAN]

Program control commands:

[:SENSe]:ACPower:SWEep:FFT:WIDTh <real>

[:SENSe]:ACPower:SWEep:FFT:WIDTh?

[:SENSe]:ACPower:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1

[:SENSe]:ACPower:SWEep:FFT:WIDTh:AUTO?

Command description: to set FFT Width. The FFT width includes [Auto], [<100 kHz], [<3 MHz], [<13 MHz], [<=Max.]. FFT width is only active when the FFT sweep type is selected. Under Auto type, when the signal/spectrum analyzer performs FFT spectrum measurement, the maximum Res BW is 30 kHz. To guarantee best dynamic measurement range, the signal/spectrum analyzer automatically optimizes the FFT width within 100 kHz. The larger is the FFT width, the faster is FFT spectrum measurement, but the dynamic range performance will be affected.

Under FFT sweep, the FFT width setup limits the maximum value for center frequency step of each tune. For example, if [<100 Hz] is selected, the maximum value for center freq step of each tune is 100 Hz. As the FFT width gets larger, the count of instrument center frequencies get smaller when performing measurement of same frequency scope, and the response measurement gets faster. Therefore, to improve measurement speed, you can manually change the FFT width.

Key path: 【Sweep】, [Sweep Setup>>], [FFT Width>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: FFT Width is set as Auto.

Examples:

:ACPower:SWEep:FFT:WIDTh 1

:ACPower:SWEep:FFT:WIDTh?

:ACPower:SWEep:FFT:WIDTh:AUTO OFF

:ACPower:SWEep:FFT:WIDTh:AUTO?

[Sweep points]

Program control commands:

[:SENSe]:ACPower:SWEep:POINts <integer>

[:SENSe]:ACPower:SWEep:POINts?

Command description: to set the trace points.

Key path: 【Sweep】, [Sweep Points] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1001.

Setting range: 101-30001.

Knob increment: in increase, the knob increment is 1/10 of the most significant bit; in decrease, the knob increment is 1/100 of the most significant bit.

Stepping key increment: in increase, the knob increment is 1/1 of the most significant bit; in decrease, the knob increment is 1/10 of the most significant bit.

Examples:

:ACPower:SWEep:POINts 1001

:ACPower:SWEep:POINts?

3.3.5.8 Single

Program control commands:

:INITiate:ACPower

Command description: the 【Single】 key on the front panel has no corresponding soft menu. This function is mainly used for manual trigger of a measurment. When the Average is ON, this function performs the measurements at the count specified by the Average Num.

In remote control programming and system establishment, this function combined with *WAI can effectively synchronize the measurement process and enable the trace data obtained after the *WAI finishes directly correspond to the measurement process one by one.

Examples:

:INITiate:ACPower

3.3.5.9 Continuous

Program control commands:

:INITiate:CONTinuous ON

Command description: Continuous ON is mainly used for changing the Continuous OFF into Continuous ON; if the current measurement is Continuous ON, the instrument performs no operation.

Examples:

:INITiate:CONTinuous ON

3.3.5.10 Trigger

See description of Swept SA 【Trigger】 for more details.

3.3.5.11 Display

Pop up soft menus related to display, including [Display Line ON OFF], [Bar Graph ON OFF], [Display Config>>].

[Display Line On Off]

See description of Swept SA 【Display】 [Display Line ON OFF] for more details.

[Display Config>>]

It is used for configurations of interface language, status area display ON OFF related to interface display, The soft More include [Select Language 中文 English], [Graticule On Off], [Status Display On Off], [Freq Info Disp On Off]. See description of Swept SA 【Display】 [Display Config>>] for more details.

[Bar Graph On Off]

Program control commands:

:DISPlay:ACPower:VIEW:WINDow:BGRaph ON|OFF|1|0

:DISPlay:ACPower:VIEW:WINDow:BGRaph?

Command description: to turn on or off Bar Graph Display.

Key path: 【Display】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:DISPlay:ACPower:VIEW:WINDow:BGRaph ON

:DISPlay:ACPower:VIEW:WINDow:BGRaph?

3.3.5.12 Input Output

See description of Swept SA 【Input/output] 】for more details.

3.3.5.13 Marker

Pop up the soft menu related to markers, including [Select Marker], [Normal], [Delta], [Fixed], [OFF], [Properties], [Couple Markers ON OFF], and [All Markers OFF].

[Select Marker >> Marker 1]

Command description: to select among 12 different markers of the analyzer. When a certain marker is selected, the marker will be indicated in the menu where its type and attribute can be set. Select and trigger another marker and place it at the center of the current trace. Users can read amplitude and frequency information (when the frequency span is 0 Hz, time information will be displayed) at the marker display area at the top right corner of the screen.

Key path: 【Marker】, [Select Marker >>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Marker 1.

[Normal]

Program control commands:

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE POSition

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Normal Marker.

Key path: 【Marker】, [Select Marker>>], [Normal] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:ACPower:MARKer1:MODE POS

:CALCulate:ACPower:MARKer1:MODE?

[Delta]

Program control commands:

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE DELTa

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Delta Marker. Display the amplitude difference and frequency difference (or time difference, when span is zero) between two markers at the marker display area at the top right corner of the screen. If there exists a single marker, a [Delta] operation will generate a Ref marker in the active marker position. Move the active marker through the knob, stepping keys or number keys. The display amplitude difference unit is dB.

Key path: 【Marker】, [Select Marker>>], [Delta] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:ACPower:MARKer1:MODE DELTa

:CALCulate:ACPower:MARKer1:MODE?

[Fixed]

Program control commands:

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE FIXed

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Fixed Marker. The X Axis and Y Axis positions of the fixed marker are fixed. The Fixed Marker can be used as reference marker.

Key path: 【Marker】, [Select>>], [Fixed] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:ACPower:MARKer1:MODE FIXed

:CALCulate:ACPower:MARKer1:MODE?

[Off]

Program control commands:

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE OFF

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to turn off the selected marker.

Key path: 【Marker】, [Select Marker>>], [OFF] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:ACPower:MARKer1:MODE OFF

:CALCulate:ACPower:MARKer1:MODE?

[Properties>>]

Pop up the corresponding menu of currently selected marker attribute setup, including [Relative To>>], [X Axis Scale Auto MAN], [Marker Trace>>] and [Marker Display Line ON OFF].

[Relative To**>>]**

Program control commands:

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence <integer>

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence?

Command description: to select reference marker for current marker. It can be any one from 11 markers except the currently selected marker.

Key path: 【Marker】, [Select Marker >>], [Properties>>], [Relative To>>] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:ACPower:MARKer1:REFerence 2

:CALCulate:ACPower:MARKer1:REFerence?

[Lines>> On Off]

Program control commands:

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe] OFF|ON|0|1

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe]?

Command description: to set whether the current marker is displayed as a line on the screen, which is good for observation.

Key path: 【Marker】, [Select Marker >>], [Properties>>] and [Lines On/Off].

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:CALCulate:ACPower:MARKer1:LINes ON

:CALCulate:ACPower:MARKer1:LINes?

[Couple Markers On Off]

Program control commands:

:CALCulate:ACPower:MARKer:COUPle[:STATe] ON|OFF|1|0

:CALCulate:ACPower:MARKer:COUPle[:STATe]?

Command description: to turn on or off Marker Couple. When it is ON, moving any marker horizontal axis position will cause an equal movement of horizontal axis position of every other marker which is ON. When the marker is moved to less than Start Frequency or larger than Stop Frequency, the marker is limited to the value of the Start Frequency or the Stop Frequency; when the span is zero, the minimum value is limited as 0, and the maximum value is limited as the Sweep Time.

Key path: 【Marker】, [More 1/2>>], [**Couple Markers** ON OFF] on the front panel.

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:CALCulate:ACPower:MARKer:COUPle ON

:CALCulate:ACPower:MARKer:COUPle?

[Marker All Off]

Program control commands:

:CALCulate:ACPower:MARKer:AOFF

Command description: to turn off all current markers which are ON and related soft keys, e.g, [Noise Marker].

Key path: 【Marker】, [More 1/2>>], [All Markers OFF] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:ACPower:MARKer:AOFF

3.3.5.14 Maker->

This key has no soft menu.

3.3.5.15 Marker Function

This key has no soft menu.

3.3.5.16 Peak Search

Program control commands:

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum

Command description: the 【Peak Search】 key on the front panel is used for turning on the peak search for traces by the control instrument and turning on marker for display, including [Next Peak], [Next Peak Right], [Next Pk Left].

Key path: 【Peak Search】 on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:ACPower:MARKer:MAXimum

[Next Peak]

Program control commands:

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:NEXT

Command description: Taking the Amplitude of the point where the current marker is located, search for the next peak of current test trace.

Key path: 【Peak Search】, [Next Peak] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:ACPower:MARKer:MAXimum:NEXT

[Next Pk Right]

Program control commands:

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:RIGHt

Command description: to search for the peak to the right of the current test trace marker position.

Key path: 【Peak Search】, [Next Pk Right] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:ACPower:MARKer:MAXimum:RIGHt

[Next Pk Left]

Program control commands:

:CALCulate:ACPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:LEFT

Command description: to search for the peak to the left of the current test trace marker position.

Key path: 【Peak Search】, [Next Pk Left] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:ACPower:MARKer :MAXimum:LEFT

3.3.5.17 Measurement Setting

Pop up the soft menu related to measurement setting, including [Average Num ON OFF], [Average Mode Exponential Repeat], [Carrier Setup>>], [Offset Limit>>], [Ref Type>>], [Meas Method], [Limit Test ON OFF], [Low Noise Path ON OFF], [Preselector Preselecting Bypass], [RF Gain>>], [ADC Dither Auto MAN] and [Measurement Reset].

[Average Num On Off]

Program control commands:

[:SENSe]:ACPower:AVERage:COUNt <integer>

[:SENSe]:ACPower:AVERage:COUNt?

[:SENSe]:ACPower:AVERage[:STATe] ON|OFF|1|0

[:SENSe]:ACPower:AVERage[:STATe]?

Command description: to turn on or off Average. When Average Count is ON, the user can specify the average count required for measurement. The Average Count can be adjusted by number keys, stepping keys or knob.

Key path: 【Meas Setup】, [Average Num ON OFF] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 100/OFF

Setting range: 1~10000

Knob increment: 1

Stepping key increment: 1.

Default unit: none

Examples:

:ACPower:AVERage:COUNt 10

:ACPower:AVERage:COUNt?

:ACPower:AVERage ON

:ACPower:AVERage?

[Average Mode Exponential Repeat]

Program control commands:

[:SENSe]:ACPower:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:ACPower:AVERage:TCONtrol?

Command description: when Average Count is ON, the user can select Average State required for measurement.

Exponential - Different from Linear Average, in Exponential State, the weight of new data is larger than that of old data. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases.

Repeat - Similarly, it takes exponential averaging. However, when the average count is met, clear all previous results, restart average till the set average count and repeat this process.

Key path: 【Meas Setup】, [Average Mode Exponential Repeat] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Exponential

Examples:

:ACPower:AVERage:TCONtrol EXPonential

:ACPower:AVERage:TCONtrol?

[Carrier Setup>>]

Command description: to access the Carrier Setting menu to set the Carrier Count and Reference Carrier parameters.

Key path: 【Meas Setup】, [Carrier Setup] on the front panel.

[Carriers]

Program control commands:

[:SENSe]:ACPower:CARRier:COUNt <integer>

[:SENSe]:ACPower:CARRier:COUNt?

Command description: to select the Carrier Count menu to specify the number of carriers to be measured. Use number keys, stepping keys or knob to change the Carrier Count.

Key path: 【Meas Setup】, [Carrier Setup>>], [Carriers] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1

Setting range: 1~12

Knob increment: 1

Stepping key increment: 1.

Default unit: none

Examples:

:ACPower:CARRier:COUNt 2

:ACPower:CARRier:COUNt?

[Ref Carrier Auto MAN]

Program control commands:

[:SENSe]:ACPower:CARRier:RCARrier <integer>

[:SENSe]:ACPower:CARRier:RCARrier?

[:SENSe]:ACPower:CARRier:RCARrier:AUTO OFF|ON|0|1

[:SENSe]:ACPower:CARRier:RCARrier:AUTO?

Command description: to select the Reference Carrier (Auto ON) menu to specify a carrier. Other related power measurements will be made according to this carrier. When the Reference Carrier is set to Auto ON, the instrument selects the one with largest power as reference; when set to Auto OFF, use number keys, stepping keys or knob to change the Reference Carrier.

Key path: 【Meas Setup】, [Carrier Setup>>], [Ref Carrier Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto

Setting range: 1~12

Knob increment: 1

Stepping key increment: 1.

Default unit: none

Examples:

:ACPower:CARRier:RCARrier 1

:ACPower:CARRier:RCARrier?

:ACPower:CARRier:RCARrier:AUTO ON

:ACPower:CARRier:RCARrier:AUTO?

[Config Carriers>>]

Command description: to access the Carrier Configure menu to further define each carrier.

Key path: 【Meas Setup】[Carrier Setup>>], [Config Carriers>>] on the front panel.

[Carrier]

Command description: to select the carrier index to be configured. Use number keys, stepping keys or knob to change the carrier.

Key path: 【Meas Setup】, [Carrier Setup>>], [Config Carriers>>], [Carrier] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1

Setting range: 1~12

Knob increment: 1

Stepping key increment: 1.

Default unit: none

[Carrier Pwr Present Absolute Relative]

Program control commands:

[:SENSe]:ACPower:CARRier:LIST:PPResent YES|NO,..

[:SENSe]:ACPower:CARRier:LIST:PPResent?

Command description: to specify the carrier with power display. Firstly, press the [Carrier] key and use stepping keys, knob or number keys to select the Carrier Count to be defined. Then switch the [Power Display] as Abs Or Rel. If a carrier is defined as non-power display, the displayed power is relative to the reference carrier; otherwise, an absolute power is displayed.

Key path: 【Meas Setup】, [Carrier Setup>>], [Config Carriers>>], [Carrier Pwr Present Abs Rel] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Absolute

Examples:

:ACPower:CARRier:LIST:PPResent YES,YES,YES,YES,YES,YES

:ACPower:CARRier:LIST:PPResent?

[Carrier Spacing]

Program control commands:

[:SENSe]:ACPower:CARRier:LIST:WIDTh <bandwidth>,...

[:SENSe]:ACPower:CARRier:LIST:WIDTh?

Command description: to specify the width between adjacent carriers. Firstly, press the [Carrier] key and use stepping keys, knob or number keys to select the carrier to be defined. Then, press the [Carrier Width] key and use stepping keys, knob or number keys to set the Carrier Width.

Key path: 【Meas Setup】, [Carrier Setup>>], [Config Carrier>>], [Carrier Spacing] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 0 MHz

Setting range: 0 Hz - 1.0 GHz.

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: 1,2,5,10…

Default unit: Hz

Examples:

:ACPower:CARRier:LIST:WIDTh 5 MHz, 5 MHz, 5 MHz, 5 MHz, 5 MHz, 5 MHz

:ACPower:CARRier:LIST:WIDTh?

[Integration BW]

Program control commands:

[:SENSe]:ACPower:CARRier:LIST:BANDwidth[:INTegration] <freq>,...

[:SENSe]:ACPower:CARRier:LIST:BANDwidth[:INTegration]?

Command description: to set the integration bandwidth for calculating carrier power. Firstly, press the [Carrier] key and use stepping keys, knob or number keys to select the carrier to be defined. Then, press the [Integration Bandwidth] key and use stepping keys, knob or number keys to set the Integration Bandwidth.

Key path: 【Meas Setup】, [Carrier Setup>>], [Config Carrier>>], [Integration BW] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 2.0 MHz

Setting range: 100 Hz - 1.0 GHz.

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: 1,2,5,10…

Default unit: Hz

Examples:

:ACPower:CARRier:LIST:BANDwidth 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz

:ACPower:CARRier:LIST:BANDwidth?

[Method>>]

Program control commands:

[:SENSe]:ACPower:CARRier:LIST:FILTer[:RRC][:STATe] ON|OFF|1|0, …

[:SENSe]:ACPower:CARRier:LIST:FILTer[:RRC][:STATe] ?

Command description: to select the calculation method for measuring carrier power, where, ON indicates RRC Weighting method and OFF indicates Bandwidth Integration method.

Key path: 【Meas Setup】, [Carrier Setup>>], [Config Carrier>>], [Method>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Bandwidth Integration.

[BW Integration]

Command description: to select the calculation method as Bandwidth Integration method.

Key path: 【Meas Setup】, [Carrier Setup>>], [Config Carrier>>], [Method>>], [BW Integration] on the front panel.

Examples:

:ACPower:CARRier:LIST:FILTer OFF,OFF,OFF,OFF,OFF,OFF

:ACPower:CARRier:LIST:FILTer ?

[RRC Weighting]

Command description: to select the calculation method as RRC Weighting.

Key path: 【Meas Setup】, [Carrier Setup>>], [Config Carrier>>], [Method>>], [RRC Weighting] on the front panel.

Examples:

:ACPower:CARRier:LIST:FILTer ON,ON,ON,ON,ON,ON

:ACPower:CARRier:LIST:FILTer ?

[Filter Factor a]

Program control commands:

[:SENSe]:ACPower:CARRier:LIST:FILTer:ALPHa <real>,...

[:SENSe]:ACPower:CARRier:LIST:FILTer:ALPHa?

Command description: to set the Filter Factor a if RRC Weighting method is used. The influence factors of RRC Filter will be considered in calculating the measurement results.

Use number keys, stepping keys or knob to change the Filter Factor a.

Key path: 【Meas Setup】, [Carrier Setup>>], [Config Carrier>>], [Filter Factor a] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 0.22

Setting range: 0.01~1.0

Knob increment: 0.01

Stepping key increment: 0.1

Default unit: none

Examples:

:ACPower:CARRier:LIST:FILTer:ALPHa 0.22,0.22,0.22,0.22,0.22,0.22

:ACPower:CARRier:LIST:FILTer:ALPHa?

[Offset/Limit>>]

Command description: to set the measurement offset and limit.

Key path: 【Meas Setup】, [Offset/Limit] on the front panel.

[Offset]

Command description: to select the offset to be set.

Key path: 【Meas Setup】, [Offset/Limit>>], [Offset] on the front panel.

Status saved: saved in the instrument status.

Factory preset: A

[Offset Freq]

Program control commands:

[:SENSe]:ACPower:OFFSet:LIST[:FREQuency] <freq>,...

[:SENSe]:ACPower:OFFSet:LIST[:FREQuency]?

[:SENSe]:ACPower:OFFSet:LIST:STATe OFF|ON|0|1,...

[:SENSe]:ACPower:OFFSet:LIST:STATe?

Command description: to set the center frequency difference between the offset channel and carrier channel. Upper channel offset is the frequency difference between the offset channel center and the highest carrier channel center,

while lower channel offset is the frequency difference between the offset channel center and the lowest carrier channel center. If set to 0 Hz, the Offset Channel will close. Use stepping keys, knob or number keys to set the Offset Frequency.

Key path: 【Meas Setup】, [Offset/Limit>>], [Offset Freq] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 3.0 MHz

Setting range: 0 Hz - 500.0 MHz.

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: 1,2,5,10…

Default unit: Hz

Examples:

:ACPower:OFFSet:LIST 3 MHz,6 MHz,9 MHz,15 MHz,18 MHz,21 MHz

:ACPower:OFFSet:LIST?

:ACPower:OFFSet:LIST:STATe ON,ON,OFF,OFF,OFF,OFF

:ACPower:OFFSet:LIST:STATe?

[Integration BW]

Program control commands:

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth[:INTegration] <bandwidth>,...

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth[:INTegration]?

3.3 Instrument Commands

Command description: to set the Power Integration bandwidth under the selected offset. Use stepping keys, knob or number keys to set the Integration Bandwidth.

Key path: 【Meas Setup】, [Offset/Limit>>], [Integration BW] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 2.0 MHz

Setting range: 10 Hz - 1.0 GHz.

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: 1,2,5,10…

Default unit: Hz

Examples:

:ACPower:OFFSet:LIST:BANDwidth 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz

:ACPower:OFFSet:LIST:BANDwidth?

[Offset BW>>]

Command description: to set the bandwidth parameters for measuring offset.

Key path: 【Meas Setup】, [Offset/Limit>>], [Offset BW>>] on the front panel.

[Res BW Auto MAN]

Program control commands:

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth:RESolution <bandwidth>, ...

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth:RESolution?

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth:RESolution:AUTO ON|OFF|1|0,...

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth:RESolution:AUTO?

Command description: to set the instrument Res BW for measuring offset. Use stepping keys, knob or number keys to set the Res BW.

Key path: 【Meas Setup】, [Offset/Limit>>], [Offset BW>>], [Res BW Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 220 kHz

Setting range: 1 Hz – 20 MHz.

Knob increment: available Res BW

Stepping key increment: available Res BW

Default unit: Hz

Examples:

:ACPower:OFFSet:LIST:BANDwidth:RESolution

220 kHz, 220 kHz, 220 kHz, 220 kHz, 220 kHz, 220 kHz

:ACPower:OFFSet:LIST:BANDwidth:RESolution?

:ACPower:OFFSet:LIST:BANDwidth:RESolution:AUTO OFF,OFF,OFF,OFF,OFF,OFF

:ACPower:OFFSet:LIST:BANDwidth:RESolution:AUTO?

[Video BW Auto MAN]

Program control commands:

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth:VIDeo <freq>,...

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth:VIDeo?

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth:VIDeo:AUTO OFF|ON|0|1,...

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth:VIDeo:AUTO?

Command description: to set the instrument Video Bandwidth for measuring offset. Use stepping keys, knob or number keys to set the Video Bandwidth.

Key path: 【Meas Setup】, [Offset/Limit>>], [Offset BW>>], [Video BW Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 2.2 MHz

Setting range: 1 Hz – 20 MHz.

Knob increment: available video bandwidth

Stepping key increment: available video bandwidth

Default unit: Hz

Examples:

:ACPower:OFFSet:LIST:BANDwidth:VIDeo

100 kHz, 100 kHz, 100 kHz, 100 kHz, 100 kHz, 100 kHz

:ACPower:OFFSet:LIST:BANDwidth:VIDeo?

:ACPower:OFFSet:LIST:BANDwidth:VIDeo:AUTO OFF,OFF,OFF,OFF,OFF,OFF

:ACPower:OFFSet:LIST:BANDwidth:VIDeo:AUTO?

[Filter Type>>]

Program control commands:

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth:SHAPe GAUSsian|FLATtop,...

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth:SHAPe?

Command description: to set the Bandwidth Filter Type for measuring offset.

Key path: [Measurement Setting], [Offset/Limit>>], [Offset Bandwidth>>], [Filter Type>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Gaussian

Examples:

:ACPower:OFFSet:LIST:BANDwidth:SHAPe GAUS,GAUS,GAUS,GAUS,GAUS,GAUS

:ACPower:OFFSet:LIST:BANDwidth:SHAPe?

[Gaussian]

Command description: to select the Bandwidth Filter Type as Gaussian.

Key path: 【Meas Setup】, [Offset/Limit>>], [Offset BW>>], [Filter Type>>], [Gaussian] on the front panel.

[Flattop]

Command description: to select the Bandwidth Filter Type as Top Flat.

Key path: 【Meas Setup】, [Offset/Limit>>], [Offset BW>>], [Filter Type>>], [Top Flat] on the front panel.

[Filter BW>>]

Program control commands:

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth:TYPE DB3|DB6,...

[:SENSe]:ACPower:OFFSet:LIST:BANDwidth:TYPE?

Command description: to set the Filter Bandwidth type.

Key path: 【Meas Setup】, [Offset/Limit>>], [Offset BW>>], [Filter BW>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset:-3 dB.

Examples:

:ACPower:OFFSet:LIST:BANDwidth:TYPE DB3,DB3,DB3,DB3,DB3,DB3

:ACPower:OFFSet:LIST:BANDwidth:TYPE?

[-3 dB]

Command description: to set the Filter Bandwidth type as 3 dB Bandwidth.

Key path: [Meas Setup, [Offset/Limit>>], [Offset BW>>], [Filter BW>>], [-3 dB] on the front panel.

[-6 dB]

Command description: to set the Filter Bandwidth type as 6 dB Bandwidth.

Key path: 【Meas Setup】, [Offset/Limit>>], [Offset BW>>], [Filter BW>>], [-6 dB] on the front panel.

[Limit>>]

Command description: to set the offset limit and test template type.

Key path: 【Meas Setup】, [Offset/Limit>>], [Limit>>] on the front panel.

[Absolute Limit]

Program control commands:

[:SENSe]:ACPower:OFFSet:LIST:ABSolute <real>,...

[:SENSe]:ACPower:OFFSet:LIST:ABSolute?

Command description: to set the limit absolute power value. Use stepping keys, knob or number keys to set the Absolute Limit.

Key path: 【Meas Setup】, [Offset/Limit>>], [Limit>>], [Abs Limit] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 0 dBm

Setting range:-200 dBm – 50 dBm

Knob increment: amplitude scale/100

Stepping key increment: amplitude scale

Default unit: dBm.

Example:

:ACPower:OFFSet:LIST:ABSolute -45, -45, -45, -45, -45, -45

:ACPower:OFFSet:LIST:ABSolute?

[Relative Limit (Car)]

Program control commands:

[:SENSe]:ACPower:OFFSet:LIST:RCARrier <real>,...

[:SENSe]:ACPower:OFFSet:LIST:RCARrier?

Command description: to set the limit power value relative to the carrier power. Use stepping keys, knob or number keys to set the Limit.

Key path: 【Meas Setup】, [Offset/Limit>>], [Limit>>], [Rel Limit (Car)>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset:-45 dB.

Setting range: - 200.0 dB -50 dB

Knob increment: amplitude scale/100

Stepping key increment: amplitude scale

Default unit: dB.

Examples:

:ACPower:OFFSet:LIST:RCARrier -30, -30, -30, -30, -30, -30

:ACPower:OFFSet:LIST:RCARrier?

[Relative Limit (PSD)]

Program control commands:

[:SENSe]:ACPower:OFFSet:LIST:RPSDensity <rel_ampl>,...

[:SENSe]:ACPower:OFFSet:LIST:RPSDensity?

Command description: to set the limit power value relative to the spectral density. Use stepping keys, knob or number keys to set the Limit.

Key path: [Measurement Setting], [Offset/Limit>>], [Limit>>], [Relative Limit (PSD)>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset:-28.87 dB.

Setting range: - 200.0 dB -50 dB

Knob increment: amplitude scale/100

Stepping key increment: amplitude scale

Default unit: dB.

Examples:

:ACPower:OFFSet:LIST:RPSDensity -80,-80,-80,-80,-80,-80

:ACPower:OFFSet:LIST:RPSDensity?

[Fail Mask>>]

Program control commands:

[:SENSe]:ACPower:OFFSet:LIST:TEST ABSolute|AND|OR|RELative,...

[:SENSe]:ACPower:OFFSet:LIST:TEST?

Command description: to set the Limit Test Type for currently selected offset, including:

Absolute: When measured absolute result exceeds the absolute limit value, the test failed.

Relative: When measured relative result exceeds the relative limit value, the test failed.

Absolute and relative: When measured absolute results exceeds the absolute limit value, and measured relative result exceeds the relative limit value, the test failed.

Absolute or relative: When measured absolute results exceeds the absolute limit value, or measured relative result exceeds the relative limit value, the test failed.

Key path: 【Meas Setup】, [Offset/Limit>>], [Limit>>], [Fail Mask>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Absolute

Examples:

:ACPower:OFFSet:LIST:TEST ABS,ABS,ABS,ABS,ABS,ABS

:ACPower:OFFSet:LIST:TEST?

[Method>>]

Program control commands:

[:SENSe]:ACPower:OFFSet:LIST:FILTer[:RRC][:STATe] ON|OFF|1|0,...

[:SENSe]:ACPower:OFFSet:LIST:FILTer[:RRC][:STATe]?

Command description: to select the calculation method for measuring offset channel power, where, ON indicates RRC Weighting method and OFF indicates Bandwidth Integration method.

Key path: 【Meas Setup】[Offset/Limit>>], [Method] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Bandwidth Integration.

Examples:

:ACPower:OFFSet:LIST:FILTer ON,ON,ON,ON,ON,ON

:ACPower:OFFSet:LIST:FILTer?

[BW Integration]

Command description: to select the calculation method as Bandwidth Integration method.

Key path: 【Meas Setup】[Offset/Limit>>], [Method], [BW Integration] on the front panel.

[RRC Weighting]

Command description: to select the calculation method as RRC Weighting.

Key path: 【Meas Setup】[Offset/Limit>>], [Method], [RRC Weighting] on the front panel.

[Filter Factor a]

Program control commands:

[:SENSe]:ACPower:OFFSet:LIST:FILTer:ALPHa <real>,...

[:SENSe]:ACPower:OFFSet:LIST:FILTer:ALPHa?

Command description: to set the Filter Factor when using RRC method. The influence factor of RRC Filter will be considered in calculating the measurement result. Use number keys, stepping keys or knob to change the Filter Factor a.

Key path: 【Meas Setup】 [Offset/Limit>>], [Filter Factor a] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 0.22

Setting range: 0.01~1.0

Knob increment: 0.01

Stepping key increment: 0.1

Default unit: none

Examples:

:ACPower:OFFSet:LIST:FILTer:ALPHa 0.1,0.1,0.1,0.1,0.1,0.1

:ACPower:OFFSet:LIST:FILTer:ALPHa?

[Carrier Result]

Command description: to view the carrier power value by inputting carrier index or use number keys, stepping keys or knob to select the viewed carrier.

Key path: 【Meas Setup】, [Carrier Result] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1

Setting range: 1 - Carrier Count

Knob increment: 1

Stepping key increment: 1

Default unit: none

[Meas Method>>]

Program control commands:

[:SENSe]:ACPower:METHod IBW|FAST|RBW

[:SENSe]:ACPower:METHod?

Command description: to select the Measurement Method for usage.

Key path: 【Meas Setup】, [More 1/3>>], [Meas Method] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Bandwidth Integration method

Examples:

:ACPower:METHod IBW

:ACPower:METHod?

[IBW]

Program control commands:

[:SENSe]:ACPower:METHod IBW

Command description: to select the Measurement Method as Bandwidth Integration method.

Key path: 【Meas Setup】, [More 1/3>>], [Meas Method>>], [IBW] on the front panel.

Status saved: saved in the instrument status.

Examples:

:ACPower:METHod IBW

[Fast Meas Method]

Program control commands:

[:SENSe]:ACPower:METHod FAST

Command description: to select the Measurement Method as Fast Meas Method.

Key path: 【Meas Setup】, [More 1/3>>], [Meas Method>>], [Fast Meas Method] on the front panel.

Examples:

:ACPower:METHod FAST

[Time Domain Measurement Method]

Program control commands:

[:SENSe]:ACPower:METHod RBW

Command description: to select the Measurement Method as Time Domain Measurement Method.

Key path: 【Meas Setup】, [More 1/3>>], [Meas Method>>], [Time Domain Meas Method] on the front panel.

Examples:

:ACPower:METHod RBW

[Limit Test On Off]

Program control commands:

:CALCulate:ACPower:LIMit:STATe OFF|ON|0|1

:CALCulate:ACPower:LIMit:STATe?

Command description: to turn on or off the limit test. If the Limit Test is ON, each offset will be compared to its high-end and low-end limit values. When the power exceeds limit, the red F near the dBc result indicates Fail. All offsets that are OFF will not be measured and their results will not be displayed on the screen.

Key path: 【Meas Setup】, [More 1/3>>], [Limit Test MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:CALCulate:ACPower:LIMit:STATe ON

:CALCulate:ACPower:LIMit:STATe?

[Low Noise Path On Off]

Program control commands:

[:SENSe]:ACPower:POWer:MW:PATH STD|LNPath

[:SENSe]:ACPower:POWer:MW:PATH?

Command description: this command is only available when the H34 option (Low Noise Preamplifier) is purchased. When the preamplifier is ON, the Low Noise Path is OFF and this menu is grayed out; when the preamplifier is OFF, this menu lights on and is switchable.

Key path: 【Meas Setup】, [More 2/3>>], [Low Noise Path ON OFF] on the front panel.

Status saved: saved in the instrument status.

Examples:

:ACPower:POWer:MW:PATH STD

:ACPower:POWer:MW:PATH?

[Preselector Preselecting Bypass]

Program control commands:

INPut:ACPower:FILTer:YIG[:STATe] OFF|ON|0|1

INPut:ACPower:FILTer:YIG[:STATe]?

Command description: this menu is only available after the H36 option is purchased. It is used for setting whether to bypass the front-end preselector of the signal/spectrum analyzer. In analyzing bandwidth signal, bypass is usually required.

Key path: 【Meas Setup】, [More 1/3>>], [More 2/3>>], [Preselector Preselecting Bypass] on the front panel.

Status saved: saved in the instrument status.

Examples:

INPut:ACPower:FILTer:YIG ON INPut:ACPower:FILTer:YIG]?

3.3 Instrument Commands

[RF Gain>>]

Program control commands:

[:SENSe]:ACPower:RF:GAIN:AUTO OFF|ON|0|1

[:SENSe]:ACPower:RF:GAIN:AUTO?

[:SENSe]:ACPower:RF:GAIN:AUTO:RULes RANGE|SENSITIVITY

[:SENSe]:ACPower:RF:GAIN:AUTO:RULes?

Command description: to set the Auto MAN of the RF Gain and best allocation algorithm for RF Gain. The soft menus include [Auto], [Best for Dynamic Range] and [Best for Sensitivity].

Key path: 【Meas Setup】, [More 1/3>>], [More 2/3 >>], [RF Gain] on the front panel.

Status saved: saved in the instrument status.

Examples:

:ACPower:RF:GAIN:AUTO OFF

:ACPower:RF:GAIN:AUTO?

:ACPower:RF:GAIN:AUTO:RULes SENSITIVITY

:ACPower:RF:GAIN:AUTO:RULes?

[Auto]

Program control commands:

:ACPower:RF:GAIN:AUTO OFF|ON|0|1

:ACPower:RF:GAIN:AUTO?

Command description: to set the RF Gain distribution algorithm to Auto. In this case, the RF Gain distribution is “Best Dynamic Range”.

Key path: 【Meas Setup】, [More 1/3>>], [More 2/3>>], [RF Gain>>], [Auto] on the front panel.

Status saved: saved in the instrument status.

Examples:

:ACPower:RF:GAIN:AUTO OFF

:ACPower:RF:GAIN:AUTO?

[Best for Dynamic Range]

Program control commands:

:ACPower:RF:GAIN:AUTO:RULes RANGE

Command description: to set the RF Gain distribution algorithm to Best Dynamic Range. In this case, the RF Gain is switched to “Auto OFF”

Key path: 【Meas Setup】, [More 1/3>>], [More 2/3>>], [RF Gain>>], [Best Dynamic Range] on the front panel.

Status saved: saved in the instrument status.

[Best for Sensitivity]

Program control commands:

:ACPower:RF:GAIN:AUTO:RULes SENSITIVITY

Command description: to set the RF Gain distribution algorithm to Best Sensitivity. In this case, the RF Gain is switched to "Auto OFF"

Key path: 【Meas Setup】, [More 1/3>>], [More 2/3>>], [RF Gain>>], [Best for Sensitivity] on the front panel.

Status saved: saved in the instrument status.

[ADC Dither Auto MAN]

Program control commands:

[:SENSe]:ACPower:ADC:DITHer[:STATe] OFF|ON|HIGH

[:SENSe]:ACPower:ADC:DITHer[:STATe]?

[:SENSe]:ACPower:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:ACPower:ADC:DITHer:AUTO[:STATe]?

Command description: to control opening/closing of ADC dither of the frequency acquisition circuit in the analyzer. Under default mode, the signal/spectrum analyzer will automatically control whether the ADC Dither is ON based on current working condition. When the ADC Dither is under Auto mode, the ON or OFF status depends on the span, Res BW and sweep type (continuous swept or step sweep); when it is continuous swept, the ADC Dither status will force to switch to Auto and turns off; when it is step sweep, under Auto mode, if the span is 2 MHz or below, the ADC Dither is ON; if the span is below 2 MHz, the ADC Dither is OFF. Under Auto OFF mode, if the span is above 2 MHz, turning on the ADC Dither may affect the measurement results based on selected dither status. You can access the submenu for manual control.

Key path: 【Meas Setup】, [More 1/3>>], [More 2/3>>], [ADC Dither Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto.

Examples:

:ACPower:ADC:DITHer OFF

:ACPower:ADC:DITHer]?

:ACPower:ADC:DITHer:AUTO ON

:ACPower:ADC:DITHer:AUTO?

[Meas Preset]

Program control commands:

:CONFigure:ACPower

Command description: to reset the measurement parameters to the factory preset status or user saved parameter status

Key path: 【Meas Setup】, [More 1/3>>], [More 2/3>>], [Meas Reset] on the front panel.

Factory preset: factory reset.

Examples:

:CONFigure:ACPower

3.3.5.18 Measurement Control

Pop up the More related to Meas Control, including [Meas Single Cont], [Restart] and [Pause].

[Measure Continuous MAN]

Program control commands:

:INITiate:CONTinuous OFF|ON|0|1

:INITiate:CONTinuous?

Command description: to set continuous measurement OFF or ON.

Key path: [Meas Control], [Meas Single Cont] on the front panel.

Examples:

:INIT:CONT OFF

[Restart]

Program control commands:

:INITiate:REST

Command description: to stop current measurement and restart measurement for the signal/spectrum analyzer.

Key path: [Meas Control], [Restart] on the front panel

Examples:

:INITiate:REST

[Pause]

Program control commands:

:INITiate:PAUS

:INITiate:RES

Command description: when the signal/spectrum analyzer is in operation, this command is used for pausing current measurement; when in Paused status, this command is used for continuing measurement.

Key path: [Meas Control], [Pause] on the front panel.

Examples:

:INITiate:PAUS

:INITiate:RES

3.3.6 Power Statistic

CCDF measurement is a statistic measurement for high level signal power or peak power. Such measurement can be accessed via the following commands to obtain measurement results:

Program control commands:

:CONFigure:PSTatistic

:FETCh:PSTatistic[n]?

:MEASure:PSTatistic[n]?

:READ:PSTatistic[n]?

n = 0 return IQ data pair

n = 1 return average power dBm,

Probability at the average power level %

Power level that has 10% of the power

Power level that has 1% of the power

Power level that has 0.1% of the power

Power level that has 0.01% of the power

Power level that has 0.001% of the power

Power level that has 0.0001% of the power

Peak power dB,

Point.

n = 2

Return a series of 5001 floating the current measured trace.

Probability at 0.0 dB power,

Probability at 0.01 dB power,

Probability at 0.02 dB power,

……,

Probability at 49.9 dB power,

Probability at 50.0 dB power,

n = 3

Return a series of 5001 floating the current Gaussian trace.

Probability at 0.0 dB power,

Probability at 0.01 dB power,

Probability at 0.02 dB power,

……,

Probability at 49.9 dB power,

Probability at 50.0 dB power,

n = 4

Return a series of 5001 floating the reference trace.

Probability at 0.0 dB power,

Probability at 0.01 dB power,

Probability at 0.02 dB power,

……,

Probability at 49.9 dB power,

Probability at 50.0 dB power,

3.3.6.1 Frequency

Set parameters related to frequency of the signal/spectrum analyzer, including [Center Freq], [CF Step Auto MAN], [Frequency Offset], etc.

[Center Freq]

Program control commands:

[:SENSe]:FREQuency:CENTer <frequency>

[:SENSe]:FREQuency:CENTer?

Command description: to set the center frequency of the signal/spectrum analyzer. If the set center frequency is inconsistent with the current span, the latter will automatically change to the value best suitable for desired frequency.

Key path: 【Frequency】, [Center Freq] on the front panel.

Setting range: Min.: 0 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT 5 GHz

[CF Step Auto MAN]

Program control commands:

[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>

[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?

[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:CENTer:STEP:AUTO?

Command description: to change the step size of the [Center Freq] , start frequency or [Stop Freq]. When it is under [Auto Mode], and when the center frequency is active, press the step key, the [CF Step] changes by 1, 2, 5 and 10. When it is under Auto Off mode, use the number keys, stepping keys or knob for change. At this time, reactivate the [Center Freq], and press the step key, the center freq will change by set step size.

Key path: 【Frequency】, [CF Step Auto On/Off] on the front panel.

Setting range: Min.: 1 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT:STEP 100 MHz

:FREQ:CENT:STEP:AUTO ON

[Freq Offset]

Program control commands:

[:SENSe]:FREQuency:OFFSet <freq> [:SENSe]:FREQuency:OFFSet?

Command description: to add the set frequency offset to the displayed frequency value, including marker frequency value, but this does not affect the signal display position.

Key path: 【Frequency】, [Freq Offset] on the front panel.

Setting range: Min.:-500 GHz, Max.: +500 GHz.

Default unit: Hz

Examples:

:FREQ:OFFS 10 MHz

3.3.6.2 Amplitude/Y Axis

Amplitude/Y Axis parameter setting command, including [Attenuation>>], [Preamplifier ON OFF].

[Attenuation>>]

Adjust the attenuation of the signal/spectrum analyzer. The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Preamplifier On Off]

Program control commands:

[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1

[:SENSe]:POWer[:RF]:GAIN[:STATe]?

The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】 [Preamplifier ON OFF>>] for more details.

Examples:

:POW:GAIN OFF

:POW:GAIN?

3.3.6.3 Span/X Axis

Press the 【Span/X Axis】 key on the front panel to enable the X Axis scale setting function. Press the 【Span/X Axis】 key to pop up [Scale/Div].

[Scale/Div]

Program control commands:

:DISPlay:PSTatistic:VIEW:WINDow:TRACe:X[:SCALe]:PDIVision <rel_ampl>

:DISPlay:PSTatistic:VIEW:WINDow:TRACe:X[:SCALe]:PDIVision?

Command description: to set the scale value to which each division of X Axis corresponds. Use number keys, stepping keys or knob to set the scale value.

Key path: 【Span/X Axis】 [Scale/Div] on the front panel.

Status saved: saved in the instrument status.

Factory preset:2.0 dB.

Setting range: 0.1 dB – 20 dB

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: 1,2,5,10…

Default unit: dB.

Examples:

:DISPlay:PSTatistic:VIEW:WINDow:TRACe:X:PDIVision 1

3.3.6.4 Bandwidth

Pop up the soft More for setting the measurement BW, [Measure BW].

[Measure BW]

Program control commands:

[:SENSe]:PSTatistic:BANDwidth <bandwidth>

[:SENSe]:PSTatistic:BANDwidth?

Command description: to change the Measure Bandwidth for power statistic function, ranging from 100 Hz to 40 MHz. Use number keys, stepping keys and knot to change the Measure Bandwidth.

Key path: 【Bandwith】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1.0 MHz

Setting range: Min.:100 Hz, Max.: 40 MHz.

Stepping key increment: 1-2-3-5-10 step.

Default unit: Hz

Examples:

:PSTatistic:BANDwidth 2 MHz

3.3.6.5 Auto Setting

Pop up the soft menu related to auto setting including [Couple All], [Mech Atten Auto Man], [Res BW Auto Man], [Video BW Auto Man], [VBW/RBW Auto Man], [Span/RBW Auto Man], [Sweep Time Auto Man] and [CF Step Auto Man].

[Couple All]

Program control commands:

:COUPle ALL

Command description: to set the Mechanical Attenuator and Frequency Step as Auto Couple.

Key path: 【Autoset】, [Couple All] on the front panel.

Status saved: not saved in instrument status.

Factory preset: Couple All.

Examples:

:COUPle ALL

3.3.6.6 Trace

Press 【Trace】 key on the front panel to pop up corresponding soft menu , including [Save Reference Traces], [Reference Trace MAN], [Gaussian Curve MAN].

[Save Reference Trace]

Program control commands:

:CALCulate:PSTatistic:STORe:REFerence

Command description: to save the current measured trace as the Reference Trace.

Key path: 【Trace】 on the front panel.

Examples:

:CALCulate:PSTatistic:STORe:REFerence

[Reference Trace On Off]

Program control commands:

:DISPlay:PSTatistic:RTRace[:STATe] OFF|ON|0|1

:DISPlay:PSTatistic:RTRace[:STATe]?

Command description: to turn on or off display of Reference Trace.

Key path: 【Trace】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:DISPlay:PSTatistic:RTRace ON

:DISPlay:PSTatistic:RTRace?

[Gaussian curve On Off]

Program control commands:

:DISPlay:PSTatistic:GAUSsian[:STATe] OFF|ON|0|1

:DISPlay:PSTatistic:GAUSsian[:STATe]?

Command description: to turn on or off display of Gaussian Curve.

Key path: 【Trace】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: ON

Examples:

:DISPlay:PSTatistic:GAUSsian OFF

:DISPlay:PSTatistic:GAUSsian?

3.3.6.7 Sweep

This key has no soft menu.

3.3.6.8 Single

Program control commands:

:INITiate:PSTatistic

Command description: the 【Single】 key on the front panel has no corresponding soft menu. This function is mainly used for manual trigger of a measurement. In remote control programming and system establishment, this function combined with *WAI can effectively synchronize the measurement process and enable the trace data obtained after the *WAI finishes directly correspond to the measurement process one by one.

Examples:

:INITiate:PSTatistic

3.3.6.9 Continuous

Program control commands:

:INITiate:CONTinuous ON

Command description: Continuous ON is mainly used for changing the Continuous OFF into Continuous ON; if the current measurement is Continuous ON, the instrument performs no operation.

Examples:

:INITiate:CONTinuous ON

3.3.6.10 Trigger

See description of Swept SA 【Trigger】 for more details.

3.3.6.11 Display

Pop up the soft menu related to display, including [Display Line MAN], [Display Config>>].

[Display Line On Off]

See description of Swept SA 【Display】 [Display Line MAN] for more details.

[Display Config>>]

It is used for configurations of interface language, status area display ON OFF related to interface display, The soft More include [Select Language 中文 English], [Graticule Display On Off], Status Display On Off], [Freq Info Disp On Off]. See description of Swept SA 【Display】 [Display Config>>] for more details.

3.3.6.12 Input Output

See description of Swept SA 【Input/output] 】for more details.

3.3.6.13 Marker

Pop up the soft menu related to markers, including [Select Marker >>], [Normal], [Delta], [Fixed], [OFF], [Properties>>] and [All Markers OFF].

[Select Marker >> Marker 1]

Command description: to select among 12 different markers of the analyzer. When a certain marker is selected, the marker will be indicated in the menu where its type and attribute can be set. Select and trigger another marker and place it at the center of the current trace.

Key path: 【Marker】, [Select Marker >>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Marker 1.

[Normal]

Program control commands:

:CALCulate:PSTatistic:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE POSition

:CALCulate:PSTatistic:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Normal Marker.

Key path: 【Marker】, [Select Marker>>], [Normal] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:PSTatistic:MARKer1:MODE POSition

:CALCulate:PSTatistic:MARKer1:MODE?

[Delta]

Program control commands:

:CALCulate:PSTatistic:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE DELTa

:CALCulate:PSTatistic:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Delta Marker. Display the probability difference and amplitude difference between two markers at the marker display area at the top right corner of the screen. If there exists a single marker, a [Delta] operation will generate a Ref marker in the active marker position. Move the active marker through the knob, stepping keys or number keys. The display amplitude difference unit is dB and probability difference unit is %.

Key path: 【Marker】, [Select Marker>>], [Delta] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:PSTatistic:MARKer1:MODE DELTa

:CALCulate:PSTatistic:MARKer1:MODE?

[Fixed]

Program control commands:

:CALCulate:PSTatistic:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE FIXed

:CALCulate:PSTatistic:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Fixed Marker. The X Axis and Y Axis positions of the fixed marker are fixed. The Fixed Marker can be used as reference marker.

Key path: 【Marker】, [Select Marker>>], [Fixed] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:PSTatistic:MARKer1:MODE FIXed

:CALCulate:PSTatistic:MARKer1:MODE?

[Off]

Program control commands:

:CALCulate:PSTatistic:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE OFF

:CALCulate:PSTatistic:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to turn off the selected marker.

Key path: 【Marker】, [Select Marker>>], [OFF] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:PSTatistic:MARKer1:MODE OFF

:CALCulate:PSTatistic:MARKer:MODE?

[Properties>>]

Pop up the menu related to the attribute setting of currently selected marker, including [Marker Trace>>].

[Marker Trace>>]

Program control commands:

:CALCulate:PSTatistic:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:TRACe 1|2|3

:CALCulate:PSTatistic:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:TRACe?

Command description: to select the trace data of current marker. The marker trace can be any active trace. 1 indicates measured trace, 2 indicates Gaussian curve and 3 indicates reference trace.

Key path: 【Marker】, [Select Marker >>], [Properties>>], [Marker Trace>>] on the front panel.

Examples:

:CALCulate:PSTatistic:MARKer1:TRACe 1

:CALCulate:PSTatistic:MARKer1:TRACe?

[Marker All Off]

Program control commands:

:CALCulate:PSTatistic:MARKer:AOFF

Command description: to turn off all current markers which are ON and related soft keys, e.g, [Noise Marker].

Key path: 【Marker】, [More 1/2>>], [All Markers OFF] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:PSTatistic:MARKer:AOFF

3.3.6.14 Maker->

This key has no soft menu.

3.3.6.15 Marker Function

This key has no soft menu.

3.3.6.16 Peak Search

This key has no soft menu.

3.3.6.17 Measurement Setting

Pop up the soft menu related to measurement setting, including [Meas Counts], [Meas Cycle], [Meas Count], [Low Noise Path ON OFF], [Preselector Preselecting Bypass], [RF Gain>>], [ADC Dither Auto MAN], [Meas Reset].

[Meas Counts]

Program control commands:

[:SENSe]:PSTatistic:COUNts <integer>

[:SENSe]:PSTatistic:COUNts?

Command description: to set the accumulated counts of sampling points of the data. Use number keys, stepping keys or knob to set the Measurement Count.

Key path: 【Meas Setup】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: 100 kpt

Setting range: 1000 - 8.389E+6

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: most significant bit

Default unit: pt

Examples:

:PSTatistic:COUNts 10000

:PSTatistic:COUNts?

[Meas Cycle]

Program control commands:

[:SENSe]:PSTatistic:SWEep:CYCLes <integer>

[:SENSe]:PSTatistic:SWEep:CYCLes?

Command description: to set the number of measurement cycles corresponding to the accumulated point count. This value is dependent on settings of the Measure Bandwidth, Measurement Time and Measurement Count. Use number keys, stepping keys or knob to set the Measurement Cycle.

Key path: 【Meas Setup】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: 80

Setting range: dependent on settings of the Measure Bandwidth, Measurement Time and Measurement Count.

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: most significant bit

Default unit: none

Examples:

:PSTatistic:SWEep:CYCLes 100

:PSTatistic:SWEep:CYCLes?

[Meas Interval]

Program control commands:

[:SENSe]:PSTatistic:SWEep:TIME <time>

[:SENSe]:PSTatistic:SWEep:TIME?

Command description: to specify the time for measurements. The minimum value is 1 us and the maximum value depends on Measure Bandwidth setting. Use number keys, stepping keys or knob to set the Measuring Time.

Key path: 【Meas Setup】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1.0 ms

Setting range: 1 us – 60 s

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: most significant bit

Default unit: s

Examples:

:PSTatistic:SWEep:TIME 5 ms

:PSTatistic:SWEep:TIME?

[Low Noise Path On Off]

Program control commands:

[:SENSe]:PSTatistic:POWer:MW:PATH STD|LNPath

[:SENSe]:PSTatistic:POWer:MW:PATH?

Command description: this command is only available after the H34 option is provided (Low Noise Preamplifier).

Key path: 【Meas Setup】, [More 1/2], [Low Noise Path ON OFF] on the front panel.

Examples:

:PSTatistic:POWer:MW

:PATH STD PSTatistic:POWer:MW:PATH?

[Preselector Preselecting Bypass]

Program control commands:

:INPut:PSTatistic:FILTer:YIG[:STATe] OFF|ON|0|1

:INPut:PSTatistic:FILTer:YIG[:STATe]?

Command description: this menu is only available after the H36 option is purchased. It is used for setting whether to bypass the front-end preselector of the signal/spectrum analyzer. In analyzing bandwidth signal, bypass is usually required.

Key path: 【Meas Setup】, [More 1/2], [Preselector Preselecting Bypass] on the front panel.

Examples:

:INPut:PSTatistic:FILTer:YIG ON

:INPut:PSTatistic:FILTer:YIG?

[RF Gain>>]

Set the Auto ON OFF of the RF Gain and best allocation algorithm for RF Gain, including [Auto], [Best Dynamic Range] and [Best for Sensitivity].

Key path: 【Meas Setup】, [More 1/2], [RF Gain] on the front panel.

[Auto]

Program control commands:

[:SENSe]:PSTatistic:RF:GAIN:AUTO OFF|ON|0|1

[:SENSe]:PSTatistic:RF:GAIN:AUTO?

Command description: to set the RF Gain distribution algorithm to Auto. In this case, the RF Gain distribution is "Best Dynamic Range".

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Auto] on the front panel.

Examples:

:PSTatistic:RF:GAIN:AUTO OFF

:PSTatistic:RF:GAIN:AUTO?

[Best for Dynamic Range]

Program control commands:

[:SENSe]:PSTatistic:RF:GAIN:AUTO:RULes RANGE

[:SENSe]:PSTatistic:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Dynamic Range. In this case, the RF Gain is switched to "Auto OFF"

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best for Dynamic Range] on the front panel.

Examples:

:PSTatistic:RF:GAIN:AUTO:RULes RANGE

:PSTatistic:RF:GAIN:AUTO:RULes?

[Best for Sensitivity]

Program control commands:

[:SENSe]:PSTatistic:RF:GAIN:AUTO:RULes SENSITIVITY

[:SENSe]:PSTatistic:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Sensitivity. In this case, the RF Gain is switched to "Auto OFF"

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best for Sensibility] on the front panel.

Examples:

:PSTatistic:RF:GAIN:AUTO:RULes SENSITIVITY

:PSTatistic:RF:GAIN:AUTO:RULes?

[ADC Dither Auto MAN]

3.3 Instrument Commands

Program control commands:

[:SENSe]:PSTatistic:ADC:DITHer[:STATe] OFF|ON|HIGH

[:SENSe]:PSTatistic:ADC:DITHer[:STATe]?

[:SENSe]:PSTatistic:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:PSTatistic:ADC:DITHer:AUTO[:STATe]?

Command description: to control opening/closing of ADC dither of the frequency acquisition circuit in the analyzer. Under default mode, the signal/spectrum analyzer will automatically control whether the ADC Dither is ON based on current working condition.

Key path: 【Meas Setup】, [More 1/2], [ADC Dither Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto OFF.

Examples:

:PSTatistic:ADC:DITHer OFF

:PSTatistic:ADC:DITHer?

:PSTatistic:ADC:DITHer:AUTO ON

:PSTatistic:ADC:DITHer:AUTO?

[Meas Preset]

Program control commands:

:CONFigure:PSTatistic

Command description: to reset the measurement parameters to the factory preset status or user saved parameter status

Key path: 【Meas Setup】 on the front panel.

Factory preset: factory reset.

Examples:

:CONFigure:PSTatistic

3.3.6.18 Measurement Control

Pop up the More related to Meas Control, including [Meas Single Cont], [Restart] and [Pause].

[Measure Continuous ON OFF]

Program control commands:

:INITiate:CONTinuous OFF|ON|0|1

:INITiate:CONTinuous?

Command description: to set continuous measurement OFF or ON.

Key path:【Meas Control】, [Meas Single Cont] on the front panel.

Examples:

:INIT:CONT OFF

[Restart]

Program control commands:

:INITiate:REST

Command description: to stop current measurement and restart measurement for the signal/spectrum analyzer.

Key path: 【Meas Control】, [Restart] on the front panel

Examples:

:INITiate:REST

[Pause]

Program control commands:

:INITiate:PAUS

:INITiate:RES

Command description: when the signal/spectrum analyzer is in operation, this command is used for pausing current measurement; when in Paused status, this command is used for continuing measurement.

Key path: 【Meas Control】, [Pause] on the front panel.

Examples:

:INITiate:PAUS

:INITiate:RES

3.3.7 Burst Power

Burst power is an accurate method to measure specific burst average power. Such measurement can be accessed via the following commands to obtain measurement results:

Program control commands:

:CONFigure:TXPower

:FETCh:TXPower[n]?

:MEASure:TXPower[n]?

:READ:TXPower[n]?

n = 1 Return average power,

RMS power,

Threshold level,

Max Value,

Min Value,

Full burst width,

Burst width,

Measuring time,

Measurement Count

n = 2, return the floating point number that represents the measurement trace data

n = 3, return the floating point number that represents the Max. Hold trace data

n = 4, return the floating point number that represents the Min. Hold trace data

3.3.7.1 Frequency

Set parameters related to frequency of the signal/spectrum analyzer, including [Center Freq], [CF Step Auto MAN], [Frequency Offset], etc.

[Center Freq]

Program control commands:

[:SENSe]:FREQuency:CENTer <frequency> [:SENSe]:FREQuency:CENTer?

Command description: to set the center frequency of the signal/spectrum analyzer. If the set center frequency is inconsistent with the current span, the latter will automatically change to the value best suitable for desired frequency.

Key path: 【Frequency】, [Center Freq] on the front panel.

Setting range: Min.: 0 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT 5 GHz

[CF Step Auto MAN]

Program control commands:

[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>

[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?

[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:CENTer:STEP:AUTO?

Command description: to change the step size of the [Center Freq] , start frequency or [Stop Freq]. When it is under [Auto Mode], and when the center frequency is active, press the step key, the [CF Step] changes by 1, 2, 5 and 10. When it is under Auto Off mode, use the number keys, stepping keys or knob for change. At this time, reactivate the [Center Freq], and press the step key, the center freq will change by set step size.

Key path: 【Frequency】, [CF Step Auto On/Off] on the front panel.

Setting range: Min.: 1 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT:STEP 100 MHz

:FREQ:CENT:STEP:AUTO ON

[Freq Offset]

Program control commands:

[:SENSe]:FREQuency:OFFSet <freq>

[:SENSe]:FREQuency:OFFSet?

Command description: to add the set frequency offset to the displayed frequency value, including marker frequency value, but this does not affect the signal display position.

Key path: 【Frequency】, [Freq Offset] on the front panel.

Setting range: Min.:-500 GHz, Max.: +500 GHz.

Default unit: Hz

Examples:

:FREQ:OFFS 10 MHz

3.3.7.2 Amplitude/Y Axis

Amplitude/Y Axis parameter settings include [Ref Level], [Attenuation>>], [Preamplifier ON OFF], [Scale/Div], [Auto Scale], [More 1/2>>], [[Y Axis Unit] and [Ref Level Offset].

[RefLevel]

Program control commands:

:DISPlay:TXPower:VIEW:WINDow:TRACe:Y:RLEVel <real>

:DISPlay:TXPower:VIEW:WINDow:TRACe:Y:RLEVel?

Command description: to set the reference level. Measure signal at reference level position to get highest accuracy. The input attenuator of the signal/spectrum analyzer is coupled to the reference level, which can be automatically changed to avoid compression of input signal.

Key path: 【Amplitude/Y Axis】, [Ref Level] on the front panel.

Setting range: Min.: -170 dBm, Max.: 30 dBm.

Default unit: set based on Y Axis scale unit.

Examples:

:DISPlay:TXPower:VIEW:WINDow:TRACe:Y:RLEVel20 dBm

[Attenuation>>]

Adjust the attenuation of the signal/spectrum analyzer. The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Preamplifier On Off]

Program control commands:

[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1

[:SENSe]:POWer[:RF]:GAIN[:STATe]?

The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】 [Preamplifier ON OFF>>] for more details.

Examples:

:POW:GAIN OFF

:POW:GAIN?

[Scale/Div]

Program control commands:

:DISPlay:TXPower:VIEW:WINDow:TRACe:Y:PDIVision <rel_ampl>

:DISPlay:TXPower:VIEW:WINDow:TRACe:Y:PDIVision?

Command description: to select the scale/division from 0.1 dB/division to 20 dB/division. This menu is only valid when the scale type is logarithm.

Key path: 【Amplitude/Y Axis】, [Scale/Div] on the front panel.

Setting range: Min.: 0.1 dB, Max.: 20 dBm.

Examples:

:DISPlay:TXPower:VIEW:WINDow:TRACe:Y:PDIVision 2

:DISPlay:TXPower:VIEW:WINDow:TRACe:Y:PDIVision?

[Auto Scale]

Program control commands:

:TXPower:ADJust:LEVel

Command description: the instrument automatically sets parameters like reference level and scale/division based on input signal sizes. When this soft menu key is pressed, the instrument performs one auto scaling. Setting rule for auto scaling: firstly obtain the maximum value and the minimum value based on current measurement trace data. Based on the maximum value, place on the 80% graticule of the screen trace Y axis for auto setting of reference level and scale/division.

Key path: 【Amplitude/Y Axis】, [Auto Scale] on the front panel.

[Y Axis Unit]

Program control commands:

:UNIT:TXPower:POWer DBM|DBMV|DBMA|V|W|A|DBUV|DBUA

:UNIT:TXPower:POWer?

Command description: to select the Y Axis unit from [dBm], [dBmV], [dBmA], [W], [V], [A], [dBμV] and [dBμA]. The instrument will automatically calculate the trace data and marker readout based on the Y axis scale unit.

Key path: 【Amplitude/Y Axis】, [More 1/2>>], [Y Axis Unit] on the front panel.

Examples:

:UNIT:TXPower:POWer DBM

:UNIT:TXPower:POWer?

[Ref Level Offset]

Program control commands:

:DISPlay:TXPower:WINDow:TRACe:Y:RLEVel:OFFSet <rel_ampl>

:DISPlay:TXPower:WINDow:TRACe:Y:RLEVel:OFFSet?

Command description: to introduce offset for all amplitude readout (e.g, reference level and marker amplitude). It will not change the trace position on the screen. This offset unit is dB and is not affected by the scale and unit.

Key path: 【Amplitude/Y Axis】, [More 1/2>>], [Ref Level Offset] on the front panel.

Setting range: Min.: -1000 dB, Max.:1000 dB.

Examples:

:DISPlay:TXPower:WINDow:TRACe:Y:RLEVel:OFFSet 12

3.3.7.3 Span/X Axis

This key has no soft menu.

3.3.7.4 Bandwidth

Pop up the soft More for setting Res BW and Video BW, including [Res BW Auto Man], [Video BW Auto Man] and [Filter BW].

[Res BW Auto MAN]

Program control commands:

[:SENSe]:TXPower:BANDwidth <bandwidth>

[:SENSe]:TXPower:BANDwidth?

[:SENSe]:TXPower:BANDwidth:AUTO ON|OFF|1|0

[:SENSe]:TXPower:BANDwidth:AUTO?

Command description: to change the swept analysis Res BW, ranging from 1 Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step. The Res BW can be changed with the number keys, step keys and knob. The shaded character indicates the currently selected mode.

Key path: 【Bandwith】, [Res BW Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto

Setting range: Min.:1 Hz, Max.: 20 MHz.

Stepping key increment: 1-2-3-5-10 step.

Default unit: Hz

Examples:

:TXPower:BANDwidth 1 kHz

:TXPower:BANDwidth:AUTO ON On

[Video BW Auto MAN]

Program control commands:

[:SENSe]:TXPower:BANDwidth:VIDeo <bandwidth>

[:SENSe]:TXPower:BANDwidth:VIDeo?

[:SENSe]:TXPower:BANDwidth:VIDeo:AUTO ON|OFF|1|0

[:SENSe]:TXPower:BANDwidth:VIDeo:AUTO?

Command description: to change the video bandwidth displayed on the active function zone ranging from 1 Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5 MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step. Use number keys, stepping keys or knob to change The mode with a underline is the current mode. When set as Auto Off, press [Video BW Auto Man] to select Auto On and return to auto mode.

Key path: 【Bandwith】, [Video BW Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto, same as the Res BW setting.

Setting range: Min.:1 Hz, Max.: 20 MHz.

Stepping key increment: 1-2-3-5-10 step.

Default unit: Hz

Examples:

:TXPower:BANDwidth:VIDeo 1 kHz

:TXPower:BANDwidth:VIDeo:AUTO ON

[Filter BW]

Program control commands:

[:SENSe]:TXPower:BANDwidth|BWIDth:TYPE DB3|DB6|IMPulse|NOISe

[:SENSe]:TXPower:BANDwidth|BWIDth:TYPE?

Command description: if Gaussian filter is used for the signal/spectrum analyzer, set the Res BW as 3 dB, 6 dB, pulse bandwidth or equivalent noise bandwidth. When this parameter is changed, the Res BW filter is fixed, and the bandwidth value in the information display zone changes.

Key path: 【Bandwith】, [Filter BW] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 3 dB.

Examples:

:TXPower:BANDwidth:TYPE DB3

:TXPower:BANDwidth:TYPE?

3.3.7.5 Auto Setting

Pop up the soft menu related to auto setting Which includes [Couple All], [Mech Atten Auto Man], [Res BW Auto Man], [Video BW Auto Man], [Sweep Time Auto Man] and [CF Step Auto Man].

[Couple All]

Program control commands:

:COUPle ALL

Command description: to set the Res BW, video bandwidth, sweep time, mechanical attenuator and frequency step as auto coupling mode. The signal/spectrum analyzer will select most suitable values for those functions based on set frequency and bandwidth (or start frequency and stop frequency). If no ratio is pre-saved, use default ratio.

Key path: 【Auto Set】, [Couple All] on the front panel.

Status saved: not saved in instrument status.

Factory preset: Couple All.

Examples:

:COUPle ALL

[Mech Atten Auto MAN]

See the description of 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Res BW Auto MAN]

See description of 【Bandwith】 [Res BW Auto MAN] for more details.

[Video BW Auto MAN]

See description of 【Bandwith】 [Video BW Auto MAN] for more details.

[Sweep Time Auto MAN]

See description of 【Sweep】 [Sweep Time Auto MAN] for more details.

[CF Step Auto MAN]

See description of 【Frequency】 [CF Step Auto MAN] for more details.

3.3.7.6 Trace

Press 【Trace】 key on the front panel to pop up corresponding soft menu including [Clear Write], [Trace Average], [Max. Hold], [Min. Hold], [View/Blank], [More 1/2>>] and [Detector>>].

[Clear Write**]**

Program control commands:

:TRACe:TXPower:TYPE WRITe

:TRACe:TXPower:TYPE?

Command description: to set the current trace processing as Refresh, i.e., clear all data of displayed trace and continue the signal trace receipt under sweep status.

Key path: 【Trace】, [Clear Write] on the front panel.

Status saved: saved in the instrument status.

Factory preset: after all traces are selected, the trace mode is defaulted as Refresh.

Examples:

:TRACe:TXPower:TYPE WRITe

:TRACe:TXPower:TYPE?

[Trace Average]

Program control commands:

:TRACe:TXPower:TYPE AVERage

:TRACe:TXPower:TYPE?

Command description: to set the current trace processing method as Average, i.e., based on the average count N set in the 【Meas Setup】, update trace after averaging the performance index of the measurement trace.

Key path: 【Trace】, [Trace Average] on the front panel.

Status saved: saved in the instrument status.

Factory preset: all trace modes are defaulted as Refresh.

Examples:

:TRACe:TXPower:TYPE AVERage

:TRACe:TXPower:TYPE?

[Max Hold]

Program control commands:

:TRACe:TXPower:TYPE MAXHold

:TRACe:TXPower:TYPE?

Command description: to set the current trace processing method as maximum hold, i.e., the new trace data will be assigned with maximum value of previous measured trace data

Key path: 【Trace】, [Max. Hold] on the front panel.

Status saved: saved in the instrument status.

Factory preset: all trace modes are defaulted as Refresh.

Examples:

:TRACe:TXPower:TYPE MAXHold

:TRACe:TXPower:TYPE?

[Min Hold]

Program control commands:

:TRACe:TXPower:TYPE MINHold

:TRACe:TXPower:TYPE?

Command description: to set the current trace processing method as minimum hold, i.e., the new trace data will be assigned with minimum value of previous measured trace data.

Key path: 【Trace】, [Min. Hold] on the front panel.

Status saved: saved in the instrument status.

Factory preset: all trace modes are defaulted as Refresh.

Examples:

:TRACe:TXPower:TYPE MINHold

:TRACe:TXPower:TYPE?

[View/Blank>> Trace On]

Program control commands:

:TRACe:TXPower:DISPlay[:STATe] ON|OFF|0|1

:TRACe:TXPower:DISPlay[:STATe]?

:TRACe:TXPower:UPDate[:STATe] ON|OFF|0|1

:TRACe:TXPower:UPDate[:STATe]?

Command description: to set the display method for the selected trace from [Trace On], [View], [Background] and [Blank]. Four statuses are completed through combination of the above four commands.

Key path: 【Trace】, [View/Blank>>] on the front panel.

Examples:

:TRACe:TXPower:DISPlay ON

:TRACe:TXPower:DISPlay?

:TRACe:TXPower:UPDate ON

:TRACe:TXPower:UPDate?

[Trace On]

Program control commands:

:TRACe:TXPower:DISPlay[:STATe] ON

:TRACe:TXPower:UPDate[:STATe] ON

Command description: to set the display of currently selected trace as [**Trace On**].

Key path: 【Trace】, [View/Blank>>], [**Trace On**] on the front panel.

Examples:

:TRACe:TXPower:DISPlay ON

:TRACe:TXPower:UPDate ON

[View]

Program control commands:

:TRACe:TXPower:DISPlay[:STATe] ON

:TRACe:TXPower:UPDate[:STATe] OFF

Command description: to set the display of currently selected trace as Static Display.

Key path: 【Trace】, [View/Blank>>], [View] on the front panel.

Examples:

:TRACe:TXPower:DISPlay ON

:TRACe:TXPower:UPDate OFF

[Background]

Program control commands:

:TRACe:TXPower:DISPlay[:STATe] OFF

:TRACe:TXPower:UPDate[:STATe] ON

Command description: to set the display of currently selected trace as Backstage Refresh.

Key path: 【Trace】, [View/Blank>>], [Background] on the front panel.

Examples:

:TRACe:TXPower:DISPlay OFF

:TRACe:TXPower:UPDate ON

[Blank]

Program control commands:

:TRACe:TXPower:DISPlay[:STATe] OFF

:TRACe:TXPower:UPDate[:STATe] OFF

Command description: to set the display of currently selected trace as Display OFF.

Key path: 【Trace】, [View/Blank>>], [Blank] on the front panel.

Examples:

:TRACe:TXPower:DISPlay OFF

:TRACe:TXPower:UPDate OFF

[Detector>>]

Pop up soft menus related to setting the detector type for the currently selected trace, including [Auto], [Normal], [Peak], [Sample], [Negative Peak], [Average>>], where, the average detector type includes [Log-Pwr Avg], [Pwr Avg] and [Voltage Avg].

Program control commands:

[:SENSe]:TXPower:DETector:AUTO ON|OFF|1|0

[:SENSe]:TXPower:DETector:AUTO?

[:SENSe]:TXPower:DETector[:FUNCtion]

NORMal|POSitive|SAMPle|NEGative|AVERage|RMS|LOG|SCALar

[:SENSe]:TXPower:DETector[:FUNCtion]?

[Auto]

Program control commands:

:TXPower:DETector:AUTO ON|OFF|1|0

:TXPower:DETector:AUTO?

Command description: to set the detector command for the currently selected trace as Auto. That means, the signal/spectrum analyzer will perform based on the parameter setting of currently selected trace.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Auto] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TXPower:DETector:AUTO ON

:TXPower:DETector:AUTO?

[Normal]

Program control commands:

:TXPower:DETector NORMal

:TXPower:DETector?

Command description: to set the detector command for the currently selected trace as Normal, i.e., display the measurement results of positive peak and negative peak at the same time to achieve display effect similar to the analog instrument.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Normal] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TXPower:DETector NORMal

:TXPower:DETector?

[Peak]

Program control commands:

:TXPower:DETector POSitive

:TXPower:DETector?

Command description: to set the detector command for the currently selected trace as Positive Peak, i.e., take the maximum value from sampling data assigned to each trace point.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Peak] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TXPower:DETector POSitive

:TXPower:DETector?

[Sample]

Program control commands:

:TXPower:DETector SAMPle

:TXPower:DETector?

Command description: to set the detector command for the currently selected trace as Sample, i.e., take the last value from sampling data assigned to each trace point.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Sample] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TXPower:DETector SAMPle

:TXPower:DETector?

[Negative Peak]

3.3 Instrument Commands

Program control commands:

:TXPower:DETector NEGative

:TXPower:DETector?

Command description: to set the detector command for the currently selected trace as Negative Peak, i.e., take the minimum value from sampling data assigned to each trace point.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Negative Peak] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TXPower:DETector NEGative

:TXPower:DETector?

[Average>> Log-Pwr Avg]

Program control commands:

:TXPower:DETector LOG

:TXPower:DETector?

Command description: to set the detector command for the currently selected trace as Video Average. Also called Logarithm Power Average Detector, i.e., take the logarithm power average value for all data assigned to each trace point; earlier signal/spectrum analyzer generally displays the measurement trace of logarithm scale, and all filtering and averaging are based on the logarithm power data; the trace is generally called as video signal. After digital IF processing is adopted, to make measurement results same as the earlier signal/spectrum analyzer, the video average detector function is added.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Log-Pwr Avg] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TXPower:DETector LOG

:TXPower:DETector?

[Average>> Pwr Avg]

Program control commands:

:TXPower:DETector AVERage or

:TXPower:DETector RMS

:TXPower:DETector?

Command description: to set the detector command for the currently selected trace as Power Average. Also called root mean square (RMS) detector. Calculate the root mean square of all sampling data assigned to each trace point; the 4051signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After square these voltage values, take sum and divide the count of sampling data points corresponding to each trace point. Finally, take square root. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those RMS values are trace data.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Pwr Avg] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TXPower:DETector RMS

:TXPower:DETector?

[Average>> Voltage Avg]

Program control commands:

:TXPower:DETector SCALar

:TXPower:DETector?

Command description: to set the detector command for the currently selected trace as Voltage Average. Take linear average for all sampling data assigned to each trace point; the 4051 signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After summing those voltage values, divide the number of sampling data points corresponding to each trace point. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those average values are trace data.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Voltage Avg] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TXPower:DETector SCALar

:TXPower:DETector?

3.3.7.7 Sweep

Enable sweep-related parameter setup function to pop up corresponding soft menu, including [Sweep Time Auto MAN], [Sweep Setup>>] and [Sweep Points].

[Sweep Time Auto MAN]

Program control commands:

[:SENSe]:TXPower:SWEep:TIME <time>

[:SENSe]:TXPower:SWEep:TIME?

[:SENSe]:TXPower:SWEep:TIME:AUTO OFF|ON|0|1

[:SENSe]:TXPower:SWEep:TIME:AUTO?

Command description: to change the sweep time of signal/spectrum analyzer. Use the number keys, step keys or knob to adjust the sweep time. If “Man” is underlined, the sweep time can be set manually. If “Auto” is underlined, the sweep time will be automatically associated according to the Res BW, frequency bandwidth and video bandwidth.

Key path: 【Sweep】, [Sweep Time Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: sweep time Auto.

Setting range: Min.: 1 ms, Max.: 6000 s.

Knob increment: in increasing sweep time, the knob increment is 1/10 of the most significant bit; in decreasing sweep time, the knob increment is 1/100 of the most significant bit.

Stepping key increment: 1-2-5-10 step.

Default unit: s

Examples:

:TXPower:SWEep:TIME 500 ms

:TXPower:SWEep:TIME:AUTO OFF

[Sweep points]

Program control commands:

[:SENSe]:TXPower:SWEep:POINts <integer>

[:SENSe]:TXPower:SWEep:POINts?

Command description: to set the trace points.

Key path: 【Sweep】, [Sweep Points] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1001.

Setting range: 101-30001.

Knob increment: in increase, the knob increment is 1/10 of the most significant bit; in decrease, the knob increment is 1/100 of the most significant bit.

Stepping key increment: in increase, the knob increment is 1/1 of the most significant bit; in decrease, the knob increment is 1/10 of the most significant bit.

Examples:

:TXPower:SWEep:POINts 1001

:TXPower:SWEep:POINts?

3.3.7.8 Single

- **Program control commands:**

:INITiate:TXPower

- Command description: the 【Single】 key on the front panel has no corresponding soft menu. This function is mainly used for manual trigger of a measurment. When the Average is ON, this function performs the measurements at the count specified by the Average Num.

  In remote control programming and system establishment, this function combined with *WAI can effectively synchronize the measurement process and enable the trace data obtained after the *WAI finishes directly correspond to the measurement process one by one.

- **Examples:**

:INITiate:TXPower

3.3.7.9 Continuous

- **Program control commands:**

:INITiate:CONTinuous ON

- Command description: Continuous ON is mainly used for changing the Continuous OFF into Continuous ON; if the current measurement is Continuous ON, the instrument performs no operation.
- **Examples:**

:INITiate:CONTinuous ON

3.3.7.10 Trigger

See description of Swept SA 【Trigger】 for more details.

3.3.7.11 Display

Pop up soft menus related to display, including [Display Line ON OFF], [Bar Graph ON OFF], [Display Config>>].

[Display Line On Off]

See description of Swept SA 【Display】 [Display Line ON OFF] for more details.

[Display Config>>]

It is used for configurations of interface language, status area display MAN related to interface display, The soft More include [Select Language 中文 English], [Graticule On Off], Status Display On Off], [Freq Info Disp On Off]. See description of Swept SA 【Display】 [Display Config>>] for more details.

[Bar Graph On Off]

Program control commands:

:DISPlay:TXPower:VIEW:WINDow:BGRaph ON|OFF|1|0

:DISPlay:TXPower:VIEW:WINDow:BGRaph?

Command description: to turn on or off Bar Graph Display.

Key path: 【Display】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:DISPlay:TXPower:VIEW:WINDow:BGRaph ON

:DISPlay:TXPower:VIEW:WINDow:BGRaph?

3.3.7.12 Input Output

See description of Swept SA 【Input/output] 】for more details.

3.3.7.13 Marker

Pop up the soft menu related to markers, including [Select Marker], [Normal], [Delta], [Fixed], [OFF], [Properties], [Couple Markers ON OFF], and [All Markers OFF].

[Select Marker >> Marker 1]

Command description: to select among 12 different markers of the analyzer. When a certain marker is selected, the marker will be indicated in the menu where its type and attribute can be set. Select and trigger another marker and place it at the center of the current trace. Users can read amplitude and frequency

information (when the frequency span is 0 Hz, time information will be displayed) at the marker display area at the top right corner of the screen.

Key path: 【Marker】, [Select Marker >>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Marker 1.

[Normal]

Program control commands:

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE POSition

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Normal Marker.

Key path: 【Marker】, [Select Marker>>], [Normal] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:TXPower:MARKer1:MODE POSition

:CALCulate:TXPower:MARKer1:MODE?

[Delta]

Program control commands:

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE DELTa

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Delta Marker. Display the amplitude difference and frequency difference (or time difference, when span is zero) between two markers at the marker display area at the top right corner of the screen. If there exists a single marker, a [Delta] operation will generate a Ref marker in the active marker position. Move the active marker through the knob, stepping keys or number keys. The display amplitude difference unit is dB.

Key path: 【Marker】, [Select Marker>>], [Delta] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:TXPower:MARKer1:MODE DELTa

:CALCulate:TXPower:MARKer1:MODE?

[Fixed]

Program control commands:

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE FIXed

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Fixed Marker. The X Axis and Y Axis positions of the fixed marker are fixed. The Fixed Marker can be used as reference marker.

Key path: 【Marker】, [Select Marker>>], [Fixed] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:TXPower:MARKer1:MODE FIXed

:CALCulate:TXPower:MARKer1:MODE?

[Off]

Program control commands:

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE OFF

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to turn off the selected marker.

Key path: 【Marker】, [Select Marker>>], [OFF] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:TXPower:MARKer1:MODE OFF

:CALCulate:TXPower:MARKer1:MODE?

[Properties>>]

Pop up the corresponding menu of currently selected marker attribute setup, including [Relative To>>], [X Axis Scale Auto MAN], [Marker Trace>>] and [Lines ON OFF].

[Relative To>>]

Program control commands:

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence <integer>

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence?

Command description: to select reference marker for current marker. It can be any one from 11 markers except the currently selected marker.

Key path: 【Marker】, [Select Marker >>], [Properties>>], [Relative To >>] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:TXPower:MARKer1:REFerence 2

:CALCulate:TXPower:MARKer1:REFerence?

[Lines>> On Off]

Program control commands:

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe] OFF|ON|0|1

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe]?

Command description: to set whether the current marker is displayed as a line on the screen, which is good for observation.

Key path: 【Marker】, [Select Marker >>], [Properties>>], [Lines ON OFF] on the front panel.

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:CALCulate:TXPower:MARKer1:LINes ON

:CALCulate:TXPower:MARKer1:LINes?

[Couple Markers On Off]

Program control commands:

:CALCulate:TXPower:MARKer:COUPle[:STATe] ON|OFF|1|0

:CALCulate:TXPower:MARKer:COUPle[:STATe]?

Command description: to turn on or off Marker Couple. When it is ON, moving any marker horizontal axis position will cause an equal movement of horizontal axis position of every other marker which is ON. When the marker is moved to less than Start Frequency or larger than Stop Frequency, the marker is limited to the value of the Start Frequency or the Stop Frequency; when the span is zero, the minimum value is limited as 0, and the maximum value is limited as the Sweep Time.

Key path: 【Marker】, [More 1/2>>], [Couple Markers ON OFF] on the front panel.

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:CALCulate:TXPower:MARKer:COUPle ON

:CALCulate:TXPower:MARKer:COUPle?

[Marker All Off]

Program control commands:

:CALCulate:TXPower:MARKer:AOFF

Command description: to turn off all current markers which are ON and related soft keys, e.g, [Noise Marker].

Key path: 【Marker】, [More 1/2>>], [All Markers OFF] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:TXPower:MARKer:AOFF

3.3.7.14 Maker->

This key has no soft menu.

3.3.7.15 Marker Function

This key has no soft menu.

3.3.7.16 Peak Search

Program control commands:

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum

The 【Peak Search】 key on the front panel is used for turning on the peak search for traces by the control instrument and turning on marker for display, including [Next Peak], [Next Pk Right], [Next Pk Left].

Examples:

:CALCulate:TXPower:MARKer:MAXimum

[Next Peak]

Program control commands:

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:NEXT

Command description: Taking the Amplitude of the point where the current marker is located, search for the next peak of current test trace.

Key path: 【Peak Search】, [Next Peak] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:TXPower:MARKer:MAXimum:NEXT

[Next Pk Right]

Program control commands:

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:RIGHt

Command description: to search for the peak to the right of the current test trace marker position.

Key path: 【Peak Search】, [Next Pk Right] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:TXPower:MARKer:MAXimum:RIGHt

[Next Pk Left]

Program control commands:

:CALCulate:TXPower:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:LEFT

Command description: to search for the peak to the left of the current test trace marker position.

Key path: 【Peak Search】, [Next Pk Left] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:TXPower:MARKer:MAXimum:LEFT

3.3.7.17 Measurement Setting

Pop up the soft menu related to measurement setting, , including [Average Num ON OFF], [Average Mode Exponential Repeat], [Average Type>>], [Threshold Lvl Abs Rel], [Meas Method>>], [Measured Burst Width Auto MAN], [Low Noise Path ON OFF], [Preselector Preselecting Bypass], [RF Gain>>], [ADC Dither Auto MAN] and [Meas Preset].

3.3 Instrument Commands

[Average Num On Off]

Program control commands:

[:SENSe]:TXPower:AVERage:COUNt <integer>

[:SENSe]:TXPower:AVERage:COUNt?

[:SENSe]:TXPower:AVERage[:STATe] ON|OFF|1|0

[:SENSe]:TXPower:AVERage[:STATe]?

Command description: to turn on or off Average. When Average Count is ON, the user can specify the average count required for measurement. The Average Count can be adjusted by number keys, stepping keys or knob.

Key path: 【Meas Setup】, [Average Num ON OFF] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 100/OFF

Setting range: 1~10000

Knob increment: 1

Stepping key increment: 1.

Default unit: none

Examples:

:TXPower:AVERage:COUNt 10

:TXPower:AVERage:COUNt?

:TXPower:AVERage ON

:TXPower:AVERage?

[Average Mode Exponential Repeat]

Program control commands:

[:SENSe]:TXPower:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:TXPower:AVERage:TCONtrol?

Command description: when Average Count is ON, the user can select Average State required for measurement.

Exponential - Different from Linear Average, in Exponential State, the weight of new data is larger than that of old data. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases.

Repeat - Similarly, it takes exponential averaging. However, when the average count is met, clear all previous results, restart average till the set average count and repeat this process.

Key path: 【Meas Setup】, [Average Mode Exponential Repeat] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Exponential

Examples:

:TXPower:AVERage:TCONtrol EXP

:TXPower:AVERage:TCONtrol?

[Average Type>>]

Program control commands:

[:SENSe]:TXPower:AVERage:TYPE LOG|RMS

[:SENSe]:TXPower:AVERage:TYPE?

Command description: to allow to specify Average Type of data results.

Key path: 【Meas Setup】, [Average Type>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Video Average

[Log-Pwr Avg]

Program control commands:

[:SENSe]:TXPower:AVERage:TYPE LOG

Command description: in calculation, divide the trace data sum by data point number.

Key path: 【Meas Setup】, [Average Type>>], [Log-Pwr Avg] on the front panel.

Status saved: saved in the instrument status.

Examples:

:TXPower:AVERage:TYPE LOG

[Pwr Avg]

Program control commands:

[:SENSe]:TXPower:AVERage:TYPE RMS

Command description: firstly, change the trace data into power in dB, then average the trace data. This averaging may take a long time.

Key path: 【Meas Setup】, [Average Type>>], [Pwr Avg] on the front panel.

Status saved: saved in the instrument status.

Examples:

:TXPower:AVERage:TYPE RMS

[Threshold Lvl Absolute Relative]

Program control commands:

[:SENSe]:TXPower:THReshold <real>

[:SENSe]:TXPower:THReshold?

[:SENSe]:TXPower:THReshold:TYPE ABSolute|RELative

[:SENSe]:TXPower:THReshold:TYPE?

3.3 Instrument Commands

Command description: to set the Threshold Level, which is used to calculate the average carrier power that is higher than this threshold. It can be relative power value in dB, or absolute power value in dBm. Use number keys, stepping keys or knob to change the Threshold Level center frequency.

Key path: 【Meas Setup】, [Threshold Lvl Abs Rel] on the front panel.

Status saved: saved in the instrument status.

Factory preset:-30 dB/Relative

Setting range: -100~100

Knob increment: 0.1

Stepping key increment: scale/division of Y Axis

Default unit: dB(dBm)

Examples:

:TXPower:THReshold -50

:TXPower:THReshold?

:TXPower:THReshold:TYPE ABS

:TXPower:THReshold:TYPE?

[Meas Method>>]

Program control commands:

[:SENSe]:TXPower:METHod THReshold|BWIDth

[:SENSe]:TXPower:METHod?

Command description: to select the Measurement Method for usage.

Key path: 【Meas Setup】, [Meas Method>> on the front panel.

Status saved: saved in the instrument status.

Factory preset: Threshold Level method

Examples:

:TXPower:METHod THReshold

:TXPower:METHod?

[Threshold Lvl Method]

Program control commands:

[:SENSe]:TXPower:METHod THReshold

Command description: to select the Measurement Method as Threshold Level: select the user-defined threshold level or default level (-30.0 dB) as the measurement standard.

Key path: 【Meas Setup】, [Meas Method>>], [Threshold Lvl Method] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Threshold Level method

Examples:

:TXPower:METHod THReshold

[Measured Burst Width Method]

Program control commands:

[:SENSe]:TXPower:METHod BWIDth

Command description: to select the Measurement Method as Burst Width Method.

Key path: 【Meas Setup】, [Meas Method>>], [Measured Burst Width Methord] on the front panel.

Status saved: saved in the instrument status.

Examples:

:TXPower:METHod BWIDth

[Measured Burst Width Auto MAN]

Program control commands:

[:SENSe]:TXPower:BURSt:WIDTh <time>

[:SENSe]:TXPower:BURSt:WIDTh?

[:SENSe]:TXPower:BURSt:AUTO ON|OFF|1|0

[:SENSe]:TXPower:BURSt:AUTO?

Command description: to set the Burst Width parameter as Auto On/Off. Under Auto ON mode, the pulse width is calculated automatically based on the threshold level. For example, if the threshold level is set to 3 dB, the pulse width is the interval between 3 dB points. Before all results are calculated, after each sweep, the pulse width will update. Since this measurement is only made above the pulse width, the measurement is between 3 dB points. Under Auto OFF mode, the user can directly input the pulse width for calculating the pulse power, or the percentage for measured pulse width. In the latter case, the pulse width is only calculated once based on the latest measured pulse width. Otherwise, the pulse width is positioned at the center of each measured pulse.

Key path: 【Meas Setup】, [Measured Burst Width Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 10 us/Auto

Setting range: 0~50 s

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: 1,2,5,10…

Default unit: s

Examples:

:TXPower:BURSt:WIDTh 20 us

:TXPower:BURSt:WIDTh?

:TXPower:BURSt:AUTO ON

:TXPower:BURSt:AUTO?

[Low Noise Path MAN]

Program control commands:

[:SENSe]:TXPower:POWer:MW:PATH STD|LNPath

[:SENSe]:TXPower:POWer:MW:PATH?

Command description: this command is only available after the H34 option is provided (Low Noise Preamplifier).

Key path: 【Meas Setup】, [More 1/2>>], [Low Noise Path ON OFF] on the front panel.

Examples:

:TXPower:POWer:MW:PATH STD

:TXPower:POWer:MW:PATH?

[Preselector Preselecting Bypass]

Program control commands:

:INPut:TXPower:FILTer:YIG[:STATe] OFF|ON|0|1

:INPut:TXPower:FILTer:YIG[:STATe]?

Command description: this menu is only available after the H36 option is purchased. It is used for setting whether to bypass the front-end preselector of the signal/spectrum analyzer. In analyzing bandwidth signal, bypass is usually required.

Key path: 【Meas Setup】, [More 1/2>>], [Preselector Preselecting Bypass] on the front panel.

Examples:

:INPut:TXPower:FILTer:YIG ON

:INPut:TXPower:FILTer:YIG?

[RF Gain>>]

Set the Auto MAN of the RF Gain and best allocation algorithm for RF Gain, including [Auto], [Best Dynamic Range] and [Best for Sensitivity].

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain] on the front panel.

[Auto]

Program control commands:

[:SENSe]:TXPower:RF:GAIN:AUTO OFF|ON|0|1

[:SENSe]:TXPower:RF:GAIN:AUTO?

Command description: to set the RF Gain distribution algorithm to Auto. In this case, the RF Gain distribution is “Best Dynamic Range”.

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Auto] on the front panel.

Examples:

:TXPower:RF:GAIN:AUTO ON

:TXPower:RF:GAIN:AUTO?

[Best for Dynamic Range]

Program control commands:

[:SENSe]:TXPower:RF:GAIN:AUTO:RULes RANGE

[:SENSe]:TXPower:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Dynamic Range. In this case, the RF Gain is switched to "Auto OFF"

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best for Dynamic Range] on the front panel.

Examples:

:TXPower:RF:GAIN:AUTO:RULes RANGE

:TXPower:RF:GAIN:AUTO:RULes?

[Best for Sensitivity]

Program control commands:

[:SENSe]:TXPower:RF:GAIN:AUTO:RULes SENSITIVITY

[:SENSe]:TXPower:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Sensitivity. In this case, the RF Gain is switched to "Auto OFF"

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best for Sensibility] on the front panel.

Examples:

:TXPower:RF:GAIN:AUTO:RULes SENSITIVITY

:TXPower:RF:GAIN:AUTO:RULes?

[ADC Dither Auto MAN]

Program control commands:

[:SENSe]:TXPower:ADC:DITHer[:STATe] OFF|ON|HIGH

[:SENSe]:TXPower:ADC:DITHer[:STATe]?

[:SENSe]:TXPower:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:TXPower:ADC:DITHer:AUTO[:STATe]?

Command description: to control opening/closing of ADC dither of the frequency acquisition circuit in the analyzer. Under default mode, the signal/spectrum analyzer will automatically control whether the ADC Dither is ON based on current working condition. When the ADC Dither is under Auto mode, the ON or OFF status depends on the span, Res BW and sweep type (continuous swept or step sweep); when it is continuous swept, the ADC Dither status will force to switch to Auto and turns off; when it is step sweep, under Auto mode, if the span is 2 MHz or below, the ADC Dither is ON; if the span is below 2 MHz, the ADC Dither is OFF. Under Auto OFF mode, if the span is above 2 MHz, turning on the ADC Dither may affect the measurement results based on selected dither status. You can access the submenu for manual control.

Key path: 【Meas Setup】, [More 1/2>>], [ADC Dither Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto.

Examples:

:TXPower:ADC:DITHer ON

:TXPower:ADC:DITHer?

:TXPower:ADC:DITHer:AUTO ON

:TXPower:ADC:DITHer:AUTO?

[Meas Preset]

Program control commands:

:CONFigure:TXPower

Command description: to reset the measurement parameters to the factory preset status or user saved parameter status

Key path: 【Meas Setup】, [More 1/2>>], [Meas Preset] on the front panel.

Factory preset: factory reset.

Examples:

:CONFigure:TXPower

3.3.7.18 Measurement Control

Pop up the More related to Meas Control, including [Meas Single Cont], [Restart] and [Pause].

[MeasureCont ON OFF]

Program control commands:

:INITiate:CONTinuous OFF|ON|0|1

:INITiate:CONTinuous?

Command description: to set continuous measurement OFF or ON.

Key path: 【Meas Control】, [Meas Single Cont] on the front panel.

Examples:

:INIT:CONT OFF

[Restart]

Program control commands:

:INITiate:REST

Command description: to stop current measurement and restart measurement for the signal/spectrum analyzer.

Key path: 【Meas Control】, [Restart] on the front panel

Examples:

:INITiate:REST

[Pause]

Program control commands:

:INITiate:PAUS

:INITiate:RES

Command description: when the signal/spectrum analyzer is in operation, this command is used for pausing current measurement; when in Paused status, this command is used for continuing measurement.

Key path: 【Meas Control】, [Pause] on the front panel.

Examples:

:INITiate:PAUS

:INITiate:RES

3.3.8 Harmonic Distortion

Measure harmonic Distortion of signals. Such measurement can be accessed via the following commands to obtain measurement results:

Program control commands:

:CONFigure:HARMonics

:FETCh:HARMonics[n]?

:MEASure:HARMonics[n]?

:READ:HARMonics[n]?

n = 1 return fundamental power in dBm

n = 2 return the values of the first two harmonic powers in dBc

n = 3 return the values of the first three harmonic powers in dBc

...

N = 10 Return values of the first 10 harmonic power in dBc

:FETCh:HARMonics:AMPLitude:ALL?

:MEASure:HARMonics:AMPLitude:ALL?

:READ:HARMonics:AMPLitude:ALL?

Return the amplitude values of the first 10 harmonics. The fundamental power is measured in dBm, the harmonic power is measured in dBm. 0 is returned for any harmonic not measured.

:FETCh:HARMonics:AMPLitude[n]?

:MEASure:HARMonics:AMPLitude[n]?

:READ:HARMonics:AMPLitude[n]?

n = 1 return fundamental power in dBm

n = 2 return the values of the first two harmonic powers in dBc

n = 3 return the values of the first three harmonic powers in dBc

...

N = 10 Return values of the first 10 harmonic power in dBc

:FETCh:HARMonics:DISTortion?

:MEASure:HARMonics:DISTortion?

:READ:HARMonics:DISTortion?

Return the computed total harmonic distortion as a percentage in %.

:FETCh:HARMonics:FREQuency:ALL?

:MEASure:HARMonics:FREQuency:ALL?

:READ:HARMonics:FREQuency:ALL?

Return the frequency values of the first 10 harmonics in Hz. 0 is returned for any harmonic not measured.

:FETCh:HARMonics:FREQuency[n]?

:MEASure:HARMonics:FREQuency[n]?

:READ:HARMonics:FREQuency[n]?

n = 1 return fundamental frequency in Hz

n = 2 return the values of the first two harmonic frequencies in Hz

n = 3 return the values of the first three harmonic frequencies in Hz

...

N = 10 Return the values of the first 10 harmonic frequencies in Hz

:FETCh:HARMonics:FUNDamental?

:MEASure:HARMonics:FUNDamental?

:READ:HARMonics:FUNDamental?

Return fundamental frequency in Hz

3.3.8.1 Frequency

Set parameters related to frequency of the signal/spectrum analyzer. The soft menus include [Fundamental Frequency], [CF Step Auto Man], [Freq Offset], etc.

[Fundamental Frequency Auto Man]

Program control commands:

[:SENSe]:HARMonics:FREQuency:FUNDamental <freq>

[:SENSe]:HARMonics:FREQuency:FUNDamental?

[:SENSe]:HARMonics:FREQuency:FUNDamental:AUTO OFF|ON|0|1

[:SENSe]:HARMonics:FREQuency:FUNDamental:AUTO?

Command description: to set the fundamental frequency at auto measurement of harmonic distortion. Under Auto mode, the fundamental frequency will be automatically searched for.

Key path: 【Frequency】 on the front panel.

Setting range: 1.0E+7-, set the maximum frequency of the instrument.

Default unit: Hz

:HARMonics:FREQuency:FUNDamental 1.0 GHz

:HARMonics:FREQuency:FUNDamental:AUTO OFF

[CF Step Auto Man]

Program control commands:

[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>

[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?

[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:CENTer:STEP:AUTO?

Command description: to change the step size of the [Center Freq] , start frequency or [Stop Freq]. When it is under [Auto Mode], and when the center frequency is active, press the step key, the [CF Step] changes by 1, 2, 5 and 10. When it is under Auto Off mode, use the number keys, stepping keys or knob for change. At this time, reactivate the [Center Freq], and press the step key, the center freq will change by set step size.

Key path: 【Frequency】, [CF Step Auto Man] on the front panel.

Setting range: Min.: 1 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT:STEP 100 MHz

:FREQ:CENT:STEP:AUTO ON

[Freq Offset]

Program control commands:

[:SENSe]:FREQuency:OFFSet <freq>

[:SENSe]:FREQuency:OFFSet?

Command description: to add the set frequency offset to the displayed frequency value, including marker frequency value, but this does not affect the signal display position.

Key path: 【Frequency】, [Freq Offset] on the front panel.

Setting range: Min.:-500 GHz, Max.: +500 GHz.

Default unit: Hz

Examples:

:FREQ:OFFS 10 MHz

3.3.8.2 Amplitude/Y Axis

Amplitude/Y Axis parameter settings include [Ref Level], [Attenuation>>], [Preamplifier ON OFF], [Auto Scale], [Auto Scale], [More1/2>>], [Y Axis Unit] and [Ref Level Offset].

[RefLevel]

Program control commands:

:DISPlay:HARMonics:VIEW:WINDow:TRACe:Y:RLEVel <real>

:DISPlay:HARMonics:VIEW:WINDow:TRACe:Y:RLEVel?

Command description: to set the reference level. Measure signal at reference level position to get highest accuracy. The input attenuator of the signal/spectrum analyzer is coupled to the reference level, which can be automatically changed to avoid compression of input signal.

Key path: 【Amplitude/Y Axis】, [Ref Level] on the front panel.

Setting range: Min.: -170 dBm, Max.: 30 dBm.

Default unit: set based on Y Axis scale unit.

Examples:

:DISPlay:HARMonics:VIEW:WINDow:TRACe:Y:RLEVel 20 dBm

[Attenuation>>]

Adjust the attenuation of the signal/spectrum analyzer. The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Preamplifier ON OFF]

Program control commands:

[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1

[:SENSe]:POWer[:RF]:GAIN[:STATe]?

The commands are same as the Swept SA. See description of Swept SA 【Amplitude/Y Axis】 [Pre-amplifier ON OFF] for more details.

Examples:

:POW:GAIN OFF

:POW:GAIN?

[Scale/Div]

Program control commands:

:DISPlay:HARMonics:VIEW:WINDow:TRACe:Y:PDIVision <rel_ampl>

:DISPlay:HARMonics:VIEW:WINDow:TRACe:Y:PDIVision?

Command description: to select the scale/division from 0.1 dB/division to 20 dB/division. This menu is only valid when the scale type is logarithm.

Key path: 【Amplitude/Y Axis】, [Scale/Div] on the front panel.

Setting range: Min.: 0.1 dB, Max.: 20 dBm.

Examples:

:DISPlay:HARMonics:VIEW:WINDow:TRACe:Y:PDIVision 10

:DISPlay:HARMonics:VIEW:WINDow:TRACe:Y:PDIVision?

[Auto Scale]

Program control commands:

:HARMonics:ADJust:LEVel

Command description: the instrument automatically sets parameters like reference level and scale/division based on input signal sizes. When this soft menu key is pressed, the instrument performs one auto scaling. Setting rule for auto scaling: firstly obtain the maximum value and the minimum value based on current measurement trace data. Based on the maximum value, place on the 80% graticule of the screen trace Y axis for auto setting of reference level and scale/division.

Key path: 【Amplitude/Y Axis】, [Auto Scale] on the front panel.

[Y Axis Unit]

Program control commands:

:UNIT:HARMonics:POWer DBM|DBMV|DBMA|V|W|A|DBUV|DBUA

:UNIT:HARMonics:POWer?

Command description: to select the Y Axis unit from [dBm], [dBmV], [dBmA], [W], [V], [A], [dBμV] and [dBμA]. The instrument will automatically calculate the trace data and marker readout based on the Y axis scale unit.

Key path: 【Amplitude/Y Axis】, [More 1/2>>], [Y Axis Unit] on the front panel.

Examples:

:UNIT:HARMonics:POWer DBM

:UNIT:HARMonics:POWer?

[Ref Level Offset]

Program control commands:

:DISPlay:HARMonics:WINDow:TRACe:Y:RLEVel:OFFSet <rel_ampl>

:DISPlay:HARMonics:WINDow:TRACe:Y:RLEVel:OFFSet?

Command description: to introduce offset for all amplitude readout (e.g, reference level and marker amplitude). It will not change the trace position on the screen. This offset unit is dB and is not affected by the scale and unit.

Key path: 【Amplitude/Y Axis】, [More 1/2>>], [Ref Level Offset] on the front panel.

Setting range: Min.: -1000 dB, Max.:1000 dB.

Examples:

:DISPlay:HARMonics:WINDow:TRACe:Y:RLEVel:OFFSet 12

3.3.8.3 Span/X Axis

This key has no soft menu.

3.3.8.4 Bandwidth

Pop up the soft menu for setting the Res BW, [Res BW Auto MAN].

[Res BW Auto Man]

Program control commands:

[:SENSe]:HARMonics:BANDwidth <bandwidth>

3.3 Instrument Commands

[:SENSe]:HARMonics:BANDwidth?

[:SENSe]:HARMonics:BANDwidth:AUTO ON|OFF|1|0

[:SENSe]:HARMonics:BANDwidth:AUTO?

Command description: to change the swept analysis Res BW, ranging from 1 Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5 MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step. The Res BW can be changed with the number keys, step keys and knob. The shaded character indicates the currently selected mode.

Key path: 【Bandwith】, [Res BW Auto Man] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto

Setting range: Min.:1 Hz, Max.: 20 MHz.

Stepping key increment: 1-2-3-5-10 step.

Default unit: Hz

Examples:

:HARMonics:BANDwidth 1 kHz

:HARMonics:BANDwidth:AUTO ON On

3.3.8.5 Auto Setting

Pop up the soft menu related to auto setting including [Couple All], [Mech Atten Auto Man], [Res BW Auto Man], [Sweep Time Auto Man], [Fundamental Frequency Auto Man] and [CF Step Auto Man].

[Couple All]

Program control commands:

:COUPle ALL

Command description: to set the Res BW, sweep time, mechanical attenuator and frequency step as auto coupling mode. The signal/spectrum analyzer will select most suitable values for those functions based on set frequency. If no ratio is pre-saved, use default ratio.

Key path: 【Auto Set】, [Couple All] on the front panel.

Status saved: not saved in instrument status.

Factory preset: Couple All.

Examples:

:COUPle ALL

[Mech Atten Auto Man]

See the description of 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Res BW Auto Man]

See description of 【Bandwith】 [Res BW Auto Man] for more details.

[Sweep Time Auto Man]

See description of 【Sweep】 [Sweep Time Auto Man] for more details.

Fundamental Frequency Auto Man]

See description of 【Frequency】 [Fundamental Frequency Auto Man] for more details.

[CF Step Auto Man]

See description of 【Frequency】 [CF Step Auto Man] for more details.

3.3.8.6 Trace

Press 【Trace】 key on the front panel to pop up corresponding soft menu Including [Clear Write], [Trace Average].

[Clear Write**]**

Program control commands:

:TRACe:HARMonics:TYPE WRITe

:TRACe:HARMonics:TYPE?

Command description: to set the current trace processing as Refresh, i.e., clear all data of displayed trace and continue the signal trace receipt under sweep status.

Key path: 【Trace】, [Clear Write] on the front panel.

Status saved: saved in the instrument status.

Factory preset: all trace modes are defaulted as Refresh.

Examples:

:TRACe:HARMonics:TYPE WRITe

[Trace Average]

Program control commands:

:TRACe:HARMonics:TYPE AVERage

:TRACe:HARMonics:TYPE?

Command description: to set the current trace processing method as Average, i.e., based on the average count N set in the 【Meas Setup】, update trace after averaging the performance index of the measurement trace.

Key path: 【Trace】, [Trace Average] on the front panel.

Status saved: saved in the instrument status.

Factory preset: all trace modes are defaulted as Refresh.

Examples:

:TRACe:HARMonics:TYPE AVERage

3.3.8.7 Sweep

Enable sweep parameter setting function to pop up setting menu for Sweep Time, [Sweep Time Auto Man]

[Sweep Time Auto Man]

Program control commands:

[:SENSe]:HARMonics:SWEep:TIME <time>

[:SENSe]:HARMonics:SWEep:TIME?

[:SENSe]:HARMonics:SWEep:TIME:AUTO OFF|ON|0|1

[:SENSe]:HARMonics:SWEep:TIME:AUTO?

Command description: to change the sweep time of signal/spectrum analyzer. Use the number keys, step keys or knob to adjust the sweep time. If "Man" is underlined, the sweep time can be set manually. If "Auto" is underlined, the sweep time will be automatically associated according to the Res BW, frequency bandwidth and video bandwidth.

Key path: 【Sweep】, [Sweep Time Auto Man] on the front panel.

Status saved: saved in the instrument status.

Factory preset: sweep time Auto.

Setting range: Min.: 1 ms, Max.: 6000 s.

Knob increment: in increasing sweep time, the knob increment is 1/10 of the most significant bit; in decreasing sweep time, the knob increment is 1/100 of the most significant bit.

Stepping key increment: 1-2-5-10 step.

Default unit: s

Examples:

:HARMonics:SWEep:TIME 500 ms

:HARMonics:SWEep:TIME:AUTO OFF

3.3.8.8 Single

Program control commands:

:INITiate:HARMonics

Command description: the 【Single】 key on the front panel has no corresponding soft menu. This function is mainly used for manual trigger of a measurment. When the Average is ON, this function performs the measurements at the count specified by the Average Num.

In remote control programming and system establishment, this function combined with *WAI can effectively synchronize the measurement process and enable the trace data obtained after the *WAI finishes directly correspond to the measurement process one by one.

Examples:

:INITiate:HARMonics

3.3.8.9 Continuous

Program control commands:

:INITiate:CONTinuous ON

Command description: Continuous ON is mainly used for changing the Continuous OFF into Continuous ON; if the current measurement is Continuous ON, the instrument performs no operation.

Examples:

:INITiate:CONTinuous ON

3.3.8.10 Trigger

See description of Swept SA 【Trigger】 for more details.

3.3.8.11 Display

Pop up soft menus related to display, including [Display Line ON OFF], [Bar Graph ON OFF], [Display Config>>].

[Display Line On Off]

See description of Swept SA 【Display】 [Display Line ON OFF] for more details.

[Display Config>>]

It is used for configurations of interface language, status area display MAN related to interface display, The soft menus include [Language 中文 English], [Graticule ON OFF], [Status Display ON OFF] and [Freq Info Disp ON OFF] See description of Swept SA 【Display】 [Display Config>>] for more details.

3.3.8.12 Input Output

See description of Swept SA 【Input/output] 】for more details.

3.3.8.13 Marker

This key has no soft menu.

3.3.8.14 Maker->

This key has no soft menu.

3.3.8.15 Marker Function

This key has no soft menu.

3.3.8.16 Peak Search

This key has no soft menu.

3.3.8.17 Measurement Setting

Pop up the soft menu related to measurement setting, Including [Average Num ON OFF], [Average Mode Exponential Repeat], [Harmonics Number], [Harmonics Table ON OFF], [Harmonics Table Config], [Low Noise Path ON OFF], [Preselector Preselecting Bypass], [RF Gain>>], [ADC Dither Auto Man], [Meas Reset].

[Average Num On Off]

Program control commands:

[:SENSe]:HARMonics:AVERage:COUNt <integer>

[:SENSe]:HARMonics:AVERage:COUNt?

[:SENSe]:HARMonics:AVERage[:STATe] ON|OFF|1|0

[:SENSe]:HARMonics:AVERage[:STATe]?

Command description: to turn on or off Average. When Average Count is ON, the user can specify the average count required for measurement. The Average Count can be adjusted by number keys, stepping keys or knob.

Key path: 【Meas Setup】, [Average Num ON OFF] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 100/OFF

Setting range: 1~10000

Knob increment: 1

Stepping key increment: 1.

Default unit: none

Examples:

:HARMonics:AVERage:COUNt 10

:HARMonics:AVERage:COUNt?

:HARMonics:AVERage ON

:HARMonics:AVERage?

[Average Mode Exponential Repeat]

Program control commands:

[:SENSe]:HARMonics:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:HARMonics:AVERage:TCONtrol?

Command description: when Average Count is ON, the user can select Average State required for measurement.

Exponential - Different from Linear Average, in Exponential State, the weight of new data is larger than that of old data. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases.

Repeat - Similarly, it takes exponential averaging. However, when the average count is met, clear all previous results, restart average till the set average count and repeat this process.

Key path: 【Meas Setup】, [Average Mode Exponential Repeat] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Exponential

Examples:

:HARMonics:AVERage:TCONtrol EXP

:HARMonics:AVERage:TCONtrol?

[Harmonics Number]

Program control commands:

[:SENSe]:HARMonics:NUMBer <integer>

[:SENSe]:HARMonics:NUMBer?

Command description: to set to calculate the total number of harmonics to be measured for harmonic distortion. The minimum value is 2 (fundamental harmonics and second harmonics). The maximum value is 10. Use number keys, stepping keys or knob to change the harmonics number.

Key path: 【Meas Setup】, [Harmonics Number] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 10/OFF

Setting range: 2~10

Knob increment: 1

Stepping key increment: 1

Default unit: none

Examples:

:HARMonics:NUMBer 10

:HARMonics:NUMBer?

[Harmonics Table On Off]

Program control commands:

[:SENSe]:HARMonics:RTABle:STATe OFF|ON|0|1

[:SENSe]:HARMonics:RTABle:STATe?

Command description: to turn on or off Range List. If it is ON, take harmonics measurement based on table. If it is OFF, the first active scope is fundamental harmonic and the self sequence active range is harmonics.

Key path: 【Meas Setup】, [Harmonics Table ON OFF] on the front panel.

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:HARMonics:RTABle:STATe ON

:HARMonics:RTABle:STATe?

[Harmonics Table Config>>]

Command description: to enter the setting interface of the harmonics editing list. If it is OFF, use "----" to indicate that this harmonic range is void and no measurement is made.

Key path: 【Meas Setup】, [Harmonics Table Config>>] on the front panel.

[Harmonic On Off]

Program control commands:

[:SENSe]:HARMonics:RANGe[:LIST]:STATe OFF|ON|0|1, ...

[:SENSe]:HARMonics:RANGe[:LIST]:STATe?

Command description: to set the parameter for each harmonics. If it is ON, measure the harmonics. If it is OFF, no measurement is made.

Key path: 【Meas Setup】, [Harmonics Table Config>>], [Harmonics ON OFF] on the front panel.

Status saved: saved in the instrument status.

Factory preset: ON

Examples:

:HARMonics:RANGe:STATe ON,ON,ON,ON,ON,ON,ON,ON,ON,ON

:HARMonics:RANGe:STATe?

[Frequency]

Program control commands:

[:SENSe]:HARMonics:RANGe[:LIST]:FREQuency <frequency>,...

[:SENSe]:HARMonics:RANGe[:LIST]:FREQuency?

Command description: to set harmonics frequency. Users may use number keys, stepping keys and the knob to adjust it.

Key path: 【Meas Setup】, [Harmonics Table Config>>], [Frequency] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1.0 GHz

Setting range: 1 - set the maximum frequency of the instrument

Knob increment: frequency step

Stepping key increment: Res BW/20

Default unit: Hz

Examples:

:HARMonics:RANGe:FREQuency

1 GHz, 2 GHz, 3 GHz, 4 GHz, 5 GHz, 6 GHz, 7 GHz, 8 GHz, 9 GHz, 10 GHz

:HARMonics:RANGe:FREQuency?

[Res BW Auto Man]

Program control commands:

[:SENSe]:HARMonics:RANGe[:LIST]:BANDwidth|BWIDth[:RESolution] <frequency>,...

[:SENSe]:HARMonics:RANGe[:LIST]:BANDwidth|BWIDth[:RESolution]?

[:SENSe]:HARMonics:RANGe[:LIST]:BANDwidth|BWIDth[:RESolution]:AUTO ON|OFF|1|0, …

[:SENSe]:HARMonics:RANGe[:LIST]:BANDwidth|BWIDth[:RESolution]:AUTO?

Command description: to set [Res BW] state of the instrument. If the video bandwidth is set to Auto ON, the optimal setting is determined by the instrument. When the Res BW is set as auto off, users may define the bandwidth and adjust it with number keys, stepping keys or the knob.

Key path: 【Meas Setup】, [Harmonics Table Config>>], [Res BW Auto Man] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 3 MHz/Auto

Setting range: 1 Hz – 20 MHz.

Knob increment: available Res BW

Stepping key increment: available Res BW

Default unit: Hz

Examples:

:HARMonics:RANGe:BANDwidth

3 MHz, 3 MHz, 3 MHz, 3 MHz, 3 MHz, 3 MHz, 3 MHz, 3 MHz, 3 MHz

:HARMonics:RANGe:BANDwidth?

:HARMonics:RANGe:BANDwidth:AUTO ON,ON,ON,ON,ON,ON,ON,ON,ON,ON

:HARMonics:RANGe:BANDwidth:AUTO?

[Video BW Auto Man]

Program control commands:

[:SENSe]:HARMonics:RANGe[:LIST]:BANDwidth|BWIDth:VIDeo <frequency>,...

[:SENSe]:HARMonics:RANGe[:LIST]:BANDwidth|BWIDth:VIDeo?

[:SENSe]:HARMonics:RANGe[:LIST]:BANDwidth|BWIDth:VIDeo:AUTO ON|OFF|1|0, …

[:SENSe]:HARMonics:RANGe[:LIST]:BANDwidth|BWIDth:VIDeo:AUTO?

Command description: to set [Video BW] state of the instrument. If the Res BW is set to Auto ON, the optimal setting is determined by the instrument. If the video bandwidth is set to Auto OFF, users may define the bandwidth and adjust it with number keys, stepping keys or the knob. and adjust it with number keys, stepping keys or the knob.

Key path: 【Meas Setup】, [Harmonics Table Config>>], [Video BW Auto Man] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 3 MHz/Auto

Setting range: 1 Hz – 20 MHz.

Knob increment: available video bandwidth

Stepping key increment: available video bandwidth

Default unit: Hz

Examples:

:HARMonics:RANGe:BANDwidth:VIDeo

3 MHz, 3 MHz, 3 MHz, 3 MHz, 3 MHz, 3 MHz, 3 MHz, 3 MHz, 3 MHz

:HARMonics:RANGe:BANDwidth:VIDeo?

:HARMonics:RANGe:BANDwidth:VIDeo:AUTO ON,ON,ON,ON,ON,ON,ON,ON,ON,ON

:HARMonics:RANGe:BANDwidth:VIDeo:AUTO?

[Sweep Time Auto Man]

Program control commands:

[:SENSe]:HARMonics:RANGe[:LIST]:SWEeptime <time>, ...

[:SENSe]:HARMonics:RANGe[:LIST]:SWEeptime?

[:SENSe]:HARMonics:RANGe[:LIST]:SWEeptime:AUTO ON|OFF|1|0, ...

[:SENSe]:HARMonics:RANGe[:LIST]:SWEeptime:AUTO?

Command description: to set the Sweep Time of the instrument as Auto ON or OFF. Use number keys, stepping keys or knob to change the time.

Key path: 【Meas Setup】, [Harmonics Table Config>>], [Sweep Time Auto MAN] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 5 ms/Auto

Setting range: 1 us – 6000 s

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: 1, 2, 5, 10…

Default unit: s

Examples:

:HARMonics:RANGe:SWEeptime 5 ms, 5 ms, 5 ms, 5 ms, 5 ms, 5 ms, 5 ms, 5 ms, 5 ms, 5 ms

:HARMonics:RANGe:SWEeptime?

:HARMonics:RANGe:SWEeptime:AUTO ON,ON,ON,ON,ON,ON,ON,ON,ON,ON

:HARMonics:RANGe:SWEeptime:AUTO?

[Auto Fill Table]

Program control commands:

[:SENSe]:HARMonics:RTABle:FILL

Command description: to automatically set the parameters of range table based on current center frequency and span.

Key path: 【Meas Setup】, [Harmonics Table Comfig>>], [Auto Fill Table] on the front panel.

Examples:

:HARMonics:RTABle:FILL

[Low Noise Path On Off]

Program control commands:

[:SENSe]:HARMonics:POWer:MW:PATH STD|LNPath

[:SENSe]:HARMonics:POWer:MW:PATH?

Command description: this command is only available after the H34 option is provided (Low Noise Preamplifier).

Key path: 【Meas Setup】, [More 1/2>>], [Low Noise Path ON OFF] on the front panel.

Examples:

:HARMonics:POWer:MW:PATH STD

:HARMonics:POWer:MW:PATH?

[Preselector Preselecting Bypass]

Program control commands:

:INPut:HARMonics:FILTer:YIG[:STATe] OFF|ON|0|1

:INPut:HARMonics:FILTer:YIG[:STATe]?

Command description: this menu is only available after the H36 option is purchased. It is used for setting whether to bypass the front-end preselector of the signal/spectrum analyzer. In analyzing bandwidth signal, bypass is usually required.

Key path: 【Meas Setup】, [More 1/2>>], [Preselector Preselecting Bypass] on the front panel.

Examples:

:INPut:HARMonics:FILTer:YIG OFF

:INPut:HARMonics:FILTer:YIG?

[RF Gain>>]

Set the Auto Man of the RF Gain and best allocation algorithm for RF Gain, including [Auto], [Best Dynamic Range] and [Best for Sensitivity].

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain] on the front panel.

[Auto]

Program control commands:

[:SENSe]:HARMonics:RF:GAIN:AUTO OFF|ON|0|1

[:SENSe]:HARMonics:RF:GAIN:AUTO?

Command description: to set the RF Gain distribution algorithm to Auto. In this case, the RF Gain distribution is “Best Dynamic Range”.

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Auto] on the front panel.

Examples:

:HARMonics:RF:GAIN:AUTO ON

:HARMonics:RF:GAIN:AUTO?

[Best for Dynamic Range]

Program control commands:

[:SENSe]:HARMonics:RF:GAIN:AUTO:RULes RANGE

[:SENSe]:HARMonics:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Dynamic Range. In this case, the RF Gain is switched to “Auto OFF”

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best for Dynamic Range] on the front panel.

Examples:

:HARMonics:RF:GAIN:AUTO:RULes RANGE

:HARMonics:RF:GAIN:AUTO:RULes?

[Best for Sensitivity]

Program control commands:

[:SENSe]:HARMonics:RF:GAIN:AUTO:RULes SENSITIVITY

[:SENSe]:HARMonics:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Sensitivity. In this case, the RF Gain is switched to "Auto OFF"

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best for Sensibility] on the front panel.

Examples:

:HARMonics:RF:GAIN:AUTO:RULes SENSITIVITY

:HARMonics:RF:GAIN:AUTO:RULes?

[ADC Dither Auto Man]

Program control commands:

[:SENSe]:HARMonics:ADC:DITHer[:STATe] OFF|ON|HIGH

[:SENSe]:HARMonics:ADC:DITHer[:STATe]?

[:SENSe]:HARMonics:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:HARMonics:ADC:DITHer:AUTO[:STATe]?

Command description: to control opening/closing of ADC dither of the frequency acquisition circuit in the analyzer. Under default mode, the signal/spectrum analyzer will automatically control whether the ADC Dither is ON based on current working condition. When the ADC Dither is under Auto mode, the ON or OFF status depends on the span, Res BW and sweep type (continuous swept or step sweep); when it is continuous swept, the ADC Dither status will force to switch to Auto and turns off; when it is step sweep, under Auto mode, if the span is 2 MHz or below, the ADC Dither is ON; if the span is below 2 MHz, the ADC Dither is OFF. Under Auto OFF mode, if the span is above 2 MHz, turning on the ADC Dither may affect the measurement results based on selected dither status. You can access the submenu for manual control.

Key path: 【Meas Setup】, [More 1/2>>], [ADC Dither Auto Man] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto.

Examples:

:HARMonics:ADC:DITHer ON

:HARMonics:ADC:DITHer?

:HARMonics:ADC:DITHer:AUTO ON

:HARMonics:ADC:DITHer:AUTO?

[Meas Preset]

Program control commands:

:CONFigure:HARMonics

Command description: to reset the measurement parameters to the factory preset status or user saved parameter status

Key path: 【Meas Setup】, [More 1/2>>], [Meas Preset] on the front panel.

Factory preset: factory reset.

Examples:

:CONFigure:HARMonics

3.3.8.18 Measurement Control

Pop up the More related to Meas Control, including [Meas Single Cont], [Restart] and [Pause/Resume].

[Measure

[Meas

Single Cont]

Program control commands:

:INITiate:CONTinuous OFF|ON|0|1

:INITiate:CONTinuous?

Command description: to set continuous measurement OFF or ON.

Key path: 【Meas Control】, [Meas Single Cont] on the front panel.

Examples:

:INIT:CONT OFF

[Restart]

Program control commands:

:INITiate:REST

Command description: to stop current measurement and restart measurement for the signal/spectrum analyzer.

Key path: 【Meas Control】, [Restart] on the front panel

Examples:

:INITiate:REST

[Pause]

Program control commands:

:INITiate:PAUS

:INITiate:RES

Command description: when the signal/spectrum analyzer is in operation, this command is used for pausing current measurement; when in Paused status, this command is used for continuing measurement.

Key path: 【Meas Control】, [Pause] on the front panel.

Examples:

:INITiate:PAUS

:INITiate:RES

3.3.9 Three-order intermodulation (TOI)

Three-order intermodulation, also known as TOI for short, is a means for analysis and measurement of intermodulation product of communication system equipment. Mutual interference between equipment is very common in communication systems, which is usually caused by distortion products from equipment such as amplifiers and frequency mixer. TOI can measure, calculate and display output intercept points (IP3) and signs on the curve show measured signals and three-order products.

3.3 Instrument Commands

Such measurement can be accessed via the following commands to obtain measurement results:

Program control commands:

:CONFigure:TOI

:FETCh:TOI[n]?

:MEASure:TOI[n]?

:READ:TOI[n]?

When n = 0, return to trace data pair.

When n = 1, return to the worst intercept power dBm,

the worst intermodulation point frequency Hz,

lower intercept power dBm,

lower intermodulation point frequency Hz,

upper intercept power dBm,

upper intermodulation point frequency Hz.

When n = 2, return to the worst intermodulation point frequency Hz,

the worst intermodulation point power dBm,

the worst intercept power dBm,

lower base frequency Hz,

lower base power dBm,

upper base frequency Hz,

upper base power dBm,

lower intermodulation point frequency Hz,

lower intermodulation point power dBm,

lower intercept power dBm,

upper intermodulation point frequency Hz,

upper intermodulation point power dBm,

upper intercept power dBm,

:FETCh:TOI:IP3?

:MEASure:TOI:IP3?

:READ:TOI:IP3?

Return to the worst intercept power dBm

3.3.9.1 Frequency

This command is used to set parameters related to the signal/spectrum analyzer, including [Center Freq], [Lower Frequency Auto On/Off], [Upper Frequency Auto On/Off], [CF Step Auto On/Off] and [Freq Offset]. See instructions in the 【Frequency】 command in Swept SA.

[Center Freq]

Program control commands:

[:SENSe]:FREQuency:CENTer <frequency>

[:SENSe]:FREQuency:CENTer?

Command description: to set the center frequency of the signal/spectrum analyzer. If the set center frequency is inconsistent with the current span, the latter will automatically change to the value best suitable for desired frequency.

Key path: 【Frequency】, [Center Freq] on the front panel.

Setting range: Min.: 0 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT 5 GHz

[Lower base frequency Auto Man]

Program control commands:

[:SENSe]:TOI:FREQuency:BASE:LOWer <freq>

[:SENSe]:TOI:FREQuency:BASE:LOWer <freq>

[:SENSe]:TOI:FREQuency:BASE:LOWer:AUTO OFF|ON|0|1

[:SENSe]:TOI:FREQuency:BASE:LOWer:AUTO?

Command description: to set the lower frequency of the base frequency for TOI measurement. When set as Auto, the equipment will automatically search for the lower frequency.

Key path: 【Frequency】 on the front panel.

Setting range: -1.0E+8~, set the maximum frequency of the instrument.

Default unit: Hz

:TOI:FREQuency:BASE:LOWer 1.0 GHz

:TOI:FREQuency:BASE:LOWer:AUTO OFF

[Upper base frequency Auto Man]

Program control commands:

[:SENSe]:TOI:FREQuency:BASE:UPPer <frequency>

[:SENSe]:TOI:FREQuency:BASE:UPPer?

[:SENSe]:TOI:FREQuency:BASE:UPPer:AUTO OFF|ON|0|1

[:SENSe]:TOI:FREQuency:BASE:UPPer:AUTO?

Command description: to set the upper frequency of the base frequency for TOI measurement. When set as Auto, the equipment will automatically search for the upper frequency.

Key path: 【Frequency】 on the front panel.

Setting range: -1.0E+8~, set the maximum frequency of the instrument.

Default unit: Hz

:TOI:FREQuency:BASE:UPPer 1.2 GHz

:TOI:FREQuency:BASE:UPPer:AUTO OFF

[CF Step Auto Man]

Program control commands:

[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>

[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?

[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:CENTer:STEP:AUTO?

Command description: to change the step size of the [Center Freq] , start frequency or [Stop Freq]. When it is under [Auto Mode], and when the center frequency is active, press the step key, the [CF Step] changes by 1, 2, 5 and 10. When it is under Auto Off mode, use the number keys, stepping keys or knob for change. At this time, reactivate the [Center Freq], and press the step key, the center freq will change by set step size.

Key path: 【Frequency】, [CF Step Auto Man] on the front panel.

Setting range: Min.: 1 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT:STEP 100 MHz

:FREQ:CENT:STEP:AUTO ON

[Freq Offset]

Program control commands:

[:SENSe]:FREQuency:OFFSet <freq>

[:SENSe]:FREQuency:OFFSet?

Command description: to add the set frequency offset to the displayed frequency value, including marker frequency value, but this does not affect the signal display position.

Key path: 【Frequency】, [Freq Offset] on the front panel.

Setting range: Min.:-500 GHz, Max.: +500 GHz.

Default unit: Hz

Examples:

:FREQ:OFFS 10 MHz

3.3.9.2 Amplitude/Y Axis

Amplitude/Y Axis parameter settings include [Ref Level], [Attenuation>>], [Preamplifier ON OFF], [Auto Scale], [Auto Scale], [More1/2>>], [Y Axis Unit] and [Ref Level Offset].

[RefLevel]

Program control commands:

:DISPlay:TOI:VIEW:WINDow:TRACe:Y:RLEVel <real>

:DISPlay:TOI:VIEW:WINDow:TRACe:Y:RLEVel?

Command description: to set the reference level. Measure signal at reference level position to get highest accuracy. The input attenuator of the signal/spectrum analyzer is coupled to the reference level, which can be automatically changed to avoid compression of input signal.

Key path: 【Amplitude/Y Axis】, [Ref Level] on the front panel.

Setting range: Min.: -170 dBm, Max.: 30 dBm.

Default unit: set based on Y Axis scale unit.

Examples:

:DISPlay:TOI:VIEW:WINDow:TRACe:Y:RLEVel 20 dBm

[Attenuation>>]

Adjust the attenuation of the signal/spectrum analyzer. The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Preamplifier ON OFF]

Program control commands:

[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1

[:SENSe]:POWer[:RF]:GAIN[:STATe]?

The commands are same as the Swept SA. See description of Swept SA 【Amplitude/Y Axis】 [Pre-amplifier ON OFF] for more details.

Examples:

:POW:GAIN OFF

:POW:GAIN?

[Scale/Div]

Program control commands:

:DISPlay:TOI:VIEW:WINDow:TRACe:Y:PDIVision <rel_ampl>

:DISPlay:TOI:VIEW:WINDow:TRACe:Y:PDIVision?

Command description: to select the scale/division from 0.1 dB/division to 20 dB/division. This menu is only valid when the scale type is logarithm.

Key path: 【Amplitude/Y Axis】, [Scale/Div] on the front panel.

Setting range: Min.: 0.1 dB, Max.: 20 dBm.

Examples:

:DISPlay:TOI:VIEW:WINDow:TRACe:Y:PDIVision 10

:DISPlay:TOI:VIEW:WINDow:TRACe:Y:PDIVision?

[Auto Scale]

3.3 Instrument Commands

Program control commands:

:TOI:ADJust:LEVel

Command description: the instrument automatically sets parameters like reference level and scale/division based on input signal sizes. When this soft menu key is pressed, the instrument performs one auto scaling. Setting rule for auto scaling: firstly obtain the maximum value and the minimum value based on current measurement trace data. Based on the maximum value, place on the 80% graticule of the screen trace Y axis for auto setting of reference level and scale/division.

Key path: 【Amplitude/Y Axis】, [Auto Scale] on the front panel.

[Y Axis Unit]

Program control commands:

:UNIT:TOI:POWer DBM|DBMV|DBMA|V|W|A|DBUV|DBUA

:UNIT:TOI:POWer?

Command description: to select the Y Axis unit from [dBm], [dBmV], [dBmA], [W], [V], [A], [dBμV] and [dBμA]. The instrument will automatically calculate the trace data and marker readout based on the Y axis scale unit.

Key path: 【Amplitude/Y Axis】, [More 1/2>>], [Y Axis Unit] on the front panel.

Examples:

:UNIT:TOI:POWer DBM

:UNIT:TOI:POWer?

[Ref Level Offset]

Program control commands:

:DISPlay:TOI:VIEW:WINDow:TRACe:Y[:SCALe]:RLEVel:OFFSet <rel_ampl>

:DISPlay:TOI:VIEW:WINDow:TRACe:Y[:SCALe]:RLEVel:OFFSet?

Command description: to introduce offset for all amplitude readout (e.g, reference level and marker amplitude). It will not change the trace position on the screen. This offset unit is dB and is not affected by the scale and unit.

Key path: 【Amplitude/Y Axis】, [More 1/2>>], [Ref Level Offset] on the front panel.

Setting range: Min.: -1000 dB, Max.:1000 dB.

Examples:

:DISPlay:TOI:WINDow:TRACe:Y:RLEVel:OFFSet 12

3.3.9.3 Span/X Axis

Press the 【Span/X Axis】 on the front panel to enable the span function and set the signal/spectrum analyzer into center frequency/span mode. Press the [Span] key to pop up [Span], [Full Span] and [Last Span].

[Span]

Program control commands:

[:SENSe]:TOI:FREQuency:SPAN <freq>

[:SENSe]:TOI:FREQuency:SPAN?

Command description: the span can be set by number keys, stepping keys or knob. Use number keys or select [Zero Span] to set the span as zero.

Key path: 【Span/X Axis】, [Span] on the front panel.

Status saved: saved in the instrument status.

Factory preset: maximum frequency limit - start frequency.

Setting range: Min.: 10 Hz, Max.: related to the maximum working frequency limit of the instrument.

Knob increment: in increase, the knob increment is 1/10 of the most significant bit; in decrease, the knob increment is 1/100 of the most significant bit.

Stepping key increment: 1-2-5-10 step.

Examples:

:TOI:FREQuency:SPAN 10 MHz

3.3.9.4 Bandwidth

Pop up the soft menu for setting Res BW and video bandwidth, including [Res BW Auto Man Auto On/Off], [Video BW Auto Man] and [Filter Type] options.

[Res BW Auto Man]

Program control commands:

[:SENSe]:TOI:BANDwidth <bandwidth>

[:SENSe]:TOI:BANDwidth?

[:SENSe]:TOI:BANDwidth:AUTO ON|OFF|1|0

[:SENSe]:TOI:BANDwidth:AUTO?

Command description: to change the swept analysis Res BW, ranging from 1 Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5 MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step. The Res BW can be changed with the number keys, step keys and knob. The shaded character indicates the currently selected mode.

Key path: 【Bandwith】, [Res BW Auto Man] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto

Setting range: Min.:1 Hz, Max.: 20 MHz.

Stepping key increment: 1-2-3-5-10 step.

Default unit: Hz

Examples:

:TOI:BANDwidth 1 kHz

:TOI:BANDwidth:AUTO ON

[Video BW Auto Man]

Program control commands:

[:SENSe]:TOI:BANDwidth:VIDeo <bandwidth>

[:SENSe]:TOI:BANDwidth:VIDeo?

[:SENSe]:TOI:BANDwidth:VIDeo:AUTO ON|OFF|1|0

[:SENSe]:TOI:BANDwidth:VIDeo:AUTO?

Command description: to change the video bandwidth displayed on the active function zone ranging from 1 Hz to 20 MHz. If the bandwidth is above 3 MHz, use 4 MHz, 5 MHz, 6 MHz, 8 MHz, 10 MHz, 20 MHz; if the bandwidth is between 1 Hz and 3 MHz, change it by 10% step. Use number keys, stepping keys or knob to change The mode with a underline is the current mode. When set as Auto Off, press [Video BW MAN**Auto** Man] to select Auto ON and return to auto mode.

Key path: 【Bandwith】, [Video BW Auto On/Off] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto, same as the Res BW setting.

Setting range: Min.:1 Hz, Max.: 20 MHz.

Stepping key increment: 1-2-3-5-10 step.

Default unit: Hz

Examples:

:TOI:BANDwidth:VIDeo 1 kHz

:TOI:BANDwidth:VIDeo:AUTO ON

[VBW/RBW Auto Man]

Program control commands:

[:SENSe]:TOI:BANDwidth|BWIDth:VIDeo:RATio:AUTO OFF|ON|0|1

[:SENSe]:TOI:BANDwidth|BWIDth:VIDeo:RATio:AUTO?

[:SENSe]:TOI:BANDwidth|BWIDth:VIDeo:RATio <number>

[:SENSe]:TOI:BANDwidth|BWIDth:VIDeo:RATio?

Command description: to set the ratio between the current video bandwidth and Res BW with the default value as 1. As the Res BW changes, the video bandwidth changes to maintain this ratio. The ratio should be displayed on the input area and used for the coupling mode of those two kinds of bandwidth. When a new ratio is selected, change the video bandwidth to meet this new ratio and the Res BW should remain unchanged.

Key path: 【Bandwith】, [VBW/RBW Auto Man] on the front panel.

Status saved: saved in the instrument status.

Factory preset: auto with VBW/RBW as 1.

Setting range: Min.:0.0001, Max.: 300000.

Stepping key increment: 1-3-10.

Examples:

:TOI:BAND:VID:RAT 2

[Span/RBW Auto Man]

Program control commands:

[:SENSe]:TOI:FREQuency:SPAN:BANDwidth[:RESolution]:RATio <integer>

[:SENSe]:TOI:FREQuency:SPAN:BANDwidth[:RESolution]:RATio?

[:SENSe]:TOI:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO OFF|ON|0|1

[:SENSe]:TOI:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO?

Command description: to set the ratio between the current span and Res BW and display it in the input area. This ratio is used in coupling mode of the Res BW.

Key path: 【Bandwith】 and [Span/RBW Auto Man] on the front panel.

Status saved: saved in the instrument status.

Factory preset: auto with span/RBW as 106.

Setting range: Min.:2, Max.: 10000.

Stepping key increment: 1-2-5-10 step.

Examples:

:TOI:FREQuency:SPAN:BANDwidth:RATio 1.0

:TOI:FREQuency:SPAN:BANDwidth:RATio?

:TOI:FREQuency:SPAN:BANDwidth:RATio:AUTO ON

:TOI:FREQuency:SPAN:BANDwidth:RATio:AUTO?

3.3.9.5 Auto Setting

Pop up the soft menu related to auto setting including [Couple All], [Mech Atten Auto Man], [Res BW Auto Man], [Video BW Auto Man], [VBW/RBW Auto Man], [Span/RBW Auto Man], [Sweep Time Auto Man] and [CF Step Auto Man].

[Couple All]

Program control commands:

:COUPle ALL

Command description: to set the Res BW, video bandwidth, sweep time, mechanical attenuator and frequency step as auto coupling mode. The signal/spectrum analyzer will select most suitable values for those functions based on set frequency and bandwidth (or start frequency and stop frequency). If no ratio is pre-saved, use default ratio.

Key path: 【Auto Set】, [Couple All] on the front panel.

Status saved: not saved in instrument status.

Factory preset: Couple All.

Examples:

:COUPle ALL

[Mech Atten Auto Man]

See the description of 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Res BW Auto Man]

See description of 【Bandwith】 [Res BW **Auto** Man] for more details.

[Video BW Auto Man]

See description of 【Bandwith】 [Video BW **Auto** Man] for more details.

[VBW/RBW Auto Man]

See description of 【Bandwith】 [VBW/RBW BW **Auto** Man] for more details.

[Span/RBW Auto Man]

See description of 【Bandwith】 [Span/RBW **Auto** Man] for more details.

[Sweep Time Auto Man]

See description of 【Sweep】 [Sweep Time **Auto** Man] for more details.

[Lower frequency Auto Man]

See description of 【Frequency】 [Lower Frequency **Auto** Man] for more details.

[Upper frequency Auto Man]

See description of 【Frequency】 [Upper Frequency **Auto** Man] for more details.

[CF Step Auto Man]

See description of 【Frequency】 [CF Step Auto Man] for more details.

3.3.9.6 Trace

Press 【Trace】 key on the front panel to pop up corresponding soft menu , including [Clear Write], [Trace Average], [Max Hold], [More 1/2>>] and [Detector>>].

[Clear Write**]**

Program control commands:

:TRACe:TOI:TYPE WRITe

:TRACe:TOI:TYPE?

Command description: to set the current trace processing as Refresh, i.e., clear all data of displayed trace and continue the signal trace receipt under sweep status.

Key path: 【Trace】, [Clear Write] on the front panel.

Status saved: saved in the instrument status.

Factory preset: after all traces are selected, the trace mode is defaulted as Refresh.

Examples:

:TRACe:TOI:TYPE WRITe

[Trace Average]

Program control commands:

:TRACe:TOI:TYPE AVERage

:TRACe:TOI:TYPE?

Command description: to set the current trace processing method as Average, i.e., based on the average count N set in the 【Meas Setup】, update trace after averaging the performance index of the measurement trace.

Key path: 【Trace】, [Trace Average] on the front panel.

Status saved: saved in the instrument status.

Factory preset: all trace modes are defaulted as Refresh.

Examples:

:TRACe:TOI:TYPE AVERage

[Max Hold]

Program control commands:

:TRACe:TOI:TYPE MAXHold

:TRACe:TOI:TYPE?

Command description: to set the current trace processing method as maximum hold, i.e., the new trace data will be assigned with maximum value of previous measured trace data

Key path: 【Trace】, [Max. Hold] on the front panel.

Status saved: saved in the instrument status.

Factory preset: all trace modes are defaulted as Refresh.

Examples:

:TRACe:TOI:TYPE MAXHold

[Detector>>]

Pop up soft menus related to setting the detector type for the currently selected trace, including [Auto], [Normal], [Peak], [Sample], [Negative Peak], [Average>>], where, the average detector type includes [Log-Pwr Avg], [Pwr Avg] and [Voltage Avg].

Program control commands:

[:SENSe]:TOI:DETector:AUTO ON|OFF|1|0

[:SENSe]:TOI:DETector:AUTO?

[:SENSe]:TOI:DETector[:FUNCtion]

NORMal|POSitive|SAMPle|NEGative|AVERage|RMS|LOG |SCALar

[:SENSe]:TOI:DETector[:FUNCtion]?

[Auto]

3.3 Instrument Commands

Program control commands:

:TOI:DETector:AUTO ON|OFF|1|0

:TOI:DETector:AUTO?

Command description: to set the detector command for the currently selected trace as Auto. That means, the signal/spectrum analyzer will perform based on the parameter setting of currently selected trace.

Key path:【Trace】, [More 1/2>>], [Detector>>], [Auto] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TOI:DETector:AUTO ON

:TOI:DETector:AUTO?

[Normal]

Program control commands:

:TOI:DETector NORMal

:TOI:DETector?

Command description: to set the detector command for the currently selected trace as Normal, i.e., display the measurement results of positive peak and negative peak at the same time to achieve display effect similar to the analog instrument.

Key path:【Trace】, [More 1/2>>], [Detector>>], [Normal] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TOI:DETector NORMal

[Peak]

Program control commands:

:TOI:DETector POSitive

:TOI:DETector?

Command description: to set the detector command for the currently selected trace as Positive Peak, i.e., take the maximum value from sampling data assigned to each trace point.

Key path:【Trace】, [More 1/2>>], [Detector>>], [Peak] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TOI:DETector POSitive

[Sample]

Program control commands:

:TOI:DETector SAMPle

:TOI:DETector?

Command description: to set the detector command for the currently selected trace as Sample, i.e., take the last value from sampling data assigned to each trace point.

Key path: 【Trace】, [More 1/2>>], [Detector>>] and [Sample] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TOI:DETector SAMPle

[Negative Peak]

Program control commands:

:TOI:DETector NEGative

:TOI:DETector?

Command description: to set the detector command for the currently selected trace as Negative Peak, i.e., take the minimum value from sampling data assigned to each trace point.

Key path: 【Trace】, [More 1/2>>], [Detector>>] and [Negative Peak] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TOI:DETector NEGative

[Average>> Log-Pwr Avg]

Program control commands:

:TOI:DETector LOG

:TOI:DETector?

Command description: to set the detector command for the currently selected trace as Video Average. Also called Logarithm Power Average Detector, i.e., take the logarithm power average value for all data assigned to each trace point; earlier signal/spectrum analyzer generally displays the measurement trace of logarithm scale, and all filtering and averaging are based on the logarithm power data; the trace is generally called as video signal. After digital IF processing is adopted, to make measurement results same as the earlier signal/spectrum analyzer, the video average detector function is added.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Trace Average] and [Log-Pwr Avg] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TOI:DETector LOG

3.3 Instrument Commands

[Average>> Pwr Avg]

Program control commands:

:TOI:DETector AVERage or

:TOI:DETector RMS

:TOI:DETector?

Command description: to set the detector command for the currently selected trace as Power Average. Also called root mean square (RMS) detector. Calculate the root mean square of all sampling data assigned to each trace point; the 4051signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After square these voltage values, take sum and divide the count of sampling data points corresponding to each trace point. Finally, take square root. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those RMS values are trace data.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Pwr Avg] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TOI:DETector RMS

[Average>> Voltage Avg]

Program control commands:

:TOI:DETector SCALar

:TOI:DETector?

Command description: to set the detector command for the currently selected trace as Voltage Average. Also called average (AVG) detector. Take linear average for all sampling data assigned to each trace point; the 4051 signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After summing those voltage values, divide the number of sampling data points corresponding to each trace point. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those average values are trace data.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Voltage Avg] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the trace detector type is Power Average.

Examples:

:TOI:DETector SCALar

3.3.9.7 Sweep

Enable scan-related parameter setup function to pop up corresponding soft menu, including [Sweep Time Auto On/Off] and [Sweep Points].

[Sweep Time

Auto Man]

Program control commands:

[:SENSe]:TOI:SWEep:TIME <time>

[:SENSe]:TOI:SWEep:TIME?

[:SENSe]:TOI:SWEep:TIME:AUTO OFF|ON|0|1

[:SENSe]:TOI:SWEep:TIME:AUTO?

Command description: to change the sweep time of signal/spectrum analyzer. Use the number keys, step keys or knob to adjust the sweep time. If "Man" is underlined, the sweep time can be set manually. If "Auto" is underlined, the sweep time will be automatically associated according to the Res BW, frequency bandwidth and video bandwidth.

Key path: 【Sweep】, [Sweep Time Auto ON OFF] on the front panel.

Status saved: saved in the instrument status.

Factory preset: sweep time Auto.

Setting range: Min.: 1 ms, Max.: 6000 s.

Knob increment: in increasing sweep time, the knob increment is 1/10 of the most significant bit; in decreasing sweep time, the knob increment is 1/100 of the most significant bit.

Stepping key increment: 1-2-5-10 step.

Default unit: s

Examples:

:TOI:SWEep:TIME 500 ms

:TOI:SWEep:TIME:AUTO OFF

[Sweep points]

Program control commands:

[:SENSe]:TOI:SWEep:POINts <integer>

[:SENSe]:TOI:SWEep:POINts?

Command description: to set the trace points.

Key path: 【Sweep】, [Sweep Points] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1001.

Setting range: 101-30001.

Knob increment: in increase, the knob increment is 1/10 of the most significant bit; in decrease, the knob increment is 1/100 of the most significant bit.

Stepping key increment: in increase, the knob increment is 1/1 of the most significant bit; in decrease, the knob increment is 1/10 of the most significant bit.

Examples:

:TOI:SWEep:POINts 1001

:TOI:SWEep:POINts?

3.3.9.8 Single

Program control commands:

:INITiate:TOI

Command description: the 【Single】 key on the front panel has no corresponding soft menu. This function is mainly used for manual trigger of a measurment. When the Average is ON, this function performs the measurements at the count specified by the Average Num.

In remote control programming and system establishment, this function combined with *WAI can effectively synchronize the measurement process and enable the trace data obtained after the *WAI finishes directly correspond to the measurement process one by one.

Examples:

:INITiate:TOI

3.3.9.9 Continuous

Program control commands:

:INITiate:CONTinuous ON

Command description: Continuous ON is mainly used for changing the Continuous OFF into Continuous ON; if the current measurement is Continuous ON, the instrument performs no operation.

Examples:

:INITiate:CONTinuous ON

3.3.9.10 Trigger

See description of Swept SA 【Trigger】 for more details.

3.3.9.11 Display

Pop up soft menus related to display, including [Display Line ON OFF], [Bar Graph ON OFF], [Display Config>>].

[Display Line On Off]

See description of Swept SA 【Display】 [Display Line ON OFF] for more details.

[Display Config>>]

It is used for configurations of interface language, status area display ON OFF related to interface display, The soft menus include [Language 中文 English], [Graticule ON OFF], [Status Display ON OFF] and [Freq Info Disp ON OFF] See description of Swept SA 【Display】 [Display Config>>] for more details.

3.3.9.12 Input Output

See description of Swept SA 【Input/output] 】for more details.

3.3.9.13 Marker

Pop up the soft menu related to markers, including [Select Marker], [Normal], [Delta], [Fixed], [Off], [Properties], [Couple Markers On/Off], and [All Markers Off].

[Select Marker >> Marker 1]

Command description: to select among 12 different markers of the analyzer. When a certain marker is selected, the marker will be indicated in the menu where its type and attribute can be set. Select and trigger another marker and place it at the center of the current trace. Users can read amplitude and frequency

information (when the frequency span is 0 Hz, time information will be displayed) at the marker display area at the top right corner of the screen.

Key path: 【Marker】, [Select Marker >>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Marker 1.

[Normal]

Program control commands:

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE POSition

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Normal Marker.

Key path: 【Marker】, [Select Marker>>], [Normal] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:TOI:MARKer1:MODE POSition

:CALCulate:TOI:MARKer1:MODE?

[Delta]

Program control commands:

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE DELTa

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Delta Marker. Display the amplitude difference and frequency difference (or time difference, when span is zero) between two markers at the marker display area at the top right corner of the screen. If there exists a single marker, a [Delta Marker] operation will generate a Ref marker in the active marker position. Move the active marker through the knob, stepping keys or number keys. The display amplitude difference unit is dB.

Key path: 【Marker】, [Select Marker>>], [Delta] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:TOI:MARKer1:MODE DELTa

:CALCulate:TOI:MARKer1:MODE?

[Fixed]

Program control commands:

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE FIXed

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Fixed Marker. The X Axis and Y Axis positions of the fixed marker are fixed. The Fixed Marker can be used as reference marker.

Key path: 【Marker】, [Select Marker>>], [Fixed] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:TOI:MARKer1:MODE FIXed

:CALCulate:TOI:MARKer1:MODE?

[Off]

Program control commands:

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE OFF

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to turn off the selected marker.

Key path: 【Marker】, [Select Marker>>], [OFF] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:TOI:MARKer1:MODE OFF

:CALCulate:TOI:MARKer1:MODE?

[Properties>>]

Pop up the corresponding menu of currently selected marker attribute setup, including [Relative To>>], [X Axis Scale Auto Man], [Marker Trace] and [Lines On/Off].

[Relative To>>]

Program control commands:

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence <integer>

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence?

Command description: to select reference marker for current marker. It can be any one from 11 markers except the currently selected marker.

Key path: 【Marker】, [Select Marker >>], [Properties>>], [Relative To>>] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:TOI:MARKer:REFerence 2

:CALCulate:TOI:MARKer:REFerence?

[Lines>> On Off]

Program control commands:

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe] OFF|ON|0|1

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe]?

Command description: to set whether the current marker is displayed as a line on the screen, which is good for observation.

Key path: 【Marker】, [Select Marker >>], [Properties>>] and [Lines On/Off].

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:CALCulate:TOI:MARKer:LINes ON

:CALCulate:TOI:MARKer:LINes?

[Marker All Off]

Program control commands:

:CALCulate:TOI:MARKer:AOFF

Command description: to turn off all current markers which are ON and related soft keys, e.g, [Noise Marker].

Key path: 【Marker】, [More 1/2>>], [All Markers OFF] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:TOI:MARKer:AOFF

3.3.9.14 Maker->

This key has no soft menu.

3.3.9.15 Marker Function

This key has no soft menu.

3.3.9.16 Peak Search

Program control commands:

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum

Command description: the 【Peak Search】 key on the front panel is used for turning on the peak search for traces by the control instrument and turning on marker for display, including [Next Peak], [Next Pk Right], [Next Pk Left].

Examples:

:CALCulate:TOI:MARKer1:MAXimum

[Next Peak]

Program control commands:

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:NEXT

Command description: Taking the Amplitude of the point where the current marker is located, search for the next peak of current test trace.

Key path: 【Peak Search】, [Next Peak] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:TOI:MARKer:MAXimum:NEXT

[Next Pk Right]

Program control commands:

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:RIGHt

Command description: to search for the peak to the right of the current test trace marker position.

Key path: 【Peak Search】, [Next Pk Right] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:TOI:MARKer:MAXimum:RIGHt

[Next Pk Left]

Program control commands:

:CALCulate:TOI:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:LEFT

Command description: to search for the peak to the left of the current test trace marker position.

Key path: 【Peak Search】, [Next Pk Left] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:TOI:MARKer:MAXimum:LEFT

3.3.9.17 Measurement Setting

Pop up the soft menu related to measurement setting, Including [Average Num On/Off], [Average Mode Exponential Repeat], [Zero-Span Mode>>], [Low Noise Path On/Off], [Preselector Bypass], [RF Gain>>], [ADC Dither Auto Man] and [Meas Reset].

[Average Num On Off]

Program control commands:

[:SENSe]:TOI:AVERage:COUNt <integer>

[:SENSe]:TOI:AVERage:COUNt?

[:SENSe]:TOI:AVERage[:STATe] ON|OFF|1|0

[:SENSe]:TOI:AVERage[:STATe]?

Command description: to turn on or off Average. When Average Count is ON, the user can specify the average count required for measurement. The Average Count can be adjusted by number keys, stepping keys or knob.

Key path: [Measurement Setting] and [Average Num On/Off] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 100/OFF

Setting range: 1~10000

Knob increment: 1

Stepping key increment: 1.

Default unit: none

Examples:

:TOI:AVERage:COUNt 10

:TOI:AVERage:COUNt?

:TOI:AVERage ON

:TOI:AVERage?

[Average Mode Exponential Repeat]

Program control commands:

[:SENSe]:TOI:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:TOI:AVERage:TCONtrol?

Command description: when Average Count is ON, the user can select Average State required for measurement.

Exponential - Different from Linear Average, in Exponential State, the weight of new data is larger than that of old data. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases.

Repeat - Similarly, it takes exponential averaging. However, when the average count is met, clear all previous results, restart average till the set average count and repeat this process.

Key path:【Meas Setup】, [Average Mode Exponential Repeat] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Exponential

Examples:

:TOI:AVERage:TCONtrol EXP

:TOI:AVERage:TCONtrol?

[Zero-Span Mod>>]

Command description: to select zero span measurement method and set parameters for measurement.

Key path:【Meas Setup】 and [Zero-Span Mode>>] on the front panel.

[Zero-Span Meas] On Off**]**

Program control commands:

[:SENSe]:TOI:ZSPan:STATe ON|OFF|1|0

[:SENSe]:TOI:ZSPan:STATe?

Command description: to turn on or off zero span measurement method and set parameters for measurement. Users may specify Res BW and residence time required for the measurement.

Key path: 【Meas Setup】, [Zero-Span Mode>>] and [Zero-Span Meas On/Off] on the front panel.

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:TOI:ZSPan:STATe ON

:TOI:ZSPan:STATe?

[Res BW Auto Man].

Program control commands:

[:SENSe]:TOI:ZSPan:BANDwidth|BWIDth <frequency>

[:SENSe]:TOI:ZSPan:BANDwidth|BWIDth?

[:SENSe]:TOI:ZSPan:BANDwidth|BWIDth:AUTO OFF|ON|0|1

[:SENSe]:TOI:ZSPan:BANDwidth|BWIDth:AUTO?

Command description: to set Res BW state of the instrument during zero span measurement. If the Res BW is set to Auto ON, the optimal setting is determined by the instrument. When the Res BW is set as auto off, users may define the bandwidth and adjust it with number keys, stepping keys or the knob.

Key path: 【Meas Setup】, [Zero-Span Mode>>], [Res BW Auto On/Off] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 3 MHz/Auto

Setting range: 1 Hz – 20 MHz.

Knob increment: available Res BW

Stepping key increment: available Res BW

Default unit: Hz

Examples:

:TOI:ZSPan:BANDwidth 3 MHz

:TOI:ZSPan:BANDwidth?

:TOI:ZSPan:BANDwidth:AUTO OFF

:TOI:ZSPan:BANDwidth:AUTO?

[Dwell Time Auto **Man]**

Program control commands:

[:SENSe]:TOI:ZSPan:SWEep:TIME <time>

[:SENSe]:TOI:ZSPan:SWEep:TIME?

[:SENSe]:TOI:ZSPan:SWEep:TIME:AUTO OFF|ON|0|1

[:SENSe]:TOI:ZSPan:SWEep:TIME:AUTO?

Command description: to set residence time of signals during zero span measurement as auto on/off and adjust it Use number keys, stepping keys or knob to change the time.

Key path: 【Meas Setup】, [Zero-Span State>>] and [Dwell Time Auto On/Off] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 80 ms.

Setting range: 1 us – 6000 s

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: 1, 2, 5, 10…

Default unit: s

Examples:

:TOI:ZSPan:SWEep:TIME 20 ms

:TOI:ZSPan:SWEep:TIME?

:TOI:ZSPan:SWEep:TIME:AUTO ON

:TOI:ZSPan:SWEep:TIME:AUTO?

[Low Noise Path On Off]

Program control commands:

[:SENSe]:TOI:POWer:MW:PATH STD|LNPath

[:SENSe]:TOI:POWer:MW:PATH?

Command description: this command is only available after the H34 option is provided (Low Noise Preamplifier).

Key path:【Meas Setup】, [More 1/2>>], [Low Noise Path MAN] on the front panel.

Examples:

:TOI:POWer:MW:PATH STD

:TOI:POWer:MW:PATH?

[Preselector Preselecting Bypass]

Program control commands:

:INPut:TOI:FILTer:YIG[:STATe] OFF|ON|0|1

:INPut:TOI:FILTer:YIG[:STATe]?

Command description: this menu is only available after the H36 option is purchased. It is used for setting whether to bypass the front-end preselector of the signal/spectrum analyzer. In analyzing bandwidth signal, bypass is usually required.

Key path:【Meas Setup】, [More 1/2>>], [Preselector Preselecting Bypass] on the front panel.

Examples:

:INPut:TOI:FILTer:YIG OFF|ON|0|1

:INPut:TOI:FILTer:YIG?

[RF Gain>>]

Set the Auto Man of the RF Gain and best allocation algorithm for RF Gain, including [Auto], [Best for Dynamic Range] and [Best for Sensitivity].

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain] on the front panel.

[Auto]

Program control commands:

[:SENSe]:TOI:RF:GAIN:AUTO OFF|ON|0|1

[:SENSe]:TOI:RF:GAIN:AUTO?

Command description: to set the RF Gain distribution algorithm to Auto. In this case, the RF Gain distribution is "Best Dynamic Range".

Key path:【Meas Setup】, [More 1/2>>], [RF Gain>>], [Auto] on the front panel.

Examples:

:TOI:RF:GAIN:AUTO ON

:TOI:RF:GAIN:AUTO?

[Best for Dynamic Range]

Program control commands:

[:SENSe]:TOI:RF:GAIN:AUTO:RULes RANGE

[:SENSe]:TOI:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Dynamic Range. In this case, the RF Gain is switched to "Auto OFF"

Key path:【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best for Dynamic Range] on the front panel.

Examples:

:TOI:RF:GAIN:AUTO:RULes RANGE

:TOI:RF:GAIN:AUTO:RULes?

[Best for Sensitivity]

Program control commands:

[:SENSe]:TOI:RF:GAIN:AUTO:RULes SENSITIVITY

[:SENSe]:TOI:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Sensitivity. In this case, the RF Gain is switched to "Auto OFF"

Key path:【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best for Sensibility] on the front panel.

Examples:

:TOI:RF:GAIN:AUTO:RULes SENSITIVITY

:TOI:RF:GAIN:AUTO:RULes?

[ADC Dither Auto Man]

Program control commands:

[:SENSe]:TOI:ADC:DITHer[:STATe] OFF|ON|HIGH

[:SENSe]:TOI:ADC:DITHer[:STATe]?

[:SENSe]:TOI:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:TOI:ADC:DITHer:AUTO[:STATe]?

Command description: to control opening/closing of ADC dither of the frequency acquisition circuit in the analyzer. Under default mode, the signal/spectrum analyzer will automatically control whether the ADC Dither is ON based on current working condition. When the ADC Dither is under Auto mode, the ON or OFF status depends on the span, Res BW and sweep type (continuous swept or step sweep); when it is continuous swept, the ADC Dither status will force to switch to Auto and turns off; when it is step sweep, under Auto mode, if the span is 2 MHz or below, the ADC Dither is ON; if the span is below 2 MHz, the ADC Dither is OFF. Under Auto OFF mode, if the span is above 2 MHz, turning on the ADC Dither may affect the measurement results based on selected dither status. You can access the submenu for manual control.

Key path: 【Meas Setup】, [More 1/2>>], [ADC Dither Auto Man] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto.

Examples:

:TOI:ADC:DITHer ON

:TOI:ADC:DITHer?

:TOI:ADC:DITHer:AUTO ON

:TOI:ADC:DITHer:AUTO?

[Meas Preset]

Program control commands:

:CONFigure:TOI

Command description: to reset the measurement parameters to the factory preset status or user saved parameter status

Key path:【Meas Setup】 on the front panel.

Factory preset: factory reset.

Examples:

:CONFigure:TOI

3.3.9.18 Measurement Control

Pop up the More related to Meas Control, including [Meas Single Cont], [Restart] and [Pause].

[Measure MANSingle Cont]

Program control commands:

:INITiate:CONTinuous OFF|ON|0|1

:INITiate:CONTinuous?

Command description: to set continuous measurement OFF or ON.

Key path:【Meas Control】, [Meas Single Cont ON OFF] on the front panel.

Examples:

:INIT:CONT OFF

[Restart]

Program control commands:

:INITiate:REST

Command description: to stop current measurement and restart measurement for the signal/spectrum analyzer.

Key path:【Meas Control】, [Restart] on the front panel

Examples:

:INITiate:REST

[Pause]

Program control commands:

:INITiate:PAUS

:INITiate:RES

Command description: when the signal/spectrum analyzer is in operation, this command is used for pausing current measurement; when in Paused status, this command is used for continuing measurement.

Key path:【Meas Control】, [Pause] on the front panel.

Examples:

:INITiate:PAUS

:INITiate:RES

3.3.10 Spurious emission

Spurious emission measurement identifies and defines the power level of spurious emission within certain bandwidth and is mainly used to measure spurious signals, harmonic and intermodulation. Such measurement can be accessed via the following commands to obtain measurement results:

Program control commands:

:CONFigure:SPURious

:FETCh:SPURious[n]?

:MEASure:SPURious[n]?

:READ:SPURious[n]?

When n = 1, return all spurious information as follows:

Number of stray,

（Each stray information is returned in the following format and sequence）

Spurious No.

Spurious scope No.

Spurious frequency (Hz)

Spurious amplitude (dBm)

Amplitude of absolute limit (dBm)

Limit result (1 or 0)

When n = 2~21, return trace data within the range list n-1; if the range is off, return each value of trace data as SCPI_NAN = 9.91E37.

When n = 22, return total spurious number

3.3.10.1 Frequency

This key has no soft menu.

3.3.10.2 Amplitude/Y Axis

Amplitude/Y Axis parameter settings include [Ref Level], [Attenuation>>], [Preamplifier On/Off], [Scale/Div], [Auto Scale], [More1/2>>], [Y Axis Unit] and [Ref Level Offset].

[RefLevel]

Program control commands:

:DISPlay:SPURious:VIEW:WINDow:TRACe:Y:RLEVel <real>

:DISPlay:SPURious:VIEW:WINDow:TRACe:Y:RLEVel?

Command description: to set the reference level. Measure signal at reference level position to get highest accuracy. The input attenuator of the signal/spectrum analyzer is coupled to the reference level, which can be automatically changed to avoid compression of input signal.

Key path: 【Amplitude/Y Axis】, [Ref Level] on the front panel.

Setting range: Min.: -170 dBm, Max.: 30 dBm.

Default unit: set based on Y Axis scale unit.

Examples:

:DISPlay:SPURious:VIEW:WINDow:TRACe:Y:RLEVel20 dBm

[Attenuation>>]

Adjust the attenuation of the signal/spectrum analyzer. The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Preamplifier ON OFF]

Program control commands:

[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1

[:SENSe]:POWer[:RF]:GAIN[:STATe]?

The commands are same as the Swept SA. See description of Swept SA 【Amplitude/Y Axis】 [Pre-amplifier MAN] for more details.

Examples:

:POW:GAIN OFF

:POW:GAIN?

3.3 Instrument Commands

[Scale/Div]

Program control commands:

:DISPlay:SPURious:VIEW:WINDow:TRACe:Y:PDIVision <rel_ampl>

:DISPlay:SPURious:VIEW:WINDow:TRACe:Y:PDIVision?

Command description: to select the scale/division from 0.1 dB/division to 20 dB/division. This menu is only valid when the scale type is logarithm.

Key path:【Amplitude/Y Axis】, [Scale/Div] on the front panel.

Setting range: Min.: 0.1 dB, Max.: 20 dBm.

Examples:

:DISPlay:SPURious:VIEW:WINDow:TRACe:Y:PDIVision 10

:DISPlay:SPURious:VIEW:WINDow:TRACe:Y:PDIVision?

[Y Axis Unit]

Program control commands:

:UNIT:SPURious:POWer DBM|DBMV|DBMA|V|W|A|DBUV|DBUA

:UNIT:SPURious:POWer?

Command description: to select the Y Axis unit from [dBm], [dBmV], [dBmA], [W], [V], [A], [dBμV] and [dBμA]. The instrument will automatically calculate the trace data and marker readout based on the Y axis scale unit.

Key path:【Amplitude/Y Axis】, [More 1/2>>], [Y Axis Unit] on the front panel.

Examples:

:UNIT:SPURious:POWer DBM

:UNIT:SPURious:POWer?

[Ref Level Offset]

Program control commands:

:DISPlay:SPURious:WINDow:TRACe:Y:RLEVel:OFFSet <rel_ampl>

:DISPlay:SPURious:WINDow:TRACe:Y:RLEVel:OFFSet?

Command description: to introduce offset for all amplitude readout (e.g, reference level and marker amplitude). It will not change the trace position on the screen. This offset unit is dB and is not affected by the scale and unit.

Key path:【Amplitude/Y Axis】, [More 1/2>>], [Ref Level Offset] on the front panel.

Setting range: Min.: -1000 dB, Max.:1000 dB.

Examples:

:DISPlay:SPURious:WINDow:TRACe:Y:RLEVel:OFFSet 12

3.3.10.3 Span/X Axis

This key has no soft menu.

3.3.10.4 Bandwidth

This key has no soft menu.

3.3.10.5 Auto Setting

Pop up the soft menu related to auto setting , including [Couple All].

[Couple All]

Program control commands:

:COUPle ALL

Command description: to set the Res BW, video bandwidth, sweep time, mechanical attenuator and frequency step as auto coupling mode. The signal/spectrum analyzer will select most suitable values for those functions based on set frequency and bandwidth (or start frequency and stop frequency). If no ratio is pre-saved, use default ratio.

Key path: 【Auto Set】, [Couple All] on the front panel.

Status saved: not saved in instrument status.

Factory preset: Couple All.

Examples:

:COUPle ALL

3.3.10.6 Trace

This key has no soft menu.

3.3.10.7 Sweep

Enable sweep-related parameter setup function to pop up [Sweep Setup>>].

[Sweep Setup>>]

Pop up the soft menu related to Sweep type, including [Sweep Type Auto Man], [Swp Type Rules Auto Man] and [FFT Width Auto Man].

[Sweep Type>> Auto Man]

Program control commands:

[:SENSe]:SPURious:SWEep:TYPE FFT|SWEep

[:SENSe]:SPURious:SWEep:TYPE?

[:SENSe]:SPURious:SWEep:TYPE:AUTO OFF|ON|0|1

[:SENSe]:SPURious:SWEep:TYPE:AUTO?

Command description: to set sweep type. to determine whether Swept or FFT is adopted for frequency spectrum measurement. Also set the FFT step bandwidth for FFT sweep The soft More include [Auto], [Swept] and [FFT]. When under Auto ON mode, the signal/spectrum analyzer will automatically select the sweep type based on sweep type rules.

Key path:【Sweep】, [Sweep Setup>>] and [Sweep Type Auto/Man] on the front panel.

Status saved: saved in the instrument status.

Factory preset: sweep type: Auto.

Examples:

:SPURious:SWEep:TYPE FFT

:SPURious:SWEep:TYPE?

:SPURious:SWEep:TYPE:AUTO ON

:SPURious:SWEep:TYPE:AUTO?

[Sweep Type Rules Auto Man]

Program control commands:

[:SENSe]:SPURious:SWEep:TYPE:AUTO:RULes SPEed|DRANge

[:SENSe]:SPURious:SWEep:TYPE:AUTO:RULes?

[:SENSe]:SPURious:SWEep:TYPE:AUTO:RULes:AUTO OFF|ON|0|1

[:SENSe]:SPURious:SWEep:TYPE:AUTO:RULes:AUTO?

Command description: to set rules for auto sweep type. While the sweep type rules include “Best Dynamic Range” and “ Best Speed”.

“Best Dynamic Range” rules: when RBW is or larger than 1 kHz, the sweep type is Swept; when RBW is less than 1 kHz, the sweep type is FFT.

“Best Speed” rules: when RBW is or larger than 30 kHz, the sweep type is Swept; when RBW is less than 30 kHz, the sweep type is FFT.

Key path:【Sweep】, [Sweep Setup>>] and [Sweep Type Rules Auto/Man] on the front panel.

Status saved: saved in the instrument status.

Factory preset: the sweep type rules are automatically set as “Best Dynamic Range”.

Examples:

:SPURious:SWEep:TYPE:AUTO:RULes SPEed

:SPURious:SWEep:TYPE:AUTO:RULes?

:SPURious:SWEep:TYPE:AUTO:RULes:AUTO ON

:SPURious:SWEep:TYPE:AUTO:RULes:AUTO?

[FFT Width Auto Man]

Program control commands:

[:SENSe]:SPURious:SWEep:FFT:WIDTh <real>

[:SENSe]:SPURious:SWEep:FFT:WIDTh?

[:SENSe]:SPURious:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1

[:SENSe]:SPURious:SWEep:FFT:WIDTh:AUTO?

Command description: to set FFT Width. The FFT width includes [Auto], [<100 kHz], [<3 MHz], [<13 MHz], [<=Max.]. FFT width is only active when the FFT sweep type is selected. Under Auto type, when the signal/spectrum analyzer performs FFT spectrum measurement, the maximum Res BW is 30 kHz. To guarantee best dynamic measurement range, the signal/spectrum analyzer automatically optimizes the FFT width within 100 kHz. The larger is the FFT width, the faster is FFT spectrum measurement, but the dynamic range performance will be affected.

Under FFT sweep, the FFT width setup limits the maximum value for center frequency step of each tune. For example, if [<100 Hz] is selected, the maximum value for center freq step of each tune is 100 Hz. As the FFT width gets larger, the count of instrument center frequencies get smaller when performing measurement of same frequency scope, and the response measurement gets faster. Therefore, to improve measurement speed, you can manually change the FFT width.

Key path: 【Sweep】, [Sweep Setup>>], [FFT Width>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: FFT Width is set as Auto.

Examples:

:SPURious:SWEep:FFT:WIDTh 1

:SPURious:SWEep:FFT:WIDTh?

:SPURious:SWEep:FFT:WIDTh:AUTO OFF

:SPURious:SWEep:FFT:WIDTh:AUTO?

3.3.10.8 Single

Program control commands:

:INITiate:SPURious

Command description: the 【Single】 key on the front panel has no corresponding soft menu. This function is mainly used for manual trigger of a measurment. When the Average is ON, this function performs the measurements at the count specified by the Average Num.

In remote control programming and system establishment, this function combined with *WAI can effectively synchronize the measurement process and enable the trace data obtained after the *WAI finishes directly correspond to the measurement process one by one.

Examples:

:INITiate:SPURious

3.3.10.9 Continuous

Program control commands:

:INITiate:CONTinuous ON

Command description: Continuous ON is mainly used for changing the Continuous OFF into Continuous ON; if the current measurement is Continuous ON, the instrument performs no operation.

Examples:

:INITiate:CONTinuous ON

3.3.10.10 Trigger

See description of Swept SA 【Trigger】 for more details.

3.3.10.11 Display

Pop up soft menus related to display, including [Display Line ON OFF], [Bar Graph ON OFF], [Display Config>>].

[Display Line On Off]

See description of Swept SA 【Display】 [Display Line ON OFF] for more details.

[Display Config>>]

It is used for configurations of interface language, status area display ON OFF related to interface display, The soft menus include [Language 中文 English], [Graticule ON OFF], [Status Display ON OFF] and [Freq Info Disp ON OFF] See description of Swept SA 【Display】 [Display Config>>] for more details.

3.3.10.12 Input Output

See description of Swept SA 【Input/output] 】for more details.

3.3.10.13 Marker

Pop up the soft menu related to markers, including [Select Marker], [Normal], [Delta], [Fixed], [Off], [Properties], [Couple Markers On/Off], and [All Markers Off].

[Select Marker>> Marker 1]

Command description: to select among 12 different markers of the analyzer. When a certain marker is selected, the marker will be indicated in the menu where its type and attribute can be set. Select and trigger another marker and place it at the center of the current trace. Users can read amplitude and frequency information (when the frequency span is 0 Hz, time information will be displayed) at the marker display area at the top right corner of the screen.

Key path:【Marker】, [Select Marker>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Marker 1.

[Normal]

Program control commands:

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE POSition

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Normal Marker.

Key path: 【Marker】, [Select Marker>>], [Normal] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:SPURious:MARKer1:MODE POSition

:CALCulate:SPURious:MARKer1:MODE POSition

[Delta]

Program control commands:

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE DELTa

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Delta Marker. Display the amplitude difference and frequency difference (or time difference, when span is zero) between two markers at the marker display area at the top right corner of the screen. If there exists a single marker, a [Delta Marker] operation will generate a Ref marker in the active marker position. Move the active marker through the knob, stepping keys or number keys. The display amplitude difference unit is dB.

Key path: 【Marker】, [Select Marker>>], [Delta Marker] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:SPURious:MARKer1:MODE DELTa

:CALCulate:SPURious:MARKer1:MODE POSition

[Fixed]

Program control commands:

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE FIXed

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Fixed Marker. The X Axis and Y Axis positions of the fixed marker are fixed. The Fixed Marker can be used as reference marker.

Key path: 【Marker】, [Select Marker>>], [Fixed] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:SPURious:MARKer1:MODE FIXed

:CALCulate:SPURious:MARKer1:MODE POSition

[Marker Off]

Program control commands:

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE OFF

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to turn off the selected marker.

Key path:【Marker】, [Select Marker>>], [Marker OFF] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:SPURious:MARKer1:MODE OFF

:CALCulate:SPURious:MARKer1:MODE POSition

[Properties>>]

Pop up the corresponding menu of currently selected marker attribute setup, including [Ref Marker>>], [X Axis Scale Auto Man], [Marker Trace] and [Marker Display Line On/Off].

3.3 Instrument Commands

[Relative To>>]

Program control commands:

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence <integer>

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:REFerence?

Command description: to select reference marker for current marker. It can be any one from 11 markers except the currently selected marker.

Key path: 【Marker】, [Select Marker>>], [Properties>>], [Relative To>>] on the front panel.

Status saved: saved in the instrument status.

Examples:

:CALCulate:SPURious:MARKer:REFerence 2

:CALCulate:SPURious:MARKer:REFerence?

[Marker Display Line>> On Off]

Program control commands:

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe] OFF|ON|0|1

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:LINes[:STATe]?

Command description: to set whether the current marker is displayed as a line on the screen, which is good for observation.

Key path: 【Marker】, [Select Marker>>], [Properties>>] and [Lines On/Off].

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:CALCulate:SPURious:MARKer:LINes OFF

:CALCulate:SPURious:MARKer:LINes?

[Couple Markers On Off]

Program control commands:

:CALCulate:SPURious:MARKer:COUPle[:STATe] ON|OFF|1|0

:CALCulate:SPURious:MARKer:COUPle[:STATe]?

Command description: to turn on or off Marker Couple. When it is ON, moving any marker horizontal axis position will cause an equal movement of horizontal axis position of every other marker which is ON. When the marker is moved to less than Start Frequency or larger than Stop Frequency, the marker is limited to the value of the Start Frequency or the Stop Frequency; when the span is zero, the minimum value is limited as 0, and the maximum value is limited as the Sweep Time.

Key path: 【Marker】, [More 1/2>>], [Marker Couple ON OFF] on the front panel.

Status saved: saved in the instrument status.

Factory preset: OFF.

Examples:

:CALCulate:SPURious:MARKer:COUPle ON

:CALCulate:SPURious:MARKer:COUPle?

[Marker All Off]

Program control commands:

:CALCulate:SPURious:MARKer:AOFF

Command description: to turn off all current markers which are ON and related soft keys, e.g, [Noise Marker].

Key path: 【Marker】, [More 1/2>>], [All Markers OFF] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:SPURious:MARKer:AOFF

3.3.10.14 Maker->

This key has no soft menu.

3.3.10.15 Marker Function

This key has no soft menu.

3.3.10.16 Peak Search

Program control commands:

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum

Command description: the 【Peak Search】 key on the front panel is used for turning on the peak search for traces by the control instrument and turning on marker for display, including [Next Pk], [Next Pk Right], [Next Pk Left].

Examples:

:CALCulate:SPURious:MARKer:MAXimum

[Next Peak]

Program control commands:

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:NEXT

Command description: Taking the Amplitude of the point where the current marker is located, search for the next peak of current test trace.

Key path:【Peak Search】, [Next Peak] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:SPURious:MARKer:MAXimum:NEXT

[Next Pk Right]

Program control commands:

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:RIGHt

Command description: to search for the peak to the right of the current test trace marker position.

Key path: 【Peak Search】, [Next Pk Right] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:SPURious:MARKer:MAXimum:RIGHt

[Next Pk Left]

Program control commands:

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MAXimum:LEFT

Command description: to search for the peak to the left of the current test trace marker position.

Key path:【Peak Search】, [Next Pk Left] on the front panel.

Status saved: not saved in instrument status.

Examples:

:CALCulate:SPURious:MARKer:MAXimum:LEFT

[Min Search]

Program control commands:

:CALCulate:SPURious:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MINimum

Command description: to turn on the Min Search.

Key path:【Peak Search】, [Min Search] on the front panel.

Examples:

:CALCulate:SPURious:MARKer:MINimum

3.3.10.17 Measurement Setting

Pop up the soft menu related to measurement setting, Including [Average Num On/Off], [Average Mode Exponential Repeat], [Range Table>>], [Report Mode], [Low Noise Path On/Off], [Preselector Bypass], [RF Gain>>], [ADC Dither Auto Man] and [Meas Reset].

[Average Num On Off]

Program control commands:

[:SENSe]:SPURious:AVERage:COUNt <integer>

[:SENSe]:SPURious:AVERage:COUNt?

[:SENSe]:SPURious:AVERage

[:STATe] ON|OFF|1|0 [:SENSe]:SPURious:AVERage[:STATe]?

Command description: to turn on or off Average. When Average Count is ON, the user can specify the average count required for measurement. The Average Count can be adjusted by number keys, stepping keys or knob.

Key path: 【Meas Setup】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: 100/OFF

Setting range: 1~10000

Knob increment: 1

Stepping key increment: 1.

Default unit: none

Examples:

:SPURious:AVERage:COUNt 10

:SPURious:AVERage:COUNt?

:SPURious:AVERage ON

:SPURious:AVERage?

[Average Mode Exponential Repeat]

Program control commands:

[:SENSe]:SPURious:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:SPURious:AVERage:TCONtrol?

Command description:when Average Count is ON, the user can select Average State required for measurement.

Exponential - Different from Linear Average, in Exponential State, the weight of new data is larger than that of old data. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases. This is good for tracking data change in terms of time. In this case, the selected averaging count determines the weight of the old data on the new data. As the average count increases, the weight of new data gradually decreases.

Repeat - Similarly, it takes exponential averaging. However, when the average count is met, clear all previous results, restart average till the set average count and repeat this process.

Key path: 【Meas Setup】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: Exponential

Examples:

:SPURious:AVERage:TCONtrol EXP

:SPURious:AVERage:TCONtrol?

[Range Table>>]

Command description: to configure parameters for 20 range lists and switch them to continuous sweep mode. The instrument will set current parameter state of Range 1 (on or off). If certain current range is off, parameters in such range list will be replaced with "----", representing non-active state of the current range.

Key path:【Meas Setup】 on the front panel.

Status saved: saved in the instrument status.

[Range On Off]

Program control commands:

[:SENSe]:SPURious[:RANGe][:LIST]:STATe ON|OFF|1|0,...

[:SENSe]:SPURious[:RANGe][:LIST]:STATe?

Command description: to configure parameters of the Range List. When the range is off, it will be used as part of the measurement, otherwise such range will not be measured. The range can be adjusted via number keys, stepping keys or the knob.

Key path:【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1/OFF

Setting range: 1~20

Knob increment: 1

Stepping key increment: 1

Default unit: none

Examples:

:SPURious:STATe

ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON

:SPURious:STATe?

[Freq Start]

Program control commands:

[:SENSe]:SPURious[:RANGe][:LIST]:FREQuency:STARt <freq>,...

[:SENSe]:SPURious[:RANGe][:LIST]:FREQuency:STARt?

Command description: to set start frequency of the current range. Users may use number keys, stepping keys and the knob to set it.

Key path: 【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1.92 GHz

Setting range: -1.0E+8~, set the maximum frequency of the instrument.

Knob increment: frequency step

Stepping key increment: frequency span/200

Default unit: Hz

Examples:

:SPURious:FREQuency:STARt

9 kHz, 150 kHz, 30 MHz, 1 GHz, 1.5 GHz, 1.5 GHz, 1.5 GHz, 1.5 GHz, 1.5GHz, 1.5GHz, 1.5GHz, 1.5 GHz, 1.5 GHz, 1.5 GHz, 1.5 GHz, 1.5 GHz, 1.5 GHz, 1.5 GHz, 1.5 GHz, 1.5 GHz

:SPURious:FREQuency:STARt?

[Stop Freq]

Program control commands:

[:SENSe]:SPURious[:RANGe][:LIST]:FREQuency:STOP <freq>,...

[:SENSe]:SPURious[:RANGe][:LIST]:FREQuency:STOP?

Command description: to set stop frequency of the current range. Users may use number keys, stepping keys and the knob to set it.

Key path: 【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1.98 GHz

Setting range: -1.0E+8~, set the maximum frequency of the instrument.

Knob increment: frequency step

Stepping key increment: frequency span/200

Default unit: Hz

Examples:

:SPURious:FREQuency:STOP

150 kHz, 30 MHz, 1 GHz, 2.1 GHz, 2.1 GHz, 2.1774 GHz, 2.18 GHz, 12.75 GHz, 2.5GHz, 2.5 GHz, 2.5 GHz, 2.5 GHz, 2.5 GHz, 2.5 GHz, 2.5 GHz, 2.5 GHz, 2.5 GHz, 2.5 GHz, 2.5 GHz, 2.5 GHz

:SPURious:FREQuency:STOP?

[Res BW Auto Man]

Program control commands:

[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth[:RESolution] <freq>,...

[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth[:RESolution]?

[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth[:RESolution]:AUTO OFF|ON|0|1,...

[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth[:RESolution]:AUTO?

Command description: to set Res BW state of the instrument during zero span measurement. If the Res BW is set to Auto ON, the optimal setting is determined by the instrument. When the Res BW is set as auto off, users may define the bandwidth and adjust it with number keys, stepping keys or the knob.

Key path:【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 3 MHz/Auto

Setting range: 1 Hz – 20 MHz.

Knob increment: available Res BW

Stepping key increment: available Res BW

Default unit: Hz

Examples:

:SPURious:BANDwidth

2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz,2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz

:SPURious:BANDwidth?

:SPURious:BANDwidth:AUTO
ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON, ON

:SPURious:BANDwidth:AUTO?

[Video BW Auto Man]

Program control commands:

[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth:VIDeo <freq>,...

[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth:VIDeo?

[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth:VIDeo:AUTO OFF|ON|0|1,...

[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth:VIDeo:AUTO?

Command description: to set video bandwidth state of the instrument during zero span measurement. If the video bandwidth is set to Auto ON, the optimal setting is determined by the instrument. If the video bandwidth is set to Auto OFF, users may define the bandwidth and adjust it with number keys, stepping keys or the knob. and adjust it with number keys, stepping keys or the knob.

Key path:【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 3 MHz/Auto

Setting range: 1 Mz – 20 MHz.

Knob increment: available video bandwidth

Stepping key increment: available video bandwidth

Default unit: Hz

Examples:

:SPURious:BANDwidth:VIDeo

2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz, 2 MHz

:SPURious:BANDwidth:VIDeo?

:SPURious:BANDwidth:VIDeo:AUTO

ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON

:SPURious:BANDwidth:VIDeo:AUTO?

[Filter Type>>]

Program control commands:

[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth:SHAPe GAUSsian|FLATtop,...

[:SENSe]:SPURious[:RANGe][:LIST]:BANDwidth:SHAPe?

Command description: to set filter type of Res BW measurement.

Key path: 【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Gaussian

[Gaussian]

Command description: to select the Bandwidth Filter Type as Gaussian.

Key path: 【Meas Setup】 [Range Table>>] on the front panel.

Examples:

:SPURious:BANDwidth:SHAPe
GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS,GAUS

:SPURious:BANDwidth:SHAPe?

[Flattop]

Command description: to select the Bandwidth Filter Type as Top Flat.

Key path: 【Meas Setup】 [Range Table>>] on the front panel.

Examples:

:SPURious:BANDwidth:SHAPe
FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT,FLAT

:SPURious:BANDwidth:SHAPe?

[Abs Start Limit]

Program control commands:

:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPer]:DATA[:STARt] <ampl>,...

:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPer]:DATA[:STARt]?

Command description: to set limit start value and the same stop value. Spurious information above the limit value will be recorded in the result report based on currently set peak offset and peak threshold. If measured spurious amplitude is above the start limit value, such amplitude will be added with a red F in the end. Users may use number keys, stepping keys or the knob to set the limit.

Key path: 【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: -50 dBm

Setting range: -200 dBm – 50 dBm

Knob increment: 1

Stepping key increment: 10

Default unit: dBm.

Examples:

:CALCulate:SPURious:LIMit:ABSolute:DATA

-50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50

:CALCulate:SPURious:LIMit:ABSolute:DATA?

[Abs Stop Limit Auto Man]

3.3 Instrument Commands

Program control commands:

:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPer]:DATA:STOP <ampl>,...

:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPer]:DATA:STOP?

:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPer]:DATA:STOP:AUTO OFF|ON|0|1,...

:CALCulate:SPURious[:RANGe][:LIST]:LIMit:ABSolute[:UPPer]:DATA:STOP:AUTO?

Command description: to set limit stop value. Spurious information above the limit value will be recorded in the result report based on currently set peak offset and peak threshold. If measured spurious amplitude is above the start limit value, such amplitude will be added with a red F in the end. Under auto mode, the instrument will automatically couple a value same with the set start value; while under auto off mode, users may use number keys, stepping keys or the knob to set the limit.

Key path: 【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset:-50 dBm

Setting range:-200 dBm – 50 dBm

Knob increment: 1

Stepping key increment: 10

Default unit: dBm.

Examples:

:CALCulate:SPURious:LIMit:ABSolute:DATA:STOP

-50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50, -50

:CALCulate:SPURious:LIMit:ABSolute:DATA:STOP?

:CALCulate:SPURious:LIMit:ABSolute:DATA:STOP:AUTO

ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON

:CALCulate:SPURious:LIMit:ABSolute:DATA:STOP:AUTO?

[Peak Definition]

Program control commands:

[:SENSe]:SPURious[:RANGe][:LIST]:PEAK:EXCursion <rel_ampl>,...

[:SENSe]:SPURious[:RANGe][:LIST]:PEAK:EXCursion?

Command description: to set the minimum amplitude change of the signal at peak point. For example, if the peak excursion is 6 dB, it means that points more than 6 dB higher or lower than the peak threshold will be considered as peak points. Users may use number keys, stepping keys or the knob to set.

Key path: 【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset:6 dB.

Setting range: 0.0 dB - 100.0 dB

Knob increment: 0.1

Stepping key increment: 10

Default unit: dB.

Examples:

:SPURious:PEAK:EXCursion

3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0, 3.0

:SPURious:PEAK:EXCursion?

[Pk Threshold]

Program control commands:

[:SENSe]:SPURious[:RANGe][:LIST]:PEAK:THReshold <real>,...

[:SENSe]:SPURious[:RANGe][:LIST]:PEAK:THReshold?

Command description: to set the minimum amplitude value of the signal at peak point. For example, if the peak threshold is -90 dBm, only points meeting the peak excursion and with an amplitude more than -90 dBm will be considered as peak points. Users may use number keys, stepping keys or the knob to set.

Key path: 【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset:6 dB.

Setting range: -200.0 dBm ~ reference level

Knob increment: 0.1

Stepping key increment: 10

Default unit: dBm.

Examples:

:SPURious:PEAK:THReshold

-90, -90, -90, -90, -90, -90, -90, -90, -90, -90, -90, -90, -90, -90, -90, -90, -90, -90, -90, -90

:SPURious:PEAK:THReshold?

[Input Attenuation Auto Man]

Program control commands:

[:SENSe]:SPURious[:RANGe][:LIST]:ATTenuation <rel_ampl>,...

[:SENSe]:SPURious[:RANGe][:LIST]:ATTenuation?

[:SENSe]:SPURious[:RANGe][:LIST]:ATTenuation:AUTO OFF|ON|0|1,...

[:SENSe]:SPURious[:RANGe][:LIST]:ATTenuation:AUTO?

Command description: to adjust decrement of the input attenuator via number keys, stepping keys or the knob. The decrement ranges from 0~70 dB and increases and decreases at a rate of 10 dB (or 2 dB if set as 2 dB). Users may use number keys, stepping keys or the knob to set.

Key path:【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 10 dB/auto

Setting range: 0 dB – 70 dB

Knob increment: 2

Stepping key increment: 2

Default unit: dB.

Examples:

:SPURious:ATTenuation 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10

:SPURious:ATTenuation?

:SPURious:ATTenuation:AUTO

ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON

:SPURious:ATTenuation:AUTO?

[Detector]

Program control commands:

[:SENSe]:SPURious[:RANGe][:LIST]:DETector[:FUNCtion]

AVERage|NEGative|NORMal|POSitive|SAMPle

[:SENSe]:SPURious[:RANGe][:LIST]:DETector[:FUNCtion]?

Command description: to set detector mode, including standard, positive and negative peak, sample, average modes.

Key path:【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: positive peak mode

Examples:

:SPURious:DETector

POS,POS,POS,POS,POS,POS,POS,POS,POS,POS,POS,POS,POS,POS,POS,POS,POS,POS, POS,POS

:SPURious:DETector?

[Sweep Time Auto Man]

Program control commands:

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME <time>,...

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME?

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME:AUTO OFF|ON|0|1,...

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:TIME:AUTO?

Command description: to set the Sweep Time of current sweep block as Auto ON or OFF. Use number keys, stepping keys or knob to change the time.

Key path: 【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 5 ms/Auto

Setting range: 1 ms ~ 6000 s

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: 1, 2, 5, 10…

Default unit: s

Examples:

:SPURious:SWEep:TIME

5 ms, 5 ms

:SPURious:SWEep:TIME?

:SPURious:SWEep:TIME:AUTO

ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON

:SPURious:SWEep:TIME:AUTO?

[Sweep points Auto Man]

Program control commands:

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:POINts <integer>,...

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:POINts?

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:POINts:AUTO OFF|ON|0|1,...

[:SENSe]:SPURious[:RANGe][:LIST]:SWEep:POINts:AUTO?

Command description: to set sweep points for one measurement at the current sweep block as auto on/off and adjust it with number keys, stepping keys or the knob.

Key path:【Meas Setup】 [Range Table>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1001/Auto

Setting range: 101~30001

Knob increment: 1/10 of maximum order of magnitudes.

Stepping key increment: most significant bit

Default unit: none

Examples:

:SPURious:SWEep:POINts

1001, 1001

:SPURious:SWEep:POINts?

:SPURious:SWEep:POINts:AUTO

ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON

:SPURious:SWEep:POINts:AUTO?

[Spur]

Program control commands: [:SENSe]:SPURious:SPUR <integer> [:SENSe]:SPURious:SPUR?

Menu description: to view spurious signals searched. When selected spurious is changed, the instrument state is set as the parameter state within the range of relevant spurious signal. Number keys, stepping keys or the knob can be used to adjust it.

3.3 Instrument Commands

Key path: 【Meas Setup】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: 1

Setting range: 1~200

Knob increment: 1

Stepping key increment: 1

Default unit: none

Examples:

:SPURious:SPUR 1

:SPURious:SPUR?

[Report Mode>>]

Program control commands:

[:SENSe]:SPURious:REPT:MODE ALL|LIMTest

[:SENSe]:SPURious:REPT:MODE?

Command description: to select the display mode of spurious information in measured data report, including display all and display spurious information beyond the set limit.

Key path: 【Meas Setup】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: display all

Examples:

:SPURious:REPT:MODE ALL

:SPURious:REPT:MODE?

[All Spurs]

Program control commands:

[:SENSe]:SPURious:REPT:MODE ALL

Command description: to select the display mode of spurious information of measured data report as display all.

Key path: 【Meas Setup】 on the front panel.

Examples:

:SPURious:REPT:MODE ALL

[Limit Test Spurs]

Program control commands:

[:SENSe]:SPURious:REPT:MODE LIMTest

Command description: to select the display mode of spurious information of measured data report as display spurious information beyond the set limit.

Key path:【Meas Setup】 on the front panel.

Examples:

:SPURious:REPT:MODE LIMTest

[Low Noise Path On Off]

Program control commands:

[:SENSe]:SPURious:POWer:MW:PATH STD|LNPath

[:SENSe]:SPURious:POWer:MW:PATH?

Command description: this command is only available after the H34 option is provided (Low Noise Preamplifier).

Key path: 【Meas Setup】, [More 1/2>>], [Low Noise Path ON OFF] on the front panel.

Examples:

:SPURious:POWer:MW:PATH STD

:SPURious:POWer:MW:PATH?

[Preselector Preselecting Bypass]

Program control commands:

:INPut:SPURious:FILTer:YIG[:STATe] OFF|ON|0|1

:INPut:SPURious:FILTer:YIG[:STATe]?

Command description: this menu is only available after the H36 option is purchased. It is used for setting whether to bypass the front-end preselector of the signal/spectrum analyzer. In analyzing bandwidth signal, bypass is usually required.

Key path: 【Meas Setup】, [More 1/2>>], [Preselector Preselecting Bypass] on the front panel.

Examples:

:INPut:SPURious:FILTer:YIG OFF

:INPut:SPURious:FILTer:YIG?

[RF Gain>>]

Set the MANAuto Man of the RF Gain and best allocation algorithm for RF Gain, including [Auto], [Best Dynamic Range] and [Best for Sensitivity].

Key path:【Meas Setup】, [More 1/2>>], [RF Gain] on the front panel.

[Auto]

Program control commands:

[:SENSe]:SPURious:RF:GAIN:AUTO OFF|ON|0|1

[:SENSe]:SPURious:RF:GAIN:AUTO?

Command description: to set the RF Gain distribution algorithm to Auto. In this case, the RF Gain distribution is “Best Dynamic Range”.

3.3 Instrument Commands

Key path:【Meas Setup】, [More 1/2>>], [RF Gain>>], [Auto] on the front panel.

Examples:

:SPURious:RF:GAIN:AUTO ON

:SPURious:RF:GAIN:AUTO?

[Best for Dynamic Range]

Program control commands:

[:SENSe]:SPURious:RF:GAIN:AUTO:RULes RANGE

[:SENSe]:SPURious:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Dynamic Range. In this case, the RF Gain is switched to "Auto OFF"

Key path: 【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best For Dynamic Range] on the front panel.

Examples:

:SPURious:RF:GAIN:AUTO:RULes RANGE

:SPURious:RF:GAIN:AUTO:RULes?

[Best for Sensitivity]

Program control commands:

[:SENSe]:SPURious:RF:GAIN:AUTO:RULes SENSITIVITY

[:SENSe]:SPURious:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Sensitivity. In this case, the RF Gain is switched to "Auto OFF"

Key path:【Meas Setup】, [More 1/2>>], [RF Gain>>], [Best for Sensibility] on the front panel.

Examples:

:SPURious:RF:GAIN:AUTO:RULes SENSITIVITY

:SPURious:RF:GAIN:AUTO:RULes?

[ADC Dither Auto Man]

Program control commands:

[:SENSe]:SPURious:ADC:DITHer[:STATe]

[:SENSe]:SPURious:ADC:DITHer[:STATe]?

[:SENSe]:SPURious:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:SPURious:ADC:DITHer:AUTO[:STATe]?

Command description: to control opening/closing of ADC dither of the frequency acquisition circuit in the analyzer. Under default mode, the signal/spectrum analyzer will automatically control whether the ADC Dither is ON based on current working condition. When the ADC Dither is under Auto mode, the ON or OFF status depends on the span, Res BW and sweep type (continuous swept or step sweep); when it is continuous swept, the ADC Dither status will force to switch to Auto and turns off; when it is step sweep, under Auto mode, if the span is 2 MHz or below, the ADC Dither is ON; if the span is below 2 MHz, the ADC Dither is

OFF. Under Auto OFF mode, if the span is above 2 MHz, turning on the ADC Dither may affect the measurement results based on selected dither status. You can access the submenu for manual control.

Key path: 【Meas Setup】, [More 1/2>>] and [ADC Dither Auto Man] on the front panel.

Status saved: saved in the instrument status.

Factory preset: Auto.

Examples:

:SPURious:ADC:DITHer OFF

:SPURious:ADC:DITHer?

:SPURious:ADC:DITHer:AUTO ON

:SPURious:ADC:DITHer:AUTO?

[Meas Preset]

Program control commands:

:CONFigure:SPURious

Command description: to reset the measurement parameters to the factory preset status or user saved parameter status

Key path: 【Meas Setup】, [More 1/2>>], [Meas Preset] on the front panel.

Factory preset: factory reset.

Examples:

:CONFigure:SPURious

3.3.10.18 Measurement Control

Pop up the menu related to measurement control, including [Meas Single Cont], [Restart] and [Pause/Resume].

[Meas Single Cont]

Program control commands:

:INITiate:CONTinuous OFF|ON|0|1

:INITiate:CONTinuous?

Command description: to set continuous measurement OFF or ON.

Key path: 【Meas Control】, [Meas Single ContON OFF] on the front panel.

Examples:

:INIT:CONT OFF

[Restart]

Program control commands:

:INITiate:REST

Command description: to stop current measurement and restart measurement for the signal/spectrum analyzer.

Key path:【Meas Control】, [Restart] on the front panel

Examples:

:INITiate:REST

[Pause/Resume]

Program control commands:

:INITiate:PAUS

:INITiate:RES

Command description: when the signal/spectrum analyzer is in operation, this command is used for pausing current measurement; when in Paused status, this command is used for continuing measurement.

Key path:【Meas Control】, [Pause/Resume] on the front panel.

Status saved: not saved in instrument status.

Examples:

:INITiate:PAUS

:INITiate:RES

3.3.11 Spectral emission mask

Spectral emission mask (SEM) measurement includes spurious emission inside and outside the band and is targeted at spurious signals inside the frequency range close to carrier signals. Analysis bandwidth for spurious measurement may differ for varied frequency range of carrier shift. To facilitate observation and judgment, spurious threshold level is given for each frequency range starting right from the carrier signal according to relevant standards, which is connected to form the spectral mask. Only spurious signals located within such spectral mask can be measured. Therefore, the spectral mask can be used as a direct indicators of whether spurious component of one signal exceeds the standard. Such measurement can be accessed via the following commands to obtain measurement results:

Program control commands:

:CONFigure:SEMask

:FETCh:SEMask[n]?

:MEASure:SEMask[n]?

:READ:SEMask[n]?

n = 1

Reference types of total power:

Returned reference channel power (dBm);

Reference channel frequency (Hz);

Relative integral power of offset A (dBc);

Absolute integral power of offset A (dBm);

Relative peak power of offset A (dBc);

Absolute peak power of offset A (dBm);

Frequency at peak of offset A (Hz)

……,

Relative integral power of offset F (dBc);

Absolute integral power of offset F (dBm);
Relative peak power of offset F (dBc);
Absolute peak power of offset F (dBm);
Frequency at peak of offset F (Hz)

Reference types of power spectral density:
Returned reference channel power (dBm/Hz);
Reference channel frequency (Hz);
Relative integral power of offset A (dB);
Absolute integral power of offset A (dBm/Hz);
Relative peak power of offset A (dB);
Absolute peak power of offset A (dBm/Hz);
Frequency at peak of offset A (Hz)
……,
Relative integral power of offset F (dB);
Absolute integral power of offset F (dBm/Hz);
Relative peak power of offset F (dB);
Absolute peak power of offset F (dBm/Hz);
Frequency at peak of offset F (Hz)

Reference types of peak spectral frequency:
Returned reference channel peak power (dBm);
Reference channel frequency (Hz);
Relative peak power of offset A (dBc);
Absolute peak power of offset A (dBm);
Frequency at peak of offset A (Hz)
……,
Relative peak power of offset F (dBc);
Absolute peak power of offset F (dBm);
Frequency at peak of offset F (Hz)

When n = 2, return trace data
When n = 3, return absolute limit line data
When n = 4, return relative limit line data

3.3.11.1 Frequency

To set frequency related parameters of the signal/spectrum analyzer, including [Center Freq], [CF Step On/Off] and [Freq Offset].

3.3 Instrument Commands

[Center Freq]

Program control commands:

[:SENSe]:FREQuency:CENTer <frequency>

[:SENSe]:FREQuency:CENTer?

Command description: to set the center frequency of the signal/spectrum analyzer. If the set center frequency is inconsistent with the current span, the latter will automatically change to the value best suitable for desired frequency.

Key path:【Frequency】, [Center Freq] on the front panel.

Setting range: Min.: 0 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT 5 GHz

[CF Step Auto Man]

Program control commands:

[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>

[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?

[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1

[:SENSe]:FREQuency:CENTer:STEP:AUTO?

Command description: to change the step size of the [Center Freq] , start frequency or [Stop Freq]. When it is under [Auto Mode], and when the center frequency is active, press the step key, the [CF Step] changes by 1, 2, 5 and 10. When it is under Auto Off mode, use the number keys, stepping keys or knob for change. At this time, reactivate the [Center Freq], and press the step key, the center freq will change by set step size.

Key path:【Frequency】, [CF Step Auto Man] on the front panel.

Setting range: Min.: 1 Hz; Max.: maximum frequency limit of signal/spectrum analyzer

Default unit: Hz

Examples:

:FREQ:CENT:STEP 100 MHz

:FREQ:CENT:STEP:AUTO ON

[Freq Offset]

Program control commands:

[:SENSe]:FREQuency:OFFSet <freq>

[:SENSe]:FREQuency:OFFSet?

Command description: to add the set frequency offset to the displayed frequency value, including marker frequency value, but this does not affect the signal display position.

Key path: 【Frequency】, [Freq Offset] on the front panel.

Setting range: Min.:-500 GHz, Max.: +500 GHz.

Default unit: Hz

Examples:

:FREQ:OFFS 10 MHz

3.3.11.2 Amplitude/Y Axis

Amplitude/Y Axis parameter settings include [Ref Level], [Attenuation>>], [Preamplifier On/Off], [Scale/Div], [Auto Scale], [More1/2>>], [Y Axis Unit] and [Ref Level Offset].

[RefLevel]

Program control commands:

:DISPlay:SEMask:VIEW:WINDow:TRACe:Y:RLEVel <real>

:DISPlay:SEMask:VIEW:WINDow:TRACe:Y:RLEVel?

Command description: to set the reference level. Measure signal at reference level position to get highest accuracy. The input attenuator of the signal/spectrum analyzer is coupled to the reference level, which can be automatically changed to avoid compression of input signal.

Key path: 【Amplitude/Y Axis】, [Ref Level] on the front panel.

Setting range: Min.: -170 dBm, Max.: 30 dBm.

Default unit: set based on Y Axis scale unit.

Examples:

:DISPlay:SEMask:VIEW:WINDow:TRACe:Y:RLEVel 20 dBm

[Attenuation>>]

Adjust the attenuation of the signal/spectrum analyzer. The commands are same as the Swept SA. See description of Swept Analysis 【Amplitude/Y Axis】 [Attenuation>>] for more details.

[Preamplifier ON OFF]

Program control commands:

[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1

[:SENSe]:POWer[:RF]:GAIN[:STATe]?

The commands are same as the Swept SA. See description of Swept SA 【Amplitude/Y Axis】 [Pre-amplifier ON OFF] for more details.

Examples:

:POW:GAIN OFF

:POW:GAIN?

[Scale/Div]

Program control commands:

:DISPlay:SEMask:VIEW:WINDow:TRACe:Y:PDIVision <rel_ampl>

:DISPlay:SEMask:VIEW:WINDow:TRACe:Y:PDIVision?

Command description: to select the scale/division from 0.1 dB/division to 20 dB/division. This menu is only valid when the scale type is logarithm.

Key path:【Amplitude/Y Axis】, [Scale/Div] on the front panel.

Setting range: Min.: 0.1 dB, Max.: 20 dBm.

Examples:

:DISPlay:SEMask:VIEW:WINDow:TRACe:Y:PDIVision 10

:DISPlay:SEMask:VIEW:WINDow:TRACe:Y:PDIVision?

[Auto Scale]

Program control commands:

:SEMask:ADJust:LEVel

Command description: the instrument automatically sets parameters like reference level and scale/division based on input signal sizes. When this soft menu key is pressed, the instrument performs one auto scaling. Setting rule for auto scaling: firstly obtain the maximum value and the minimum value based on current measurement trace data. Based on the maximum value, place on the 80% graticule of the screen trace Y axis for auto setting of reference level and scale/division.

Key path:【Amplitude/Y Axis】, [Auto Scale] on the front panel.

[Y Axis Unit]

Program control commands:

:UNIT:SEMask:POWer DBM|DBMV|DBMA|V|W|A|DBUV|DBUA

:UNIT:SEMask:POWer?

Command description: to select the Y Axis unit from [dBm], [dBmV], [dBmA], [W], [V], [A], [dBμV] and [dBμA]. The instrument will automatically calculate the trace data and marker readout based on the Y axis scale unit.

Key path: 【Amplitude/Y Axis】, [More 1/2>>], [Y Axis Unit] on the front panel.

Examples:

:UNIT:SEMask:POWer DBM

:UNIT:SEMask:POWer?

[Ref Level Offset]

Program control commands:

:DISPlay:SEMask:WINDow:TRACe:Y:RLEVel:OFFSet <rel_ampl>

:DISPlay:SEMask:WINDow:TRACe:Y:RLEVel:OFFSet?

Command description: to introduce offset for all amplitude readout (e.g, reference level and marker amplitude). It will not change the trace position on the screen. This offset unit is dB and is not affected by the scale and unit.

Key path:【Amplitude/Y Axis】, [More 1/2>>], [Ref Level Offset] on the front panel.

Setting range: Min.: -1000 dB, Max.:1000 dB.

Examples:

:DISPlay:SPURious:WINDow:TRACe:Y:RLEVel:OFFSet 12

3.3.11.3 Span/X Axis

None.

3.3.11.4 Bandwidth

To set types of the filter.

[Filter Type]

Program control commands:

[:SENSe]:SEMask:BANDwidth:SHAPe GAUSsian|FLATtop

[:SENSe]:SEMask:BANDwidth:SHAPe?

Command description: comprising [Gaussian] and [Flattop]. In general, the signal/spectrum analyzer uses Gaussian filter, i.e., use filter approximate to the Gaussian shape to complete filtering of [Res BW]. If the flat top filter is used, the signal/spectrum analyzer adopts filter approximate to the rectangular shape to complete filtering of Res BW. The response time of flat top filter is about 3 times of that of the Gaussian filter. The sweep speed of the flat top filter is smaller than that of the Gaussian filter. The flat top filter has better selectivity than the Gaussian filter and therefore is more capable of distinguishing two signals with unequal amplitude.

Key path: [BW], [Filter Type] on the front panel.

Examples:

:SEMask:BANDwidth:SHAPe GAUS

:SEMask:BANDwidth:SHAPe?

3.3.11.5 Auto Setting

Pop up the soft menu related to auto setting , including [Couple All].

[Couple All]

Program control commands:

:COUPle ALL

Command description: to set the Res BW, video bandwidth, sweep time, mechanical attenuator and frequency step as auto coupling mode. The signal/spectrum analyzer will select most suitable values for those functions based on set frequency and bandwidth (or start frequency and stop frequency). If no ratio is pre-saved, use default ratio.

Key path: 【Auto Set】, [Couple All] on the front panel.

Examples:

:COUPle ALL

3.3.11.6 Trace

Commands related to trace, including [Clear Write], [Trace Average], [More1/2>>] and [Detector>>].

[Clear Write**]**

Program control commands:

:TRACe:SEMask:TYPE WRITe

:TRACe:SEMask:TYPE?

Command description: to set the current trace processing as Refresh, i.e., clear all data of displayed trace and continue the signal trace receipt under sweep status.

Key path: 【Trace】, [Clear Write] on the front panel.

Examples:

:TRACe:SEMask:TYPE WRITe

:TRACe:SEMask:TYPE?

[Trace Average]

Command description: to set the current trace processing method as Average, i.e., based on the average count N set in the 【Meas Setup】, update trace after averaging the performance index of the measurement trace.

Key path: 【Trace】, [Trace Average] on the front panel.

Program control commands:

:TRACe:SEMask:TYPE AVERage

:TRACe:SEMask:TYPE?

Examples:

:TRACe:SEMask:TYPE AVERage

:TRACe:SEMask:TYPE?

[Detector>>]

Commands related to detector types of current trace, including [Auto], [Normal], [Peak], [Sample], [Negative Peak] and [Average>>], in which average detector type is divided into video average, power average and voltage average.

Program control commands:

[:SENSe]: SEMask:DETector:AUTO ON|OFF|1|0

[:SENSe]: SEMask:DETector:AUTO?

[:SENSe]:SEMask:DETector[:FUNCtion]

NORMal|POSitive|SAMPle|NEGative|AVERage|RMS|LOG|SCALar

[:SENSe]: SEMask:DETector[:FUNCtion]?

[Auto]

Program control commands:

:SEMask:DETector:AUTO ON|OFF|1|0

:SEMask:DETector:AUTO?

Command description: to set the detector command for the currently selected trace as Auto. That means, the signal/spectrum analyzer will perform based on the parameter setting of currently selected trace.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Auto] on the front panel.

[Normal]

Program control commands:

:SEMask:DETector NORMal

:SEMask:DETector?

Command description: to set the detector command for the currently selected trace as Normal, i.e., display the measurement results of positive peak and negative peak at the same time to achieve display effect similar to the analog instrument.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Normal] on the front panel.

Examples:

:SEMask:DETector NORMal

:SEMask:DETector?

[Peak]

Program control commands:

:SEMask:DETector POSitive

:SEMask:DETector?

Command description: to set the detector command for the currently selected trace as Positive Peak, i.e., take the maximum value from sampling data assigned to each trace point.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Peak] on the front panel.

Examples:

:SEMask:DETector POSitive

:SEMask:DETector?

[Sample]

Program control commands:

:SEMask:DETector SAMPle

:SEMask:DETector?

Command description: to set the detector command for the currently selected trace as Sample, i.e., take the last value from sampling data assigned to each trace point.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Sample] on the front panel.

Examples:

:SEMask:DETector SAMPle

:SEMask:DETector?

[Negative Peak]

Program control commands:

:SEMask:DETector NEGative

:SEMask:DETector?

Command description: to set the detector command for the currently selected trace as Negative Peak, i.e., take the minimum value from sampling data assigned to each trace point.

3.3 Instrument Commands

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Negative Peak] on the front panel.

Examples:

:SEMask:DETector NEGative

:SEMask:DETector?

[Average>> Log-Pwr Avg]

Program control commands:

:SEMask:DETector LOG

:SEMask:DETector?

Command description: to set the detector command for the currently selected trace as Video Average. Also called Logarithm Power Average Detector, i.e., take the logarithm power average value for all data assigned to each trace point; earlier signal/spectrum analyzer generally displays the measurement trace of logarithm scale, and all filtering and averaging are based on the logarithm power data; the trace is generally called as video signal. After digital IF processing is adopted, to make measurement results same as the earlier signal/spectrum analyzer, the video average detector function is added.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Log-Pwr Avg] on the front panel.

Examples:

:SEMask:DETector LOG

:SEMask:DETector?

[Average>> Pwr Avg]

Program control commands:

:SEMask:DETector AVERage or

:SEMask:DETector RMS

:SEMask:DETector?

Command description: to set the detector command for the currently selected trace as Power Average. Also called root mean square (RMS) detector. Calculate the root mean square of all sampling data assigned to each trace point; the 4051signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After square these voltage values, take sum and divide the count of sampling data points corresponding to each trace point. Finally, take square root. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those RMS values are trace data.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Average>>] and [Pwr Avg] on the front panel.

Examples:

:SEMask:DETector RMS

:SEMask:DETector?

[Average>> Voltage Avg]

Program control commands:

:SEMask:DETector SCALar

:SEMask:DETector?

Command description: to set the detector command for the currently selected trace as Voltage Average. Take linear average for all sampling data assigned to each trace point; the 4051 signal/spectrum analyzer envelopes the detector for the RF input signal and obtains linear voltage. After summing those voltage values, divide the number of sampling data points corresponding to each trace point. When the scale is logarithm, take 20 times of logarithm transformation for these RMS values (with 10 as base) and obtain the trace data. When the scale type is linear, those average values are trace data.

Key path: 【Trace】, [More 1/2>>], [Detector>>], [Average>>], [Voltage Avg] on the front panel.

Examples:

:SEMask:DETector SCALar

:SEMask:DETector?

3.3.11.7 Sweep

Commands to set parameters related to sweep, including [Sweep Setup>>].

[Sweep Setup>>]

To set commands related to sweep type, including [Sweep Type Auto Man], [Swp Type Rules Auto Man] and [FFT Width Auto Man].

[Sweep Type>> Auto Man]

Program control commands:

[:SENSe]:SEMask:SWEep:TYPE FFT|SWEep

[:SENSe]:SEMask:SWEep:TYPE?

[:SENSe]:SEMask:SWEep:TYPE:AUTO OFF|ON|0|1

[:SENSe]:SEMask:SWEep:TYPE:AUTO?

Command description: to set sweep type. to determine whether Swept or FFT is adopted for frequency spectrum measurement. Also set the FFT step bandwidth for FFT sweep

Key path:【Sweep】, [Sweep Setup>>] and [Sweep Type Auto/Man] on the front panel.

Examples:

:SEMask:SWEep:TYPE FFT

:SEMask:SWEep:TYPE?

:SEMask:SWEep:TYPE:AUTO OFF

:SEMask:SWEep:TYPE:AUTO?

[Sweep Type Rules Auto Man]

Program control commands:

[:SENSe]:SEMask:SWEep:TYPE:AUTO:RULes SPEed|DRANge

[:SENSe]:SEMask:SWEep:TYPE:AUTO:RULes?

[:SENSe]:SEMask:SWEep:TYPE:AUTO:RULes:AUTO OFF|ON|0|1

[:SENSe]:SEMask:SWEep:TYPE:AUTO:RULes:AUTO?

Command description: to set rules for auto sweep type. While the sweep type rules include “Best Dynamic Range” and “ Best Speed”.

"Best Dynamic Range" rules: when RBW is or larger than 1kHz, the sweep type is Swept; when RBW is less than 1 kHz, the sweep type is FFT.

"Best Speed" rules: when RBW is or larger than 30 kHz, the sweep type is Swept; when RBW is less than 30 kHz, the sweep type is FFT.

Key path: 【Sweep】, [Sweep Setup>>] and [Sweep Type Rules Auto/Man] on the front panel.

Examples:

:SEMask:SWEep:TYPE:AUTO:RULes SPEed

:SEMask:SWEep:TYPE:AUTO:RULes?

:SEMask:SWEep:TYPE:AUTO:RULes:AUTO OFF

:SEMask:SWEep:TYPE:AUTO:RULes:AUTO?

[FFT Width Auto Man]

Program control commands:

[:SENSe]:SEMask:SWEep:FFT:WIDTh <real>

[:SENSe]:SEMask:SWEep:FFT:WIDTh?

[:SENSe]:SEMask:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1

[:SENSe]:SEMask:SWEep:FFT:WIDTh:AUTO?

Command description: to set FFT Width. The FFT width includes [Auto], [<100 kHz], [<3 MHz], [<13 MHz], [<=Max.]. FFT width is only active when the FFT sweep type is selected. Under Auto type, when the signal/spectrum analyzer performs FFT spectrum measurement, the maximum Res BW is 30 kHz. To guarantee best dynamic measurement range, the signal/spectrum analyzer automatically optimizes the FFT width within 100 kHz. The larger is the FFT width, the faster is FFT spectrum measurement, but the dynamic range performance will be affected.

Under FFT sweep, the FFT width setup limits the maximum value for center frequency step of each tune. For example, if [<100 Hz] is selected, the maximum value for center freq step of each tune is 100 Hz. As the FFT width gets larger, the count of instrument center frequencies get smaller when performing measurement of same frequency scope, and the response measurement gets faster. Therefore, to improve measurement speed, you can manually change the FFT width.

Key path:【Sweep】, [Sweep Setup>>], [FFT Width>>] on the front panel.

Examples:

:SEMask:SWEep:FFT:WIDTh 1

:SEMask:SWEep:FFT:WIDTh?

:SEMask:SWEep:FFT:WIDTh:AUTO OFF

:SEMask:SWEep:FFT:WIDTh:AUTO?

3.3.11.8 Single

Program control commands:

:INITiate:SEMask

Command description: the 【Single】 key on the front panel has no corresponding soft menu. This function is mainly used for manual trigger of a measurment. When the Average is ON, this function performs the measurements at the count specified by the Average Num.

In remote control programming and system establishment, this function combined with *WAI can effectively synchronize the measurement process and enable the trace data obtained after the *WAI finishes directly correspond to the measurement process one by one.

Examples:

:INITiate:SEMask

3.3.11.9 Continuous

Program control commands:

:INITiate:CONTinuous ON

Command description: Continuous ON is mainly used for changing the Continuous OFF into Continuous ON; if the current measurement is Continuous ON, the instrument performs no operation.

Examples:

:INITiate:CONTinuous ON

3.3.11.10 Trigger

See description of Swept SA 【Trigger】 for more details.

3.3.11.11 Display

Pop up the soft menu related to display, including [Display Line On/Off], [Report Display>>] and [Display Config>>].

[Display Line On Off]

See description of Swept SA 【Display】 [Display Line ON OFF] for more details.

[Display Config>>]

It is used for configurations of interface language, status area display MAN related to interface display, The soft menus include [Language 中文 English], [Graticule ON OFF], [Status Display ON OFF] and [Freq Info Disp ON OFF] See description of Swept SA 【Display】 [Display Config>>] for more details.

[Report type>>]

Program control commands:

:DISPlay:SEMask:VIEW[:SELect] APFReq|RPFReq|IPOWer

:DISPlay:SEMask:VIEW[:SELect]?

Command description: to select content information displayed at the data report window.

The absolute power & frequency-data report is displayed with the absolute power and frequency corresponding to the offset.

The relative power & frequency-data report is displayed with the relative power and frequency corresponding to the offset.

The integral power-data report is displayed with the integral power corresponding to the offset.

Key path:【Display】 on the front panel.

Examples:

:DISPlay:SEMask:VIEW APFReq

:DISPlay:SEMask:VIEW?

3.3.11.12 Input Output

See description of Swept SA 【Input/output] 】for more details.

3.3.11.13 Marker

Commands related to markers, including [Select Marker], [Normal], [Delta], [Fixed], [Off] and [All Markers Off].

[Select Marker>> Marker 1]

Command description: to select among 12 different markers of the signal/spectrum analyzer. When a certain marker is selected, the marker will be indicated in the menu where its type and attribute can be set. Select and trigger another marker and place it at the center of the current trace. Users can read amplitude and frequency information (when the frequency span is 0 Hz, time information will be displayed) at the marker display area at the top right corner of the screen.

Key path: 【Marker】, [Select Marker>>] on the front panel.

[Normal]

Program control commands:

:CALCulate:SEMask:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE POSition

:CALCulate:SEMask:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Normal Marker.

Key path:【Marker】, [Select Marker>>], [Normal] on the front panel.

Examples:

:CALCulate:SEMask:MARKer:MODE POSition

:CALCulate:SEMask:MARKer:MODE?

[Delta Marker]

Program control commands:

:CALCulate:SEMask:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE DELTa

:CALCulate:SEMask:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Delta Marker. Display the amplitude difference and frequency difference (or time difference, when span is zero) between two markers at the marker display area at the top right corner of the screen. If there exists a single marker, a [Delta Marker] operation will generate a Ref marker in the active marker position. Move the active marker through the knob, stepping keys or number keys. The display amplitude difference unit is dB.

Key path: 【Marker】, [Select Marker>>], [Delta Marker] on the front panel.

Examples:

:CALCulate:SEMask:MARKer:MODE DELTa

:CALCulate:SEMask:MARKer:MODE?

[Fixed]

Program control commands:

:CALCulate:SEMask:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE FIXed

:CALCulate:SEMask:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to set the selected marker as the Fixed Marker. The X Axis and Y Axis positions of the fixed marker are fixed. The Fixed Marker can be used as reference marker.

Key path:【Marker】, [Select Marker>>], [Fixed] on the front panel.

Examples:

:CALCulate:SEMask:MARKer:MODE FIXed

:CALCulate:SEMask:MARKer:MODE?

[Marker Off]

Program control commands:

:CALCulate:SEMask:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE OFF

:CALCulate:SEMask:MARKer[1|2|3|4|5|6|7|8|9|10|11|12]:MODE?

Command description: to turn off the selected marker.

Key path:【Marker】, [Select Marker>>], [Marker OFF] on the front panel.

Examples:

:CALCulate:SEMask:MARKer:MODE OFF

:CALCulate:SEMask:MARKer:MODE?

[Marker All Off]

Program control commands:

:CALCulate:SEMask:MARKer:AOFF

Command description: to turn off all current markers which are ON and related soft keys, e.g, [Noise Marker].

Key path:【Marker】, [More 1/2>>], [All Markers OFF] on the front panel.

Examples:

3.3.11.14 Maker->

This key has no soft menu.

3.3.11.15 Marker Function

This key has no soft menu.

3.3.11.16 Peak Search

This key has no soft menu.

3.3.11.17 Measurement Setting

Pop up the soft menu related to measurement setting, including [Average Num On/Off], [Average Mode Exponential Repeat], [Ref Channel>>], [Offset/Limit>>], [Ref Type>>], [Meas Method>>], [PhNoise Opt], [Low Noise Path On/Off], [Preselector Preselecting Bypass], [RF Gain>>], [ADC Dither Auto Man] and [Meas Reset].

[Average Num On Off]

Program control commands:

[:SENSe]:SEMask:AVERage:COUNt <integer>

[:SENSe]:SEMask:AVERage:COUNt?

[:SENSe]:SEMask:AVERage[:STATe] ON|OFF|1|0

[:SENSe]:SEMask:AVERage[:STATe]?

Command description: to turn on or off Average. When Average Count is ON, the user can specify the average count required for measurement. The Average Count can be adjusted by number keys, stepping keys or knob.

Key path:【Meas Setup】 on the front panel.

Setting range: 1~10000

Default unit: none

Examples:

:SEMask:AVERage:COUNt 10

:SEMask:AVERage:COUNt?

:SEMask:AVERage ON

:SEMask:AVERage?

[Ref Channel>>]

Command description: to set parameters of reference channel

Key path:【Meas Setup】 on the front panel.

Status saved: saved in the instrument status.

[Integration BW]

Program control commands:

[:SENSe]:SEMask:BANDwidth:INTegration <bandwidth>

[:SENSe]:SEMask:BANDwidth:INTegration?

Command description: to designate the bandwidth integration range for calculating power within the channel. The integration bandwidth is displayed in the trace window and indicated with a pair of vertical lines connected with arrows. Such commands may be adjusted via number keys, stepping keys or the knob.

Key path:【Meas Setup】 on the front panel.

Setting range:1 kHz – 50 MHz.

Default unit: Hz

Examples:

:SEMask:BANDwidth:INTegration 2 MHz

:SEMask:BANDwidth:INTegration?

[Channel Span]

Program control commands:

[:SENSe]:SEMask:FREQuency:SPAN <freq>

[:SENSe]:SEMask:FREQuency:SPAN?

Command description: to designate frequency span range of the main channel. Such commands may be adjusted via number keys, stepping keys or the knob.

Key path:【Meas Setup】 on the front panel.

Setting range:10 Hz ~ maximum instrument frequency span

Default unit: Hz

Examples:

:SEMask:FREQuency:SPAN 5 MHz

:SEMask:FREQuency:SPAN?

[Sweep Time Auto Man]

Program control commands:

[:SENSe]:SEMask:SWEep:TIME <time>

[:SENSe]:SEMask:SWEep:TIME?

[:SENSe]:SEMask:SWEep:TIME:AUTO OFF|0|ON|1

[:SENSe]:SEMask:SWEep:TIME:AUTO?

Command description: to set the Sweep Time of the main channel as Auto ON or OFF. Use number keys, stepping keys or knob to change the time.

Key path:【Meas Setup】 [Ref Channel>>] on the front panel.

Setting range: 1 ms ~ 6000 s

Default unit: s

Examples:

:SEMask:SWEep:TIME 5 ms

:SEMask:SWEep:TIME?

:SEMask:SWEep:TIME:AUTO OFF

:SEMask:SWEep:TIME:AUTO?

[Res BW Auto Man]

Program control commands:

[:SENSe]:SEMask:BANDwidth[:RESolution] <bandwidth>

[:SENSe]:SEMask:BANDwidth[:RESolution]?

[:SENSe]:SEMask:BANDwidth[:RESolution]:AUTO OFF|ON|1|0

[:SENSe]:SEMask:BANDwidth[:RESolution]:AUTO?

Command description: to set Res BW of the instrument when measuring the main channel. If the Res BW is set to Auto ON, the optimal setting is determined by the instrument. When the Res BW is set as auto off, users may define the bandwidth and adjust it with number keys, stepping keys or the knob.

Key path: 【Meas Setup】 [Ref Channel>>] on the front panel.

Setting range: 1 Hz – 20 MHz.

Default unit: Hz

Examples:

:SEMask:BANDwidth 1.0 MHz

:SEMask:BANDwidth?

:SEMask:BANDwidth:AUTO OFF

:SEMask:BANDwidth:AUTO?

[Video BW Auto Man]

Program control commands:

[:SENSe]:SEMask:BANDwidth:VIDeo <bandwidth>

[:SENSe]:SEMask:BANDwidth:VIDeo?

[:SENSe]:SEMask:BANDwidth:VIDeo:AUTO OFF|ON|1|0

[:SENSe]:SEMask:BANDwidth:VIDeo:AUTO?

Command description: to set video bandwidth of the instrument when measuring the main channel. If the video bandwidth is set to Auto ON, the optimal setting is determined by the instrument. If the video bandwidth is set to Auto OFF, users may define the bandwidth and adjust it with number keys, stepping keys or the knob. and adjust it with number keys, stepping keys or the knob.

Key path: 【Meas Setup】 [Ref Channel>>] on the front panel.

Setting range: 1 Hz – 20 MHz.

Default unit: Hz

Examples:

:SEMask:BANDwidth:VIDeo 1.0 MHz

:SEMask:BANDwidth:VIDeo?

:SEMask:BANDwidth:VIDeo:AUTO ON

:SEMask:BANDwidth:VIDeo:AUTO?

[VBW/RBW Auto Man]

Program control commands:

[:SENSe]:SEMask:BANDwidth:VIDeo:RATio <real>

[:SENSe]:SEMask:BANDwidth:VIDeo:RATio?

[:SENSe]:SEMask:BANDwidth:VIDeo:RATio:AUTO OFF|ON|1|0

[:SENSe]:SEMask:BANDwidth:VIDeo:RATio:AUTO?

Command description: to set ratio of BW/RBW during main channel measurement. When it is set as auto off, users may define the ratio and adjust it with number keys, stepping keys or the knob.

Key path:【Meas Setup】 [Ref Channel>>] on the front panel.

Setting range: 0.0001~300000

Default unit: none

Examples:

:SEMask:BANDwidth:VIDeo:RATio 1.0

:SEMask:BANDwidth:VIDeo:RATio?

:SEMask:BANDwidth:VIDeo:RATio:AUTO ON

:SEMask:BANDwidth:VIDeo:RATio:AUTO?

[Offset/Limit>>]

Command description: to set parameters of offset and limit.

Key path:【Meas Setup】 on the front panel.

[Offset]

Command description: to select the offset to be set.

Key path:【Meas Setup】 [Offset/Limit>>] on the front panel.

Status saved: saved in the instrument status.

Factory preset: A

[Starting frequency On Off]

Program control commands:

[:SENSe]:SEMask:OFFSet:LIST:FREQuency:STARt <freq>,...

[:SENSe]:SEMask:OFFSet:LIST:FREQuency:STARt?

[:SENSe]:SEMask:OFFSet:LIST:STATe ON|OFF|1|0,...

[:SENSe]:SEMask:OFFSet:LIST:STATe?

Command description: to set start frequency limit of each offset (the points closest to the carrier). If it is set as off, no measurement will be made for such offset. Users may use number keys, stepping keys and the knob to adjust it.

Key path:【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range: 0 Hz ~ stop frequency - 10 Hz

Default unit: Hz

Examples:

:SEMask:OFFSet:LIST:FREQuency:STARt

2.515 MHz, 2.715 MHz, 3.515 MHz, 4.00 MHz, 8.00 MHz, 12.50 MHz

:SEMask:OFFSet:LIST:FREQuency:STARt?

:SEMask:OFFSet:LIST:STATe ON,ON,ON,ON,ON,ON

:SEMask:OFFSet:LIST:STATe?

[Stop Freq]

Program control commands:

[:SENSe]:SEMask:OFFSet:LIST:FREQuency:STOP <freq>,...

[:SENSe]:SEMask:OFFSet:LIST:FREQuency:STOP?

Command description: to set stop frequency limit of each offset (the points farthest from the carrier). Users may use number keys, stepping keys and the knob to adjust it.

Key path: 【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range: start frequency + 10 Hz ~500 MHz

Default unit: Hz

Examples:

:SEMask:OFFSet:LIST:FREQuency:STOP

2.715 MHz, 3.515 MHz, 4.00 MHz, 8.00 MHz, 12.50 MHz, 15.0 MHz

:SEMask:OFFSet:LIST:FREQuency:STOP?

[Sweep Time Auto Man]

Program control commands:

[:SENSe]:SEMask:OFFSet:LIST:SWEep:TIME <time>,...

[:SENSe]:SEMask:OFFSet:LIST:SWEep:TIME?

[:SENSe]:SEMask:OFFSet:LIST:SWEep:TIME:AUTO ON|OFF|1|0,...

[:SENSe]:SEMask:OFFSet:LIST:SWEep:TIME:AUTO?

Command description: to set offset Sweep Time as Auto ON or OFF. Use number keys, stepping keys or knob to change the time.

Key path: 【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range: 1 ms ~ 6000 s

Default unit: s

Examples:

:SEMask:OFFSet:LIST:SWEep:TIME 5 ms, 5 ms, 5 ms, 5 ms, 5 ms, 5 ms

:SEMask:OFFSet:LIST:SWEep:TIME?

:SEMask:OFFSet:LIST:SWEep:TIME:AUTO ON,ON,ON,ON,ON,ON

:SEMask:OFFSet:LIST:SWEep:TIME:AUTO?

[Res BW Auto Man]

Program control commands:

[:SENSe]:SEMask:OFFSet:LIST:BANDwidth[:RESolution] <bandwidth>,...

[:SENSe]:SEMask:OFFSet:LIST:BANDwidth[:RESolution]?

[:SENSe]:SEMask:OFFSet:LIST:BANDwidth[:RESolution]:AUTO OFF|ON|1|0,...

[:SENSe]:SEMask:OFFSet:LIST:BANDwidth[:RESolution]:AUTO?

Command description: to set Res BW of the instrument during offset measurement. If the Res BW is set to Auto ON, the optimal setting is determined by the instrument. When the Res BW is set as auto off, users may define the bandwidth and adjust it with number keys, stepping keys or the knob.

Key path 【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range: 1 Hz – 20 MHz.

Default unit: Hz

Examples:

:SEMask:OFFSet:LIST:BANDwidth 100 kHz, 100 kHz, 100 kHz, 100 kHz, 100 kHz, 100 kHz

:SEMask:OFFSet:LIST:BANDwidth?

:SEMask:OFFSet:LIST:BANDwidth:AUTO ON,ON,ON,ON,ON,ON

:SEMask:OFFSet:LIST:BANDwidth:AUTO?

[Video BW Auto Man]

Program control commands:

[:SENSe]:SEMask:OFFSet:LIST:BANDwidth:VIDeo <freq>,...

[:SENSe]:SEMask:OFFSet:LIST:BANDwidth:VIDeo?

[:SENSe]:SEMask:OFFSet:LIST:BANDwidth:VIDeo:AUTO OFF|ON|0|1,...

[:SENSe]:SEMask:OFFSet:LIST:BANDwidth:VIDeo:AUTO?

Command description: to set video bandwidth of the instrument when measuring the main channel. If the video bandwidth is set to Auto ON, the optimal setting is determined by the instrument. If the video bandwidth is set to Auto OFF, users may define the bandwidth and adjust it with number keys, stepping keys or the knob. and adjust it with number keys, stepping keys or the knob.

Key path: 【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range: 1 Hz – 20 MHz.

Default unit: Hz

Examples:

:SEMask:OFFSet:LIST:BANDwidth:VIDeo 100 kHz, 100 kHz, 100 kHz, 100 kHz, 100 kHz, 100 kHz

:SEMask:OFFSet:LIST:BANDwidth:VIDeo?

:SEMask:OFFSet:LIST:BANDwidth:VIDeo:AUTO ON,ON,ON,ON,ON,ON,ON

:SEMask:OFFSet:LIST:BANDwidth:VIDeo:AUTO?

[VBW/RBW Auto Man]

Program control commands:

[:SENSe]:SEMask:OFFSet:LIST:BANDwidth:VIDeo:RATio <real>,...

[:SENSe]:SEMask:OFFSet:LIST:BANDwidth:VIDeo:RATio?

[:SENSe]:SEMask:OFFSet:LIST:BANDwidth:VIDeo:RATio:AUTO OFF|ON|0|1,...

[:SENSe]:SEMask:OFFSet:LIST:BANDwidth:VIDeo:RATio:AUTO?

Command description: to set ratio of BW/RBW during offset measurement. When it is set as auto off, users may define the ratio to be set.

Key path:【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range: 0.0001~300000

Default unit: none

Examples:

:SEMask:OFFSet:LIST:BANDwidth:VIDeo:RATio 1.0,1.0,1.0,1.0,1.0,1.0

:SEMask:OFFSet:LIST:BANDwidth:VIDeo:RATio?

:SEMask:OFFSet:LIST:BANDwidth:VIDeo:RATio:AUTO ON,ON,ON,ON,ON,ON

:SEMask:OFFSet:LIST:BANDwidth:VIDeo:RATio:AUTO?

[Abs Start Limit]

Program control commands:

[:SENSe]:SEMask:OFFSet:LIST:STARt:ABSolute <real>,...

[:SENSe]:SEMask:OFFSet:LIST:STARt:ABSolute?

Command description: to set absolute limit start value of the current offset and the same stop.

Key path:【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range:-200 dBm – 50 dBm

Default unit: dBm.

Examples:

:SEMask:OFFSet:LIST:STARt:ABSolute -50, -50, -50, -50, -50, -50

:SEMask:OFFSet:LIST:STARt:ABSolute?

[Abs Stop Limit Auto Man]

Program control commands:

[:SENSe]:SEMask:OFFSet:LIST:STOP:ABSolute <real>,...

[:SENSe]:SEMask:OFFSet:LIST:STOP:ABSolute?

[:SENSe]:SEMask:OFFSet:LIST:STOP:ABSolute:COUPle ON|OFF|1|0,...

[:SENSe]:SEMask:OFFSet:LIST:STOP:ABSolute:COUPle?

Command description: to set absolute limit stop value of the current offset. Under auto mode, the instrument will automatically couple a start limit of the same value.

Key path:【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range:-200 dBm – 50 dBm

Default unit: dBm.

Examples:

:SEMask:OFFSet:LIST:STOP:ABSolute -50, -50, -50, -50, -50, -50

:SEMask:OFFSet:LIST:STOP:ABSolute?

:SEMask:OFFSet:LIST:STOP:ABSolute:COUPle ON,ON,ON,ON,ON,ON

:SEMask:OFFSet:LIST:STOP:ABSolute:COUPle?

[Rel Start Limit]

Program control commands:

[:SENSe]:SEMask:OFFSet:LIST:STARt:RCARrier <rel_ampl>,...

[:SENSe]:SEMask:OFFSet:LIST:STARt:RCARrier?

Command description: to set relative limit start value of the current offset and the same stop limit.

Key path:【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range: - 200.0 dB -50 dB

Default unit: dB.

Examples:

:SEMask:OFFSet:LIST:STARt:RCARrier -30, -30, -30, -30, -30, -30

:SEMask:OFFSet:LIST:STARt:RCARrier?

[Rel stop limit Auto Man]

Program control commands:

[:SENSe]:SEMask:OFFSet:LIST:STOP:RCARrier <rel_ampl>,...

[:SENSe]:SEMask:OFFSet:LIST:STOP:RCARrier?

[:SENSe]:SEMask:OFFSet:LIST:STOP:RCARrier:COUPle ON|OFF|1|0,...

[:SENSe]:SEMask:OFFSet:LIST:STOP:RCARrier:COUPle?

Command description: to set relative limit stop value of the current offset. Under auto mode, the instrument will automatically couple a start limit of the same value.

Key path:【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range: - 200.0 dB -50 dB

Default unit: dB.

Examples:

:SEMask:OFFSet:LIST:STOP:RCARrier -30, -30, -30, -30, -30, -30

:SEMask:OFFSet:LIST:STOP:RCARrier?

:SEMask:OFFSet:LIST:STOP:RCARrier:COUPle ON,ON,ON,ON,ON,ON

:SEMask:OFFSet:LIST:STOP:RCARrier:COUPle?

[Fail Mask>>]

Program control commands:

[:SENSe]:SEMask:OFFSet:LIST:TEST ABSolute|AND|OR|RELative,...

[:SENSe]:SEMask:OFFSet:LIST:TEST?

Command description: to set limit test mark of the current offset, including four following mask tests:

Absolute: to serve as absolute limit line. When measured absolute result exceeds the absolute limit value, the test failed.

Relative: to serve as relative limit line. and measured relative result exceeds the relative limit value, the test failed.

Absolute and relative: to serve both as the absolute and relative limit lines. When measured absolute results exceeds the absolute limit value,

and measured relative result exceeds the relative limit value, the test failed.

Absolute or relative: to serve as the absolute or the relative limit lines. When measured absolute results exceeds the absolute limit value, or measured relative result exceeds the relative limit value, the test failed.

Key path: 【Meas Setup】 [Offset/Limit>>] on the front panel.

Examples:

:SEMask:OFFSet:LIST:TEST ABS,ABS,ABS,ABS,ABS,ABS

:SEMask:OFFSet:LIST:TEST?

[Ref Type>>]

Program control commands:

[:SENSe]:SEMask:TYPE PSDRef|TPRef|SPRef

[:SENSe]:SEMask:TYPE?

Command description: to set measurement reference type, total power reference, power spectral density reference and frequency spectrum peak reference.

Key path: 【Meas Setup】 on the front panel.

Status saved: saved in the instrument status.

Factory preset: total power reference

[Total Power Ref]

Program control commands:

[:SENSe]:SEMask:TYPE TPRef

[:SENSe]:SEMask:TYPE?

Command description: use carrier power as reference for calculating relative power value of the offset when selecting total power reference.

Key path:【Meas Setup】 [Ref Type>>] on the front panel.

Examples:

:SEMask:TYPE TPRef

:SEMask:TYPE?

[PSD Ref]

Program control commands:

[:SENSe]:SEMask:TYPE PSDRef

[:SENSe]:SEMask:TYPE?

Command description: use carrier power spectral density as reference for calculating relative power value of the offset when selecting power spectral density reference.

Key path:【Meas Setup】 [Ref Type>>] on the front panel.

Examples:

:SEMask:TYPE PSDRef

:SEMask:TYPE?

[Frequency Spectrum Peak Reference]

Program control commands:

[:SENSe]:SEMask:TYPE SPRef

[:SENSe]:SEMask:TYPE?

Command description: use frequency spectrum peak power as reference for calculating relative power value of the offset when selecting frequency spectrum peak reference.

Key path: 【Meas Setup】 [Ref Type>>] on the front panel.

Examples:

:SEMask:TYPE SPRef

:SEMask:TYPE?

[Total Power Ref]

Auto Man]

Program control commands:

[:SENSe]:SEMask:CARRier[:POWer] <real>

[:SENSe]:SEMask:CARRier[:POWer]?

[:SENSe]:SEMask:CARRier:AUTO[:STATe] OFF|ON|1|0

[:SENSe]:SEMask:CARRier:AUTO[:STATe]?

Command description: to set a reference value corresponding to the reference type of the menu when selecting total power reference as measurement type. Under auto mode, the reference value will be the power spectral density of the current main channel; while under auto off mode, users may use number keys, stepping keys or the knob to set the reference value.

Key path: 【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range: -200 dBm – 200 dBm

Default unit: dBm.

Examples:

:SEMask:CARRier -10

:SEMask:CARRier?

:SEMask:CARRier:AUTO ON

:SEMask:CARRier:AUTO?

[PSD Ref Auto Man]

Program control commands:

[:SENSe]:SEMask:CARRier:CPSD <real>

[:SENSe]:SEMask:CARRier:CPSD?

[:SENSe]:SEMask:CARRier:CPSD:AUTO[:STATe] OFF|ON|1|0

[:SENSe]:SEMask:CARRier:CPSD:AUTO[:STATe]?

Command description: to set a reference value corresponding to the reference type of the menu when selecting spectral density reference as measurement type. Under auto mode, the reference value will be the power spectral density of the current main channel; while under auto off mode, users may use number keys, stepping keys or the knob to set the reference value.

Key path:【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range: -200 dBm/Hz ~200 dBm/Hz

Default unit: dBm/Hz

Examples:

:SEMask:CARRier:CPSD -100

:SEMask:CARRier:CPSD?

:SEMask:CARRier:CPSD:AUTO ON

:SEMask:CARRier:CPSD:AUTO?

[Frequency Spectrum Peak Reference Auto Man]

Program control commands:

[:SENSe]:SEMask:CARRier:PEAK[:POWer] <real>

[:SENSe]:SEMask:CARRier:PEAK[:POWer]?

[:SENSe]:SEMask:CARRier:PEAK:AUTO[:STATe]OFF|ON|1|0

[:SENSe]:SEMask:CARRier:PEAK:AUTO[:STATe]?

Command description: to set a reference value corresponding to the reference type of the menu when selecting frequency spectrum peak reference as measurement type. Under auto mode, the reference value will be the frequency spectrum peak power of the current main channel; while under auto off mode, users may use number keys, stepping keys or the knob to set the reference value.

Key path:【Meas Setup】 [Offset/Limit>>] on the front panel.

Setting range: -200 dBm – 200 dBm

Default unit: dBm.

Examples:

:SEMask:CARRier:PEAK -80

:SEMask:CARRier:PEAK?

:SEMask:CARRier:PEAK:AUTO ON

:SEMask:CARRier:PEAK:AUTO?

[Meas Method>>]

Program control commands:

[:SENSe]:SEMask:FILTer[:RRC][:STATe] OFF|ON|0|1

[:SENSe]:SEMask:FILTer[:RRC][:STATe]?

Command description: to select the calculation method used for measurement, in which ON stands for RRC weighting method and OFF stands for bandwidth integration method.

Key path: 【Meas Setup】 on the front panel.

Examples:

:SEMask:FILTer ON

:SEMask:FILTer?

[BW Integration]

Program control commands:

[:SENSe]:SEMask:FILTer[:RRC][:STATe] OFF

[:SENSe]:SEMask:FILTer[:RRC][:STATe]?

Command description: to select the calculation method as Bandwidth Integration method.

Key path: 【Meas Setup】, [More 1/3>>], [Meas Method] and [BW Integration] on the front panel.

Examples:

:SEMask:FILTer OFF

:SEMask:FILTer?

[RRC Weighting]

Program control commands:

[:SENSe]:SEMask:FILTer[:RRC][:STATe] ON

[:SENSe]:SEMask:FILTer[:RRC][:STATe]?

Command description: to select the calculation method as RRC Weighting.

Key path:【Meas Setup】, [More 1/3>>], [Meas Method] and [RRC Weighting] on the front panel.

Examples:

:SEMask:FILTer ON

:SEMask:FILTer?

[Filter Factor a]

Program control commands:

[:SENSe]:SEMask:FILTer[:RRC]:ALPHa <real>

[:SENSe]:SEMask:FILTer[:RRC]:ALPHa?

Command description: to set the Filter Factor when using RRC method. The influence factor of RRC Filter will be considered in calculating the measurement result. Use number keys, stepping keys or knob to change the Filter Factor a.

Key path:【Meas Setup】, [More 1/3>>] , [Filter Factor a] on the front panel.

Setting range: 0.01~1.0

Default unit: none

Examples:

:SEMask:FILTer:ALPHa 0.22

:SEMask:FILTer:ALPHa?

3.3 Instrument Commands

[Low Noise Path On Off]

Program control commands:

[:SENSe]:SEMask:POWer:MW:PATH STD|LNPath

[:SENSe]:SEMask:POWer:MW:PATH?

Command description: this command is only available after the H34 option is provided (Low Noise Preamplifier).

Key path: 【Meas Setup】, [More 1/3>>], [More 2/3>>], [Low Noise Path ON OFF] on the front panel.

Examples:

:SEMask:POWer:MW:PATH STD

:SEMask:POWer:MW:PATH?

[Preselector Preselecting Bypass]

Program control commands:

:INPut:SEMask:FILTer:YIG[:STATe] OFF|ON|0|1

:INPut:SEMask:FILTer:YIG[:STATe]?

Command description: this menu is only available after the H36 option is purchased. It is used for setting whether to bypass the front-end preselector of the signal/spectrum analyzer. In analyzing bandwidth signal, bypass is usually required.

Key path:【Meas Setup】, [More 1/3>>], [More 2/3 >>], [Preselector Preselecting **Bypass**] on the front panel.

Examples:

:INPut:SEMask:FILTer:YIG ON

:INPut:SEMask:FILTer:YIG?

[RF Gain>>]

Set the MANAuto Man of the RF Gain and best allocation algorithm for RF Gain, including [Auto], [Best Dynamic Range] and [Best for Sensitivity].

Key path: 【Meas Setup】, [More 1/3>>], [More 2/3>>], [RF Gain] on the front panel.

[Auto]

Program control commands:

[:SENSe]:SEMask:RF:GAIN:AUTO OFF|ON|0|1

[:SENSe]:SEMask:RF:GAIN:AUTO?

Command description: to set the RF Gain distribution algorithm to Auto. In this case, the RF Gain distribution is “Best Dynamic Range”.

Key path:【Meas Setup】, [More 1/3>>], [More 2/3>>], [RF Gain>>], [Auto] on the front panel.

Examples:

:SEMask:RF:GAIN:AUTO ON

:SEMask:RF:GAIN:AUTO?

[Best for Dynamic Range]

Program control commands:

[:SENSe]:SEMask:RF:GAIN:AUTO:RULes RANGE

[:SENSe]:SEMask:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Dynamic Range. In this case, the RF Gain is switched to "Auto OFF"

Key path:【Meas Setup】, [More 1/3>>], [More 2/3>>], [RF Gain>>], [Best for Dynamic Range] on the front panel.

Examples:

:SEMask:RF:GAIN:AUTO:RULes RANGE

:SEMask:RF:GAIN:AUTO:RULes?

[Best for Sensitivity]

Program control commands:

[:SENSe]:SEMask:RF:GAIN:AUTO:RULes SENSITIVITY

[:SENSe]:SEMask:RF:GAIN:AUTO:RULes?

Command description: to set the RF Gain distribution algorithm to Best Sensitivity. In this case, the RF Gain is switched to "Auto OFF"

Key path:【Meas Setup】, [More 1/3>>], [More 2/3>>], [RF Gain>>], [Best for Sensitivity] on the front panel.

Examples:

:SEMask:RF:GAIN:AUTO:RULes SENSITIVITY

:SEMask:RF:GAIN:AUTO:RULes?

[ADC Dither Auto Man]

Program control commands:

[:SENSe]:SEMask:ADC:DITHer[:STATe] OFF|ON|HIGH

[:SENSe]:SEMask:ADC:DITHer[:STATe]?

[:SENSe]:SEMask:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1

[:SENSe]:SEMask:ADC:DITHer:AUTO[:STATe]?

Command description: to control opening/closing of ADC dither of the frequency acquisition circuit in the analyzer. Under default mode, the signal/spectrum analyzer will automatically control whether the ADC Dither is ON based on current working condition. When the ADC Dither is under Auto mode, the ON or OFF status depends on the span, Res BW and sweep type (continuous swept or step sweep); when it is continuous swept, the ADC Dither status will force to switch to Auto and turns off; when it is step sweep, under Auto mode, if the span is 2MHz or below, the ADC Dither is ON; if the span is below 2MHz, the ADC Dither is OFF. Under Auto OFF mode, if the span is above 2MHz, turning on the ADC Dither may affect the measurement results based on selected dither status. You can access the submenu for manual control.

Key path:【Meas Setup】, [More 1/3>>], [More 2/3>>], [ADC Dither **Auto** Man] on the front panel.

Examples:

:SEMask:ADC:DITHer OFF

:SEMask:ADC:DITHer?

:SEMask:ADC:DITHer:AUTO ON

:SEMask:ADC:DITHer:AUTO?

[Meas Preset]

Program control commands:

:CONFigure:SEMask

Command description: to reset the measurement parameters to the factory preset status or user saved parameter status

Key path: 【Meas Setup】, [More 1/3>>], [More 2/3>>], [Meas Preset] on the front panel.

Factory preset: factory reset.

Examples:

:CONFigure:SEMask

3.3.11.18 Measurement Control

Pop up the More related to Meas Control, including [Meas Single Cont], [Restart] and [Pause/Resume].

[Measure Cont ON OFF]

Program control commands:

:INITiate:CONTinuous OFF|ON|0|1

:INITiate:CONTinuous?

Command description: to set continuous measurement OFF or ON.

Key path:【Meas Control】, [Meas Single Cont ON OFF] on the front panel.

Examples:

:INIT:CONT OFF

[Restart]

Program control commands:

:INITiate:REST

Command description: to stop current measurement and restart measurement for the signal/spectrum analyzer.

Key path:【Meas Control】, [Restart] on the front panel

Examples:

:INITiate:REST

[Pause]

Program control commands:

:INITiate:PAUS

:INITiate:RES

Command description: when the signal/spectrum analyzer is in operation, this command is used for pausing current measurement; when in Paused status, this command is used for continuing measurement.

Key path: 【Meas Control】, [Pause/Resume] on the front panel.

Examples:

:INITiate:PAUS

:INITiate:RES4 Programming examples

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4.1 Basic Operation Examples

The following example shows the basic method of instrument programming with the VISA library. Take the C++ language as the example.

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4.1.1 VISA Library

VISA is a general term of the standard I/O function library and related standards. The VISA library is a set of functions which can be called easily called. The core function can be used to control various kinds of devices, regardless of the interface type and I/O interface software operations. The function library is used to write the instrument drive program and complete command and data transmission between the computer and instrument to realize the programmed control of the instrument. The instrument connection with the program-controlled port (LAN, USB, GPIB, RS-232, etc.) can be established by initializing the address character string ("VISA resource string").

The VISA library must be installed at first for remote control. The VISA library includes the transmission functions of the bottom VXI, GPIB, LAN and USB interface to facilitate direct calling. This signal/spectrum analyzer is compatible with the programming interfaces of GPIB, LAN and RS-232. Combination of such interfaces with the VISA library helps to remotely control the signal/spectrum analyzer. At present, the Agilent I/O Library provided by Agilent is commonly used as the bottom I/O library.

Fig. 4.1 shows the relationship between the programmed interface, VISA library, programming language and signal/spectrum analyzer, with GPIB interface as an example.

4.1 Basic Operation Examples

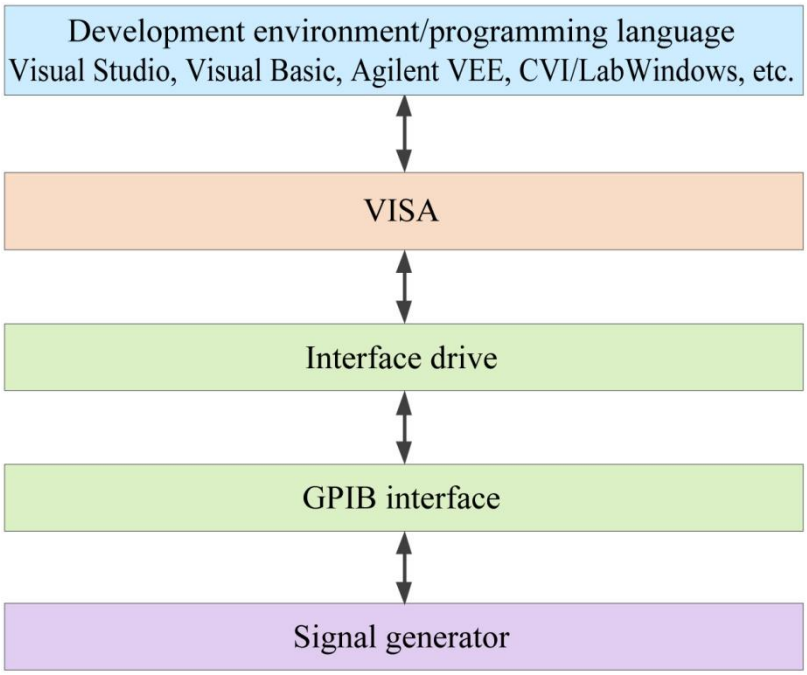

Fig. 4.1 Programming Software and Hardware Layer

4.1.2 Operating Environment Examples

4.1.2.1 Configuration Requirements

The programming examples described in this chapter have been successfully run in the computer with the following configuration.

- PC compatible with IBM or with Pentium or above;
- Windows 2000 or Windows XP operating system;
- Visual Studio 2010/2012 integrated development environment;
- PCI-GPIB interface card of NI or GPIB interface card of Agilent
- VISA library of NI or VISA library of Agilent;
- GPIB card;
- Network card;
- Available serial port: COM1 and COM2.

4.1.2.2 Included documents

Run the program example write in C/C++ and VC6.0 project must contain necessary files

If you use VISA database, you must execute the following steps:

- Add visa32.lib to the source file;
- Add the visa.h file to the header file.

When using the NI-488.2 library:

- Add the GPIB-32.OBJ file to the source file;
- Add the windows.h file to the header file;
- Add the Deci-32.h file to the header file;

For details of NI-488.2 library and VISA library, please visit the website of NI or Agilent.

4.1.3 Initialization and Default State Setting

Initialize the VISA resource manager at the beginning of programming. Open the VISA library and establish the communication connection between the VISA library and instrument. Specific steps are as follows.

4.1.3.1 Generation of Global Variables

First generate global variables required for other program modules, such as the instrument handle variable. The following global variables are included in the program example.

ViSession analyzer;

ViSession defaultRM;

Const char analyzerString [VI_FIND_BUFLEN] = "GPIB0::20::INSTR";

Const analyzerTimeout = 10000;

The constant analyzerString refers to the instrument descriptor, “GPIB0” refers to the controller, and “20” refers to the instrument connected to the controller. If the instrument is connected to LAN and the IP address is “192.168.1.1”, the variable value will be:

Const char analyzerString [VI_FIND_BUFLEN] = " TCPIP::192.168.1.1::INSTR ";

4.1.3.2 Controller Initialization

/***/

The following example shows how to establish the communication connection between the VISA library and instrument (with the specified descriptor).

// initialize the controller: open the default resource manager and return the instrument handle to the analyzer.

/***/

void InitController()

{

ViStatus status;

status = viOpenDefaultRM(&defaultRM);

status = viOpen(defaultRM, analyzerString, VI_NULL, VI_NULL, &analyzer);

}

4.1.3.3 Instrument Initialization

/***/

The following example shows the initialization of the default instrument state and clearing of the status register.

/***/

void InitDevice()

{

ViStatus status;

long retCnt;

status = viWrite(analyzer, “*CLS”, 4, &retCnt); //reset status register

status = viWrite(analyzer, "*RST", 4, &retCnt); //Reset instrument

status = viWrite(analyzer, ":INST:SEL SA", 12, &retCnt); //Set instrument operating mode (with commands of the signal/spectrum analyzer as an example)

}

4.1.4 Sending of Setting Command

/***/

The following example shows how to set the center frequency of 4051 signal/spectrum analyzers.

/***/

void SimpleSettings()

{

ViStatus status;

long retCnt;

// set the center frequency as 128 MHz.

status = viWrite(analyzer, ":FREQENCY:CENTER 128 MHz", 22, &retCnt);

}

4.1.5 Reading of Measurement Instrument Status

/***/

The following example shows how to read the setting status of the instrument.

/***/

void ReadSettings()

{

ViStatus status;

long retCnt;

char rd_Buf_CW[VI_READ_BUFLEN]; // #define VI_READ_BUFLEN 40

//Query center frequency

status = viWrite(analyzer, ":FREQ:CENT?", 10, &retCnt);

status = viRead(analyzer, rd_Buf_CW, 20, &retCnt);

// printing of commissioning information

sprint("Cw is %s", rd_Buf_CW);

}

4.1.6 Reading of frequency marker (signal/spectrum analyzers)

/***/

The following example shows how to read the frequency scale information.

/***/

void ReadMarker ()

{

ViStatus status;

long retCnt;

```
char rd_Buf_Marker[VI_READ_BUFLEN]; // #define VI_READ_BUFLEN 20

// opening of frequency marker 1 and query of frequency marker peak (frequency and amplitude)
status = viWrite(analyzer, ":CALC:MARKER:MAX", 25, &retCnt);
status = viWrite(analyzer, ":CALC:MARK:Y?", 15, &retCnt);
// printing of commissioning information
sprint("Marker is %s", rd_Buf_Marker);
}
```

4.1.7 Command Synchronization

```
/*************************************************************************/
```

The method of command synchronization is introduced below, taking the scanning process as an example.

```
/*************************************************************************/
void SweepSync()
{
ViStatus status;
long retCnt;
ViEventType etype;
ViEvent eevent;
int stat;
char OpcOk [2];

/*************************************************************************/
/* Command INITiate[:IMMediate] start single sweep ( closed in Cont SweepINIT:CONT OFF)*/
/* Execute next command of command buffer zone after single scanning */
/*************************************************************************/
status = viWrite(analyzer, ":INIT:CONT OFF", 13, &retCnt);
// Method 1 of waiting for ending of scanning: use *WAI
status = viWrite(analyzer, ":INIT", 18, &retCnt);
status = viWrite(analyzer, "*WAI", 18, &retCnt);

// Method 2 of waiting for ending of scanning: use *OPC?
status = viWrite(analyzer, ":INIT", 20, &retCnt);
status = viWrite(analyzer, "*OPC?", 18, &retCnt);
status = viRead(analyzer, OpcOk, 2, &retCnt); //Wait for*OPC and return to “1”

// Method 3 of waiting for ending of scanning: use *OPC
// To enable GPIB service request, set "Disable Auto Serial Poll" as "yes"
```

```
status = viWrite(analyzer, "*SRE 32", 7, &retCnt);
status = viWrite(analyzer, "*ESE 1", 6, &retCnt); // enable service request ESR
// set event enabling bit to complete operation
status = viEnableEvent(analyzer, VI_EVENT_SERVICE_REQ, VI_QUEUE, VI_NULL);
// enable SRQ event
status = viWrite(analyzer, ":INIT ", 18, &retCnt);
status = viWrite(analyzer, "*OPC?", 18, &retCnt);

// start scanning synchronously with OPC
status = viWaitOnEvent(analyzer, VI_EVENT_SERVICE_REQ, 10000, &etype, &eevent)
// wait for service request
status = viReadSTB(analyzer, &stat);
status = viClose(eevent); // close event handle
// prohibit SRQ event
status = viDisableEvent(analyzer, VI_EVENT_SERVICE_REQ, VI_QUEUE);
// main program continues……
}
```

4.2 Advanced Operation Examples

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4.2.1 Setting and query of cw frequency of lan interface (SOCKET)

/***/

To use these programming examples, you must adjust the host address to match the IP address of your signal generator. (The LAN programming interface examples are materialized by creating a socket under VC6.0 running environment using WINSOCK components.)

/***/

```
#include"stdafx.h"
#include <afxsock.h>
#include <stdio.h>
#include <stdlib.h>
CSocket sockClient;
void main()
{
bool flag;
char buff[100];
if (!AfxSocketInit())//initialize network port
```

```
{
AfxMessageBox("initialization failure", "ok", MB_OK);
}
else
{
flag = sockClient.Create();
if(flag)
{
AfxMessageBox("socket creating success", "ok", MB_OK);
}
else
{
AfxMessageBox("socket creating failure", "ok", MB_OK);
sockClient.Close();
}
}
flag=sockClient.Connect(name, 5001);    //Connect the network port
flag=sockClient.Send("FREQ 1 GHz\n", 12, 0);    //Set the CW frequency as 1 GHz
if(!flag)
{
MessageBox("sending failure", "ERROR", MB_OK);
exit(0);
}
cout<<"Prints CW frequency"<<end1
flag=sockClient.Send("FREQ?n", 6, 0);//query current frequency value
if(!flag)
{
MessageBox("sending failure", "ERROR", MB_OK);
exit(0);
}
flag= sockClient.Receive(buff, 100, 0);// place the query value into the array
if(!flag)
{
MessageBox("Receive Failed!", "ERROR", MB_OK);
Exit(0);
}
sockClient.Close();
```

}

4.2.2 LAN Interface Setting --- VISA

It is recommended to use the VISA library as the bottom I/O library when the network controller is applied. However, the network differs from GPIB in that GPIB has parallel lines with hard link indicating the end on the bus. Therefore, end byte should be enabled when using VISA library.

viSetAttribute(*instrSession, VI_ATTR_TERMCHAR_EN, VI_TRUE));

After such setting, network communication will terminate automatically when the "\n" signal is received.

/***/

This example uses VISA library functions to query different instrument states and conditions. Launch Microsoft Visual C++ 6.0, add the required files, and enter the following code into your .cpp source file.

/***/

#include <visa.h>

#include “stdAfx.h”

#include <iostream>

#include <conio.h>

#include <stdlib.h>

void main()

{

VISession defaultRM, vi;// specify the variable of VISession type

Char buff[256]; // Declares variable to hold string data

int num; // specify the variable of integer data storage

vistatus = viopenDefaultRM(&defalutRM); //open the GPIB task at the address 18.

vistatus=viopen(defaultRM , ”TCPIP0::192.168.15.15::5000::SOCKET”, VI_NULL,

VI_NULL, &vi);

if(vistatus)

{

Printf (“Could not open ViSession! Check instruments and connections\n”);

exit(0);

}

viSetAttribute (*instrSession, VI_ATTR_TERMCHAR_EN,VI_TRUE))

viprintf(vi, ”*RST\n”);//reset broadband receiver

viprintf(vi, ”:FREQ:CENT?\n”);//Query center frequency

viScanf(vi, "%s", buff); // place query results into the array

printf(“source CW freq is: %s\n”, buff); //display the queried frequency

viprintf(vi, ”:DISPl:WIND1:TRAC:Y:RLEV?\n”);//query power level

viScanf(vi, "%s", buff); // place query results into the array

printf(“RL is: %s\n”, buff)//display power query result

} viclose(vi);

viclose(defaultRM);

4.2.3 Setting and query of CW of GPIB interface

/***/

The function of the VISA library is used in this example. Set the CW at 500 MHz and the output power of -2 dBm for the signal generator. Query the current frequency and power. Start VC6.0, add the required file, and enter the following codes into the .cpp file.

/***/

```
#include “stdAfx.h”
#include <visa.h>
#include <iostream>
#include <stdlib.h>
#include <conio.h>
void main()
{

VISession defaultRM, vi;// specify the variable of VISession type
ViStatus vistatus = 0;  //for equipment communication
Char buff[256];// specify the variable of character data storage
int num; // specify the variable of integer data storage
vistatus = viOpenDefaultRM (&defalutRM); //Open the GPIB tasks at the address 19
vistatus=viOpen(defaultRM, ”GPIB::19::INSTR”, VI_NULL, VI_NULL, &vi);
if(vistatus)
{
Printf (“Could not open ViSession! Check instruments and connections\n”);
exit(0);
}
viPrintf(vi, ”*RST\n”); //Reset the signal source
viPrintf(vi，”FREQ 500 MHZ\n”);//set dot frequency of 500 MHz
viPrintf(vi, ”FREQ?\n”); //Query the CW frequency
viScanf(vi, "%s", buff); // place query results into the array
printf(“source CW freq is:  %s\n”, buff); //Display the CW frequency
viPrintf(vi, ”POW  -2 dBm\n”); //Set the power level as -2 dBm
viPrintf(vi, ”POWER?\n”);//query current power
viScanf(vi, "%s", buff); // place query results into the array
printf(“source POWER is:  %s\n”, buff); //display the power
viClear(vi);
viClose(vi);
```

4.2 Advanced Operation Examples

```
viClose(defaultRM);
}
```

5 Error description

This chapter will introduce how to find out problems and receive the after-sale service. Indicate error messages of the signal generator.

5.1 Error Information

The signal/spectrum analyzer records errors occurred during measurement in two ways: error message queue displayed in the operation interface of the front panel and SCPI (under remote control) error message queue. Such two queues are stored separately for management.

5.1.1 Local Error Information

1) View error messages by interface operation:

Error messages prompted at the bottom right corner of the signal/spectrum analyzer during operation indicates software operation or hardware problems. Types of problems can be more or less determined based on error codes and measures can be taken for troubleshooting accordingly.

Only one error message will be display at a time in the error display area of the signal/spectrum analyzer. As the problems may occur at the same time, the following operations can help to view all the error prompt information:

Step 1: press [System] > [Error List] to pop up the error list window.

Step 2: prompt information will be displayed in the window;

Step 3: browse the error information with the mouse and close the dialog window;

Step 4: click [Clear error list] to clear historical error information.

2) Description of Error Information

If any error is detected during measurement of the analyzer, the warning or error message will be displayed at the right corner of the status indicator field (error code + error abbreviation) as follows:

Fig. 5.1 Error message displayed in the status indicator field

See Schedule 3 Local Error Message Table of Appendix D: Error Message Index in the User Manual of 4051 Series Signal/Spectrum Analyzer for more details of description of local error messages.

5.1.2 Program Error Information

1) Error information formats

In the remote control mode, error messages are recorded in the error/event queue in the status report system and can be inquired with “SYSTem:ERRor?” command with the format as follows:

“<error code>, “<error message in error queue>; <detailed description of error message>”

Example:

“-110, "Out-of-limit data; input parameter beyond lower bound.”

Program error information is divided into two types:

- Negative error codes defined in the SCPI standard, not detailed here;
- See Schedule 4 Remote Error Message Table of Appendix D: Error Message Zoom Table in the User Manual of 4051 Series Signal/Spectrum Analyzer for positive-value error codes with instrument characteristics and more details of description of local error messages.

2) Error message type

Error event corresponds to only one type of error message. Error messages are classified into the following types (8257):

- System error (0 to 49): control platform, OS, file system, etc.
- Processing error (50 to 99): control platform, OS, file system, etc.
- LO RF (100 to 199): lock detect, status detect, etc.
- Wideband IF (200 to 299): bandwidth, gain, attenuation, compensation, etc.
- Narrowband IF (300 to 499): bandwidth, gain, attenuation, compensation, etc.
- Video & sample (500 to 599): Adc, dsp, platform interface, etc.
- Communication interface (600 to 699): network, gpib, print, etc.

5.2 Repair

5.2.1 Contact Us

If 4051 series signal/spectrum analyzer fails, first observe and save the error information, analyze the possible causes and solve the problems with reference to the solutions provided in "7.2 Fault Diagnosis and Troubleshooting" of the User Manual. You also can contact with our customer service and provide the error information collected, we will provide assistance to solve the problem as quickly as possible. You may visit the website www.ei41.com, to query the contact information of the nearby technical support center.

Contact Information:

Tel: +86-0532-86896691

E-mail: sales@ceyear.com

Web : www.ceyear.com

Zip code: 266555

Address: NO. 98 Xiangjiang Road, Qingdao City, China

5.2.2 Packing and Mailing

In case of problems hard to solve, contact us via telephone or fax. If it is confirmed that the analyzer needs to be returned for repair, pack the analyzer with the original package and case according to the following steps:

1) Place a detailed description of faults of the analyzer along with the instrument into the case.
2) Pack it with the original package to reduce possible damage.
3) Set pads in the four corners of the outer packing box, and place the instrument into the outer packing box.
4) Seal the opening of the packing box with a tape and strengthen the packing box with nylon straps.
5) Mark "Fragile!" on the box. No touch! Handle with care! on the box body.
6) Transport the network analyzer as a precision instrument.
7) Keep the copies of all transport documents.

Attention

Notes of packing

Packaging materials other than the original ones may damage the analyzer. Do not pack the instrument with the polystyrene sphere; otherwise, the instrument cannot be fully protected, and the generated static electricity may be sucked into the fan to cause damage to the instrument.

Prompt

Instrument packing and transportation

Transport or handle the instrument (such as the damage caused in the delivery period) in strict accordance with the precautions described in “3.1.1.1 Unpacking” of the user manual.

Appendix

Appendix A SCPI Command Index

Schedule 1 Table of Swept Analysis Measurement Commands

Command	Function
*CLS	Generic commands
*ESE	Generic commands
*ESE?	Generic commands
*ESR?	Generic commands
*IDN?	Generic commands
*OPC	Generic commands
*OPC?	Generic commands
*RST	Generic commands
*SRE	Generic commands
*SRE?	Generic commands
*STB?	Generic commands
*TRG	Generic commands
*WAI	Generic commands
:ABORt	Cancel (only for remote control)
:CALCulate:BWIDth|BANDwidth:NDB <rel_ampl>	ndB setting
:CALCulate:BWIDth|BANDwidth:NDB?	ndB setting query
:CALCulate:BWIDth|BANDwidth[:STATe] OFF|ON|0|1	ndB measurement switch
:CALCulate:BWIDth|BANDwidth[:STATe]?	ndB measurement switch query
:CALCulate:BWIDth|BANDwidth:RESult?	ndB result query
:CALCulate:MARKer:TRCKing[:STATe] OFF|ON|0|1	Set signal track
:CALCulate:MARKer:TRCKing[:STATe]?	Query signal track
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MAXimum	Peak search
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MAXimum:NEXT	Next Peak
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MAXimum:RIGHt	Next Peak Right
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MAXimum:LEFT	Next Peak Left

Appendix A SCPI Command Index

:CALCulate:MARKer:PEAK:EXCursion <rel_ampl>	Set peak definition
:CALCulate:MARKer:PEAK:EXCursion?	Query peak definition
:CALCulate:MARKer:PEAK:EXCursion:STATe OFF|ON|0|1	Set peak definition switch
:CALCulate:MARKer:PEAK:EXCursion:STATe?	Query peak definition switch
:CALCulate:MARKer:PEAK:THReshold <ampl>	Set peak threshold
:CALCulate:MARKer:PEAK:THReshold?	Query peak threshold
:CALCulate:MARKer:PEAK:THReshold:STATe OFF|ON|0|1	Set peak threshold switch
:CALCulate:MARKer:PEAK:THReshold:STATe?	Query peak threshold switch
:CALCulate:MARKer:PEAK:TABLe:STATe OFF|ON|0|1	Set peak list switch
:CALCulate:MARKer:PEAK:TABLe:STATe?	Query peak list switch
:CALCulate:MARKer:PEAK:SORT FREQuency|AMPLitude	Set peak sequence
:CALCulate:MARKer:PEAK:SORT?	Query peak sequence
:CALCulate:MARKer:PEAK:TABLe:READout ALL|GTDLine|LTDLine	Set peak read-out
:CALCulate:MARKer:PEAK:TABLe:READout?	Query peak read-out
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:CPSearch[:STATe] ON|OFF|1|0	Set peak track on/off
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:CPSearch[:STATe]?	Query peak track on/off
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:PTPeak	Peak-to-peak search
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MINimum	Min Search
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MODE POSition|DELTa|FIXed|OFF	Set marker mode
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:MODE?	Query marker mode
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X <freq>	Set marker position on X axis
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X?	Query marker position on X axis
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X:POSition <real>	Set marker X point
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X:POSition?	Query marker X point
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:Y <real>	Set marker position on Y axis
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:Y?	Query marker position on Y axis
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:REFerence <integer>	Set marker reference
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:REFerence?	Query marker reference
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X:READout FREQuency|TIME|ITIMe|PERiod	Marker X axis scale attribute
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X:READout?	Query marker X axis scale attribute
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X:READout:AUTO ON|OFF|1|0	Marker X axis scale attribute
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:X:READout:AUTO?	Query marker X axis scale attribute
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:TRACe1|2|3|4|5|6	Set marker trace
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:TRACe?	Query marker trace
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:LINes[:STATe] OFF|ON|0|1	Set marker line display on/off
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:LINes[:STATe]?	Query marker line display on/off
:CALCulate:MARKer:TABLe[:STATe] OFF|ON|0|1	Set marker report window on/off
:CALCulate:MARKer:TABLe[:STATe]?	Query marker report window on/off

:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FCOunt[:STATe] OFF|ON|0|1	Set marker count on/off
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FCOunt[:STATe]?	Query marker count on/off
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FCOunt:X?	Query marker count
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FCOunt:GATetim e <time>	Set marker count gate time
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FCOunt:GATetim e?	Query marker count gate time
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FCOunt:GATetim e:AUTO OFF|ON|0|1	Set marker count gate time auto on/off
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FCOunt:GATetim e:AUTO?	Query marker count gate time auto on/off
:CALCulate:MARKer:COUPle[:STATe] OFF|ON|0|1	Set marker couple
:CALCulate:MARKer:COUPle[:STATe]?	Query marker couple
:CALCulate:MARKer:AOFF	Set all markers off
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion NOISe|BPOWer|BDENsity|OFF	Set marker function
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion?	Query marker function
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND: SPAN <freq>	Set bandwidth adjustment span
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND: SPAN?	Query bandwidth adjustment span
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND: LEFT <freq>	Set bandwidth adjustment start frequency
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND: LEFT?	Query bandwidth adjustment start frequency
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND: RIGHt <freq>	Set bandwidth adjustment stop frequency
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12:FUNCtion:BAND: RIGHt?	Query bandwidth adjustment stop frequency
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12 [:SET]:CENTer	Marker -> Center
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12 [:SET]:STEP	Marker ->Frequency Step
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12 [:SET]:STARt	Marker -> Start
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12 [:SET]:STOP	Marker -> Stop
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12 [:SET]:DELTa:SPAN	Marker Delta -> Span
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12 [:SET]:DELTa:CENTer	Delta Marker -> Center
:CALCulate:MARKer[1]|2|3|4|5|6|7|8|9|10|11|12 [:SET]:RLEVel	Maker -> Reference
:CALCulate:MATH:MODE <LINear|LOGarithmic|POWer>	Set trace operation method
:CALibration[:ALL]	Calibration all
:CALibration[:ALL]?	Search the current calibration state.
:CONFigure?	Measurement function query
:CONFigure:SANalyzer	Set as spectrum measurement
:CONFigure:SANalyzer:NDEFault	Enter spectrum measurement as default
:COUPle ALL|NONE	Set couple all
:DEMod AM|FM|PM|OFF	Set audio demodulation type
:DEMod?	Query audio demodulation type
:DEMod:TIME <time>	Set audio demodulation time

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:DEMod:TIME?	Query audio demodulation time
:DISPlay:WINDow[1]:ANNotation[:ALL] OFF|ON|0|1	Set status area display on/off
:DISPlay:WINDow[1]:ANNotation[:ALL]?	Query status area display on/off
:DISPlay:ANNotation:FREQuency OFF|ON|0|1	Set frequency information display on/off
:DISPlay:ANNotation:FREQuency?	Query frequency information display on/off
:DISPlay:WINDow[1]:TRACe:GRATicule:GRID[:STATe] OFF|ON|0|1	Set grid line on/off
:DISPlay:WINDow[1]:TRACe:GRATicule:GRID[:STATe]?	Query grid line on/off
:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:PDIVision <rel_ampl>	Set scale/division
:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:PDIVision?	Query scale/division
:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel <real>	Set reference level
:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel?	Query reference level
:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel:OFFSet <rel_power>	Set reference level offset
:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:RLEVel:OFFSet?	Query reference level offset
:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:SPACing LINear|LOGarithmic	Set scale type
:DISPlay:WINDow[1]:TRACe:Y[:SCALe]:SPACing?	Query scale type
:DISPlay:WINDow[1]:TRACe:Y:DLINe <ampl>	Set display line
:DISPlay:WINDow[1]:TRACe:Y:DLINe?	Query display line
:DISPlay:WINDow[1]:TRACe:Y:DLINe:STATe OFF|ON|0|1	Set display line on/off
:DISPlay:WINDow[1]:TRACe:Y:DLINe:STATe?	Query display line on/off
:FETCh:SANalyzer[n]?	
:FORMat:TRACe[:DATA] ASCii|INTeger32|REAL32 |REAL64	Set trace data type (only for remote control)
:FORMat:TRACe[:DATA]?	Query trace data type (only for remote control)
:FORMat:BORDer NORMal|SWAPped	Set data byte sequence (only for remote control)
:FORMat:BORDer?	Query data byte sequence (only for remote control)
:HCOPy[:IMMediate]	Output the screen snapshooting on printer.
:INITiate:CONTinuous OFF|ON|0|1	Set continuous on/off
:INITiate:CONTinuous?	Query continuous on/off
:INITiate:SANalyzer	Swept Analysis initialize
:INITiate[:IMMediate]	Refresh now
:INITiate:PAUS	Measurement pause
:INITiate:RES	Restart measurement
:INITiate:RESTart	Restart Measurement
:INPut:COUPling AC|DC	Set coupling method
:INPut:COUPling?	Query coupling method
INPut:FILTer:YIG[:STATe] OFF|ON|0|1	Set preselector bypass on/off
INPut:FILTer:YIG[:STATe]?	Query preselector bypass on/off
:MEASure:SANalyzer[n]?	Make spectrum measurement

	as default
:MMEMory:DATA? <file_name>	Return the file data
:MMEMory:LOAD:STATe <filename>	Call the state file
:MMEMory:STORe:SCReen <filename>	Save the state file
:MMEMory:STORe:STATe <filename>	Save the screen image
:MMEMory:STORe:TRACe:DATA TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6|ALL<filename >	Set trace data store
:MMEMory:LOAD:TRACe:DATA TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6<filename>	Trace call
:MMEMory:LOAD:CORRection 1|2|3|4|5|6, <filename>	Call amplitude correction
:MMEMory:STORe:CORRection 1|2|3|4|5|6, <filename>	Save amplitude correction
:OUTPut:AUX SIF|AIF| OFF	Set HIF and IF output on/off
:OUTPut:AUX?	Query HIF and IF output on/off
:OUTPut:AUX:AIF <value>	Set IF output frequency
:OUTPut:AUX:AIF?	Query IF output frequency
:OUTPut:AUX:SIF <value>	Set HIF output frequency
:OUTPut:AUX:SIF?	Query HIF output frequency
:READ:SANalyzer[n]?	
[:SENSe]:ADC:DITHer[:STATe] OFF|ON|HIGH	Set ADC on/off
[:SENSe]:ADC:DITHer[:STATe]?	Query ADC on/off
[:SENSe]:ADC:DITHer:AUTO[:STATe] OFF|ON|0|1	Set ADC auto on/off
[:SENSe]:ADC:DITHer:AUTO[:STATe]?	Query ADC auto on/off
[:SENSe] :ADJust:LEVel	Set amplitude auto scaling
[:SENSe]:AVERage:COUNt <integer>	Set up average frequency.
[:SENSe]:AVERage:COUNt?	Query average count
[:SENSe]:AVERage:CLEar	Clear current average count
[:SENSe]:AVERage:TYPE:AUTO OFF|ON|0|1	Average type auto on/off
[:SENSe]:AVERage:TYPE:AUTO?	Query average type auto on/off
[:SENSe]:AVERage:TYPE RMS|LOG|SCALar	Set average type
[:SENSe]:AVERage:TYPE?	Query average type
[:SENSe]:BANDwidth|BWIDth[:RESolution] <freq>	Set Res BW
[:SENSe]:BANDwidth|BWIDth[:RESolution]?	Query Res BW
[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO OFF|ON|0|1	Set Res BW auto on/off
[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO?	Query Res BW auto on/off
[:SENSe]:BANDwidth|BWIDth:VIDeo <freq>	Set video bandwidth
[:SENSe]:BANDwidth|BWIDth:VIDeo?	Query video bandwidth
[:SENSe]:BANDwidth|BWIDth:VIDeo:AUTO OFF|ON|0|1	Set video bandwidth auto on/off
[:SENSe]:BANDwidth|BWIDth:VIDeo:AUTO?	Query video bandwidth auto on/off
[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio <real>	Set VBW/RBW
[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio?	Query VBW/RBW
[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio:AUTO OFF|ON|0|1	Set VBW/RBW on/off
[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio:AUTO?	Query VBW/RBW

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[:SENSe]:BANDwidth|BWIDth:SHAPe GAUSsian|FLATtop	Set filter type
[:SENSe]:BANDwidth|BWIDth:SHAPe?	Query filter type
[:SENSe]:BANDwidth|BWIDth:TYPE DB3|DB6|IMPulse|NOISe	Set filter bandwidth
[:SENSe]:BANDwidth|BWIDth:TYPE?	Query filter bandwidth
[:SENSe]:CORRection:CSET[1]|2|3|4|5|6[:STATe] ON|OFF|1|0	Set current amplitude correction on/off
[:SENSe]:CORRection:CSET[1]|2|3|4|5|6[:STATe]?	Query current amplitude correction on/off
[:SENSe]:CORRection:CSET[1]|2|3|4|5|6:DELete	Delete current amplitude correction
[:SENSe]:CORRection:CSET:ALL[:STATe] ON|OFF|1|0	Apply all corrections on/off
[:SENSe]:CORRection:CSET:ALL[:STATe]?	Query all corrections application on/off
[:SENSe]:CORRection:CSET:ALL:DELete	Delete All Corrections
[:SENSe]:CORRection:NOISe:FLOor ON|OFF|1|0	Set the noise correction switch
[:SENSe]:CORRection:NOISe:FLOor?	Search the noise correction switch
[:SENSe]:DEMod:STATe:MODE INTER|CONT	Set audio demodulation method
[:SENSe]:DEMod:STATe:MODE?	Query audio demodulation method
[:SENSe]:DETector:TRACe[1]|2|3|4|5|6 AVERage|NEGative|NORMal|POSitive|SAMPle|QPEak|EAVerage| RAVerage	Set trace detector mode
[:SENSe]:DETector:TRACe[1]|2|3|4|5|6?	Query trace detector mode setting
[:SENSe]:DETector[:FUNCtion] NORMal|AVERage|POSitive|SAMPle|NEGative|QPEak|EAVerage| EPOSitive|MPOSitive|RMS	Set trace detector mode (applicable for all traces)
[:SENSe]:DETector[:FUNCtion]?	Query trace detector mode setting (applicable for all traces)
[:SENSe]:DETector:TRACe[1]|2|3|4|5|6:AUTO ON|OFF|1|0	Set detector mode auto on/off
[:SENSe]:DETector:TRACe[1]|2|3|4|5|6:AUTO?	Query detector mode auto on/off
[:SENSe]:DETector:AUTO ON|OFF|1|0	Set detector mode auto on/off (for all traces)
[:SENSe]:DETector:AUTO?	Query detector mode auto on/off (for all traces)
[:SENSe]:FEED RF|AREFerence	Set input port
[:SENSe]:FEED?	Query input port
[:SENSe]:FEED:AREFerence REF500|REFCOMB|REF4800|OFF	Set calibration port
[:SENSe]:FEED:AREFerence?	Query calibration port
[:SENSe]:FREQuency:TUNE:IMMediate	Initiate auto tune
[:SENSe]:FREQuency:STARt <freq>	Set the starting frequency
[:SENSe]:FREQuency:STARt?	Query start frequency
[:SENSe]:FREQuency:STOP <freq>	Set the stop frequency

[:SENSe]:FREQuency:STOP?	Query stop frequency
[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio <integer>	Set Span/RBW
[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio?	Query Span/RBW
[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO OFF|ON|0|1	Set Span/RBW on/off
[:SENSe]:FREQuency:SPAN:BANDwidth[:RESolution]:RATio:AUTO?	Query Span/RBW
[:SENSe]:FREQuency:SPAN <freq>	Set frequency span
[:SENSe]:FREQuency:SPAN?	Query frequency span
[:SENSe]:FREQuency:SPAN:FULL	Set full frequency span
[:SENSe]:FREQuency:SPAN:PREVious	Query previous frequency span setting
[:SENSe]:FREQuency:SYNThesis:[:STATe] OFF|ON|0|1	Set phase noise optimization on/off
[:SENSe]:FREQuency:SYNThesis:[:STATe]?	Query phase noise optimization on/off
[:SENSe]:FREQuency:SYNThesis:AUTO[:STATe] OFF|ON|0|1	Set phase noise optimization auto on/off
[:SENSe]:FREQuency:SYNThesis:AUTO[:STATe]?	Query phase noise optimization auto on/off
[:SENSe]:IF:GAIN:AUTO OFF|ON|0|1	Set IF gain auto on/off
[:SENSe]:IF:GAIN:AUTO?	Query IF gain auto on/off
[:SENSe]:IF:GAIN:AUTO:LEVEL 5|0|-5|-10	Set IF auto gain level
[:SENSe]:IF:GAIN:AUTO:LEVEL?	Query IF auto gain level
[:SENSe]:IF:GAIN:SWEPt[:STATe] OFF|ON|0|1	Set sweep IF gain on/off
[:SENSe]:IF:GAIN:SWEPt[:STATe]?	Query sweep IF gain on/off
[:SENSe]:IF:GAIN:SWEPt:AUTO[:STATe] OFF|ON|0|1	Set sweep IF gain auto on/off
[:SENSe]:IF:GAIN:SWEPt:AUTO[:STATe]?	Query sweep IF gain auto on/off
[:SENSe]:IF:GAIN:FFT[:STATe] LOW|HIGH	Set FFT IF gain on/off
[:SENSe]:IF:GAIN:FFT[:STATe]?	Query FFT IF gain on/off
[:SENSe]:IF:GAIN:FFT:AUTO[:STATe] OFF|ON|0|1	Set FFT IF gain auto
[:SENSe]:IF:GAIN:FFT:AUTO[:STATe]?	Query FFT IF gain auto
[:SENSe]:POWer[:RF]:MW:PATH STD|LNPath	Set low noise path on/off
[:SENSe]:POWer[:RF]:MW:PATH?	Query low noise path on/off
[:SENSe]:RF:GAIN:AUTO:RULes RANGE	RF gain best dynamic range
[:SENSe]:RF:GAIN:AUTO:RULes SENSITIVITY	RF gain best sensitivity
[:SENSe]:RF:GAIN:AUTO:RULes?	Query RF gain distribution rules
[:SENSe]:RF:GAIN:AUTO[:STATe] OFF|ON|0|1	Set RF gain auto on/off
[:SENSe]:RF:GAIN:AUTO[:STATe]?	Query RF gain auto on/off
[:SENSe]:SWEep:EGATe[:STATe] OFF|ON|0|1	Set time gate on/off
[:SENSe]:SWEep:EGATe[:STATe]?	Query time gate on/off
[:SENSe]:SWEep:EGATe:CONTrol EDGE|LEVel	Set time gate function controlling mode
[:SENSe]:SWEep:EGATe:CONTrol?	Query time gate function controlling mode
[:SENSe]:SWEep:EGATe:DELay <time>	Set gate delay

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[:SENSe]:SWEep:EGATe:DELay?	Query gate delay
[:SENSe]:SWEep:EGATe:HOLDoff <time>	Set gate control source holdoff time
[:SENSe]:SWEep:EGATe:HOLDoff?	Query gate control source holdoff time
[:SENSe]:SWEep:EGATe:HOLDoff:AUTO OFF|ON|0|1	Set gate control source holdoff on/off
[:SENSe]:SWEep:EGATe:HOLDoff:AUTO?	Query gate control source holdoff on/off
[:SENSe]:SWEep:EGATe:LENGth <time>	Set gate width
[:SENSe]:SWEep:EGATe:LENGth?	Query gate width
[:SENSe]:SWEep:EGATe:METHod FFT	Set gate method as FFT
[:SENSe]:SWEep:EGATe:METHod LO	Set gate method as LO
[:SENSe]:SWEep:EGATe:METHod VIDeo	Set gate method as video
[:SENSe]:SWEep:EGATe:METHod?	Query gate method
[:SENSe]:SWEep:EGATe:SOURceEXTernal1|EXTernal2|LINE|FRAMe|RFBurst	Set gate control source
[:SENSe]:SWEep:EGATe:SOURce?	Query gate control source
[:SENSe]:SWEep:EGATe:TIME <time>	Set preview sweep time
[:SENSe]:SWEep:EGATe:TIME?	Query preview sweep time
[:SENSe]:SWEep:EGATe:VIEW ON|OFF|1|0	Set time gate preview on/off
[:SENSe]:SWEep:EGATe:VIEW?	Query time gate preview on/off
[:SENSe]:SWEep:FFT:WIDTh <real>	Set FFT width
[:SENSe]:SWEep:FFT:WIDTh?	Query FFT width
[:SENSe]:SWEep:FFT:WIDTh:AUTO OFF|ON|0|1	Set FFT width auto on/off
[:SENSe]:SWEep:FFT:WIDTh:AUTO?	Query FFT width auto on/off
[:SENSe]:SWEep:TIME <time>	Set the scanning time
[:SENSe]:SWEep:TIME?	Query sweep time
[:SENSe]:SWEep:TIME:AUTO OFF|ON|0|1	Set sweep time on/off
[:SENSe]:SWEep:TIME:AUTO?	Query sweep time
[:SENSe]:SWEep:TIME:AUTO:RULes NORMal|ACCuracy|SRESponse	Set sweep time rules
[:SENSe]:SWEep:TIME:AUTO:RULes?	Query sweep time rules
[:SENSe]:SWEep:TYPE FFT|SWEep	Set the scanning type
[:SENSe]:SWEep:TYPE?	Query sweep type
[:SENSe]:SWEep:TYPE:AUTO OFF|ON|0|1	Set sweep type auto on/off
[:SENSe]:SWEep:TYPE:AUTO?	Query sweep type auto on/off
[:SENSe]:SWEep:TYPE:AUTO:RULes SPEed|DRANge	Set sweep type rules
[:SENSe]:SWEep:TYPE:AUTO:RULes?	Query sweep type rules
[:SENSe]:SWEep:TYPE:AUTO:RULes:AUTO[:STATe] OFF|ON|0|1	Set sweep type rules auto on/off
[:SENSe]:SWEep:TYPE:AUTO:RULes:AUTO[:STATe]?	Query sweep type rules auto on/off
[:SENSe]:SWEep:POINts <integer>	Set the scanning point number
[:SENSe]:SWEep:POINts?	Query sweep points
:TRACe:COPY TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6,TRACE1|TRACE2|	Initiate trace copy

TRACE3|TRACE4|TRACE5|TRACE6	
:TRACe:COPY?	Query trace copy
:TRACe<1|2|3|4|5|6>:DISPlay[:STATe] ON|OFF|0|1	Set trace display status on/off
:TRACe<1|2|3|4|5|6>:DISPlay[:STATe]?	Query trace display status on/off
:TRACe:PRESet:ALL	Reset All Traces
:TRACe<1|2|3|4|5|6>:TYPE WRITe|AVERage|MAXHold|MINHold	Set trace display mode
:TRACe<1|2|3|4|5|6>:TYPE?	Query race display mode
:TRACe#:UPDate[:STATe] ON|OFF|0|1	Set trace update state on/off
:TRACe#:UPDate[:STATe]?	Query trace update state on/off
:TRACe[:DATA]? TRACE1|TRACE2|TRACE3|TRACE4|TRACE5|TRACE6	Query trace data (only for remote control)
:UNIT:POWer DBM|DBMV|DBMA|V|W|A|DBUV|DBUA|DBUVM|DBUAM|DBPT|D BG	Set Y axis scale unit
:UNIT:POWer?	Query Y axis scale unit
INITiate:PAUSe	Sweep pause
:INITiate:RESume	Sweep resume
[:SENSe]:FREQuency:CENTer <freq>	Set center frequency
[:SENSe]:FREQuency:CENTer?	Query center frequency
[:SENSe]:FREQuency:CENTer:STEP[:INCRement] <freq>	Set frequency step
[:SENSe]:FREQuency:CENTer:STEP[:INCRement]?	Query frequency step
[:SENSe]:FREQuency:CENTer:STEP:AUTO OFF|ON|0|1	Set frequency step auto on/off
[:SENSe]:FREQuency:CENTer:STEP:AUTO?	Query frequency step auto on/off
[:SENSe]:FREQuency:OFFSet <freq>	Set frequency offset
[:SENSe]:FREQuency:OFFSet?	Query frequency offset
frequency step auto on/off	Set mechanical attenuation
[:SENSe]:POWer[:RF]:ATTenuation?	Query mechanical attenuation
[:SENSe]:POWer[:RF]:ATTenuation:AUTO OFF|ON|0|1	Set mechanical attenuation auto on/off
[:SENSe]:POWer[:RF]:ATTenuation:AUTO?	Query mechanical attenuation auto on/off
[:SENSe]:POWer[:RF]:EATTenuation <rel_ampl>	Set electronic attenuation
[:SENSe]:POWer[:RF]:EATTenuation?	Query electronic attenuation
[:SENSe]:POWer[:RF]:EATTenuation:STATe OFF|ON|0|1	Set electronic attenuator on/off
[:SENSe]:POWer[:RF]:EATTenuation:STATe?	Query electronic attenuator on/off
[:SENSe]:POWer[:RF]:EATTenuation <rel_ampl>	Set electronic attenuator
[:SENSe]:POWer[:RF]:EATTenuation?	Query electronic attenuator
[:SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement] 10 dB|2 dB	Set mechanical attenuation step
[:SENSe]:POWer[:RF]:ATTenuation:STEP[:INCRement]?	Query mechanical

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	attenuation step
[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer] <real>	Set maximum mixer level
[:SENSe]:POWer[:RF]:MIXer:RANGe[:UPPer]?	Query maximum mixer level
[:SENSe]:POWer[:RF]:GAIN[:STATe] OFF|ON|0|1	Set pre-amplifier on/off
[:SENSe]:POWer[:RF]:GAIN[:STATe]?	Query pre-amplifier on/off
[:SENSe]:ROSCillator:SOURce INTernal|EXTernal	Set frequency reference internal/external
[:SENSe]:ROSCillator:SOURce?	Query frequency reference internal/external
:SYSTem:CLOGging ON|OFF	Set log text on/off
:SYSTem:CLOGging?	Query log text on/off
:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess <integer>	set GPIB address
:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess?	Query the GPIB address.
:SYSTem:ERRor[:NEXT]?	Search the current error information
:SYSTem:PRESet:USER	Change the preset mode to user preset
:SYSTem:PRESet:USER:SAVE	Save the user preset state
:TRIGger[:SEQuence]:EXTernal[1]|2:DELay <time>	Set external trigger 1 or external trigger 2 delay
:TRIGger[:SEQuence]:EXTernal[1]|2:DELay?	Query external trigger 1 or external trigger 2 delay
:TRIGger[:SEQuence]:EXTernal[1]|2:DELay:STATe OFF|ON|0|1	Set external trigger 1 or external trigger 2 delay
:TRIGger[:SEQuence]:EXTernal[1]|2:DELay:STATe?	Set external trigger 1 or external trigger 2 delay on/off
:TRIGger[:SEQuence]:EXTernal[1]|2:LEVel <level>	Set external trigger 1 or external trigger 2 level
:TRIGger[:SEQuence]:EXTernal[1]|2:LEVel?	Query external trigger 1 or external trigger 2 level
:TRIGger[:SEQuence]:EXTernal[1]|2:SLOPe POSitive|NEGative	Set external trigger 1 or external trigger 2 polarity
:TRIGger[:SEQuence]:EXTernal[1]|2:SLOPe?	Query external trigger 1 or external trigger 2 polarity
:TRIGger[:SEQuence]:FRAMe:DELay <time>	Set timer trigger delay
:TRIGger[:SEQuence]:FRAMe:DELay?	Query timer trigger delay
:TRIGger[:SEQuence]:FRAMe:DELay:STATe OFF|ON|0|1	Set timer trigger delay on/off
:TRIGger[:SEQuence]:FRAMe:DELay:STATe?	Query timer trigger delay on/off
:TRIGger[:SEQuence]:FRAMe:OFFSet <time>	Set timer trigger offset
:TRIGger[:SEQuence]:FRAMe:OFFSet?	Query timer trigger offset
:TRIGger[:SEQuence]:FRAMe:PERiod <time>	Set timer trigger period
:TRIGger[:SEQuence]:FRAMe:PERiod?	Query timer trigger period
:TRIGger[:SEQuence]:FRAMe:SYNC EXTernal1|EXTernal2|RFBurst|OFF	Select Sync Source
:TRIGger[:SEQuence]:FRAMe:SYNC?	Query sync source selection
:TRIGger[:SEQuence]:FRAMe:SYNC:HOLDoff <time>	Set sync source holdoff
:TRIGger[:SEQuence]:FRAMe:SYNC:HOLDoff?	Query sync source holdoff

:TRIGger[:SEQuence]:LINE:DELay <time>	Set power trigger delay
:TRIGger[:SEQuence]:LINE:DELay?	Query power trigger delay
:TRIGger[:SEQuence]:LINE:DELay:STATe OFF|ON|0|1	Set power trigger delay on/off
:TRIGger[:SEQuence]:LINE:DELay:STATe?	Query power trigger delay on/off
:TRIGger[:SEQuence]:LINE:SLOPe POSitive|NEGative	Set power trigger polarity
:TRIGger[:SEQuence]:LINE:SLOPe?	Query power trigger polarity
:TRIGger[:SEQuence]:RFBurst:DELay <time>	Set burst signal trigger delay
:TRIGger[:SEQuence]:RFBurst:DELay?	Query burst signal trigger delay
:TRIGger[:SEQuence]:RFBurst:DELay:STATe OFF|ON|0|1	Set burst signal trigger delay on/off
:TRIGger[:SEQuence]:RFBurst:DELay:STATe?	Query burst signal trigger delay on/off
:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute <ampl>	Set burst signal trigger level
:TRIGger[:SEQuence]:RFBurst:LEVel:ABSolute?	Query burst signal trigger level
:TRIGger[:SEQuence]:RFBurst:SLOPe POSitive|NEGative	Set burst signal trigger polarity
:TRIGger[:SEQuence]:RFBurst:SLOPe?	Query burst signal trigger polarity
:TRIGger[:SEQuence]:SOURce EXTernal1|EXTernal2|IMMediate|LINE|FRAMe|RFBurst|VIDeo| IF|ALARm|LAN|IQMag|IDEMod|QDEMod|IINPut|QINPut|AIQMag	Select trigger method
:TRIGger[:SEQuence]:SOURce?	Query trigger method selection
:TRIGger[:SEQuence]:VIDeo:DELay <time>	Set video trigger delay
:TRIGger[:SEQuence]:VIDeo:DELay?	Query video trigger delay
:TRIGger[:SEQuence]:VIDeo:DELay:STATe OFF|ON|0|1	Set video trigger delay
:TRIGger[:SEQuence]:VIDeo:DELay:STATe?	Query video trigger delay
:TRIGger[:SEQuence]:VIDeo:LEVel <ampl>	Set video trigger level
:TRIGger[:SEQuence]:VIDeo:LEVel?	Query video trigger level
:TRIGger[:SEQuence]:VIDeo:SLOPe POSitive|NEGative	Set video trigger polarity
:TRIGger[:SEQuence]:VIDeo:SLOPe?	Query video trigger polarity

Appendix B Error Message Index

Schedule 2 Table of Error Information

Error code	Key Error Field	Description of error
1	USBINITERR	Instrument keyboard initialization failed, please check hardware and driver
2	LANINIT ERR	LAN port initialization failed, please check hardware and driver
3	HARDINIT ERR	Hardware function initialization failed, please check hardware and driver
4	WINSOCKET ERR	Winsocket library initialization failed
5	SOCKETCRT ERR	SOCKET interface creation failed
6	SOCKETBAND ERR	SOCKET interface binding failed
7	LISTEN ERR	Listener interface failed
8	LINK ERR	Link creation failed
9	FMDATA ERR	FM offset data calling failed
15	CALFILE ERR	Calibration file calling failed
20	GPS INIT	GPS initialization failed
30	FACTDATA ERR	Factory commissioning status data calling failed
31	FLATNESS ERR	Flatness data calling failed
32	LOADFILE ERR	File loading failed
33	SAVEFILE ERR	File saving failed
34	LICENSE ERR	Invalid license
35	LICENSE OPEN	License opening failed
40	CRET EVT	System sync event creation error
41	NO MEMRY	No dynamic allocation memory
42	SHUTDOWN FAIl	Remote instrument shutdown failed
43	SPACE LOW	Low disk space
44	CRET DIRY	Folder creation failed
45	CRET FILE	File creation failed
46	CHECK DISK	Free disk space checking failed
47	READ FILE	File reading failed
48	WRITE FILE	File writing failed
90	CALCBAND	Band parameter calculation error
100	LO ALLOT	LO allocation algorithm failed
101	FRACNLOW	Lower fractional loop lock loss
102	SAMP UPR	Upper sample loop lock loss
103	YTO CHK	YTO loop lock detect
104	OVERSTEP	Error voltage zero adjustment times beyond 15
105	CORS LOW	Coarse tuned DAC out of range of 0~255 and below 0
106	CORS UPR	Coarse tuned DAC out of range of 0~255 and above 255
107	CORS LOW	Fined tuned DAC falls below 65 during coarse tuning, resulting in coarse tuned DAC below 0
108	CORS UPR	Fined tuned DAC increases to over 255 during coarse tuning, resulting in coarse tuned DAC above 255
109	CORS UPR	Fined tuned DAC increases to over 255 during fine tuning, resulting in coarse tuned DAC above 255

110	CORS UPR	Fined tuned DAC increases to over 191 during fine tuning, resulting in coarse tuned DAC beyond 0~255 and above 255
111	CORS LOW	Fined tuned DAC falls below 0 during fine tuning, resulting in coarse tuned DAC beyond 0~255 and above 255
112	CORS LOW	Fined tuned DAC falls below 65 during fine tuning, resulting in coarse tuned DAC beyond 0~255 and above 255
113	SAMP LOW	Lower sample loop lock loss
114	FRACNUPR	Upper fractional loop lock loss
201	LOAD CAL	Calibration file loading failed
202	DSP DATA	Calibration data writing into DSP failed
203	SAVE CAL	Writing or creation of file to save calibration data failed
210	GETCALTR	Calibration sweep trace acquiring during calibration failed
220	CALFLTNS	Calibration data out of limit during in-band flatness calibration
221	40MFLTNS	40 MHz in-band flatness calibration error
222	13MFLTNS	13 MHz in-band flatness calibration error
223	3M FLTNS	3 MHz in-band flatness calibration error
224	.1MFLTNS	100 kHz in-band flatness calibration error
225	FULFLTNS	Wideband direct range in-band flatness calibration error
226	200MFLTN	200 MHz in-band flatness calibration error
227	100MFLTN	100 MHz in-band flatness calibration error
228	50MFLTNS	50 MHz in-band flatness calibration error
230	FulBEror	Wideband direct range bandwidth switching error calibration error
231	200MEror	200 MHz bandwidth switching error calibration error
232	100MEror	100 MHz bandwidth switching error calibration error
233	50MError	50 MHz bandwidth switching error calibration error
234	40MError	40 MHz bandwidth switching error calibration error
235	20MError	20 MHz bandwidth switching error calibration error
236	10MError	10 MHz bandwidth switching error calibration error
237	5M Error	5 MHz bandwidth switching error calibration error
238	2M Error	2 MHz bandwidth switching error calibration error
239	1M Error	1 MHz bandwidth switching error calibration error
240	500kEror	500 kHz bandwidth switching error calibration error
241	200kEror	200 kHz bandwidth switching error calibration error
242	100kEror	100 kHz bandwidth switching error calibration error
243	50kError	50 kHz bandwidth switching error calibration error
244	20kError	20 kHz bandwidth switching error calibration error
245	10kError	10 kHz bandwidth switching error calibration error
246	<10kEror	<10 kHz bandwidth switching error calibration error
255	RF GAIN	RF variable gain calibration error
256	FLATGDAC	Flatness amplifier gain calibration error
258	NBIFGAIN	Narrowband IF variable gain calibration error
259	WBIFGAIN	Wideband IF variable gain calibration error
260	300MAMPL	Absolute amplitude error calculation error when narrowband pre-amplifier is off
261	300MAMPL	Absolute amplitude error calculation error when wideband pre-amplifier is off

Appendix B Error Message Index

262	300MAMPL	Absolute amplitude error calculation error when narrowband pre-amplifier is on
263	300MAMPL	Absolute amplitude error calculation error when wideband pre-amplifier is on
300	NB DEV	Narrowband acquisition equipment opening failed
301	NB INIT	Narrowband acquisition equipment initialization failed
302	NB FPGA	Narrowband acquisition equipment FPGA configuration failed
303	NB WRKP	Narrowband equipment operating parameter setting failed
304	FIR FILE	FIR file loading failed
305	FPGA FILE	Narrowband acquisition equipment FPGA file opening failed
306	NB EVT	Narrowband acquisition equipment driver sync event creation failed
310	NBOVERTIME	Narrowband acquisition equipment sampling overtime
311	DIRVER READ	Narrowband acquisition equipment driver reading failed
312	DIRVER WRITE	Narrowband acquisition equipment driver writing failed
313	DRIVER DMA	Narrowband acquisition equipment driver DMA failed
315	WBOVERTIME"	Wideband acquisition equipment sampling overtime
320	WB DEV	Wideband acquisition equipment opening failed
321	WB INIT	Wideband acquisition equipment initialization failed
322	WB FPGA	Wideband acquisition equipment FPGA configuration failed
323	WB WRKP "	Wideband equipment operating parameter setting failed
325	FPGA FILE	Wideband acquisition equipment FPGA file opening failed
326	WB EVT	Wideband acquisition equipment driver sync event creation failed
330	OVERTIME	Wideband acquisition equipment sampling overtime
331	DIRVER READ	Wideband acquisition equipment driver reading failed
332	DIRVER WRITE	Wideband acquisition equipment driver writing failed
333	DRIVER DMA	Wideband acquisition equipment driver DMA failed
340	BBS DEV	Audio acquisition equipment opening failed
341	BBS INIT	Audio acquisition equipment initialization failed
342	BBS FPGA	Audio acquisition equipment FPGA configuration failed
343	BBS WRKP	Audio equipment operating parameter setting failed
345	FPGA FILE	Audio acquisition equipment FPGA file opening failed
346	BBS EVT	Audio acquisition equipment driver sync event creation failed
350	OVERTIME	Audio acquisition equipment sampling overtime
351	DIRVER READ	Audio acquisition equipment driver reading failed
352	DIRVER WRITE	Audio acquisition equipment driver writing failed
353	DRIVER DMA	Audio acquisition equipment driver DMA failed
354	DATA LACK	Too short data length of audio acquisition equipment
360	LARGEREF	Audio board wide range reference calibration error
361	LARGEGND	Audio board wide range calibration error
362	SMALLREF	Audio board wide range reference calibration error
363	SMALLGND	Audio board wide range calibration error
400	FIR TMOUT	Timeout error in continuous sweep
401	FIR RDERR	Data reading error in continuous sweep and reading points mismatch
500	NODSPDEV	Data processor opening error
501	DEV INIT	Data processor initialization error

502	DSP PARM	Data processor operating parameter setting error
503	DSPA ERR	DSPA initialization failed
504	DSPB ERR	DSPB initialization failed
505	DSPC ERR	DSPC initialization failed
506	FPGA ERR	Data processor FPGA configuration error
507	FPGA PARM	Data processor FPGA operating parameter setting error
508	FPGA FILE	Data processor FPGA file opening failed
509	DSP FILE	dsp file opening failed
510	CRET EVT	Data processor driver sync event creation failed
511	DIRVER READ	Data processor driver reading failed
512	DIRVER WRITE	Data processor driver writing failed
513	DRIVER DMA	Data processor driver DMA failed
600	CMD ERR	No parameter allowed in command
601	CMD ERR	Command parameter error
602	GPIB ERR	Current mode command file damaged
603	CMD ERR	Remote command not exist
604	CMD ERR	Command not exist in current mode
605	GPIB ERR	Receiver mode command file damaged
606	GPIB ERR	Phase noise mode command file damaged
607	CMD ERR	Too much key words with number
608	CMD ERR	No number allowed in key words
610	SFP ERR	Recorder path link failed
650	GPIBINIT ERRO	GPIB initialization failed
651	Register ERRO	GPIB access to registry failed
652	GPIBMEMERRO	GPIB storage initialization failed