Field Master Pro™ MS2090A

Spectrum Analyzer

MS2090A-0709 9 kHz to 9 GHz (Option 709)
MS2090A-0714 9 kHz to 14 GHz (Option 714)
MS2090A-0720 9 kHz to 20 GHz (Option 720)
MS2090A-0726 9 kHz to 26.5 GHz (Option 726)
MS2090A-0732 9 kHz to 32 GHz (Option 732)
MS2090A-0743 9 kHz to 43.5 GHz (Option 743)
MS2090A-0754 9 kHz to 54 GHz (Option 754)
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# Table of Contents

## Chapter 1—Programming with SCPI

1-1 Scope of Manual ......................................................... 1-1  
    Additional Documentation ........................................... 1-1
1-2 Introduction .......................................................... 1-1
1-3 Remote Programming Setup and Interface  
    Network Interface Connection and Setup ......................... 1-1
1-4 SCPI Command Overview ............................................ 1-5  
    Command Names ...................................................... 1-5
    Command Syntax ..................................................... 1-5
    Data Parameters ..................................................... 1-7
    Spectrum Trace Data Format ........................................ 1-7
    Unit Suffixes .......................................................... 1-7
    Query Commands ..................................................... 1-8
    Hierarchical Command Structure .................................. 1-8
1-5 SCPI Command Types ............................................... 1-9  
    SCPI Common Commands ............................................. 1-9
    SCPI Required Commands ........................................... 1-10
    SCPI Optional Commands ........................................... 1-10
1-6 Status System Reporting ........................................... 1-10  
    Status Group Registers ............................................ 1-10
    Status Group Reporting ............................................. 1-11
1-7 SCPI Command Programming Examples  
    Notational Examples ............................................... 1-14
    Spectrum Trace Data via SCPI ...................................... 1-15
1-8 SCPI Commands ...................................................... 1-16

## Chapter 2—MS209xx Commands

2-1 Common Commands ................................................... 2-1
2-2 System Commands .................................................... 2-3
2-3 SPA Commands ....................................................... 2-26

## Appendix A—SCPI Error Table

## Appendix B—SCPI Command Reference
Chapter 1 — Programming with SCPI

1-1 Scope of Manual

This manual provides SCPI programming information and a list of SCPI programming commands for the Anritsu MS2090A Field Master Pro™ Spectrum Analyzer.

Additional Documentation

<table>
<thead>
<tr>
<th>Document Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10100-00069</td>
<td>Important Product Information, Compliance, and Safety Notices</td>
</tr>
<tr>
<td>11410-01000</td>
<td>MS2090A Field Master Pro Technical Data Sheet</td>
</tr>
<tr>
<td>10580-00444</td>
<td>MS2090A Field Master Pro User Guide</td>
</tr>
</tbody>
</table>

Updates, if any, can be downloaded from the Library tab on the Anritsu product page:
https://www.anritsu.com/en-us/test-measurement/products/ms2090a

1-2 Introduction

This chapter provides an introduction to Standard Commands for Programming Instruments (SCPI). The SCPI standard defines a set of programming commands and standards for use by all SCPI compatible instruments. SCPI is intended to provide a consistent environment for program development. It does so by defining standardized controller messages, instrument responses, and message formats for all SCPI compatible instruments. The following sections include descriptions of the command types, hierarchical command structure, command subsystems, data parameters, and notational conventions with examples.

1-3 Remote Programming Setup and Interface

Remote programming and operation of the instrument is accomplished via the Ethernet or WLAN (Wi-Fi) interfaces. The following sections provide information about the interface connections, cable requirements, and remote operation setup.

Network Interface Connection and Setup

The MS2090A uses Ethernet or WLAN to communicate remotely with a controller. Most instrument functions (except power on/off) can be controlled via a network connection to a PC connected directly (with an Ethernet cross-over cable or Wi-Fi peer-to-peer/ad hoc) or through a network. The instrument software supports the TCP/IP raw socket network protocol.

Ethernet networking uses a bus or star topology in which all of the interfacing devices are connected to a central cable called the bus, or are connected to a hub. Ethernet uses Carrier Sense Multiple Access/Collision Detection (CSMA/CD) access method to handle simultaneous transmissions over the bus. This standard enables network devices to detect simultaneous data channel usage, called a collision, and provides for a contention protocol. When a network device detects a collision, the CSMA/CD standard dictates that the data is retransmitted after waiting a random amount of time. If a second collision is detected, the data is again retransmitted after waiting twice as long. This is known as exponential back off.

Wi-Fi uses a similar star topology in which all of the interfacing devices are connected to an access point. Wi-Fi uses Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) access method to handle simultaneous transmissions. CSMA/CA doesn't detect collisions but rather avoids them through the use of a control message. If the control message collides with another control message from another node, it means that the medium is not available for transmission and the back-off algorithm is applied before attempting another transmission.
The TCP/IP setup requires the following:

- **IP Address**: Every computer and electronic device in a TCP/IP network requires an IP address. An IP address has four numbers (each between 0 and 255) separated by periods. For example: 128.111.122.42 is a valid IP address.

- **Subnet Mask**: The subnet mask distinguishes the portion of the IP address that is the network ID from the portion that is the station ID. The subnet mask 255.255.0.0, when applied to the IP address given above, would identify the network ID as 128.111 and the station ID as 122.42. All stations in the same local area network should have the same network ID, but different station IDs.

- **Default Gateway**: A TCP/IP network can have a gateway to communicate beyond the LAN identified by the network ID. A gateway is a computer or electronic device that is connected to two different networks and can move TCP/IP data from one network to the other. A single LAN that is not connected to another LAN requires a default gateway setting of 0.0.0.0. If you have a gateway, then the default gateway would be set to the appropriate value of your gateway.

- **Ethernet Address**: An Ethernet address, or *Media Access Control* (MAC) address, is a unique 48-bit value that identifies a network interface card to the rest of the network. Every network card has a unique Ethernet address permanently stored into its memory.

- **Remote programming and operation between the instrument and remote program is accomplished via a TCP/IP raw socket connection to port 9001. The remote program must establish a TCP/IP raw socket connection at port 9001 to the MS2090A.**

- **The remote application may connect to the instrument IP address or to its `HOSTNAME`. If using DHCP instead of a static IP, using the `HOSTNAME` may be more reliable for finding an instrument on a network.**

- **You may need to contact your network administrator to ensure network security policies, antivirus, and firewall settings do not block access to the controlling computer and its ports.**

The MS2090A can be configured for *Dynamic Host Configuration Protocol* (DHCP), an Internet protocol that automates the process of setting IP addresses for devices that use TCP/IP, and is the most common method of configuring a device for network use.

To determine if a network is set up for DHCP, connect the instrument to the network and select DHCP protocol. Power cycle the instrument. If the network is set up for DHCP, the assigned IP address should be displayed in the network settings.
Network Connection

Interface between the instrument and other devices on the network is via a category five (CAT-5) interface cable connected to a network. This cable uses four twisted pairs of insulated copper wires terminated into an RJ45 connector. CAT-5 cabling is capable of supporting frequencies up to 100 MHz and data transfer speeds up to 1 Gbps, which accommodates 1000Base-T, 100Base-T, and 10Base-T networks. CAT-5 cables are based on the EIA/TIA 568 Commercial Building Telecommunications Wiring Standard developed by the Electronics Industries Association. A pinout diagram is shown in Table 1-1.

Table 1-1. 8-pin Ethernet RJ45 Connector Pinout Diagram

<table>
<thead>
<tr>
<th>Pin</th>
<th>Name</th>
<th>Description</th>
<th>Wire Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
<td>Transmit data (&gt; +3 volts)</td>
<td>White/Orange</td>
</tr>
<tr>
<td>2</td>
<td>TX–</td>
<td>Transmit data (&lt; −3 volts)</td>
<td>Orange</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
<td>Receive data (&gt; +3 volts)</td>
<td>White/Green</td>
</tr>
<tr>
<td>4</td>
<td>–</td>
<td>Not used (common mode termination)</td>
<td>Blue</td>
</tr>
<tr>
<td>5</td>
<td>–</td>
<td>Not used (common mode termination)</td>
<td>White/Blue</td>
</tr>
<tr>
<td>6</td>
<td>RX–</td>
<td>Receive data (&lt; −3 volts)</td>
<td>Green</td>
</tr>
<tr>
<td>7</td>
<td>–</td>
<td>Not used (common mode termination)</td>
<td>White/Brown</td>
</tr>
<tr>
<td>8</td>
<td>–</td>
<td>Not used (common mode termination)</td>
<td>Brown</td>
</tr>
</tbody>
</table>

Integrated into the RJ45 connector are two LEDs. The amber LED indicates the presence of LAN voltages (a live LAN connection) while the green LED flashes to show that LAN traffic is present. The instrument IP address and its HOSTNAME are set via the System menu (upper left corner) and accessing the ETHERNET or WIFI settings menu.

TCP/IP connectivity requires setting up the parameters described at the beginning of this section. The following is a brief overview of how to set up a general LAN connection on the MS2090A.

Note: You may need to consult your network documentation or network administrator for assistance in configuring your network setup.
1. Access the System menu (three bars in upper left corner).

2. Press SETTINGS to access the instrument settings menu, then select either ETHERNET or WIFI to change the IP address or HOSTNAME. If using Wi-Fi

![Network Settings](image)

**Figure 1-1. Network Settings**

When using Ethernet, the instrument IP address can be set automatically using DHCP or manually by entering the desired IP address, gateway address, and subnet mask. DHCP is an Internet protocol that automates the process of setting IP addresses for devices that use TCP/IP, and is the most common method of configuring a device for network use.

To determine if a network is set up for DHCP, connect the instrument to the network and select DHCP protocol. Power cycle the instrument. If the network is set up for DHCP, the assigned IP address should be displayed in the network settings.

| Note | An active Ethernet cable must be connected to the instrument before it is turned on in order to enable the Ethernet port for DHCP or for a static IP address. Depending on local conditions, the port may remain enabled when changing between DHCP and static IP address, or when temporarily disconnecting the Ethernet cable. If the port becomes disabled, verify that an active Ethernet cable is attached to the instrument, then cycle the instrument power off and on |

When using Wi-Fi, an active Wi-Fi connection to an access point that is connected to your network must be established in order to enable DHCP. Static IP and HOSTNAME connections are not supported by the MS2090A.
1-4 SCPI Command Overview

SCPI commands, which are also referred to as SCPI instructions, are messages to the instrument to perform specific tasks and to return data. The following sections provide descriptions of the command syntax and notational conventions, command types and the hierarchical command structure, and command subsystems and data parameter format. For further information about SCPI, refer to the Standard Commands for Programmable Instruments (SCPI) 1999.0 document hosted by the IVI Foundation. A subset of the standard conventions defined in that document as they apply to the MS2090A are covered in this manual.

Command Names

Typical SCPI commands consist of one or more keywords, parameters, and punctuation. SCPI command keywords can be a mixture of upper and lower case characters. As with any programming language, the exact command keywords and command syntax must be used. The syntax of the individual commands is described in detail in the programming command chapters. Unrecognized versions of long form or short form commands or improper syntax will generate an error.

Long Format vs. Short Format

Except for common commands, each keyword has a long and a short form. The short form is a subset of the long form of the command. In this manual, the long form is presented with the short form in upper case and the remainder in lower case. For example, the long form of the command keyword to control the instrument display is :DISPlay.

The short form keyword is usually the first four characters of the long form (:DISP for :DISPlay). The exception to this rule is when the long form is longer than four characters and the fourth character is a vowel. In such cases, the vowel is dropped and the short form becomes the first three characters of the keyword. For example, the short form of the keyword :POWer is :POW.

A mixture of short form keywords with the entire long form keyword of each command is acceptable. For example, :SENS:FREQuency:STAR is an acceptable form of the command. However, :SENS:FREQuen:STAR is not an acceptable form of the command because :FREQuen is not the entire short nor long form of the command keyword.

Command Syntax

The command statement usually starts with a colon “:” and includes a number of keywords and parameters. The leading colon is optional, but each subsequent keyword must be separated by a colon “:” and may be followed by a parameter setting when they are available. The end of the command string and the first command parameter must be separated by a space. For example:

:DISPLAY:POINtcount 201

A comma “,” is generally used for separating multiple command parameters, for example:

:SYSTem:DATE 2018,10,31

Complete command strings may be combined on a single line and separated by a semicolon “;” as follows:

:SENSe:FREQuency:STARt 1000; SENS:FREQuency:STOP 5000

Some command keywords may have a keyword parameter suffix to differentiate between multiple instrument features such as multiple trace options. When these features are available, the keyword parameter is identified and enclosed by curly braces. For example, :TRACe<n> is entered as :TRACe1 or :TRACe3.

Note

If a keyword parameter is not included in a command, the first option is implied. In the previous paragraph, :TRACe is identical to :TRACe1.

Angle brackets <> enclose keyword and command parameters. Curly braces {} enclose optional command parameters. Square brackets [] enclose optional command keywords.
Notational Conventions

The SCPI interface standardizes command syntax and style that simplifies the task of programming across a wide range of instrumentation. As with any programming language, the exact command syntax, and command keywords, must be used. Unrecognized commands or improper syntax will not function and most often produce an error condition. The table below lists the standard notational conventions used in this document.

Table 1-2. Notational Conventions

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>:</td>
<td>A colon links command keywords together to form commands. The colon is not an actual part of the keyword, but is a signal to the SCPI interface parser. A colon must precede a root keyword immediately following a semicolon (see “Notational Examples” on page 1-14).</td>
</tr>
<tr>
<td>;</td>
<td>A semicolon separates commands if multiple commands are placed on a single program line.</td>
</tr>
<tr>
<td>[ ]</td>
<td>Square brackets enclose one or more optional keywords.</td>
</tr>
<tr>
<td>{ }</td>
<td>Curly braces enclose one or more keyword or command parameters that may be included one or more times.</td>
</tr>
<tr>
<td></td>
<td>A vertical bar indicates ‘or’ and is used to separate alternative parameter options. For example: ON</td>
</tr>
<tr>
<td>&lt; &gt;</td>
<td>Angle brackets enclose keyword and command parameters (see “Data Parameters” on page 1-7).</td>
</tr>
</tbody>
</table>

Command Terminators

The new line character (ASCII 10) in the last data byte of a command string is used as a command terminator. Use of a command terminator will reset the command path to the root of the tree.
Data Parameters

Data parameters, referred to simply as “parameters,” are the quantitative values used as arguments for the SCPI commands. The parameter type associated with a particular SCPI command is determined by the type of information required to control the particular instrument function. For example, Boolean (ON|OFF) type parameters are used with commands that control switch functions. Some command descriptions specify the type of data parameter to be used with each command. The most commonly used parameter types are numeric, extended numeric, discrete, string, and Boolean.

Numeric: Numeric parameters comprise integer numbers or any number in decimal or scientific notation, and may include polarity signs. This includes specific extended values as defined in “Data Parameter Notations” below.

Extended Numeric: Extended numeric parameters include values such as NAN|INFinity|NINFinity (not a number|infinity|negative infinity).

Discrete: Discrete parameters, such as INTernal and EXTernal, are used to control program settings to a predetermined finite value or condition.

Boolean: Boolean parameters represent binary conditions and may be expressed as ON, OFF or 1, 0.

Data Parameter Notations

The following conventions are used to note data parameter descriptions:

Table 1-3. Parameter Notations

<table>
<thead>
<tr>
<th>&lt;integer&gt;</th>
<th>an unsigned integer without a decimal point (implied radix point)</th>
</tr>
</thead>
</table>
| <numeric_value> | SCPI numeric value: <NRf>|NAN|INFinity|NINFinity or other types  
<NRf> is any of <NR1>|<NR2>|<NR3>  
<NR1> is a signed integer without a decimal point (implied radix point)  
<NR2> is a signed number with an explicit radix point  
<NR3> is a scaled explicit decimal point numeric with an exponent (floating point number)  
+- infinity (INFinity|NINFinity) and Not-A-Number (NAN) values can be specified for parameters of type NR3 with the values of +/- 9.9e37 and 9.91e37, respectively. |
| <char> | <CHARACTER PROGRAM DATA> Examples: CW, FixEd, UP, and DOWN |
| <string> | <STRING PROGRAM DATA> ASCII characters enclosed by double quotes, such as “OFF” |
| <block> | IEEE-488.2 block data format (see “Spectrum Trace Data Format”) |

Spectrum Trace Data Format

Trace data uses SCPI standard (IEEE 488.2) block data format. The data format is '#AXD', where D is a comma separated list of amplitudes (in ASCII), X is one or more ASCII digits specifying the number of bytes in D, and A is a single ASCII digit specifying the number of digits in X.

Trace data only contains amplitude. The frequency information for each point is

\[
\text{Frequency} = \text{start-frequency} + (\text{span}/(\text{display-points}-1)) \times N
\]

where N = 0, 1, 2, … display_points

Unit Suffixes

Unit suffixes are not required for data parameters, provided the values are scaled for the global default units; they do not require a space and they are not case sensitive. The instrument SCPI default units are:

- HZ (hertz) for frequency related parameters
- DB for power related parameters
- MS (milliseconds) for time related parameters
- M (meters) for distance related parameters
Query Commands

All commands, unless specifically noted in the commands syntax descriptions, have a query form. As defined in IEEE-488.2, a query is a command with a question mark “?” appended to the command. For example:

```
SENS:FREQ:STAR?
```

When a query form of a command is received, the current setting associated with the command is placed in the output buffer. Query commands always return the short form of the parameter unless otherwise specified. Boolean values are returned as 1 or 0, even when they can be set as on or off.

Hierarchical Command Structure

All SCPI commands, except the common commands, are organized in a hierarchical structure similar to the inverted tree file structure used in most computers. The SCPI standard refers to this structure as “the Command Tree.” The command keywords that correspond to the major instrument control functions are located at the top of the command tree. The root command keywords for the SCPI command set are shown in Figure 1-2.

```
<table>
<thead>
<tr>
<th>root</th>
</tr>
</thead>
<tbody>
<tr>
<td>:ABORt</td>
</tr>
<tr>
<td>:CALCulate</td>
</tr>
<tr>
<td>:CONFigure</td>
</tr>
</tbody>
</table>
```

Figure 1-2. SCPI Command Tree

All instrument SCPI commands, except the :ABORt command, have one or more subcommands (keywords) associated with them to further define the instrument function to be controlled. The subcommand keywords may also have one or more associated subcommands (keywords). Each subcommand level adds another layer to the command tree. The command keyword and its associated subcommand keywords form a portion of the command tree called a command subsystem. A sample of the :UNIT command subsystem is shown in Figure 1-3.

```
<table>
<thead>
<tr>
<th>root</th>
</tr>
</thead>
<tbody>
<tr>
<td>:UNIT</td>
</tr>
<tr>
<td>:CHPower</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
```

Figure 1-3. SCPI :Sample :UNIT Subsystem
1-5 SCPI Command Types

The MS2090A command set includes the following command types:

- SCPI “common” commands (IEE488.2 mandated commands)
- SCPI required commands (per SCPI 1999.0)
- SCPI optional commands

SCPI Common Commands

Some common commands are defined in the IEEE-488.2 standard and must be implemented by all SCPI compatible instruments. These commands are identified by an asterisk (*) at the beginning of the command. These commands are defined to control instrument status registers, status reporting, synchronization, and other common functions. Examples of common commands supported by the instrument are shown below.

*CLS

Title: Clear Status Command
Description: This command clears all status data structures in the device (registers and error queue) and forces the Operation Complete state to Idle.

*IDN?

Title: Identify
Description: This command returns the following information in <string> format separated by commas: manufacturer name ("Anritsu"), model number/options, serial number, firmware package number. The model number and options are separated by a "/" and each option is separated by a "/".

For example, the return string might look like:

Anritsu,MS2090A/0031/0090/0104/0198/0720/0883/0888,1851109,V2019.3.1

*RST

Title: Reset
Description: This command sets the instrument into a known state that is ready for SCPI command processing. Setting the instrument into a known state includes the following steps:

1. All applications beside the default application of the particular model will be turned off.
2. Settings for all applications (regardless of an application being active) are preset to default values.
3. System settings excluding settings associated with client connections (like ethernet addresses or DNS) are preset to default values.
4. Pending operations are aborted and the pending operation flag will be reset. The instrument will be forced into the operation complete command idle state (OCIS) and the operation complete query idle state (OQIS) before the pending operation flag is reset.
SCPI Required Commands

The required SCPI commands supported by the instrument are listed below. These commands work in all measurement modes.

Table 1-4. SCPI Required Commands

<table>
<thead>
<tr>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>:STATus</td>
</tr>
<tr>
<td>:SYSTem</td>
</tr>
</tbody>
</table>

SCPI Optional Commands

Optional SCPI commands comprise the majority of the MS2090A command set. These commands control most of the programmable functions of the instrument. The top level command subsystems are listed in the table below.

Table 1-5. SCPI Optional Commands

<table>
<thead>
<tr>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>:ABORT</td>
</tr>
<tr>
<td>:CALCulate</td>
</tr>
<tr>
<td>:CONFIGure</td>
</tr>
<tr>
<td>:CPRI</td>
</tr>
<tr>
<td>:DIAGnostic</td>
</tr>
<tr>
<td>:DISPLAY</td>
</tr>
<tr>
<td>:FETCH</td>
</tr>
<tr>
<td>:FORMAT</td>
</tr>
<tr>
<td>:INITiate</td>
</tr>
<tr>
<td>:INPUT</td>
</tr>
<tr>
<td>:INSTRument</td>
</tr>
<tr>
<td>:MEASure</td>
</tr>
<tr>
<td>:MMEMory</td>
</tr>
<tr>
<td>:OUTPut</td>
</tr>
<tr>
<td>:READ</td>
</tr>
<tr>
<td>:ROUTE</td>
</tr>
<tr>
<td>:SENSe</td>
</tr>
<tr>
<td>:SWEep</td>
</tr>
<tr>
<td>:TEST</td>
</tr>
<tr>
<td>:TRACe</td>
</tr>
<tr>
<td>:TRIGger</td>
</tr>
<tr>
<td>:UNIT</td>
</tr>
</tbody>
</table>

The SCPI optional commands are sorted by measurement modes and the commands may be repeated in more than one mode.

1-6 Status System Reporting

The MS2090A status system consists of the following SCPI-defined status-reporting structures:

- The Instrument Summary Status Byte Group
- The Standard Event Status Group
- The Operation Status Group
- The Questionable Status Group

The following paragraphs describe the registers that make up a status group and explain the status information that each status group provides.

Note Parallel Polling is not supported in the MS2090A VNA.

Status Group Registers

In general, a status group consists of a condition register, a transition filter, an event register, and an enable register. Each component is briefly described in the following paragraphs.

Condition Register

The condition register is continuously updated to reflect the current status of the MS2090A. There is no latching or buffering for this register, it is updated in real time. Reading the contents of a condition register does not change its contents.
Event Register

The event register latches transition events from the condition register as specified by the transition filter. Bits in the event register are latched, and once set they remain set until cleared by a query or a *CLS command. Event registers are read only.

Enable Register

The enable register specifies the bits in the event register that can produce a summary bit. The MS2090A logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to obtain a summary bit. Summary bits are recorded in the Summary Status Byte. Enable registers are read-write. Querying an enable register does not affect it.

Status Group Reporting

The state of certain MS2090A hardware and operational events and conditions can be determined by programming the status system. Three lower status groups provide status information to the Summary Status Byte group. The Summary Status Byte group is used to determine the general nature of an event or condition and the other status groups are used to determine the specific nature of the event or condition. The following paragraphs explain the information that is provided by each status group. Programming commands for the status system can be found in Section 2-1 “Common Commands”.

Summary Status Byte Group

The Summary Status Byte group, consisting of the Summary Status Byte Enable register and the Summary Status Byte, is used to determine the general nature of a MS2090A event or condition. The bits in the Summary Status Byte provide the following:

<table>
<thead>
<tr>
<th>Bit #</th>
<th>Bit Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,1</td>
<td>Not Used</td>
<td>These bits are always set to 0.</td>
</tr>
<tr>
<td>2</td>
<td>Not Used</td>
<td>These bits are always set to 0.</td>
</tr>
<tr>
<td>3</td>
<td>Not Used</td>
<td>These bits are always set to 0.</td>
</tr>
<tr>
<td>4</td>
<td>Message Available (MAV)</td>
<td>Set to indicate that the MS2090A has data ready in its error queue.</td>
</tr>
<tr>
<td>5</td>
<td>Standard Event (ESB)</td>
<td>Set to indicate that the Standard Event Status summary bit has been set. The Standard Event Status register can then be read to determine the specific event that caused the bit to be set.</td>
</tr>
<tr>
<td>6</td>
<td>Master Summary Status (MSS/RQS)</td>
<td>Set to indicate that the MS2090A has at least one reason to require service. This bit is also called the Master Summary Status Bit (MSS). The individual bits in the Status Byte are ANDed with their corresponding Service Request Enable Register bits, then each bit value is ORed and input to this bit.</td>
</tr>
<tr>
<td>7</td>
<td>Not Used</td>
<td>These bits are always set to 0.</td>
</tr>
</tbody>
</table>
**Standard Event Status Group**

The Standard Event Status group, consisting of the Standard Event Status register (an Event register) and the Standard Event Status Enable register, is used to determine the specific event that set bit 5 of the Summary Status Byte. The bits in the Standard Event Status register provide the following:

<table>
<thead>
<tr>
<th>Bit #</th>
<th>Bit Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Operation Complete (OP)</td>
<td>Set to indicate that all pending MS2090A operations were completed following execution of the “*OPC” command. For more information, see the descriptions of the *OPC, *OPC?, and *WAI commands in Section 2-1 “Common Commands”.</td>
</tr>
<tr>
<td>1</td>
<td>Not Used</td>
<td>The bit is always set to 0.</td>
</tr>
<tr>
<td>2</td>
<td>Query Error</td>
<td>Set to indicate that a query error has occurred (error -400 in Appendix A, “SCPI Error Table”).</td>
</tr>
<tr>
<td>3</td>
<td>Device Dependent Error</td>
<td>Set to indicate that a device-dependent error has occurred (errors -300 to -399 in Appendix A, “SCPI Error Table”).</td>
</tr>
<tr>
<td>4</td>
<td>Execution Error</td>
<td>Set to indicate that an execution error has occurred (errors -200 to -299 in Appendix A, “SCPI Error Table”).</td>
</tr>
<tr>
<td>5</td>
<td>Command Error</td>
<td>Set to indicate that a command error (usually a syntax error) has occurred (errors -100 to -199 in Appendix A, “SCPI Error Table”).</td>
</tr>
<tr>
<td>6</td>
<td>Not Used</td>
<td>This bit should be set to 0 (zero).</td>
</tr>
<tr>
<td>7</td>
<td>Power ON</td>
<td>Set to indicate that the MS2090A is powered ON and in operation.</td>
</tr>
</tbody>
</table>

**Operation Status Group**

The Operation Status group, consisting of the Operation Condition register, the Operation Positive Transition register, the Operation Negative Transition register, the Operation Event register, and the Operation Event Enable register, is used to determine the specific condition that set bit 7 in the Summary Status Byte. The bits in the Operation Event register provide the following:

<table>
<thead>
<tr>
<th>Bit #</th>
<th>Bit Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-7</td>
<td>Not Used</td>
<td>This bit should be set to 0 (zero).</td>
</tr>
<tr>
<td>8</td>
<td>Sweep Complete</td>
<td>Set to indicate that a sweep is complete.</td>
</tr>
<tr>
<td>9</td>
<td>I/Q Capture</td>
<td>Set to indicate that I/Q data capture is in process.</td>
</tr>
<tr>
<td>10-15</td>
<td>Not Used</td>
<td>These bits should be set to 0 (zero).</td>
</tr>
</tbody>
</table>
Figure 1-4. Status Register Structure
1-7 SCPI Command Programming Examples

Command statements read from left to right and from top to bottom. In the command statement below, the
:freqeuncy keyword immediately follows the :sense keyword with no separating space. A space is used
between the command string and its argument.

Notational Examples

[:sense]:freqeuncy:star 1 <numeric_value>{HZ|KHZ|MHZ|GHZ}

The following command syntax all produce the same result:

:Sense:FREQ:START 1 MHZ
:SEN:FREQ:STAR 1 MHZ
:sense:frequency:start 1000000
:FREQ:STAR 1000 KHZ

Note Note that the first keyword in the command string does not require a leading colon; however, it is
good practice to always use a leading colon for all keywords. Note also that the :Sense keyword is
optional. This is a SCPI convention for all voltage or signal source type instruments that allows
shorter command statements to be used.

:CALCulate:MARKer<n>:X <numeric_value>{HZ|KHZ|MHZ|GHZ}

The first two commands below set the location of marker 1, the third command sets the location of marker 2:

:CALC:MARK:X 1 GHZ
:CALC:MARK1:X 1 GHZ
:CALC:MARK2:X 2ghz

:UNIT:POWer <DBM|DBUV>

The following command syntax is identical:

:UNIT:POWer DBM
:unit:pow dbm

:INITiate:CONTinuous <0|1|ON|OFF>

The following commands are identical:

:INITiate:CONTinuous OFF
:init:cont 0

The following is an example of a multiple command statement that uses two separate commands in a single
program line:

:FREQ:START 10E6;:FREQ:STOP 20E9

Note A semicolon is used to join the commands and a leading colon used immediately after the semicolon
to start the second command.
Spectrum Trace Data via SCPI

This section provides an abbreviated example of setting up and capturing spectrum trace data via SCPI commands. SCPI commands are sent to port 9001 of the instrument.

//Set the Start and Stop Frequencies
SENS:FREQ:STAR 88 MHz
SENS:FREQ:STOP 108 MHz

//Set the RBW to 30 kHz
BAND:RES 30 KHz

//Set the Reference Level to -30 dBm

//Set to single sweep
INIT:CONT OFF

//Get trace amplitude data
TRACE:DATA? 1

//Get number of display points to calculate frequency array
DISP:POIN?
1-8 SCPI Commands

Command subsystems control specific instrument functions and some general purpose functions as described earlier in this text. All command subsystems are identified by the leading keyword in a command statement, as in :INITiate:CONTinuous.

The following information is provided for each command described in this guide:

- The command name, see “Command Names” on page 1-5
- The path from the subsystem root command, see “Hierarchical Command Structure” on page 1-8
- The query form of the command (if applicable), see “Query Commands” on page 1-8
- A description of the command function and purpose
- The data parameters used as arguments for the command, see “Data Parameters” on page 1-7

This may include the parameter type, available parameter choices, and numeric ranges and default values.

Refer to the following for the programming command descriptions:

- Chapter 2, “MS209xx Commands”

Refer to the following for an alphabetical list of all supported SCPI commands:

- Appendix A, “Alphabetical SCPI Command List”
Chapter 2 — MS209xx Commands

2-1 Common Commands

*CLS

Title: Clear Status Command
Description: This command clears all status data structures in the device (registers and error queue) and forces the Operation Complete state to Idle.

*ESE <numeric_value>
*ESE?

Title: Standard Event Status Enable
Description: This command provides access the Standard Event Status Enable Register. Refer to IEEE 488.2, section 11.5.1 for more information about each supported bit. Value ranges from 0 to 255.
Query returns a NR1 Numeric response.
Refer to *ESR? for the list of supported bit values.
Parameter(s): <numeric_value>

*ESR?

Title: Standard Event Status
Description: This command queries the Standard Event Status Register. Refer to IEEE 488.2, section 11.5.1 for more information about each supported bit. Query returns a NR1 Numeric response.
Supported bits:
bit 0: Operation Complete (OP)
bit 1: Not Used
bit 2: Query Error
bit 3: Device Dependent Error
bit 4: Execution Error
bit 5: Command Error
bit 6: Not Used
bit 7: Power On

Note Refer to Section 1-6 "Status System Reporting" for a description of the status reporting structure and supported bits.
**IDN?**

**Title:** Identify

**Description:** This command returns the following information in `<string>` format separated by commas: manufacturer name ("Anritsu"), model number, serial number, and firmware package number.

**OPC**

**OPC?**

**Title:** Operation Complete

**Description:** The *OPC command causes the device to set the OPC bit of the Standard Event Status Register on the next transition of the No Operation Pending flag from false to true.

The *OPC? command returns 1 in the response whenever the No Operation Pending Flag is true.

**RST**

**Title:** Reset

**Description:** This command sets the instrument into a known state that is ready for SCPI command processing. Setting the instrument into a known state includes the following steps:

1. All applications beside the default application of the particular model will be turned off.
2. Settings for all applications (regardless of an application being active) are preset to default values.
3. System settings excluding settings associated with client connections (like ethernet addresses or DNS) are preset to default values.
4. Pending operations are aborted and the pending operation flag will be reset. The instrument will be forced into the operation complete command idle state (OCIS) and the operation complete query idle state (OQIS) before the pending operation flag is reset.

**SRE <numeric_value>**

**SRE?**

**Title:** Service Request Enable

**Description:** This command provides access to the Service Request Enable Register. Refer to IEEE 488.2, section 11.5.1 for more information about each supported bit.

Refer to *STB? for the list of supported mask bit values.

Bit 6 (MSS) cannot be set as per IEEE 488.2 standard.

Query returns a NR1 Numeric response.

**Parameter(s):** `<numeric_value>`
**STB?**

**Title:** Status Byte Query

**Description:** This command queries the Status Byte Register. Refer to IEEE 488.2, section 11.5.1 for more information about each supported bit.

Query returns a NR1 Numeric response.

Supported bits:
- bit 0: Not Used
- bit 1: Not Used
- bit 2: Not Used
- bit 3: Not Used
- bit 4: Message Available (MAV)
- bit 5: Standard Event Status (ESB)
- bit 6: Master Summary Status (MSS)
- bit 7: Not Used

**WAI**

**Title:** Wait-to-Continue Command

**Description:** This command causes the device to execute no further commands or queries until the No Operation Pending flag is TRUE.

### 2-2 System Commands

**:DIAGnostic:MEMory?**

**Title:** Used Memory

**Description:** This command returns the total memory available on the instrument, the free memory, and the memory used by the backend process in kB.

If the instrument runs into an error while retrieving system memory data, "nan,nan,nan" will be returned as the response and a "-100" (SCPI command error) will be placed in the SCPI error queue.

**:FETCh:GPS?**

**Title:** Basic GPS Information

**Description:** This command returns the timestamp, latitude, and longitude of the device. The response is a comma-delimited ASCII response of one of the following forms: NO FIX or GOOD FIX,<timestamp>,<latitude>,<longitude>

If no GPS fix is currently available, the first response form (NO FIX) is returned.

If the GPS does have a fix, the second response form (GOOD FIX) is returned.

<timestamp> is in ISO8601 format. The timestamp provides the 24-hour time, and will include the year/date and/or UTC offset if the hardware supports it. If no UTC offset is provided, the time is in UTC time.

<latitude> and <longitude> are specified in decimal degrees.
**:FETCH:GPS:FULL?**

**Title:** Full GPS Information

**Description:** This command returns the timestamp, latitude, longitude, altitude, and satellite count of the device. The response is a comma-delimited ASCII response of one of the following forms: NO FIX or GOOD FIX,<timestamp>,<latitude>,<longitude>,<altitude>,<satellites>

If no GPS fix is currently available, the first response form (NO FIX) is returned.

If the GPS does have a fix, the second response form (GOOD FIX) is returned.

<timestamp> is in ISO8601 format. The timestamp provides the 24-hour time, and will include the year/date and/or UTC offset if the hardware supports it. If no UTC offset is provided, the time is in UTC time.

<latitude> and <longitude> are specified in decimal degrees.

<altitude> specifies the current altitude relative to mean sea level, in meters.

<satellites> specifies an integer count of the number of satellites currently used in the fix.

**:FETCH:GPS:LAST?**

**Title:** Last GPS Fix

**Description:** This command returns the timestamp, latitude, longitude, and altitude of the last fixed GPS result. The response is a comma-delimited ASCII response of one of the following forms: NO FIX or GOOD FIX,<timestamp>,<latitude>,<longitude>,<altitude> If a GPS fix has never been acquired, the first response form (NO FIX) is returned.

If a GPS fix was previously acquired, the second response form (GOOD FIX) is returned.

<timestamp> is in ISO8601 format. The timestamp provides the 24-hour time, and will include the year/date and/or UTC offset if the hardware supports it. If no UTC offset is provided, the time is in UTC time.

<latitude> and <longitude> are specified in decimal degrees.

<altitude> specifies the current altitude relative to mean sea level, in meters.

**:INSTRument:CATalog:ACTive?**

**Title:** List Active Applications

**Description:** This command queries all active applications. The response is returned as a comma-delimited list of application names. The application names are the same as those returned by the INSTRument:CATalog:FULL? query or used as parameters to the INSTRument:SELect command.

If no applications are currently active, this query will return NONE.

**:INSTRument:CATalog:FULL?**

**Title:** Query Available Applications

**Description:** This query returns a list of string - number pairs. The string contains the name of the available application. The immediately following NR1-formatted number is its associated application number. All response data elements are comma separated.

If no application is available, a null string followed by a zero is returned.
:MMEMory:CATalog:DIRectory? <string>,<string>

Title: Memory Catalog Directory
Description: Returns the non-recursive contents of the memory specified by the MSUS and DIRECTORY parameters. Both parameters are case sensitive.

Parameter 1: Directory. Use "/" as a directory separator. Note that this parameter should NOT be an empty string. To access the root directory, pass in "/" as the first parameter.

Parameter 2: MSUS (Use :MMEMory:CATalog:MSUSs query command to retrieve the list of available storage devices).

For example:

MMEMory:CATalog:DIRectory? "/", "USB0"

The response is formatted as follows: <total space used on MSUS>,<total space available on MSUS>,{<file entry1>},{<file entryN>} where <file entry> is: <file or directory name>,<file type>,<file size>

Parameter(s): <string>,<string>

:MMEMory:CATalog:MSUSs?

Title: Memory Catalog Msuss
Description: Returns a list of all available mass storage devices present, formatted as follows: <Device Name 1>,<Device Name 2>,...<Device Name N>

For example, sending:

MMEMory:CATalog:MSUSs?

could return:

Internal,USB0

:MMEMory:CDIRectory <string>

:MMEMory:CDIRectory?

Title: Default Mass Storage Directory
Description: This command selects the default directory on the default mass storage device (see :MMEMory:MSIS) for use with MMEMory commands. The parameter is case sensitive. Use "/" as a directory separator.

For example:

MMEMory:CDIRectory "/example_folder"

The set command will fail and an error is reported if the requested directory does not exist. Note that the query command returns the name of the default directory that was previously set and the device does not check whether the directory is still present.

Parameter(s): <string>
:MMEMory:COPY <string>,<string>,<string>,<string>

Title: Copy File

Description: This command copies the specified source file into a new file located at the specified destination location. Four parameters are required for this command:

1. Source File Location: The file path to the file to be copied.
2. Source MSUS: The mass storage device the file is located in (i.e. Internal).
3. Destination File Location: The destination file path that the file should be copied to.
4. Destination MSUS: The mass storage device that the destination file should be written to (i.e. Internal).

For example:

MMEMory:COPY "/example_file.ext", "Internal", "/example_file.ext", "USB0"

Please note that if a file already exists at the destination location or if the source file does not exist, the command will fail to execute and add an execution error into the SCPI error queue. This command will only copy files. If a directory path is passed in as a parameter, the command will fail to execute.

Parameter(s): <string>,<string>,<string>,<string>

:MMEMory:CREate:DIRectory <string>,<string>

Title: Create Directory

Description: Creates a directory at the specified mass storage device. Both parameters are case sensitive.

Parameter 1: Directory. Use "/" as a directory separator.

Parameter 2: MSUS (Use :MMEMory:CATalog:MSUSs query command to retrieve the list of available storage devices)

For example:

MMEMory:CREate:DIRectory "/example_folder", "USB0"

If the intermediate directories in the path don't exist, the command will automatically create them. Common causes of the command failure are:

- The MSUS device is not present (Use :MMEMory:CATalog:MSUSs query command to retrieve the list of available storage devices)
- The total space available on MSUS device is not big enough (Use :MMEMory:CATalog:DIRectory query command to retrieve the total space available on MSUS)

Parameter(s): <string>,<string>
**Title:** File Transfer

**Description:** This command imports/exports a file to/from the instrument. Data is transferred to/from the instrument as an IEEE definite length arbitrary block response, which has the form `<header><block>`. This set command takes three parameters:

1. File Path: The path of the file to be written
2. Msus: The mass storage device to write the file to
3. Block Data: The data to be written to the instrument in block data format

If any directories in the file path do not exist, the instrument will automatically create the required directories. Please note that the maximum file transfer size to the instrument is 25 MB.

The ASCII header specifies the number of data bytes of the file. It looks like #AX, where A is the number of digits in X and X is the number of bytes in the `<block>`. The first character is the literal ascii hash '#' 043. The second character (A) is a single ascii digit '1' to '9' describing the number of bytes in the length section (X). This number is called nlength. The next nlength bytes make up an ascii string of digits '1' to '9' describing the length of the `<block>` data.

For example, if the first 6 bytes are #49999, then the nlength is 4. The 4 bytes of length are 9999. After that follows the `<block>`, which would be 9999 bytes in size.

The query command takes two parameters.

1. File Path: The path to the file to be retrieved.
2. Msus: The mass storage device to retrieve the file from.

The file is returned in block data format with an ASCII header. The query command will return a #10 if the file cannot be found.

**Set Command**

**Parameter(s):** `<string>,<string>,<block data>`

**Query Command**

**Parameter(s):** `<string>,<string>`

**:MMEMory:DELete:DIRectory <string>,<string>**

**Title:** Delete Directory

**Description:** Deletes the specified directory and all its content at the specified mass storage device. The two parameters for this command are directory name and mass storage device. Both parameters are case sensitive. Use "/" as a directory separator. To delete the root folder in a specified mass storage device, enter "/" for directory name parameter.

For example:

MMEMory:DELete:DIRectory "/example_folder", "USB0"

The available mass storage devices can be retrieved by using the :MMEMory:CATalog:MSUSs command. The command will fail if the directory doesn't exist or the mass storage device is not present.

**Parameter(s):** `<string>,<string>`
**:MMEMory:DELeTe:FILE <string>,<string>**

**Title:** Delete File

**Description:** Deletes the specified file at the specified mass storage device. The two parameters for this command are file name with relative path and mass storage device. Both parameters are case sensitive. Use "/" as a directory separator.

For example:

```
:MMEMory:DELeTe:FILE "/example_folder/example_file.ext", "USB0"
```

The available mass storage devices can be retrieved by the :MMEMory:CATalog:MSUSs command. The command will fail if the file doesn't exist or the mass storage device is not present.

**Parameter(s):** <string>,<string>

---

**:MMEMory:EJECt <string>**

**Title:** Eject USB drive

**Description:** This command safely ejects (unmounts) a USB drive from the instrument. Following this command, a USB drive can be safely removed from the instrument. See :MMEMory:CATalog:MSUSs for more information on obtaining the name of the USB drive(s) currently mounted on the instrument.

For example:

```
:MMEMory:EJECT "USB0"
```

Parameter(s): <string>

---

**:MMEMory:LOAD:STATe <numeric_value>,<string>,<string>**

**Title:** Load State

**Description:** This command recalls the specified setup. The file location is resolved using the MSUS and file path parameters. These parameters are case sensitive.

**Parameters:**

1. **Numeric Value:** currently unused. Send a 0.
2. **File path:** The file path (including file name) relative to the MSUS root directory. File extension is optional.
3. **MSUS:** Device to recall the file from. See MMEMory:CATalog:MSUSs for information on obtaining the list of available devices.

For example:

```
:MMEMory:LOAD:STATe 0,"/example_setup_file", "Internal"
```

The model of the device that the setup was created in must match the model of the device to recall in; otherwise, the recall will be rejected. The options of the device that the setup was created in must be enabled in the device to recall in; otherwise, the recall will be rejected.

**Parameter(s):** <numeric_value>,<string>,<string>
:MMEMory:LOAD:TRACe <string>,<string>,<string>

Title: Load Trace

Description: This command recalls the specified measurement and setup. After recall all traces will have update state turned off, but sweeping will continue with the recalled setup. This means that traces will retain the recalled measurement data until the trace update state is turned on. The file location is resolved using the MSUS and file path parameters. These parameters are case sensitive.

Parameters:
1. Label: Used to specify which trace to recall. Currently, the label only supports recalling all traces. Send an empty string or "ALL" to load all traces.
2. File path: The file path (including file name) relative to the MSUS root directory. File extension is optional.
3. MSUS: Device to recall the file from. See MMEMory:CATalog:MSUSs? for information on obtaining the list of available devices.

For example:
MMEMory:LOAD:TRACe "ALL", "/example_measurement_file", "Internal"

The model of the device that the measurement was saved in must match the model of the device to recall in; otherwise, the recall will be rejected. The options of the device that the measurement was saved in must be enabled in the device to recall in; otherwise, the recall will be rejected.

Parameter(s): <string>,<string>,<string>

:MMEMory:MSIS <string>

:MMEMory:MSIS?

Title: Default Mass Storage Device

Description: This command selects the default device for use with MMEMory commands. The mass storage device parameter is case sensitive and must match a device returned from the :MMEMory:CATalog:MSUSs? command

For example:
MMEMory:MSIS "Internal"

Parameter(s): <string>
:MMEMory:STORe:SCReen

Title: Screen Shot

Description: The set command prompts a screenshot of the local UI to be taken and saved to local user storage. The naming convention and file path will be the same as what has been set up when taking a screenshot through the UI.

The query command will take a screenshot and return the image file as block data. No image will be saved in the local user storage.

The binary block header specifies the number of data bytes. It looks like \#AX, where A is the number of digits in X and X is the number of bytes in the <block>.

The first character is the literal ascii hash '# 043.

The second character (A) is a single ascii digit '1' to '9' describing the number of bytes in the length section (X). This number is called nlenght.

The next nlenght bytes make up an ascii string of digits '1' to '9' describing the length of the <block> data.

For example, if the first 6 bytes are #49999, then the nlenght is 4. The 4 bytes of length are 9999. After that follows the <block>, which would be 9999 bytes in size.

:MMEMory:STORe:STATe <numeric_value>,<string>,<string>

Title: Store State

Description: This command saves the current setup to the specified file location. The file location is resolved using the MSUS and file path parameters. These parameters are case sensitive. If a file with the resolved name already exists, it will be overwritten.

Parameters:

1. Numeric Value: currently unused. Send a 0.
2. File path: The file path (including file name) relative to the MSUS root directory. File extension should not be specified.
3. MSUS: Device to save the file on. See MMEMory:CATalog:MSUSs? for information on obtaining the list of available devices.

For example:

MMEMory:STORe:STATe 0,"/example_setup_file", "Internal"

A common cause of the command failure is not having enough space available on MSUS to save the setup. Use :MMEMory:CATalog:DIREctory query command to retrieve the total space available on MSUS.

Parameter(s): <numeric_value>,<string>,<string>
:MMEMory:STORe:TRACe <string>,<string>,<string>

Title: Store Trace

Description: This command saves the current measurement data along with the current setup to the specified file location. The file location is resolved using the MSUS and file path parameters. These parameters are case sensitive. Parameters:

1. Label: Used to specify which trace to save. Currently, the label only supports saving all traces. Send an empty string or "ALL" to store all traces.
2. File path: The file path (including file name) relative to the MSUS root directory. File extension should not be specified.
3. MSUS: Device to save the file on. See MMEMory:CATalog:MSUSs? for information on obtaining the list of available devices.

For example:
MMEMory:STORe:TRACe "ALL","/example_measurement_file","Internal"

A common cause of the command failure is not having enough space available on MSUS to save trace. Use :MMEMory:CATalog:DIRectory query command to retrieve the total space available on MSUS.

Parameter(s): <string>,<string>,<string>

[:SENSe]:BIAS:EXTernal:CURRent?

Title: External Bias Current

Description: This command queries the actual bias current in A.

[:SENSe]:BIAS:EXTernal:STATE <0 | 1 | ON | OFF>

[:SENSe]:BIAS:EXTernal:STATE?

Title: External Bias On/Off

Description: This command enables or disables the external bias. The query returns 1 if external bias is enabled; otherwise, returns 0.

Parameter(s): <0 | 1 | ON | OFF>

Query Return: 0 | 1

Default Value: OFF

[:SENSe]:BIAS:EXTernal:TRIPped[:STATE]?

Title: External Bias Fault

Description: This command queries whether the external bias is tripped. The query returns 1 for tripped; otherwise, returns 0.

Query Return: 0 | 1

Default Value: OFF

[:SENSe]:BIAS:EXTernal:TRIPped[:STATE]:CLEar

Title: Clear External Bias Fault

Description: This command clears the external bias tripped status. See command [:SENSe]:BIAS:EXTernal:TRIPped[:STATE] for retrieving the current tripped status.
[:SENSe]:BIAS:EXTernal:VOLTage <numeric_value>
[:SENSe]:BIAS:EXTernal:VOLTage?

Title: External Bias Voltage
Description: This command sets the desired voltage for the external bias. The query returns the actual bias voltage in V.
Parameter(s): <numeric_value>

[:SENSe]:FREQuency:REFerence:SOURce?

Title: Frequency Reference Source
Description: Returns the current frequency reference source used by the instrument, as specified in the following table:
Return value: Description
GPS: GPS High Accuracy
ACQ: Acquiring GPS Reference
INT: Internal Standard Accuracy
HI: Internal High Accuracy
EXT: External (10 MHz) Reference
Query Return: ACQ|EXT|GPS|HI|INT
Default Value: INT

[:SENSe]:TIMe:REFerence:SOURce?

Title: Time Reference Source
Description: Returns the current time reference used by the instrument, as specified in the following table:
Return value: Description
GPS GPS High Accuracy
INT Internal Standard Accuracy
HI Internal High Accuracy
Query Return: GPS|HI|INT
Default Value: INT
:SYSTem:COMMunicate:LAN:CONFig <string>,<string>,<string>
:SYSTem:COMMunicate:LAN:CONFig?

Title: Static LAN Configuration
Description: This command set and queries the static ethernet configuration of the device. The static configuration allows user to specify the ip, gateway, and subnet mask of the unit on a network. Parameters:
- Static IP Address: The desired IP address of the unit.
- Gateway: The network gateway.
- Subnet Mask: the subnet mask of the network the device is connected to.
A new valid configuration will automatically be applied to the device. The user will be required to access the unit through the new configuration.
CAUTION: Consult with your network administrator when configuring the network interface to avoid potential loss of access or discovery of the device.

Parameter(s): <string>,<string>,<string>

:SYSTem:COMMunicate:LAN:CONFig:CURRent?

Title: Current LAN Configuration
Description: This command queries the current ethernet configuration of the device.

:SYSTem:COMMunicate:LAN:DHCP <ON|OFF>
:SYSTem:COMMunicate:LAN:DHCP?

Title: DHCP Configuration
Description: This command sets and queries the DHCP configuration of the device. If the DHCP configuration is set to OFF, the device is configured to the static ethernet configuration (See :SYSTem:COMMunicate:LAN:CONFig). If the DHCP configuration is set to ON, the device will obtain its IP address, gateway, and subnet mask from the DHCP server in the network.
This set command should be used to caution, as changing the ethernet configuration will result in temporary loss of communication with the device.
CAUTION: Consult with your network administrator when configuring the network interface to avoid potential loss of access or discovery of the device.

Parameter(s): <ON|OFF>
Query Return: ON|OFF
Default Value: OFF

:SYSTem:COMMunicate:LAN:DNS <string>,<string>,<string>
:SYSTem:COMMunicate:LAN:DNS?

Title: Dynamic DNS Configuration
Description: This command sets and queries the Dynamic Domain Name Server (Dynamic DNS) configuration of the device. Currently, only http://www.noip.com (TM) is available for use. For support, please contact the vendor at http://www.noip.com. Parameters:
- Dynamic DNS NoIp.com Host Name: Desired host name of the device.
- Dynamic DNS NoIp.com Password: noip.com password.

Parameter(s): <string>,<string>,<string>
:SYSTem:COMMunicate:LAN:DNSServer:APPend <string>, {<string>}, ...

    Title: Domain Name System Server Append
    Description: This command will add one or more Domain Name System Servers to the end of the device's current list of DNS Servers.
    To view the entire list of DNS Servers, see SYSTem:COMMunicate:LAN:DNSServer:LIST. To remove a DNS Server, see SYSTem:COMMunicate:LAN:DNSServer:DELete.
    This command takes a list of one or more string values. For example:
    SYSTem:COMMunicate:LAN:DNSServer:APPend "8.8.8.8, "123.125.81.6"

Parameter(s): <string>, {<string>}, ...

:SYSTem:COMMunicate:LAN:DNSServer:DELete <string>, {<string>}, ...

    Title: Domain Name System Server Delete
    Description: This command will delete the device's given Domain Name System Servers from the device's current list of DNS servers. To view the entire list of DNS Servers, see SYSTem:COMMunicate:LAN:DNSServer:LIST.
    This command takes a list of one or more string values. For example:
    SYSTem:COMMunicate:LAN:DNSServer:DELete "8.8.8.8, "123.125.81.6"

Parameter(s): <string>, {<string>}, ...

:SYSTem:COMMunicate:LAN:DNSServer:LIST <string>, {<string>}, ...
:SYSTem:COMMunicate:LAN:DNSServer:LIST?

    Title: Domain Name System Server List
    Description: This command sets and retrieves a list of the device's currently set Domain Name System Servers.
    The DNS Server is used to resolve a Domain Name. The list of DNS Servers will be contacted after any DNS Server assigned by DHCP Setting, if applicable, and will be contacted in the order given in the list.
    This command takes a list of one or more string values. Setting the DNS server list with this command will override the currently set DNS server list.
    An example of using the command: SYSTem:COMMunicate:LAN:DNSServer:LIST "8.8.8.8, "123.125.81.6"
    This query version of this command returns a comma delimited list of strings. For example: 123.125.81.6,8.8.8.8
    To remove DNS Server, see SYSTem:COMMunicate:LAN:DNSServer:DELete.
    To add to the end of the current list, see SYSTem:COMMunicate:LAN:DNSServer:APPend.

Parameter(s): <string>, {<string>}, ...
:SYSTem:COMMunicate:LAN:HOSTname <string>

:SYSTem:COMMunicate:LAN:HOSTname?

Title: Local Host Name

Description: This command sets and retrieves the local host name of the instrument. A valid hostname may contain only the ASCII letters 'a' through 'z' (in a case-insensitive manner), the digits '0' through '9', and the hyphen ('-'). They cannot start/end with '-'. No other symbols, punctuation characters, or white space are permitted.

Parameter(s): <string>

:SYSTem:COMMunicate:WLAN:CONFig:CURRent?

Title: Current WLAN Configuration

Description: This command queries the device wireless LAN configuration.

For example: { "ipAddress" : "192.168.0.190",
               "gateWay" : "192.168.0.1",
               "subnetMask" : "255.255.255.0"
            }

:SYSTem:COMMunicate:WLAN:CONNection <string>,[<string>]

Title: Connect to a WiFi Access Point

Description: This command connects to a WiFi access point. The first string parameter is the ssid of the access point. The second string parameter, which is optional is the password of the access point.

Parameter(s): <string>,[<string>]
**:SYSTem:COMMunicate:WLAN:CONNection:ACTive?**

**Title:** WiFi Active Connection Information

**Description:** This command returns properties of the current WLAN connection.

If SYSTem:COMMunicate:WLAN:CONNection:STATus is not CONNected, the response is an ASCII empty JSON object: `{}` Otherwise the response is an ASCII JSON object with the following properties:

1. **SSID (ssid):** The Service Set Identifier identifying the access point connected to.
2. **Frequency (frequency):** The radio channel frequency in use by the access point, in MHz.
3. **Max Bit Rate (rate):** The maximum bitrate this access point is capable of.
4. **Signal Strength (signal):** The current signal quality of the access point, in percent.
5. **Security (security):** The list of authentication methods the access point supports, or an empty array if the access point has no security requirements. Possible values include: WEP|WPA1|WPA2|802.1X
6. **BSSID (bssid):** The hardware address of the access point.

For example:
```
{"ssid" : "ExampleAccessPoint",
"frequency" : "5220 MHz",
"rate" : "54 Mbit/s",
"signal" : 72,
"security" : ["WPA1", "WPA2"],
"bssid" : "00:13:1A:34:D8:52"
```

**:SYSTem:COMMunicate:WLAN:CONNection:FORGet <string>**

**Title:** Forget a WiFi Access Point

**Description:** This command disconnects and forgets a WiFi access point.

The first string parameter is the ssid of the access point.

**Parameter(s):** <string>

**:SYSTem:COMMunicate:WLAN:CONNection:STATus?**

**Title:** WiFi Connection Status

**Description:** This command returns the connection status of the WLAN device. The response is ASCII character data of one of the following values:

**Parameter value Description**

CONNected A connection is established
DISConnected No connection currently exists

**Query Return:** CONN|DISC

**Default Value:** DISConnected
:SYSTem:COMMunicate:WLAN:NETWorks?

Title: WiFi Access Points

Description: This command returns available WiFi access points.

If SYSTem:COMMunicate:WLAN:STATE is false, the response is an empty list []
Otherwise the response is ASCII of JSON object array with the following properties:

1. SSID (ssid): The Service Set Identifier identifying the access point connected to.
2. Frequency (frequency): The radio channel frequency in use by the access point, in MHz.
3. Max Bit Rate (rate): The maximum bitrate this access point is capable of.
4. Signal Strength (signal): The current signal quality of the access point, in percent.
5. BSSID (bssid): The hardware address of the access point.
6 Security Methods (security) : the security methods supported by the access point

For example: {
  "ssid" : "RAPTOR",
  "frequency" : "5220 MHz",
  "rate" : "54 Mbit/s",
  "signal" : 72,
  "bssid" : "00:13:1A:34:D8:52",
  "security" : "WPA1","WPA2"
},

{  
  "ssid" : "AM-Employee",
  "frequency" : "5 MHz",
  "rate" : "5.22",
  "signal" : 62,
  "bssid" : "06:18:1A:31:4E:62"
  "security" : "WPA1","WPA2"
}

:SYSTem:COMMunicate:WLAN:STATE <0 | 1 | ON | OFF>

:SYSTem:COMMunicate:WLAN:STATE?

Title: Enable or Disable WiFi

Description: This command toggles the WLAN interface on or off.

Parameter(s): <0 | 1 | ON | OFF>

Query Return: 0 | 1

Default Value: OFF
:SYSTem:DATE <numeric_value>,<numeric_value>,<numeric_value>

Description: This command sets and queries the system's internal calendar. Changing the system date does not affect the system time zone (if time zone is available). The three parameters for this command are <year>,<month> and <day>. The query response message shall consist of three fields separated by commas: <year>,<month>,<day>. The year shall be entered as a four-digit number, including century and millennium information. This shall not be affected by a *RST command. Note: Some products only support the query version of this command.

Parameter(s): <numeric_value>,<numeric_value>,<numeric_value>

:SYSTem:DEFault:RESet:DATA <USER|SYSTem>

Description: This command deletes the instrument data files as specified in the following table:

<table>
<thead>
<tr>
<th>Parameter Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>USER</td>
<td>Deletes all user files in the instrument's internal memory including measurements, setup files, and screen shots. User-customized system files will not be deleted.</td>
</tr>
<tr>
<td>SYSTem</td>
<td>Deletes all user-customized system files including keyboard EZ names, cable lists, antenna lists, and log files.</td>
</tr>
</tbody>
</table>

Parameter(s): <USER|SYSTem>

:SYSTem:DEFault:RESet:FACTory

Description: This command presets parameters in all applications as well as system settings with the exception of ethernet settings (DHCP On/Off, static IP, Static Gateway, Static Subnet) and time zone setting to their factory default values, and restarts the instrument. Last saved settings will be deleted.

:SYSTem:DEFault:RESet:MASTer

Description: This command presets parameters in all applications as well as system settings with the exception of ethernet settings (DHCP On/Off, static IP, Static Gateway, Static Subnet) and time zone setting to default values, and restarts the instrument. Last saved settings, log files, and user files will all be deleted.
:SYSTem:ERRor[:NEXT]?

Title: System Error Queue

Description: If an error occurs, the error number and message are placed in the error queue, which can be read by this query command. Errors are cleared by reading them. Error code 0, is "No error". Error codes from -100 to -199 belong to the Command error category and sets bit 5 of the standard ESR register. Error codes from -200 to -299 belong to the Command error category and sets bit 4 of the standard ESR register. Error codes from -400 to -499 belong to the Query error category and sets bit 2 of the standard ESR register. Error codes from -300 to -399 and 1 to 32767 belongs to the Device-specific error and sets bit 3 of the standard ESR register.

Negative error numbers (command error, execution error, device-dependent error, query error) are standard SCPI errors. Positive error numbers are device specific errors, not standard SCPI errors. The error queue is also cleared by *CLS, *RST, and when power is turned on.

If more errors have occurred than can fit in the buffer, the last error stored in the queue (the most recent error) is replaced with -350, Queue overflow. No additional errors are stored until removing errors from the queue. If no errors have occurred when reading the error queue, the instrument responds with 0, No error.

:SYSTem:FIRMware:UPDate <string>,<string>

Title: Firmware Update

Description: Initiate a firmware update from the MSUS whose path is specified as parameters. If the requested firmware package is not recognized, an appropriate error will be added to the error queue. Otherwise, the instrument will verify that the package is safe to install, update to the new firmware.

The instrument will disconnect all remote clients and reboot after the new firmware has been installed.

The two parameters for this command are file name with relative path and mass storage device. Both parameters are case sensitive. Use "\" as a directory separator.

For example:
SYSTem:FIRMware:UPDate "V2019.01.1.raucb", "USB4"

The available mass storage devices can be retrieved by the :MMEMory:CATalog:MSUSs command. The command will fail if the file doesn't exist or the mass storage device is not present.

Parameter(s): <string>,<string>
**:SYSTem:FIRMware:UPDate:LIST?**

**Title:** Firmware Package List

**Description:** This command queries the instrument for a list of firmware packages that can be installed from mounted USB block devices. Please note that firmware packages are only detected on the top level of a USB block device. Any files located in subfolders will be ignored.

The response is in JSON format and consists of the path of the package relative to the root of the MSUS, the MSUS that the package is located in, and the version of the package.

The following is an example of the response:

```json
[{
  "msus": "USB1",  "path": "V2018.2.22.raucb",  "version": "V2018.2.22"},
  {
  "msus": "USB2",  "path": "V2018.2.19.raucb",  "version": "V2018.2.19"}
]
```

These package names enumerate the valid parameter values to the :SYSTem:FIRMware:UPDate command.

**:SYSTem:FIRMware:UPDate:REMote <string>**

**Title:** Remote Firmware Update

**Description:** Initiate a remote firmware update to the package whose name is specified as a parameter. Use :SYSTem:FIRMware:UPDate:REMote:LIST? to inspect the packages that can be installed. If the requested firmware package is not recognized, an appropriate error will be added to the error. Otherwise, the instrument will download the specified firmware package, verify that the package is safe to install, update to the new firmware.

The instrument will disconnect all remote clients and reboot after the new firmware has been installed.

If the <STRING DATA> argument begins with (case insensitive) any of

http://
https://
ftp://

Then the firmware update will be downloaded from that URL. The URL must be percent-encoded per RFC-2396 section 2.4.1.

**Parameter(s):** <string>

**:SYSTem:FIRMware:UPDate:REMote:AUTO <0 | 1 | ON | OFF>**

**:SYSTem:FIRMware:UPDate:REMote:AUTO?**

**Title:** Remote Firmware Update Auto Check

**Description:** This command sets and queries the state to enable automatically checking a remote server (see SYSTem:FIRMware:UPDate:REMote:SOURce?) for software updates. If this command is set to ON, The server will be checked for a newer version on bootup and every 24 hours thereafter. If this command is set to OFF, no automatic checking will take place, but a check can be initiated manually (see SYSTem:FIRMware:UPDate:REMote:SOURce command). If the check finds a newer version available, the SYSTem:FIRMware:UPDate:REMote:LIST:REFresh command. If the check finds a newer version available, the SYSTem:FIRMware:UPDate:REMote:LATest? query will indicate the newer version. Use the SYSTem:FIRMware:UPDate:REMote command to initiate the download and install.

**Parameter(s):** <0 | 1 | ON | OFF>

**Query Return:** 0 | 1

**Default Value:** ON
:SYSTem:FIRMware:UPDATE:REMote:LAst?

Title: Check For Firmware Update

Description: Check whether the instrument firmware is at the latest version. This command will access the package list specified by SYST:FIRM:UPD:REM:SOUR and return a response of the form <string>,<number> where <string> is the name of the latest firmware package, and <number> is 1 if the latest firmware package is newer than the version of firmware currently installed (a firmware update is available), or 0 if the current instrument firmware version matches the latest version (the instrument is up to date).

Clients can update the instrument to the latest firmware by passing the <string> component of the response as a parameter to the SYST:FIRM:UPD:REM command.

:SYSTem:FIRMware:UPDATE:REMote:LIST?

Title: Remote Firmware Package List

Description: This command queries the instrument for a list of firmware packages that can be installed remotely. The package list will be populated from a resource file that is downloaded from a URL specified by the current value of :SYSTem:FIRMware:UPDATE:REMote:SOURce.

The response is ASCII response consisting of one or more comma-delimited package names. For example: 2.0.0,1.0.0

These package names enumerate the valid parameter values to the :SYSTem:FIRMware:UPDATE:REMote command.

:SYSTem:FIRMware:UPDATE:REMote:LIST:REFResh

Title: Remote Firmware Package List Refresh

Description: This command causes the list of firmware packages that can be installed remotely (:SYSTem:FIRMware:UPDATE:REMote:LIST?) to be refreshed from the remote source server immediately. Normally the list is automatically updated on a timer interval to limit the amount of network requests. The exact timer interval varies by model and could be anywhere from one minute to one day. Use this command if you do not want to wait for the next automatic timer-based update to the remote firmware package list.

Note that this command only initiates the request to the server to get the updated list of packages. It does not wait until the list (as visible by :SYSTem:FIRMware:UPDATE:REMote:LIST?) is actually updated as the request is made asynchronously.
**Title:** Remote Firmware Package Source

**Description:** This command sets or queries the instrument's remote firmware update package list source. This source must be an http URL that is accessible to the instrument over the current network interface.

The set version of this command takes a string that spells the URL to the package list file. The query version returns that string. The default value points to the repository on anritsu.com where official firmware packages for this instrument are distributed. Most users will never need to change this setting from the default.

The package list file must be a JSON file that has a minimum structure. The root object must contain a "version" string (which is reserved but currently unused), a "packages" array of zero or more package objects (each at minimum have a "name", "url", "version", and "model"), and a "default" string that matches one of the package names, or is ".". The version and model attributes have semantic meaning, but the name and filename (url) can be anything. An example package list file is shown below:

```json
{
  "version": "0.0.1",
  "packages": [
    {
      "name": "2.0.0 (MS2090A)",
      "version": "2.0.0",
      "model": "MS2090A",
      "url": "http://files.us.anritsu.com/firmware/sh/MS2090A_2.0.0.tar"
    },
    {
      "name": "1.0.0 (MS2090A)",
      "version": "1.0.0",
      "model": "MS2090A",
      "url": "http://files.us.anritsu.com/firmware/sh/MS2090A_1.0.0.tar"
    }
  ],
  "default": "1.0.0"
}
```

When the package source is set, the instrument will attempt to download the file and validate it according to the above rules before making the change permanent. If the file cannot be accessed or the file does not conform to the minimum criteria, a device specific error will be added to the error queue and the package source will remain unchanged.

**Parameter(s):** `<string>`

---

**Title:** Firmware Version

**Description:** This command queries the device firmware version.
`:SYS:TEm:GPS:STATe <0 | 1 | ON | OFF>`

Title: GPS State

Description: Enable or disable the GPS. When the GPS is OFF, the GPS module is placed into standby to save power, and features which depend on the GPS may be unusable.

Parameter(s): <0 | 1 | ON | OFF>

Query Return: 0 | 1

Default Value: OFF

`:SYS:TEm:GPS:VOLTage <numeric_value>`

Title: GPS Voltage

Description: Supplies either 3.3V or 5V to power the attached GPS

Parameter(s): <numeric_value>

Query Return: Numeric

Default Value: 3.3

Range: 3.3 to 5

`:SYS:TEm:LOG:ERRor?`

Title: System Error Log

Description: This command retrieves the error log. The log is encrypted and can be saved to a file and sent to Anritsu Service if required.

`:SYS:TEm:MACaddress?`

Title: MAC Address

Description: This command accesses the mac address of the device.

`:SYS:TEm:OPTions?`

Title: Query Options

Description: This command retrieves the options that are currently set. The response is returned in "/" delimited form.

`:SYS:TEm:OPTions:CONFig?`

Title: Option Configuration

Description: This command returns a quoted string of characters readable only by Anritsu Customer Service. Only instrument configuration information is returned. No setup information is included.
:SYSTem:OPTions:UPGRade <string>

Title: Option Upgrade
Description: This command upgrades the options of the device with a valid license key provided as a quoted string parameter. The device must be reboot immediately after this command for the installation of the new options to complete. The device must not be powered off while the command is executing. The recommended way to restart the device safely is sending the *RST command after this command. This command might report the following error code: -200 : The command failed to complete. Detailed error message will be provided in the response of :SYStem:ERRor[:NEXT]? command.
Parameter(s): <string>

:SYSTem:PRESet

Title: Preset
Description: This command presets parameters in the current application to their factory default values.

:SYSTem:PRESet:MODE

Title: Preset Mode
Description: This command presets parameters in the current mode to their factory default values.

:SYSTem:REBoot

Title: System Reboot
Description: This command saves the current state of the instrument and reboots the instrument.

:SYSTem:SHUTdown

Title: System Shutdown
Description: This command shuts down the instrument. The current instrument state and settings will be saved.

:SYSTem:TEMPerature?

Title: Get CPU Temperature
Description: This command returns the CPU temperature in Celsius.

:SYSTem:TIME <numeric_value>,<numeric_value>,<numeric_value>
:SYSTem:TIME?

Title: System Time
Description: This command sets and queries the system's internal clock. Changing the system time does not affect the system time zone (if time zone is available). The three parameters for this command are <hour>,<minute> and <second>. The query response message shall consist of three fields separated by commas: <hour>,<minute>,<second>. Note: Some products only support the query version of this command.
Parameter(s): <numeric_value>,<numeric_value>,<numeric_value>
:SYSTem:TIME:SYNC <AUTO>|MANual>

Title: Sync System Time
Description: This command sets the system to either automatically synchronize with GPS/Internet server or manually adjust the time setting. Valid parameter values are AUTO|MANual. When AUTO is selected, GPS takes priority if it is present and turned on (see command :SYSTem:GPS:STATe to set GPS on or off). When the time setting is AUTO synchronized, the current time zone setting is not changed.

Parameter(s): <AUTO|MANual>
Query Return: AUTO|MAN
Default Value: AUTO

:SYSTem:TIME:SYNC? 

:SYSTem:TIME:SYNC:STATus?

Title: Sync Time Status
Description: This command query the last system time synchronization status. The return value range are INT, GPS, NONE, or NA.

INT - the system time was successfully synchronized with internet server.
GPS - the system time was successfully synchronized with GPS device time.
NONE - the system time was set to automatically synchronize with GPS/internet. However, it was unable to synchronize with the time source. It may indicates the time source connection is not available or time source is not ready such as GPS is off.
NA - the system time was set to manually update, thus synchronization status is not available.

Query Return: INT|GPS|NONE|NA
Default Value: INTERNet

:SYSTem:TIME:ZONE <string>

:SYSTem:TIME:ZONE?

Title: System Time Zone
Description: This command sets and queries the system time zone. The time zone parameter is in string format of "(UTC+/-offset) Area/Location" as returned from the :SYSTem:TIME:ZONE:CATalog command. Changing the system time zone affects the system date/time.

Parameter(s): <string>

:SYSTem:TIME:ZONE:CATalog?

Title: System Time Zone Catalog
Description: This command queries the available system time zone catalog. The query returns comma delimited description for time zone sorted by UTC offset. Each item is in the format of "(UTC+/-offset) Area/Location" where Area/Location is defined in the tz database
**:SYSTem:UNIT:NAMe <string>**

**Title:** System Unit Name

**Description:** This command sets/queries the unit name of the current system. The name of the unit must not be greater than 45 ASCII characters

**Parameter(s):** <string>

**:TEST:SELFtest?**

**Title:** Self Test

**Description:** Perform a self-test and return the results. The response is formatted as a JSON (http://json.org/) array of name,value pair result objects. Some result objects also include a 'status' property that will be either 'pass' or 'fail' based on whether the criteria for that test was met.

For tests of voltages, the test passes if the measured voltage is within 10% of the expected voltage.

### 2-3 SPA Commands

**:ABORt**

**Title:** Abort

**Description:** Resets the trigger system. This has the effect of aborting the sweep or any measurement that is currently in progress.

Additionally, any pending operation flags that were set by initiation of the trigger system will be set to false.

If :INITiate:CONTinuous is OFF (i.e. the instrument is in single sweep mode), send the command :INITiate[:IMMediate] to trigger the next sweep.

If :INITiate:CONTinuous is ON (i.e. the instrument is in continuous sweep mode) a new sweep will start immediately.

**:CALCulate<n>:LIMit<n>:COMMent <string>**

**:CALCulate<n>:LIMit<n>:COMMent?**

**Title:** Limit Comment

**Description:** Associates a user-defined comment with each limit. The set version of this command takes a single parameter that is a string containing the desired comment. The query version returns the comment that is set.

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

Note that this command is not available for Spectral Emission Mask measurement.

**Parameter(s):** <string>

**CALCulate Suffix**

- **Range:** 1, Default = 1

**LIMit Suffix Range:** 1-10, Default = 1
:CALCulate<n>:LIMit<n>:CONTroll[:DATA] <numeric_value> {HZ | KHZ | MHZ | GHZ}, {<numeric_value> {HZ | KHZ | MHZ | GHZ}}, ...

:CALCulate<n>:LIMit<n>:CONTroll[:DATA]?

Title: Limit Control Data

Description: This command sets or queries the control data (X-axis values) for the specified limit.

The numeric suffix on LIMit specifies which limit number to query or set data. If the suffix is omitted, the command will refer to limit 1.

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

This command takes a list of one or more frequency values as parameters. For example, CALC:LIM1:CONT:DATA 1 MHz, 2 MHz, 3 MHz.

Note that it is permitted to set one or more invalid 'placeholder' values of Not-A-Number (NAN). The placeholder value for NAN is 9.91e37. If a control data point contains a value of 9.91e37, limit line interpolation from the previous data point, and to the next data point, will not occur. This is useful for defining discontiguous (or segmented) limit lines within a single limit.

For example, to define a limit line of two discontiguous segments, one from 1 MHz to 10 MHz, and another from 20 MHz to 30 MHz, send the following control data:
CALC:LIM1:CONT:DATA 1MHz, 10MHz, 9.91e37, 20MHz, 30MHz.

Note that the upper (or lower) data, if used, should contain the same amount of points as the control data (see CALC:LIM:FAIL? for details on what happens when this is not true). Thus, when using placeholders in control data, it is recommended that placeholders are also used in the upper (or lower) data. For example,
CALC:LIM1:CONT:UPP 0dBm, 10dBm, 9.91e37, 10dBm, 0dBm.

The exact value for the middle point does not matter, as interpolation will always be skipped due to the control data containing NAN, but using NAN for the corresponding upper (or lower) data value will make it easier to remember that the point is a placeholder.

Note that this command is not available for Spectral Emission Mask measurement.

Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}, {<numeric_value> {HZ | KHZ | MHZ | GHZ}}, ...

CALCulate Suffix
Range: 1, Default = 1

LIMit Suffix Range: 1-10, Default = 1
:CALCulate<n>:LIMit<n>:CONTrol:MODE <ABSolute|RELative>

Title: Limit Control Mode
Description: Choose either ABSolute or RELative limit.
   In ABSolute mode, the control value of the limit line is defined by absolute physical values (Hz).
   In RELative mode, the control value of the limit line is relative to the center frequency (Hz).
   If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).
   Note that this command is not available for Spectral Emission Mask measurement.

Parameter(s): <ABSolute|RELative>
Query Return: ABS|REL
CALCulate Suffix
   Range: 1, Default = 1
LIMit Suffix Range: 1-10, Default = 1
Default Value: ABSolute

:CALCulate<n>:LIMit<n>:CONTrol:SHIFT <numeric_value> {HZ | KHZ | MHZ | GHZ}

Title: Limit Control Shift
Description: Move a limit line along the control axis. This command changes the value of :CALCulate<n>:LIMit<k>:CONTrol[:DATA].
   Issuing this command multiple times will change the limits each time. For example, sending
   CALC:LIM1:CONT:SHIFT 1 Hz
   CALC:LIM1:CONT:SHIFT 1 Hz
   CALC:LIM1:CONT:SHIFT 1 Hz
   CALC:LIM1:CONT:SHIFT 1 Hz
   CALC:LIM1:CONT:SHIFT 1 Hz
   will shift the control axis by 5 Hz
   If a limit of the specified number does not already exist, a default limit will be created
   first (having empty data, with state set to ON).
   Note that this command is not available for Spectral Emission Mask measurement.

Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
CALCulate Suffix
   Range: 1, Default = 1
LIMit Suffix Range: 1-10, Default = 1
`CALCulate<n>:LIMit<n>:COPY <numeric_value>`

**Title:** Limit Copy

**Description:** Copies a limit line eg: CALC:LIM1:COPY 2 Copies limit 1 to line 2

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

Note that this command is not available for Spectral Emission Mask measurement.

**Parameter(s):** `<numeric_value>`

`CALCulate` Suffix

`Range:` 1, Default = 1

`LIMit` Suffix Range: 1-10, Default = 1

`CALCulate<n>:LIMit<n>:DELETE`  

**Title:** Limit Delete

**Description:** Deletes a limit line

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

Note that this command is not available for Spectral Emission Mask measurement.

`CALCulate` Suffix

`Range:` 1, Default = 1

`LIMit` Suffix Range: 1-10, Default = 1

`CALCulate<n>:LIMit<n>:FAIL?`  

**Title:** Limit Fail

**Description:** This command queries the result of a limit check.

All traces that have had checking enabled (via CALC:TRAC:CHEC) will be evaluated against the upper and lower data of the specified limit, unless the limit STATE is OFF (in which case this command will always return 0), or the upper or lower STATE is OFF (in which case only the data with STATE ON will be checked).

If the sweep has not completed yet, the partial trace will be evaluated. If INITiate:CONTinuous is ON, a snapshot of the trace at the time this command was received will be evaluated against the limit. This command returns 1 if any of the checked traces violate the limit, otherwise it returns 0.

When a limit is evaluated, there are some rules that are followed if the cardinality of the limits control, upper, and lower data are not equal. If there are fewer control data points than upper or lower data points, then only the first `n` upper or lower points will be evaluated, where `n` is the number of control points. If there are fewer upper or lower points than control points, then the effective number of upper or lower points will be increased to the number of control points, with the 'extrapolated' points having a value equal to the last upper or lower point.

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

`CALCulate` Suffix

`Range:` 1, Default = 1

`LIMit` Suffix Range: 1-10, Default = 1
:\texttt{CALCulate<n>:LIMit<n>:LOWer[:DATA]} \{\texttt{numeric\_value}\} \{\texttt{DBM}\},
\{\texttt{numeric\_value} \{\texttt{DBM}\}\}, \ldots
\texttt{CALCulate<n>:LIMit<n>:LOWer[:DATA]}

	extbf{Title:} Lower Limit Data

	extbf{Description:} This command sets or queries the lower limit data (Y-axis values) for the specified limit.

The numeric suffix on LIMit specifies which limit number to query or set data. If the suffix is omitted, the command will refer to limit 1.

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

This command takes a list of one or more amplitude values as parameters. For example,
\texttt{CALC:LIM1:LOW:DATA 1 dBm, 2dBm, 3 dBm}

Note that it is permitted to set one or more data values of +/- infinity. The placeholder value for +/- infinity is +/-9.9e37. If a lower data point contains a value of +/-9.9e37, the amplitude at that point will be treated as if it were +/-infinity (i.e. the lower limit will either always fail or always pass at that point).

It is also permitted to set one or more invalid 'placeholder' values of Not-A-Number (NAN). This is useful for defining discontiguous (or segmented) limit lines within a single limit.

For details, and an example, of using placeholder values, see \texttt{CALC:LIM:CONT:DATA}.

Note that this command is not available for Spectral Emission Mask measurement.

\textbf{Parameter(s):} \{\texttt{numeric\_value} \{\texttt{DBM}\}, \{\texttt{numeric\_value} \{\texttt{DBM}\}\}, \ldots

\textbf{CALCulate Suffix}
\textbf{Range:} 1, Default = 1

\textbf{LIMit Suffix Range:} 1-10, Default = 1

\texttt{CALCulate<n>:LIMit<n>:LOWer:MODE} \{\texttt{ABSolute|RELative}\}
\texttt{CALCulate<n>:LIMit<n>:LOWer:MODE?}

	extbf{Title:} Limit Lower Mode

	extbf{Description:} Choose either ABSolute or RELative limit.

In ABSolute mode, the control value of the limit line is defined by absolute physical values (dBm).

In RELative mode, the control value of the limit line is relative to the reference level (dB).

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

Note that this command is not available for Spectral Emission Mask measurement.

\textbf{Parameter(s):} \{\texttt{ABSolute|RELative}\}

\textbf{Query Return:} ABS|REL

\textbf{CALCulate Suffix}
\textbf{Range:} 1, Default = 1

\textbf{LIMit Suffix Range:} 1-10, Default = 1

\textbf{Default Value:} ABSolute
:CALCulate<n>:LIMit<n>:LOWer:SHIFT <numeric_value> {DB}

Title: Lower Limit Shift

Description: Move the lower limit up or down by a relative amplitude. This command changes the value of :CALCulate<n>:LIMit<k>:LOWer[:DATA]. Issuing this command multiple times will change the limits each time. For example, sending

CALC:LIM1:LOW:SHIFT 1 dB
CALC:LIM1:LOW:SHIFT 1 dB
CALC:LIM1:LOW:SHIFT 1 dB
CALC:LIM1:LOW:SHIFT 1 dB
CALC:LIM1:LOW:SHIFT 1 dB

will shift the lower limit by 5 dB

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

Note that this command is not available for Spectral Emission Mask measurement.

Parameter(s): <numeric_value> {DB}
CALCulate Suffix
  Range: 1, Default = 1
LIMit Suffix Range: 1-10, Default = 1

:CALCulate<n>:LIMit<n>:LOWer:STATe <0 | 1 | ON | OFF>
:CALCulate<n>:LIMit<n>:LOWer:STATe?

Title: Lower Limit State

Description: Turns ON or OFF the lower limit.

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

Note that this command is not available for Spectral Emission Mask measurement.

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
CALCulate Suffix
  Range: 1, Default = 1
LIMit Suffix Range: 1-10, Default = 1
  Default Value: OFF
**:CALCulate<n>:LIMit<n>:NAME <string>**
** :CALCulate<n>:LIMit<n>:NAME?**

**Title:** Limit Name

**Description:** Associates a user-defined name with each limit.

The set version of this command takes a single parameter that is a string containing the desired limit name. The query version returns the name that is set.

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON). Note that this command is not available for Spectral Emission Mask measurement.

**Parameter(s):** <string>

**CALCulate Suffix**
**Range:** 1, Default = 1

**LIMit Suffix Range:** 1-10, Default = 1

**:CALCulate<n>:LIMit<n>:STATe <0 | 1 | ON | OFF>**
**:CALCulate<n>:LIMit<n>:STATe?**

**Title:** Limit State

**Description:** Turns the limit check for a specific limit ON or OFF.

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

Note that this command is not available for Spectral Emission Mask measurement.

**Parameter(s):** <0 | 1 | ON | OFF>

**Query Return:** 0 | 1

**CALCulate Suffix**
**Range:** 1, Default = 1

**LIMit Suffix Range:** 1-10, Default = 1

**Default Value:** OFF

**:CALCulate<n>:LIMit<n>:TRACe<n>:CHECk <0 | 1 | ON | OFF>**
**:CALCulate<n>:LIMit<n>:TRACe<n>:CHECk?**

**Title:** Limit Trace Check

**Description:** This command turns the limit check for a specific trace on and off.

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

Note that this command is not available for Spectral Emission Mask measurement.

**Parameter(s):** <0 | 1 | ON | OFF>

**CALCulate Suffix**
**Range:** 1, Default = 1

**LIMit Suffix Range:** 1-10, Default = 1

**TRACe Suffix**
**Range:** 1-6, Default = 1
:CALCulate<n>:LIMit<n>:UPPer[:DATA] <numeric_value> {DBM},
{<numeric_value> {DBM}}, ...
:CALCulate<n>:LIMit<n>:UPPer[:DATA]?

Title: Upper Limit Data

Description: This command sets or queries the upper limit data (Y-axis values) for the specified limit.

The numeric suffix on LIMit specifies which limit number to query or set data. If the suffix is omitted, the command will refer to limit 1.

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

This command takes a list of one or more amplitude values as parameters. For example, CALC:LIM1:UPP:DATA 1 dBm, 2dBm, 3 dBm

Note that it is permitted to set one or more data values of +/- infinity. The placeholder value for +/- infinity is +/-9.9e37. If an upper data point contains a value of +/-9.9e37, the amplitude at that point will be treated as if it were +/-infinity (i.e. the upper limit will either always pass or always fail at that point).

It is also permitted to set one or more invalid 'placeholder' values of Not-A-Number (NAN). This is useful for defining discontiguous (or segmented) limit lines within a single limit.

For details, and an example, of using placeholder values, see CALC:LIM:CONT:DATA.

Note that this command is not available for Spectral Emission Mask measurement.

Parameter(s): <numeric_value> {DBM}, {<numeric_value> {DBM}}, ...

CALCulate Suffix
Range: 1, Default = 1
LIMit Suffix Range: 1-10, Default = 1

:CALCulate<n>:LIMit<n>:UPPer:MODE <ABSolute|RELative>
:CALCulate<n>:LIMit<n>:UPPer:MODE?

Title: Upper Limit Mode

Description: Choose either ABSolute or RELative limit.

In ABSolute mode, the control value of the limit line is defined by absolute physical values (dBm).

In RELative mode, the control value of the limit line is relative to the reference level (dB).

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

Note that this command is not available for Spectral Emission Mask measurement.

Parameter(s): <ABSolute|RELative>

Query Return: ABS|REL

CALCulate Suffix
Range: 1, Default = 1
LIMit Suffix Range: 1-10, Default = 1
Default Value: ABSolute
\texttt{CALCulate<n>:LIMit<n>:UPPer:SHIFT <numeric\_value> \{DB\}}

\textbf{Title:} Upper Limit Shift

\textbf{Description:} Move the upper limit up or down by a relative amplitude. This command changes the value of :\texttt{CALCulate<n>:LIMit<k>:UPPer[:DATA]}.

Issuing this command multiple times will change the limits each time. For example, sending
\begin{verbatim}
CALC:LIM1:UPP:SHIFT 1 dB
CALC:LIM1:UPP:SHIFT 1 dB
CALC:LIM1:UPP:SHIFT 1 dB
CALC:LIM1:UPP:SHIFT 1 dB
CALC:LIM1:UPP:SHIFT 1 dB
\end{verbatim}
will shift the upper limit by 5 dB

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

Note that this command is not available for Spectral Emission Mask measurement.

\textbf{Parameter(s):} <\textit{numeric\_value}> \{DB\}

\texttt{CALCulate Suffix}

\texttt{Range:} 1, Default = 1

\texttt{LIMit Suffix Range:} 1-10, Default = 1

\texttt{CALCulate<n>:LIMit<n>:UPPer:STATe <0 | 1 | ON | OFF>}

\texttt{CALCulate<n>:LIMit<n>:UPPer:STATe?}

\textbf{Title:} Upper Limit State

\textbf{Description:} Turns ON or OFF the upper limit.

If a limit of the specified number does not already exist, a default limit will be created first (having empty data, with state set to ON).

Note that this command is not available for Spectral Emission Mask measurement.

\textbf{Parameter(s):} <0 | 1 | ON | OFF>

\textbf{Query Return:} 0 | 1

\texttt{CALCulate Suffix}

\texttt{Range:} 1, Default = 1

\texttt{LIMit Suffix Range:} 1-10, Default = 1

\textbf{Default Value:} OFF

\texttt{CALCulate<n>:LIMi\textbf{t}:ACTive?}

\textbf{Title:} Limit Active

\textbf{Description:} Queries the numbers of all active limit lines in ascending order. This command returns an empty string if no limits are active.

Note that this command is not available for Spectral Emission Mask measurement.
:CALCulate:ACPower:LIMit:ADJacent:ABSolute <numeric_value> {DBM}
:CALCulate:ACPower:LIMit:ADJacent:ABSolute?

   Title: Adjacent Channel Power Adjacent Absolute Limit
   Description: Sets and queries the amplitude of absolute limit for ACPR adjacent power.
   Parameter(s): <numeric_value> {DBM}
   Query Return: Numeric (dBm)
   Default Value: 10 dBm
   Default Unit: dBm
   Range: -200 dBm to 200 dBm

:CALCulate:ACPower:LIMit:ADJacent:LOWer:FAIL?

   Title: ACPR Limit Adjacent Lower Fail
   Description: This command queries the result of a limit check on lower adjacent channel power

:CALCulate:ACPower:LIMit:ADJacent:RELative <numeric_value> {DBM}
:CALCulate:ACPower:LIMit:ADJacent:RELative?

   Title: Adjacent Channel Power Adjacent Relative Limit
   Description: Sets and queries the amplitude of relative limit for ACPR adjacent power.
   Parameter(s): <numeric_value> {DBM}
   Query Return: Numeric (dBm)
   Default Value: 10 dBm
   Default Unit: dBm
   Range: -200 dBm to 200 dBm

:CALCulate:ACPower:LIMit:ADJacent:UPPer:FAIL?

   Title: ACPR Limit Adjacent Upper Fail
   Description: This command queries the result of a limit check on upper adjacent channel power

:CALCulate:ACPower:LIMit:ALTernate:ABSolute <numeric_value> {DBM}
:CALCulate:ACPower:LIMit:ALTernate:ABSolute?

   Title: Adjacent Channel Power Alternate Absolute Limit
   Description: Sets and queries the amplitude of absolute limit for ACPR alternate power.
   Parameter(s): <numeric_value> {DBM}
   Query Return: Numeric (dBm)
   Default Value: 10 dBm
   Default Unit: dBm
   Range: -200 dBm to 200 dBm
:CALCulate:ACPower:LIMit:ALTerminate:LOWer:FAIL?

Title: ACPR Limit Alternate Lower Fail
Description: This command queries the result of a limit check on lower alternate channel power

:CALCulate:ACPower:LIMit:ALTerminate:RELative <numeric_value> {DBM}
:CALCulate:ACPower:LIMit:ALTerminate:RELative?

Title: Adjacent Channel Power Alternate Relative Limit
Description: Sets and queries the amplitude of relative limit for ACPR alternate power.
Parameter(s): <numeric_value> {DBM}
Query Return: Numeric (dBm)
Default Value: 10 dBm
Default Unit: dBm
Range: -200 dBm to 200 dBm

:CALCulate:ACPower:LIMit:ALTerminate:UPPer:FAIL?

Title: ACPR Limit Alternate Upper Fail
Description: This command queries the result of a limit check on upper alternate channel power

:CALCulate:ACPower:LIMit:FAIL?

Title: ACPR Limit Fail
Description: This command queries the result of a limit check on adjacent channel power ratio

:CALCulate:ACPower:LIMit:MAIN <numeric_value> {DBM}
:CALCulate:ACPower:LIMit:MAIN?

Title: Adjacent Channel Power Main Limit
Description: Sets and queries the amplitude of limit for main power.
Parameter(s): <numeric_value> {DBM}
Query Return: Numeric (dBm)
Default Value: 10 dBm
Default Unit: dBm
Range: -200 dBm to 200 dBm

:CALCulate:ACPower:LIMit:MODE <ABSolute|RELative>
:CALCulate:ACPower:LIMit:MODE?

Title: Adjacent Channel Power Limit Mode
Description: Sets the ACPR limit mode to be absolute or relative
Parameter(s): <ABSolute|RELative>
Query Return: ABS|REL
Default Value: ABSolute
:CALCulate:ACPower:LIMit:STATe <0 | 1 | ON | OFF>
:CALCulate:ACPower:LIMit:STATe?

Title: Adjacent Channel Power Limit State
Description: Sets the ACPR limit state to be ON or OFF
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF

:CALCulate:CHPower:LIMit <numeric_value> {DBM}
:CALCulate:CHPower:LIMit?

Title: Channel Power Limit
Description: Sets and queries the amplitude of limit on channel power.
Parameter(s): <numeric_value> {DBM}
Query Return: Numeric (dBm)
Default Value: 10 dBm
Default Unit: dBM
Range: -200 dBm to 200 dBm

:CALCulate:CHPower:LIMit:FAIL?

Title: Channel Power Limit Fail
Description: This command queries the result of a limit check on channel power

:CALCulate:CHPower:LIMit:PSDensity <numeric_value> {DBM}
:CALCulate:CHPower:LIMit:PSDensity?

Title: Channel Power Spectral Density Limit
Description: Sets and queries the amplitude of limit on channel power spectral density.
Parameter(s): <numeric_value> {DBM}
Query Return: Numeric (dBm)
Default Value: 10 dBm
Default Unit: dBm
Range: -200 dBm to 200 dBm

:CALCulate:CHPower:LIMit:PSDensity:STATe <0 | 1 | ON | OFF>
:CALCulate:CHPower:LIMit:PSDensity:STATe?

Title: Channel Power Spectral Density Limit State
Description: Sets and queries the state of limit on channel power spectral density. The set form of this command sets the limit state to be ON or OFF
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF
:CALCulate:CHPower:LIMit:PSD:FAIL?
   Title: Power Spectral Density Limit Fail
   Description: This command queries the result of a limit check on channel power spectral density

:CALCulate:CHPower:LIMit:STATE <0 | 1 | ON | OFF>
:CALCulate:CHPower:LIMit:STATE?
   Title: Channel Power Limit State
   Description: Sets and queries the state of limit on channel power. The set form of this command sets the limit state to be ON or OFF
   Parameter(s): <0 | 1 | ON | OFF>
   Query Return: 0 | 1
   Default Value: OFF

:CALCulate:EIRPower:LIMit:FAIL?
   Title: EIRP Limit Pass/Fail
   Description: This command queries the result of a limit check on EIRP. The query returns 1 for fail and 0 for pass.

:CALCulate:EIRPower:LIMit:LOWer <numeric_value> {DBM}
:CALCulate:EIRPower:LIMit:LOWer?
   Title: EIRP Lower Limit
   Description: This command sets or queries the EIRP Lower limit. The query returns the EIRP lower limit in dBm.
   Parameter(s): <numeric_value> {DBM}
   Query Return: Numeric (dBm)
   Default Value: 0 dBm
   Default Unit: dBm
   Range: -99 dBm to 100 dBm

:CALCulate:EIRPower:LIMit:LOWer:STATE <0 | 1 | ON | OFF>
:CALCulate:EIRPower:LIMit:LOWer:STATE?
   Title: EIRP Lower Limit State
   Description: This command sets or queries the EIRP lower limit state. The query returns 1 if the lower limit state is On, otherwise 0.
   Parameter(s): <0 | 1 | ON | OFF>
   Query Return: 0 | 1
   Default Value: OFF
**:CALCulate:EIRPower:LIMit:UPPer <numeric_value> {DBM}**

Title: EIRP Upper Limit

Description: This command sets or queries the EIRP upper limit. The query returns the EIRP upper limit in dBm.

Parameter(s): <numeric_value> {DBM}

Query Return: Numeric (dBm)

Default Value: 0 dBm

Default Unit: dBm

Range: -99 dBm to 100 dBm

**:CALCulate:EIRPower:LIMit:UPPer:STATe <0 | 1 | ON | OFF>**

Title: EIRP Upper Limit State

Description: This command sets or queries the EIRP upper limit state. The query returns 1 if the upper limit state is On, otherwise 0.

Parameter(s): <0 | 1 | ON | OFF>

Query Return: 0 | 1

Default Value: OFF

**:CALCulate:EIRPower:MAXimum:LIMit:FAIL?**

Title: MAXimum EIRP Limit Pass/Fail

Description: This command queries the result of the maximum EIRP limit check. The query returns 1 for fail and 0 for pass.

**:CALCulate:INTERference:LIMit <numeric_value> {DBM}**

Title: Interference Finder Limit

Description: Sets and queries the limit of integrated power on interference finder.

Parameter(s): <numeric_value> {DBM}

Query Return: Numeric (dBm)

Default Value: 10 dBm

Default Unit: dBm

Range: -200 dBm to 200 dBm

**:CALCulate:INTERference:LIMit:FAIL?**

Title: Interference Finder Limit Fail

Description: This command queries the result of a limit check on interference finder.
:CALCulate:INTERference:LIMit:STATe <0 | 1 | ON | OFF>

Title: Interference Finder Limit State
Description: Sets and queries the state of limit on interference finder power. The set form of this command sets the limit state to be ON or OFF.

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF

:CALCulate:LIMit<n>:ENVelope:UPDATE:Y

Title: Update Limit Envelope Amplitude
Description: This command updates the amplitude of the upper and lower limits without changing the frequencies of the inflection points.
Note that this command is not available for Spectral Emission Mask measurement.
Limit Suffix Range: 1-10, Default = 1

:CALCulate:LIMit<n>:LOWer:ENVelope:CREate

Title: Create Lower Limit Envelope
Description: This command is used to create a Lower limit envelope on the selected trace.
Note that this command is not available for Spectral Emission Mask measurement.
Limit Suffix Range: 1-10, Default = 1

:CALCulate:LIMit<n>:LOWer[:TRACe]:POINts?

Title: Lower Limit Points
Description: This command queries the lower limit trace points (Y-axis values) for the specified limit. This differs from the limit data in that a value is returned for each point in the trace to indicate the values that are being used to evaluate limit pass/fail status.
The numeric suffix on LIMit specifies which limit number to query or set data. If the suffix is omitted, the command will refer to limit 1.
If a limit of the specified number does not exist, an empty list will be returned. Points which are not covered by the limit will be ‘inf’.
Note that this command is not available for Spectral Emission Mask measurement.
Limit Suffix Range: 1-10, Default = 1

:CALCulate:LIMit<n>:UPPer:ENVelope:CREate

Title: Create Upper Limit Envelope
Description: This command is used to create an Upper limit envelope on the selected trace.
Note that this command is not available for Spectral Emission Mask measurement.
Limit Suffix Range: 1-10, Default = 1
**Title:** Upper Limit Points

**Description:** This command queries the upper limit trace points (Y-axis values) for the specified limit. This differs from the limit data in that a value is returned for each point in the trace to indicate the values that are being used to evaluate limit pass/fail status.

The numeric suffix on `LI`M`i`t specifies which limit number to query or set data. If the suffix is omitted, the command will refer to limit 1.

If a limit of the specified number does not exist, an empty list will be returned. Points which are not covered by the limit will be ‘inf’.

Note that this command is not available for Spectral Emission Mask measurement.

**LI`M`i`t Suffix Range:** 1-10, Default = 1

**Title:** Limit Alarm

**Description:** This command enables/disables the AAE notification for limit failures.

Note that this command is not available for Spectral Emission Mask measurement.

**Parameter(s):** `<0 | 1 | ON | OFF>`

**Query Return:** 0 | 1

**Default Value:** OFF

**Title:** Limit Envelope Offset

**Description:** This command sets/gets the limit envelope offset. This defines how far away from the measured signal indicated the limit envelope is placed. Use `CALCulate:LIMi:t:TYPe` to set the currently active limit line.

Note that this command is not available for Spectral Emission Mask measurement.

**Parameter(s):** `<numeric_value> {DBM}`

**Query Return:** Numeric (dBm)

**Default Value:** 3 dBm

**Default Unit:** dBm

**Range:** -100 dBm to 100 dBm

**Title:** Number of Limit Envelope Points

**Description:** This command sets the number of inflection point for the limit envelope.

Note that this command is not available for Spectral Emission Mask measurement.

**Parameter(s):** `<numeric_value>`

**Query Return:** Numeric

**Default Value:** 20

**Range:** 2 to 41
:CALCulate:LIMit:ENVelope:SHApe <SQUare|SLOPe>

:CALCulate:LIMit:ENVelope:SHApe?

Title: Limit Envelope Shape
Description: This command sets/get the currently active limit envelope shape.
Note that this command is not available for Spectral Emission Mask measurement.
Parameter(s): <SQUare|SLOPe>
Query Return: SQU|SLOP
Default Value: SQUare

:CALCulate:MARKer<n>:FUNCtion <OFF|NOISe|FCOunter>

:CALCulate:MARKer<n>:FUNCtion?

Title: Marker Function
Description: Select the marker function to perform post-processing operation. The default/OFF function performs pass through operation.
Parameter(s): <OFF|NOISe|FCOunter>
Query Return: OFF|NOIS|FCO
MARKer Suffix
Range: 1-12, Default = 1
Default Value: OFF

:CALCulate:MARKer<n>:MAXimum

Title: Maker Move To Highest Peak
Description: Moves the marker X value to the point in the marker's assigned trace that has the highest peak.
MARKer Suffix
Range: 1-12, Default = 1

:CALCulate:MARKer<n>:MAXimum:LEFT

Title: Marker Move To Left Peak
Description: Moves the marker X value to the point in the marker's assigned trace that is the highest peak to the LEFT of the current X position of the marker.
MARKer Suffix
Range: 1-12, Default = 1

:CALCulate:MARKer<n>:MAXimum:NEXT

Title: Marker Move To Next Peak
Description: Moves the marker X value to the point in the marker's assigned trace that is the next highest peak.
MARKer Suffix
Range: 1-12, Default = 1
:CALCulate:MARKer<n>:MAXimum:RIGHt
  Title: Marker Move To Right Peak
  Description: Moves the marker X value to the point in the marker's assigned trace that is the highest peak to the RIGHT of the current X position of the marker.
  MARKer Suffix
  Range: 1-12, Default = 1

:CALCulate:MARKer<n>:MODE <POSition|DELTa|FIXed>
:CALCulate:MARKer<n>:MODE?
  Title: Marker Mode
  Description: Select the marker mode. POSition mode is a normal marker mode. DELTa mode is marker report difference relative to another marker. FIXed mode is a marker whose Y value is fixed at the last measured value before it is set to FIXed.
  Parameter(s): <POSition|DELTa|FIXed>
  Query Return: POS|DELT|FIX
  MARKer Suffix
  Range: 1-12, Default = 1
  Default Value: POSition

:CALCulate:MARKer<n>:MOVE:LEFT
  Title: Marker Move To Left
  Description: Moves the marker X value to the next display point to the LEFT.
  MARKer Suffix
  Range: 1-12, Default = 1

:CALCulate:MARKer<n>:MOVE:RIGHt
  Title: Marker Move To Right
  Description: Moves the marker X value to the next display point to the RIGHT.
  MARKer Suffix
  Range: 1-12, Default = 1

:CALCulate:MARKer<n>:REFerence <numeric_value>
:CALCulate:MARKer<n>:REFerence?
  Title: Marker Reference
  Description: Sets the reference marker for the specified delta marker. This setting will be applied only if the marker mode set to DELTa.
  Parameter(s): <numeric_value>
  Query Return: Numeric
  MARKer Suffix
  Range: 1-12, Default = 1
  Default Value: 0
  Range: 0 to 12
:CALCulate:MARKer<n>[:SET]:CENTER
Title: Marker Set Center
Description: Sets the center frequency of the instrument to the current X value of the marker.
MARKer Suffix
Range: 1-12, Default = 1

:CALCulate:MARKer<n>[:SET]:RLEVEL
Title: Marker Set Reference Level
Description: Sets the reference level of the instrument to the current Y value of the marker.
MARKer Suffix
Range: 1-12, Default = 1

:CALCulate:MARKer<n>:STATE <0 | 1 | ON | OFF>
:CALCulate:MARKer<n>:STATE?
Title: Marker State
Description: Turns the selected marker on or off.
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
MARKer Suffix
Range: 1-12, Default = 1
Default Value: OFF

:CALCulate:MARKer<n>:TRACE <numeric_value>
:CALCulate:MARKer<n>:TRACE?
Title: Marker Trace
Description: Changes the trace to which the marker is currently attached.
Parameter(s): <numeric_value>
Query Return: Numeric
MARKer Suffix
Range: 1-12, Default = 1
Default Value: 1
Range: 1 to 6
:CALCulate:MARKer<n>:X <numeric_value> {PS | NS | US | MS | S | MIN | HR}
:CALCulate:MARKer<n>:X?

Title: Marker Position Zero Span
Description: Sets the marker time.
Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}
Query Return: Numeric (ms)
MARKer Suffix
Range: 1-12, Default = 1
Default Value: 29999.99 ms
Default Unit: ms
Range: -1000 ms to 61670 ms

:CALCulate:MARKer<n>:X <numeric_value> {HZ | KHZ | MHZ | GHZ}
:CALCulate:MARKer<n>:X?

Title: Marker Position
Description: Sets the marker frequency.
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
MARKer Suffix
Range: 1-12, Default = 1
Default Value: 200000000000 Hz
Default Unit: Hz
Range: -40000000000 Hz to 300000000000 Hz

:CALCulate:MARKer<n>:Y <numeric_value> {DBM}
:CALCulate:MARKer<n>:Y?

Title: Marker Value
Description: Set/Get the marker Y value. The user defined Y maker value will be applied only if the marker is in Fixed mode.
Parameter(s): <numeric_value> {DBM}
Query Return: Numeric (dBm)
MARKer Suffix
Range: 1-12, Default = 1
Default Value: 10 dBm
Default Unit: dBm
Range: -250 dBm to 130 dBm

:CALCulate:MARKer:AOFF

Title: Marker All Off
Description: Turns all markers off.
:CALCulate:MARKer:APReset

Title: Marker Preset
Description: Presets all markers to their preset values.

:CALCulate:MARKer[:DATA]:ALL?

Title: All Marker Data
Description: Returns the last stored X and Y values of all markers. The response format is (marker1.x, marker1.y), (marker2.x, marker2.y), ... (markern.x, markern.y). Returns (0,nan) if the marker has never been turned on or the marker is preset.

:CALCulate:MARKer:PEAK:EXCursion <numeric_value> {DB}
:CALCulate:MARKer:PEAK:EXCursion?

Title: Marker Excursion
Description: Sets the excursion for a marker. The excursion is the vertical distance from the peak to the next highest valley which must be exceeded for a peak to be considered a peak in marker max commands.

Parameter(s): <numeric_value> {DB}
Query Return: Numeric (dB)
Default Value: 0 dB
Default Unit: dB
Range: 0 dB to 200 dB

:CALCulate:MARKer:PEAK:EXCursion:STATe <0 | 1 | ON | OFF>
:CALCulate:MARKer:PEAK:EXCursion:STATe?

Title: Marker Excursion State
Description: Turn on/off excursion checking for marker max commands.

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF

:CALCulate:MARKer:PEAK:THReshold <numeric_value> {DBM}
:CALCulate:MARKer:PEAK:THReshold?

Title: Marker Threshold
Description: Sets the threshold level for a marker. The threshold is the level that a peak must exceed to be considered a peak in marker max commands.

Parameter(s): <numeric_value> {DBM}
Query Return: Numeric (dBm)
Default Value: 0 dBm
Default Unit: dBm
Range: -200 dBm to 100 dBm
:CALCulate:MARKer:PEAK:THReshold:STATe <0 | 1 | ON | OFF>

:CALCulate:MARKer:PEAK:THReshold:STATe?

Title: Marker Threshold State
Description: Turn on/off threshold checking for marker max commands.
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF

:CALCulate:OBW:LIMit <numeric_value> {HZ | KHZ | MHZ | GHZ}

:CALCulate:OBW:LIMit?

Title: OBW Limit
Description: Sets and queries the frequency limit on occupied bandwidth power.
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 10000 Hz
Default Unit: Hz
Range: 1000 Hz to 300000000000 Hz

:CALCulate:OBW:LIMit:FAIL?

Title: OBW Limit Fail
Description: This command queries the result of a limit check on occupied bandwidth power

:CALCulate:OBW:LIMit:STATe <0 | 1 | ON | OFF>

:CALCulate:OBW:LIMit:STATe?

Title: OBW Power Limit State
Description: Sets and queries the state of limit on occupied bandwidth power. The set form of this command sets the limit state to be ON or OFF
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF

:CONFigure:ACPower

Title: Configure Adjacent Channel Power Ratio
Description: Configures and enables the default adjacent channel power ratio measurement. Disables channel power and occupied bandwidth measurements. Sets the main channel bandwidth equal to the span. Sets the adjacent channel bandwidth and channel spacing equal to the main channel bandwidth. Sets the detection method to RMS. Sets the instrument to single sweep mode (:INITiate:CONTinuous OFF). Measurement settings can be modified by using the [:SENSe]:ACPower commands before initiating a sweep.
:CONFigure:CHPower

Title: Configure Channel Power

Description: Configures and enables the default channel power measurement. Disables ACPR and occupied bandwidth measurements. Sets the integration bandwidth equal to the span. Sets the detection method to RMS. Sets the instrument to single sweep mode (:INITiate:CONTinuous OFF). Measurement settings can be modified by using the [:SENSe]:CHPower commands before initiating a sweep. Note that this measurement is not valid in zero span.

:CONFigure:EIRPower

Title: Configure EIRP

Description: Configures the EIRP measurement. This will disable other Spectrum measurements, configure a normal peak detect trace, and set the instrument in a single sweep mode (:INITiate:CONTinuous: OFF). Measurement settings can be modified by using the [:SENSe]:EIRPower commands before initiating a sweep.

:CONFigure:INTERference

Title: Configure Interference Finder

Description: Configures and enables the default interference finder measurement. Disables other measurements. Sets the instrument to single sweep mode (:INITiate:CONTinuous: OFF). Measurement settings can be modified by using the [:SENSe]:INTERference commands before initiating a sweep. Note that this measurement is not valid in zero span.

:CONFigure:OBWidth

Title: Configure Occupied Bandwidth

Description: Configures and enables the default occupied bandwidth measurement. Disables channel power and ACPR measurements. Sets the method to %. Sets the % of power to 99%. Sets the instrument to single sweep mode (:INITiate:CONTinuous: OFF). Measurement settings can be modified by using the [:SENSe]:OBWidth commands before initiating a sweep. Note that this measurement is not valid in zero span.

:CONFigure:SEMask

Title: Configure Spectral Emission Mask Measurement

Description: Configures and enables the Spectral Emission Mask measurement. This will disable all other measurements, set the span to mask width, set the detection method to RMS, and set the instrument in a single sweep mode (:INITiate:CONTinuous: OFF). Measurement settings can be modified by using the [:SENSe]:SEMask commands before initiating a sweep.

:DIAGnostic:SWEep:TIME?

Title: Measured Sweep Time

Description: This command queries the measured sweep time, in number of milliseconds. This command will return "nan" if no measured sweep time is available, which happens if the sweep was reset and the instrument has not yet swept enough to measure a full sweep.
:DISPlay:POINtcount <numeric_value>
:DISPlay:POINtcount?

Title: Display Point Count
Description: Changes the number of display points the instrument currently measures. Increasing the number of display points can improve the resolution of measurements but will also increase sweep time.
Parameter(s): <numeric_value>
Query Return: Numeric
Default Value: 501
Range: 10 to 4001

:DISPlay:VIEW <NORMal|SPECTrogram>
:DISPlay:VIEW?

Title: Display View
Description: The display view command can be used to enable/disable spectrogram features in the spectrum application.
Parameter(s): <NORMal|SPECTrogram>
Query Return: NORM|SPEC
Default Value: NORMal

:DISPlay:VIEW:LTE <NORMal|SUMMary>
:DISPlay:VIEW:LTE?

Title: LTE mode display view
Description: Display views specific to LTE Mode.
Parameter(s): <NORMal|SUMMary>
Query Return: NORM|SUMM
Default Value: NORMal

:DISPlay:VIEW:NRADio <NORMal|SBEam|MBEam|QVIew|SCANner|TABLe>
:DISPlay:VIEW:NRADio?

Title: New Radio mode display view
Description: Display views specific to New Radio Mode.
Available selections are NORMal, SBEam (Single Beam), and MBEam (Multiple Beam)
Parameter(s): <NORMal|SBEam|MBEam|QVIew|SCANner|TABLe>
Query Return: NORM|SBE|MBE|QVI|SCAN|TABL
Default Value: MBEam
**:DISPlay:VIEW:RTSA <NORMal|SPECtrogram>**

**Title:** RTSA mode display view.

**Description:** Display views specific to RTSA Mode. The display view SPECtrogram parameter is a combination of normal and spectrogram displays.

**Parameter(s):** <NORMal|SPECtrogram>

**Query Return:** NORM|SPEC

**Default Value:** NORMal

**:DISPlay:VIEW:SPECtrogram:AADJust**

**Title:** Spectrogram Scale Auto Adjust

**Description:** Automatically adjusts the spectrogram scale reference and bottom amplitude to the max and min amplitudes, respectively, of the most recent trace data collected.

**:DISPlay:VIEW:SPECtrogram:BOTTom <numeric_value> {DBM}**

**Title:** Spectrogram Scale Bottom

**Description:** The spectrogram scale bottom indicates the amplitude that corresponds to the least intense color in the spectrogram waterfall display. This is used in conjunction with the spectrogram scale reference command to establish the color gradient scale.

**Parameter(s):** <numeric_value> {dBm}

**Query Return:** Numeric (dBm)

**Default Value:** -90 dBm

**Default Unit:** dBm

**Range:** -150 dBm to 30 dBm
:DISPlay:VIEW:SPECTrogram:HISTory[:DATA]? <numeric_value>

Title: Spectrogram History Data
Description: This command transfers the spectrogram history from the instrument to the client. This command takes an integer parameter specifying the last trace ID received by client and returns all trace data after the received trace ID in a binary block response. The binary block response is formatted as below
- History Header: (20 bytes)
- Number Of Traces: 4 bytes, unsigned integer
- Number Of Trace Points Per Trace: 4 bytes, unsigned integer
- Last trace ID in the block: 4 bytes, unsigned integer
- Reserved: 8 bytes

History Body:
- Block of trace points formatted as a 4 byte, single-precision floating point value for each point. The history body size (in bytes) can be calculated as: <Number Of Traces> * (<Number Of Trace Points Per Trace> * 4).
- If no new trace data was found in history, this command will return header only binary block with all zeros except <last trace ID in the block> is set to the last trace ID received by client.

Parameter(s): <numeric_value>


Title: Spectrogram History Elapsed
Description: Provides the time values for the specified index in spectrogram history. Returns a negative value if the specified index is invalid.

Parameter(s): <numeric_value>

:DISPlay:VIEW:SPECTrogram:HUE <numeric_value>
:DISPlay:VIEW:SPECTrogram:HUE?

Title: Spectrogram Hue
Description: The spectrogram hue command indicates the color that represents the highest amplitude in the spectrogram waterfall display. All of the other amplitudes are represented by colors starting at this hue setting and following a color wheel.

Parameter(s): <numeric_value>
Query Return: Numeric
Default Value: 0
Range: 0 to 359
:DISPlay:VIEW:SPECTrogram:REFe rence <numeric_value> {DBM}

Title: Spectrogram Scale Reference
Description: The spectrogram scale reference indicates the amplitude that corresponds to the most intense color in the spectrogram waterfall display. This is used in conjunction with the spectrogram scale bottom command to establish the color gradient scale.

Parameter(s): <numeric_value> {DBM}
Query Return: Numeric (dBm)
Default Value: 10 dBm
Default Unit: dBm
Range: -150 dBm to 30 dBm

:DISPlay:VIEW:SPECTrogram:SCALE:PDIVision <numeric_value> {PS | NS | US | MS | S | MIN | HR}

:DISPlay:VIEW:SPECTrogram:SCALE:PDIVision?

Title: Spectrogram Per Division
Description: Identifies the scale of the spectrogram's grid spacing.

Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}
Query Return: Numeric (ms)
Default Value: 1000 ms
Default Unit: ms
Range: 1000 ms to 100000 ms

:DISPlay:VIEW:SPECTrogram:TRACE:SELection <POSition|TIME>

:DISPlay:VIEW:SPECTrogram:TRACE:SELection?

Title: Cursor Selection
Description: Selects which time cursor setting to use, position or time. For position, the DISP:VIEW:SPEC:POS setting will be used to determine which trace from the spectrogram history to show. For time, the DISP:VIEW:SPEC:TIME setting will be used instead.

Parameter(s): <POSition|TIME>
Query Return: POS|TIME
Default Value: POSition

:DISPlay:WINDow:TRACE:Y[:SCALE]:PDIVision <numeric_value>

:DISPlay:WINDow:TRACE:Y[:SCALE]:PDIVision?

Title: Scale Per Division
Description: Set or query the scale per division setting of trace graph. This command doesn't change any behavior in the backend, but will be included in save/recall operations.

Parameter(s): <numeric_value>
Query Return: Numeric
Default Value: 10
Range: 1 to 15
**Title:** Reference Level

**Description:** Sets the reference level amplitude value for the y-axis. This value is the display reference level, which means it has the reference level offset applied. It also means that a change to the reference level offset will change this setting (though the actual, unadjusted reference level will stay the same).

Note that this may cause a change in attenuation if the automatic input attenuation coupling is enabled. For the purpose of coupling, the actual reference level (without the offset applied) is used, though this command will always reflect the display value.

For example, suppose a starting reference level offset of 0 dB and a reference level of 10 dBm. If the offset is set to 20 dB, the display reference level will be set to 10 dBm - 20 dB = -10 dBm; no attenuation change will occur. Likewise, if the starting reference level offset is 20 dB and the (display) reference level is set to 0 dBm, the display reference level will remain at 0 dBm, though the (actual) reference level value used in auto attenuation coupling is 0 dBm + 20 dB = 20 dBm.

To obtain the actual reference level, either add in the reference level offset, or temporarily set the offset to 0 (in which case the display reference level will reflect the actual one).

**Parameter(s):** <numeric_value> {DBM}

**Query Return:** Numeric (dBm)

**Default Value:** 10 dBm

**Default Unit:** dBm

**Range:** -150 dBm to 30 dBm

---

**Title:** Automatic Reference Level

**Description:** This command causes the reference level to immediately be set to an automatically computed value that best displays the particular data. The reference level is set to a specified dB above the selected trace max value. This command is semantically equivalent to :DISPlay[:WINDow]:TRACe[:SCALE]:RLEVel:AUTO[:MMEDIATE] <numeric_value> {DB}

**Parameter(s):** <numeric_value> {DB}
:DISPlay[:WINDow]:TRACe:Y[:SCALe]:RLEVel:OFFSet <numeric_value> {DB}
:DISPlay[:WINDow]:TRACe:Y[:SCALe]:RLEVel:OFFSet?

Title: Reference Level Offset

Description: Sets the reference level offset value for the y-axis.

This offset is used for display purposes only, and does not affect the actual reference level used for auto attenuation coupling, or any other settings that depend on reference level.


Parameter(s): <numeric_value> {DB}
Query Return: Numeric (dB)
Default Value: 0 dB
Default Unit: dB
Range: -99.9 dB to 99.9 dB

:FETCh:ACPower?

Title: Fetch Adjacent Channel Power Ratio

Description: Returns the most recent adjacent channel power ratio measurement results. If the instrument is sweeping, it will not return until the sweep is complete. If the instrument is not sweeping and the current data is not valid it will return error -230. This could occur if there was a *RST immediately before the :FETCh? or if a measurement parameter was changed without an :INITiate.

Data is returned as 9 comma-separated values: main channel power, absolute lower adjacent channel power, absolute upper adjacent channel power, absolute lower alternate channel power, absolute upper alternate channel power, relative lower adjacent channel power, relative upper adjacent channel power, relative lower alternate channel power, relative upper alternate channel power.

If the measurement is not enabled (see [:SENSe]:CHPower:STATe) then, the instrument will indicate error -400 and return the string "nan,nan,nan,nan,nan,nan,nan,nan,nan".

:FETCh:AMPLitude? <numeric_value> {HZ | KHZ | MHZ | GHZ}

Title: Fetch Amplitude

Description: Returns the amplitude at the given frequency. The command does not wait for the sweep to complete.

If the trace data at the requested frequency is invalid (or out of span) then NAN is returned and error code -230 is indicated.

Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
:FETCH:CHPower?

Title: Fetch Channel Power and Density
Description: This command returns the most recent channel power measurement results: channel power and channel power density.
If the instrument is sweeping, it will not return until the sweep is complete.\nIf the instrument is not sweeping and the current data is not valid it will return error -230. This could occur if there was a *RST immediately before the :FETCh? or if a measurement parameter was changed without an :INITiate. Data is returned as 2 comma-separated values: channel power, channel power density.
If the measurement is not enabled (see [:SENSe]:CHPower:STATE) then, the instrument will indicate error -400 and return the string "nan,nan"

:FETCH:CHPower:CHPower?

Title: Fetch Channel Power
Description: Returns the most recent channel power measurement result. It returns only the channel power, not the channel power density. Use :FETCh:CHPower? to get both channel power and channel power density.
If the instrument is sweeping, it will not return until the sweep is complete. If the instrument is not sweeping and the current data is not valid it will return error -230. This could occur if there was a *RST immediately before the :FETCh? or if a measurement parameter was changed without an :INITiate.
If the measurement is not enabled (see [:SENSe]:CHPower:STATE) then, the instrument will indicate error -400 and return the string "nan,nan"

:FETCH:CHPower:DENSity?

Title: Fetch Channel Power Density
Description: Returns the most recent channel power density measurement result. It returns only the channel power density, not the channel power.
Use :FETCh:CHPower? to get both channel power and channel power density.
If the instrument is sweeping, it will not return until the sweep is complete. If the instrument is not sweeping and the current data is not valid it will return error -230. This could occur if there was a *RST immediately before the :FETCh? or if a measurement parameter was changed without an :INITiate.
If the measurement is not enabled (see [:SENSe]:CHPower:STATE) then, the instrument will indicate error -400 and return the string "nan,nan"

:FETCH:EIRPower?

Title: Fetch EIRP
Description: This command returns the current EIRP and maximum EIRP result in dBm. If the instrument is sweeping, it will not return until the sweep is complete. If the instrument is not sweeping and the current data is not valid it will return error -230. This could occur if there was a *RST immediately before the :FETCh? or if a measurement parameter was changed without an :INITiate. Data is returned as 2 comma-separated values: EIRP power, Max power. If the measurement is not active, the instrument will indicate error -400 and return the string "nan,nan".
:FETCH:EIRPower:DATA?

Title: Fetch Current EIRP

Description: This command returns the current EIRP measurement result in dBm.
If the instrument is sweeping, it will not return until the sweep is complete.
If the instrument is not sweeping and the current data is not valid it will return error -230. This could occur if there was a *RST immediately before the :FETCH? or if a measurement parameter was changed without an :INITiate. If the measurement is not active, the instrument will indicate error -400 and return the string "nan".

:FETCH:EIRPower:MAXimum?

Title: Fetch MAXimum EIRP

Description: This command returns the maximum EIRP measurement result in dBm.
If the instrument is sweeping, it will not return until the sweep is complete.
If the instrument is not sweeping and the current data is not valid it will return error -230. This could occur if there was a *RST immediately before the :FETCH? or if a measurement parameter was changed without an :INITiate. If the measurement is not active, the instrument will indicate error -400 and return the string "nan".

:FETCH:INTERference:POWer?

Title: Fetch Interference Finder Integrated Power

Description: Returns the most recent interference finder measurement result. It returns only the integrated power.
If the instrument is sweeping, it will not return until the sweep is complete. If the instrument is not sweeping and the current data is not valid it will return error -230. This could occur if there was a *RST immediately before the :FETCH? or if a measurement parameter was changed without an :INITiate.
If the measurement is not enabled (see [:SENSe]:INTERference:STATe) then, the instrument will indicate error -400 and return the string "nan,nan"

:FETCH:OBWidth<n>?

Title: Fetch Occupied Bandwidth

Description: Returns a different set of measurement information depending on the suffix. The default suffix of 1 will return the most recent occupied bandwidth measurement results: occupied bandwidth, percent of power and dB down. One of either percent of power or dB down is measured and the other is set. That is determined by the value set using [:SENSe]:OBWidth:METHod. If the measurement is not enabled with [:SENSe]:OBWidth:STATe then, the instrument will indicate error -400 and return the string "nan,nan,nan".
Using suffix 2 will return the most recent channel power, x dB bandwidth, percent bandwidth, and transmit frequency error. The channel power and occupied bandwidth measurements will be calculated regardless of CHP:STAT and OBW:STAT settings.
For both suffixes, if the instrument is sweeping, it will not return until the sweep is complete. If the instrument is not sweeping and the current data is not valid it will return error -230. This could occur if there was a *RST immediately before the :FETCH? or if a measurement parameter was changed without an :INITiate.

OBWidth Suffix
Range: 1-2, Default = 1
:FETCh:PCI?

Title: Fetch PCI Measurements

Description: Returns the PCI measurements. This command returns cell id, group id, corrected carrier frequency, detected beam, frame start, frequency error, sector id, group id, and time offset(in ns) as output in json format.

If a measurement is in progress, it blocks until complete.

An example is as follows:

```
{
  "cellId": 0,
  "cellIdGroup": 0,
  "correctedCarrierFrequency": 4499999985.264854,
  "detectedBeam": 4,
  "frameStart": 233097,
  "frequencyError": -14.735145792134368,
  "ppmFrequencyError": 0.09346635883256266,
  "sectorId": 0,
  "status": {
    "hardwareErrors": {
      "ADCOverRange": 0,
      "DeviceAccess": 0,
      "EEPROM": 0,
      "IrregularData": 0,
      "Limit": 0,
      "LockLO1": 0,
      "LockLO2": 0,
      "NoCal": 0,
      "Overpower": 0,
      "SLOLock": 0,
      "Saturation": 0,
      "TgLockLo1": 0
    },
    "statusMessage": "statusPciDone",
    "statusNumber": 10
  },
  "gps": {
    "coordinates": "37.14681, -121.65609, 128m",
    "time": "Fri Jun 28 19:56:45 2019 GMT"
  },
  "timeOffset": -634782.9687499882
}
```
:FETCH:PEAK?

Title: Fetch Peak

Description: Returns a pair (amplitude, frequency in Hz) of the peak amplitude in the current sweep. The command does not wait for the sweep to complete. If the trace data is invalid then both numbers in the pair will be NaN and error code -230 will be indicated.

:FETCh:SEMask?

Title: Fetch Spectral Emission Mask

Description: This command returns the current Spectral Emission Mask measurement result. If the instrument is sweeping, it will not return until the sweep is complete. If the instrument is not sweeping and the current data is not valid, it will return an empty JSON object and an array of segment information. The following is the format of the response: 

```
{ "referencePwr": <amplitude value>, "referenceChannelPwr": <amplitude value>, "segments": ["setup": {"rbw": <frequency value>, "points": [{"x": <frequency value>, "y": <amplitude value>}, {"x": <frequency value>, "y": <amplitude value>}]], "result": {"peakPwr": <amplitude value>, "peakFreq": <amplitude value>, "pass": <true | false>}}, { ... }
```

If the measurement is not active, the instrument will indicate error -400 and return an empty object.
**Title:** Fetch SSB Measurements

**Description:** Returns the SSB measurements.

This command returns the beam numbers with the best EVM and power, followed by Power and EVM results for PSS, SSS, PBCH, PBCH DM-RS and SS Signal Quality Results in a json format. If a measurement is in progress, it blocks until complete.

```json
{
  "bestEvmBeam":5,
  "bestPowerBeam":0,
  "status": { 
    "hardwareErrors": { 
      "ADCOverRange": 0,
      "DeviceAccess": 0,
      "EEPROM": 0,
      "IrregularData": 0,
      "Limit": 0,
      "LockLO1": 0,
      "LockLO2": 0,
      "NoCal": 0,
      "Overpower": 0,
      "SLOLock": 0,
      "Saturation": 0,
      "TgLockLo1": 0
    },
    "statusMessage": "statusPciDone",
    "statusNumber": 10
  },
  "gps":{
    "coordinates":"37.14681, -121.65609, 128m",
    "time":"Fri Jun 28 19:56:45 2019 GMT"
  },
  "values":{
    "dmRsPbch":{
      "peakEvm":{
        "percent":11.926020622253418,
        "subcarrierNumber":1529,
        "symbolNumber":3
```
"power":-31.813847928749347,
"rmsEvm":3.813983917236328
},
"pbch":{
"peakEvm":{
"percent":13.430730819702148,
"subcarrierNumber":1638,
"symbolNumber":5
},
"power":-31.8139914869584,
"rmsEvm":3.736370325088501
},
"pss":{
"peakEvm":{
"percent":12.912864685058594,
"subcarrierNumber":1638,
"symbolNumber":2
},
"power":-31.704519932556128,
"rmsEvm":1.7515575885772705
},
"ssRsrp":-31.750750515723816,
"ssRsrq":-10.728772378478801,
"ssSnr":-13.878087163543444,
"sss":{
"peakEvm":{
"percent":11.369827270507812,
"subcarrierNumber":1638,
"symbolNumber":4
},
"power":-31.750750515723816,
"rmsEvm":2.5253000259399414
}}
:FORMat[:TRACe][:DATA] <ASCii|INTeger|REAL>,[<numeric_value>]
:FORMat[:TRACe][:DATA]?

Title: Trace Data Format

Description: This command specifies the format in which data is returned in TRAC:DATA queries. The optional numeric parameter is needed for REAL format only. It defines the length of the floating point number in bits. Valid values are 32 and 64. If the optional numeric parameter is omitted, the default length of REAL data is set to 64 bits.

ASCii format returns the data in comma-separated ASCII format. The units are the current measurement units.

INTeger,32 values are signed 32-bit integers in little-endian byte order. This format returns the data in 4-byte blocks. The values are scaled by 1000, so if the current measurement units are dBm the integer values would be mdBm. For example, if the measured result was -12.345 dBm, that value would be sent as -12345.

REAL,32 values are 32-bit floating point numbers conforming to the IEEE 754 standard in little-endian byte order. This format returns the data in 4-byte binary format. The units are the current measurement units.

REAL,64 values are 64-bit floating point numbers conforming to the IEEE 754 standard in little-endian byte order. This format returns the data in 8-byte binary format. The units are the current measurement units.

Parameter(s): <ASCii|INTeger|REAL>,[<numeric_value>]

Query Return: ASC|INT|REAL

Default Value: ASCii
:INITiate:CONTinuous <0 | 1 | ON | OFF>

:INITiate:CONTinuous?

Title: Sweep Type
Description: Specifies whether the sweep/measurement is triggered continuously. If the value is set to ON or 1, another sweep/measurement is triggered as soon as the current one completes. If continuous is set to OFF or 0, the instrument remains initiated until the current sweep/measurement completes, then enters the 'idle' state and waits for the :INITiate[:IMMediate] command or for :INITiate:CONTinuous ON.

If :INITiate:CONTinuous is changed to ON before the current sweep/measurement completes, a new sweep/measurement will be continuously triggered as soon as the current sweep/measurement completes. If :INITiate[:IMMediate] is received before the current sweep/measurement completes, it will be ignored. Clients must either wait for the current sweep/measurement to complete before triggering a 'single sweep', or :ABORt the sweep/measurement after setting :INITiate:CONTinuous to OFF (which will cause the instrument to immediately enter the idle state where it can accept new triggers).

The default value is ON. That is, sending :INIT:CONT is equivalent to sending :INIT:CONT ON. The query version of the command returns a 1 if the instrument is continuously sweeping/measuring and returns a 0 if the instrument is in single sweep/measurement mode.

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: ON

:INITiate[:IMMediate]

Title: Initiate Single Sweep
Description: Initiates a sweep/measurement. If :INITiate:CONTinuous is set to ON, or if :INITiate:CONTinuous is set to OFF but the current sweep has not completed yet, this command is ignored. Use this command in combination with :STATus:OPERation? or *OPC? to synchronize the capture of one complete set of data. When this command is sent, the "sweep complete" bit of :STATus:OPERation? is set to 0, indicating that the measurement has not completed. The data collection is then triggered. The controlling program can poll :STATus:OPERation? to determine the status. When the "sweep complete" bit is set to 1, data is ready to be retrieved.

This command is also overlapped, so alternatively, *OPC? can be used to wait for completion of the measurement without polling. When this command is received, the pending operation bit is set. The pending operation will finish once the sweep/measurement is done. Clients can use *OPC? to 'block' until the sweep/measurement is completed.

:INITiate[:IMMediate]:ALL

Title: Initiate Average Count Sweep
Description: Initiates sweep until all active traces reach its average count
:INITiate:SPA:SELFtest?

   Title: Self Test
   Description: Perform a self-test and return the results. The response is formatted as a JSON
               (http://json.org/) array of name,value pair result objects. Some result objects also include
               a 'status' property that will be either 'pass' or 'fail' based on whether the criteria for that
               test was met.
               For tests of voltages, the test passes if the measured voltage is within 10% of the expected
               voltage.

:INSTrument:ACTive:STATe <0 | 1 | ON | OFF>
:INSTrument:ACTive:STATe?

   Title: RemoteSpectrumAnalyzerInUse
   Description: The "set" state indicates that the instrument is used by someone.
               The "unset" state indicates it is not used by anyone
   Parameter(s): <0 | 1 | ON | OFF>
   Query Return: 0 | 1
   Default Value: OFF

:INSTrument:REMote:STATe <0 | 1 | ON | OFF>,<string>
:INSTrument:REMote:STATe?

   Title: RemoteSpectrumAnalyzerId
   Description: This command can be used to indicate the device is being used by someone. The set
               command takes two parameters:
               - a boolean to indicate whether the device is being used
               - a string to indicate the identification of someone currently using the device.
               When a value of 1 is passed into the boolean parameter (indicating the device being
               used), the identification string parameter must be non-empty; otherwise, a scpi error will
               be generated.
               When no longer being used, these settings should be cleared with a boolean parameter of
               zero. The string paramter does not matter because it will automatically be set to the
               empty string.
               The query command returns the current values of the boolean and the string settings.
               The remote identification string setting is empty only if it has never been set or has been
               cleared via this command.
               Both settings will be reset after a reboot.
   Parameter(s): <0 | 1 | ON | OFF>,<string>
:MEASure:ACPower?

Title: Measure Adjacent Channel Power Ratio

Description: Sets the active measurement to adjacent channel power ratio, sets the default measurement parameters, triggers a new measurement and returns the main channel power, lower adjacent, upper adjacent, lower alternate and upper alternate channel power results. It is a combination of the commands :CONFigure:ACPower; :READ:ACPower? For a description of the default adjacent channel power ratio measurement parameters see :CONFigure:ACPower. To make an adjacent channel power ratio measurement with settings other than the default values send: :CONFigure:ACPower

Commands to set desired settings: :READ:ACPower?

Data is returned as 9 comma-separated values: main channel power, absolute lower adjacent channel power, absolute upper adjacent channel power, absolute lower alternate channel power, absolute upper alternate channel power, relative lower adjacent channel power, relative upper adjacent channel power, relative lower alternate channel power, relative upper alternate channel power.

:MEASure:CHPower?

Title: Measure Channel Power And Density

Description: Sets the active measurement to channel power, sets the default measurement parameters, triggers a new measurement and returns the channel power and channel power density results. It is a combination of the commands :CONFigure:CHPower; :READ:CHPower? For a description of the default channel power measurement parameters see :CONFigure:CHPower. To make a channel power measurement with settings other than the default values send: :CONFigure:CHPower Commands to set desired settings :READ:CHPower? Data is returned as 2 comma-separated values: channel power, channel power density.

:MEASure:CHPower:CHPower?

Title: Measure Channel Power

Description: Sets the active measurement to channel power, sets the default measurement parameters, triggers a new measurement and returns channel power as the result. It is a combination of the commands :CONFigure:CHPower; :READ:CHPower:CHPower? To measure both channel power and channel power density use MEASure:CHPower? For a description of the default channel power measurement parameters see :CONFigure:CHPower. To make a channel power measurement with settings other than the default values send: :CONFigure:CHPower, Commands to set desired settings: :READ:CHPower:CHPower?
:MEASure:CHPower:DENSity?

Title: Measure Channel Power Density

Description: Sets the active measurement to channel power, sets the default measurement parameters, triggers a new measurement and returns channel power density as the result. It is a combination of the commands :CONFigure:CHPower;

:READ:CHPower:DENSity?

To measure both channel power and channel power density use MEASure:CHPower? For a description of the default channel power measurement parameters see :CONFigure:CHPower. To make a channel power measurement with settings other than the default values send: :CONFigure:CHPower, Commands to set desired settings:

:READ:CHPower:DENSity?

:MEASure:INTerference:POWer?

Title: Measure Interference Finder Integrated Power

Description: Sets the active measurement to interference finder, sets the default measurement parameters, triggers a new measurement and returns integrated power as the result. It is a combination of the commands :CONFigure:INTerference;

:READ:INTerference:POWer?

For a description of the default interference finder measurement parameters see :CONFigure:INTerference. Use :CONFigure:INTerference command to replace the default values.

:MEASure:IQ:CAPTure:FAIL <OFF|FIRSt|REPeat>

:MEASure:IQ:CAPTure:FAIL?

Title: Capture on Failure

Description: Sets or queries whether the instrument will automatically save an IQ capture when losing sync.

When the instrument goes from having good sync to no sync, the IQ data for the failed measurement is saved to the user partition.

"FIRSt" causes a single capture to be performed and then transition to the OFF" state. REPeat" causes saves the IQ data on every loss of sync.

"FIRSt" is recommended to avoid accidentally filling up the user partition.

This command is only available when in 5G NR Analyzer mode (:SENSe:MODE NRADio).

Parameter(s): <OFF|FIRSt|REPeat>

Query Return: OFF|FIRS|REP

Default Value: OFF
"MMEMory:LOAD:LIMit <string>,<string>,<string>

Title: Load Limit From File
Description: This command loads limit data from the specified limit file. The file location is resolved using the MSUS and file path parameters. Parameters:
1. Label: Used to specify which limit to load. Currently, the label only supports loading all limits. Send an empty string or "ALL" to load all limits.
2. File path: The file path (including file name) relative to the MSUS root directory. File path is case sensitive. File extension is optional.
3. MSUS: Device to load the file from. See MMEMory:MSUSs? for information on obtaining the list of available devices. MSUS parameter is case sensitive.

For example:
`MMEMory:LOAD:LIMit "ALL","/example_limit_file", "USB1"

The model of the device that the limit was saved in must match the model of the the device to load in; otherwise, the load will be rejected.

Parameter(s): <string>,<string>,<string>

"MMEMory:LOAD:RAM <numeric_value>,<numeric_value>,<string>

Title: Load RAM
Description: Store data to RAM from a file. This command takes three parameters
1. data block size: that needs to be stored in bytes (must be a word aligned)
2. offset: in bytes from start of RAM address to store data at
3. filename: name of the file without the full path. Contents of this file will be copied over to RAM

Parameter(s): <numeric_value>,<numeric_value>,<string>

"MMEMory:STOEvent:CLEarall

Title: Clear All Save On Event
Description: Turns off all save on event types that are active.

"MMEMory:STOEvent:EOSWeep:MODE <CONTinuous|SINGle>

Title: End of Sweep Save On Event Mode
Description: Specifies the stop mode of the end of sweep save on event system. Setting the value to CONTinuous will cause the instrument to keep saving traces at the completion of every valid sweep. Setting the value to SINGle will trigger a save trace on the next complete valid sweep and then automatically turn the end of sweep save on event feature OFF.

Parameter(s): <CONTinuous|SINGle>
Query Return: CONT|SING
Default Value: CONTinuous
:**MMEMory:STOEvent:EOSWeep[:STATe] <0 | 1 | ON | OFF>
:**MMEMory:STOEvent:EOSWeep[:STATe]?

Title: End of Sweep Save on Event State
Description: Turn the end of sweep save on event ON or OFF. Turning the feature on will cause the instrument to automatically save a trace whenever a sweep completes.
A common cause of the command failure is not having enough space available on the storage location. Use :MMEMory:CATalog:DIRectory query command to retrieve the total space available on the storage location.
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF

:**MMEMory:STOEvent:LIMit:INTerval <numeric_value> {PS | NS | US | MS | S | MIN | HR}
:**MMEMory:STOEvent:LIMit:INTerval?

Title: Limit Save On Event Interval
Description: Sets the time interval to keep saving after a limit line failure has occurred when :MMEMory:STOEvent:LIMit:MODE is set to INTerval.
Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}
Query Return: Numeric (ms)
Default Value: 60000 ms
Default Unit: ms
Range: 0 ms to 216000000 ms

:**MMEMory:STOEvent:LIMit:MODE <CONTinuous|SINGle|INTerval>
:**MMEMory:STOEvent:LIMit:MODE?

Title: End of Sweep Save On Event Mode
Description: Specifies the stop mode of the limit save on event system. Setting the value to CONTinuous will cause the instrument to keep saving traces at every limit line failure. Setting the value to SINGle will trigger a save trace on the next limit line failure and then automatically turn the end of sweep save on event feature OFF automatically. Setting the value to INTerval will trigger a save on the next limit line failure and continue to save at every end of sweep until the set time interval has expired.
Parameter(s): <CONTinuous|SINGle|INTerval>
Query Return: CONT|SING|INT
Default Value: CONTinuous
```
:MEMory:STOEvent:LIMit:PTrigger[:STATe] <0 | 1 | ON | OFF>

:MEMory:STOEvent:LIMit:PTrigger[:STATe]?

Title: Limit Pretrigger Save on Event State

Description: Turn the limit pre-trigger save on event ON or OFF. Turning the feature ON will cause the instrument to automatically save a trace captured prior to the limit line failure trace. The :MEMory:STOEvent:LIMit[:STATe] and :INITiate:CONTinuous needs to be turned ON for the pre-trigger feature to apply.

A common cause of the command failure is not having enough space available on the storage location. Use :MEMory:CATalog:DIRectory query command to retrieve the total space available on the storage location.

Parameter(s): <0 | 1 | ON | OFF>

Query Return: 0 | 1

Default Value: OFF

:MEMory:STOEvent:LIMit[:STATe] <0 | 1 | ON | OFF>

:MEMory:STOEvent:LIMit[:STATe]?

Title: Limit Save on Event State

Description: Turn the limit save on event ON or OFF. Turning the feature on will cause the instrument to automatically save a trace whenever a limit line failure occurs.

A common cause of the command failure is not having enough space available on the storage location. Use :MEMory:CATalog:DIRectory query command to retrieve the total space available on the storage location.

Parameter(s): <0 | 1 | ON | OFF>

Query Return: 0 | 1

Default Value: OFF

:MEMory:STOEvent:TIMer:INTerval <numeric_value> {PS | NS | US | MS | S | MIN | HR}

:MEMory:STOEvent:TIMer:INTerval?

Title: Timer Save On Event Interval

Description: Sets the time interval to save when :MEMory:STOEvent:TIMer[:STATe] is enabled. The queried value is always in milliseconds.

Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}

Query Return: Numeric (ms)

Default Value: 240000 ms

Default Unit: ms

Range: 0 ms to 3600000 ms
```
:MMEMory:STOEvent:TIMer[:STATe] <0 | 1 | ON | OFF>

Title: Limit Save on Event State

Description: Turn the timer save on event ON or OFF. Turning the feature on will cause the instrument to automatically save a trace at the interval specified by :MMEMory:STOEvent:LILimit:INTerval, if space is available. Available memory may be checked using :MMEMory:CATalog:DIRectory query command.

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF

:MMEMory:STORe:LILimit <string>,<string>,<string>

Title: Store Limit To File

Description: This command stores the limit data into the specified file location. The file location is resolved using the MSUS and file path parameters. Intermediate folders specified by the file path parameter are automatically created. The output file extension is .lim.

The command automatically overwrites the specified file if present. Parameters:
1. Label: Used to specify which limit to store. Currently, the label only supports storing all limits. Send an empty string or "ALL" to store all limits.
2. File path: The file path (including file name) relative to the MSUS root directory. File path is case sensitive. File extension is optional.
3. MSUS: Device to store the file to. See MMEMory:MSUSs? for information on obtaining the list of available devices. MSUS parameter is case sensitive.

For example:
MMEMory:STORe:LILimit "ALL",/example_limit_file", "USB1"

A common cause of the command failure is not having enough space available on the storage location. Use :MMEMory:CATalog:DIRectory query command to retrieve the total space available on the storage location.

Parameter(s): <string>,<string>,<string>

:MMEMory:STORe:RAM <numeric_value>,<numeric_value>,<string>

Title: Store RAM

Description: Load data from RAM to a file. This command takes three parameters
1. data block size: that needs to be loaded in bytes (must be a word aligned)
2. offset: in bytes from start of RAM address to load from
3. filename: name of the file without the full path. This is the destination file where the contents of RAM are copied over

Parameter(s): <numeric_value>,<numeric_value>,<string>
:MEMORY:STORE:TRACE:CSV <string>,<string>,<string>

Title: Store Trace in CSV

Description: This command saves the current trace to CSV file in specified file location. The file location is resolved using the MSUS and file path parameters. These parameters are case sensitive.

Parameters:
1. Label: Used to specify which trace to save. Currently, the label only supports saving all traces. Send an empty string or "ALL" to store all traces.
2. File path: The file path (including file name) relative to the MSUS root directory. File extension should not be specified.
3. MSUS: Device to save the file on. See MEMORY:CATalog:MSUSs? for information on obtaining the list of available devices.

A common cause of the command failure is not having enough space available on MSUS to save trace. Use :MEMORY:CATalog:DIRECTory query command to retrieve the total space available on MSUS.

Parameter(s): <string>,<string>,<string>

:OUTPUT:IF:FILTER <K750|M7P5|M14|M30|M100>

:OUTPUT:IF:FILTER?

Title: IF Filter Select

Description: If the following criteria is met the IF filter can be manually selected: Option 0089 (IF Output) is enabled/Zero Span is selected/IF output is ON. Parameter Filter Bandwidth

K750 750kHz
M7P5 7.5MHz
M14 14MHz
M30 32MHz
M100 100MHz

**The 100MHz filter selection is only available with options 0103 and 0104

Parameter(s): <K750|M7P5|M14|M30|M100>
Query Return: K750|M7P5|M14|M30|M100
Default Value: M100

:OUTPUT:IF:STATE <0 | 1 | ON | OFF>

:OUTPUT:IF:STATE?

Title: IF Output State

Description: Toggles the analog IF output on/off.

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF
`:OUTPut:ROSCillator:STATe <0 | 1 | ON | OFF>`

**Title:** 10MHz Reference Output State

**Description:** This command enables or disables the 10MHz reference output. The query returns 1 if 10MHz reference output is enabled; otherwise, returns 0.

**Parameter(s):** <0 | 1 | ON | OFF>

**Query Return:** 0 | 1

**Default Value:** OFF

`:READ:ACPower?`

**Title:** Read Adjacent Channel Power Ratio

**Description:** Triggers a new adjacent channel power ratio measurement and returns the results: main channel power, lower adjacent and upper adjacent channel power. It is the equivalent of the command sequence :ABORT; :INITiate; :FETCh:ACPower?

The channel power measurement must be the active measurement (specified by the command :CONFigure:ACPower). The instrument should be in the single sweep mode.

The current measurement can be queried using the command :CONFigure? Data is returned as 9 comma-separated values: main channel power, absolute lower adjacent channel power, absolute upper adjacent channel power, relative lower adjacent channel power, relative upper adjacent channel power, relative lower alternate channel power, relative upper alternate channel power.

If the measurement is not active, the instrument will indicate error -400 and return the string "nan,nan,nan,nan,nan". If :INITiate command fails or if :INITiate:CONTinuous is set to ON(continuous sweep) it returns a string "nan,nan,nan,nan,nan,nan,nan,nan,nan"

`:READ:CHPower?`

**Title:** Read Channel Power And Density

**Description:** Triggers a new channel power measurement and returns the results: channel power and channel power density. It is the equivalent of the command sequence: ":ABORT; :INITiate; :FETCh:CHPower?"

The channel power measurement must be the active measurement (specified by the command :CONFigure:CHPower). The instrument should be in the single sweep mode.

Data is returned as 2 comma-separated values: channel power, channel power density.

If the measurement is not active, the instrument will indicate error -400 and return the string "nan,nan". If :INITiate command fails, or if :INITiate:CONTinuous is set to ON(continuous sweep), it returns a string "nan,nan".
:READ:CHPower:CHPower?

Title: Read Channel Power

Description: Triggers a new channel power measurement and returns the channel power result: channel power. It is the equivalent of the command sequence ":ABORT; :INITiate; :FETCh:CHPower:CHPower?"
The channel power measurement must be the active measurement (specified by the command :CONFigure:CHPower). The instrument should be in the single sweep mode. Data returned is: channel power.

If the measurement is not active, the instrument will indicate error -400 and return the string "nan,nan". If :INITiate command fails, or if :INITiate:CONTinuous is set to ON(continuous sweep), it returns a string "nan,nan".

:READ:CHPower:DENSity?

Title: Read Channel Power Density

Description: Triggers a new channel power measurement and returns the results: channel power density. It is the equivalent of the command sequence :ABORT; :INITiate; :FETCh:CHPower:DENSity? The channel power measurement must be the active measurement (specified by the command :CONFigure:CHPower). The instrument should be in the single sweep mode. Data returned is: channel power density.

If the measurement is not active, the instrument will indicate error -400 and return the string "nan,nan". If :INITiate command fails, or if :INITiate:CONTinuous is set to ON(continuous sweep), it returns a string "nan,nan".

:READ:EIRPower?

Title: Read EIRP

Description: Triggers a new EIRP measurement and returns the current EIRP and maximum EIRP results in dBm. It is a combination of the commands :ABORT; :INITiate; :FETCh:EIRPower?
The EIRP measurement must be the active measurement (specified by the command :CONFigure:EIRPower). The instrument should be in the single sweep mode. Data is returned as 2 comma-separated values: EIRP, max EIRP. If the measurement is not active, the instrument will indicate error -400 and return the string "nan,nan". If :INITiate command fails or if :INITiate:CONTinuous is set to ON(continuous sweep), it returns a string "nan,nan".

:READ:EIRPower:DATA?

Title: Read Current EIRP

Description: Triggers a new EIRP measurement and returns the current EIRP result in dBm. It is a combination of the commands :ABORT; :INITiate; :FETCh:EIRPower:DATA?
The EIRP measurement must be the active measurement (specified by the command :CONFigure:EIRPower). The instrument should be in the single sweep mode. If the measurement is not active, the instrument will indicate error -400 and return the string "nan". If :INITiate command fails or if :INITiate:CONTinuous is set to ON(continuous sweep), it returns a string "nan".
**:READ:EIRPower:MAXimum?**

**Title:** Read MAXimum EIRP

**Description:** Triggers a new EIRP measurement and returns the maximum EIRP results in dBm. It is a combination of the commands :ABORT; :INITiate; :FETCh:EIRPower:MAX?

The EIRP measurement must be the active measurement (specified by the command :CONFigure:EIRPower). The instrument should be in the single sweep mode. If the measurement is not active, the instrument will indicate error -400 and return the string "nan". If :INITiate command fails or if :INITiate:CONTinuous is set to ON(continuous sweep), it returns a string "nan".

**:READ:INTERference:POWer?**

**Title:** Read Interference Finder Integrated Power

**Description:** Triggers a new interference finder measurement and returns the integrated power result: integrated power. It is the equivalent of the command sequence ":ABORT; :INITiate; :FETCh:INTERference:POWer?"

The interference finder measurement must be the active measurement (specified by the command :CONFigure:INTERference). The instrument should be in the single sweep mode. If the measurement is not active, the instrument will indicate error -400 and return the string "nan,nan". If :INITiate command fails, or if :INITiate:CONTinuous is set to ON(continuous sweep), it returns a string "nan,nan".

**:READ:SEMask?**

**Title:** Read Spectral Emission Mask

**Description:** Triggers a new Spectral Emission Mask measurement and returns the current Spectral Emission Mask measurement result. It is a combination of the commands :ABORT; :INITiate; :FETCh:SEMask? The Spectral Emission Mask measurement must be the active measurement (specified by the command :CONFigure:SEMask). Data is returned as ASCII of JSON object. Please refer to :FETCh:SEMask command for sample response.

If the measurement is not active, the instrument will indicate error -400 and return an empty object.

[:SENSe]:ACPower:BANDwidth|BWIDth:ADJacent <numeric_value> {HZ | KHZ | MHZ | GHZ}

[:SENSe]:ACPower:BANDwidth|BWIDth:ADJacent?

**Title:** Adjacent CHPWR Adjacent Integration Bandwidth

**Description:** Sets the adjacent channel bandwidth for adjacent channel power measurement. Integration bandwidth must be less than or equal to span

**Parameter(s):** <numeric_value> {HZ | KHZ | MHZ | GHZ}

**Query Return:** Numeric (Hz)

**Default Value:** 10350000 Hz

**Default Unit:** Hz

**Range:** 10 Hz to 400000000000 Hz
[:SENSe]:ACPower:BANDwidth|BWIDth:ALTernate <numeric_value> {HZ | KHZ | MHZ | GHZ}

[:SENSe]:ACPower:BANDwidth|BWIDth:ALTernate?

Title: Adjacent CHPWR Alternate Integration Bandwidth
Description: Sets the alternate channel bandwidth for adjacent channel power measurement. Integration bandwidth must be less than or equal to span
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 10350000 Hz
Default Unit: Hz
Range: 10 Hz to 400000000000 Hz

[:SENSe]:ACPower:BANDwidth|BWIDth:MAIN <numeric_value> {HZ | KHZ | MHZ | GHZ}

[:SENSe]:ACPower:BANDwidth|BWIDth:MAIN?

Title: Adjacent CHPWR Main Integration Bandwidth
Description: Sets the main channel bandwidth for adjacent channel power measurement. Integration bandwidth must be less than or equal to span
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 10350000 Hz
Default Unit: Hz
Range: 10 Hz to 400000000000 Hz

[:SENSe]:ACPower:BANDwidth|BWIDth:SPACing <numeric_value> {HZ | KHZ | MHZ | GHZ}

[:SENSe]:ACPower:BANDwidth|BWIDth:SPACing?

Title: Adjacent Channel Power Spacing
Description: Controls the channel spacing which is the distance from the modulated carrier signal to the upper or lower Adjacent Channel.
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 10350000 Hz
Default Unit: Hz
Range: 10 Hz to 400000000000 Hz
[:SENSe]:ACPower:STATe <0 | 1 | ON | OFF>
[:SENSe]:ACPower:STATe?

Title: Adjacent Channel Power State
Description: Sets the state of the adjacent channel power ratio measurement, ON or OFF. When using :CONFigure:ACPower, the state is automatically set to ON
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF

[:SENSe]:ARFChannel <numeric_value>
[:SENSe]:ARFChannel?

Title: Absolute RF Channel Number
Description: Sets or queries the Absolute RF Channel Number for the current demod measurement. Accepted values vary based on the current operating band. Inputting invalid values will set the closest valid value possible for the given circumstances.
When the operating band is not being used ([:SENSe]:OBANd is INValid), this value will not be settable. Attempts to set this when the system is in this state will return the error -221.
Parameter(s): <numeric_value>
Query Return: Numeric
Default Value: 0
Range: 0 to 3279165

[:SENSe]:AVERage:COUNt <numeric_value>
[:SENSe]:AVERage:COUNt?

Title: Sense Average Count
Description: Sets the effective number of averages and the length of the rolling min and max hold. Due to memory limitations the actual length of buffers for rolling min and max hold are limited to 2,000,000 / number of trace points.
Parameter(s): <numeric_value>
Query Return: Numeric
Default Value: 10
Range: 2 to 1000
[:SENSe]:AVERage:TYPE
<NORMal|MINimum|MAXimum|AVERage|RMAXimum|RMINimum|RAVerage>
[:SENSe]:AVERage:TYPE?

Title: Sense Average Type

Description: Specifies how successive traces are combined to produce the resulting display value. Only applies to trace 1. Setting the TYPE to NORMal will cause the displayed value for a point to be the current measured value for that point. Setting the TYPE to AVERage will cause the displayed value for a point to be the average of the last <integer> measured values where <integer> is set by [:SENSe]:AVERage:COUNt. Setting the TYPE to MAXimum will cause the displayed value for a point to be the maximum measured value for that point over sweeps. Setting the TYPE to MINimum will cause the displayed value for a point to be the minimum measured value for that point over sweeps. Setting the TYPE to RMAXimum will cause the displayed value for a point to be the maximum of the last <integer> measured values where <integer> is set by [:SENSe]:AVERage:COUNt. Setting the TYPE to RMINimum will cause the displayed value for a point to be the minimum of the last <integer> measured values where <integer> is set by [:SENSe]:AVERage:COUNt.

Parameter(s): <NORMal|MINimum|MAXimum|AVERage|RMAXimum|RMINimum|RAVerage>
Query Return: NORM|MIN|MAX|AVER|RMAX|RMIN|RAV
Default Value: NORMal

[:SENSe]:BANDwidth|BWIDth[:RESolution] <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:BANDwidth|BWIDth[:RESolution]?

Title: RBW

Description: Sets the resolution bandwidth.

Note that using this command turns the automatic resolution bandwidth setting OFF.

Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 3000000 Hz
Default Unit: Hz
Range: 1 Hz to 50000000 Hz
[:SENSe]:BANDwidth|BWIDth[:RESolution] <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:BANDwidth|BWIDth[:RESolution]?

Title: RBW Zero Span
Description: Sets the resolution bandwidth.
   Note that using this command turns the automatic resolution bandwidth setting OFF. 
   In Zero Span, the range will change to allow a minimum of 5 KHz to the maximum of 20 
   MHz.
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 3000000 Hz
Default Unit: Hz
Range: 5000 Hz to 20000000 Hz

[:SENSe]:BANDwidth|BWIDth[:RESolution]:RATio <numeric_value>
[:SENSe]:BANDwidth|BWIDth[:RESolution]:RATio?

Title: RBW Span Ratio
Description: Sets the ratio of the resolution bandwidth to the span for use when the resolution 
bandwidth to span coupling is enabled. Note that the front panel interface sets the 
inverse ratio: the span to the resolution bandwidth.
Parameter(s): <numeric_value>
Query Return: Numeric
Default Value: 0.01
Range: 1e-05 to 1

[:SENSe]:BANDwidth|BWIDth:VIDeo <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:BANDwidth|BWIDth:VIDeo?

Title: VBW
Description: Sets the video bandwidth.
   Note that using this command turns the automatic video bandwidth setting OFF.
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 1000000 Hz
Default Unit: Hz
Range: 1 Hz to 50000000 Hz
[:SENSe]:BANDwidth|BWIDth:VIDeo <numeric_value> {HZ | KHZ | MHZ | GHZ}

Title: VBW Zero Span
Description: Sets the video bandwidth.
   Note that using this command turns the automatic video bandwidth setting OFF.
   In Zero Span, the range will change to allow a minimum of 5 KHz to the maximum of 20 MHz.
   The Default value will also change to 3 MHz.
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 3000000 Hz
Default Unit: Hz
Range: 5000 Hz to 20000000 Hz

[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio <numeric_value>
[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio?

Title: VBW RBW Ratio
Description: Sets the ratio of the video bandwidth to the resolution bandwidth for use when the video to resolution bandwidth coupling is enabled. Note that the front panel interface sets the inverse ratio: the resolution bandwidth to the video bandwidth which is an integer, in other words, if you send 0.35, the display will show 2 not 2.857
Parameter(s): <numeric_value>
Query Return: Numeric
Default Value: 0.333333333333333
Range: 1e-05 to 1

[:SENSe]:BANDwidth|BWIDth:VIDeo:TYPE <LINear|LOGarithmic>
[:SENSe]:BANDwidth|BWIDth:VIDeo:TYPE?

Title: VBW Averaging
Description: Changes the VBW/Average type.
Parameter(s): <LINear|LOGarithmic>
Query Return: LIN|LOG
Default Value: LINear
[:SENSe]:BANDwidth[:RESolution]:AUTO <0 | 1 | ON | OFF>
[:SENSe]:BANDwidth[:RESolution]:AUTO?

Title: RBW Auto
Description: Sets the state of the coupling of the resolution bandwidth to the frequency span. Setting the value to ON or 1 will result in the resolution bandwidth being coupled to the span. That is, when the span changes, the resolution bandwidth changes. Setting the value to OFF or 0 will result in the resolution bandwidth being decoupled from the span. That is, changing the span will not change the resolution bandwidth. When this command is issued, the resolution bandwidth setting itself will not change

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: ON

[:SENSe]:BANDwidth:VIDeo:AUTO <0 | 1 | ON | OFF>
[:SENSe]:BANDwidth:VIDeo:AUTO?

Title: VBW Auto
Description: Sets the state of the coupling of the video bandwidth to the resolution bandwidth. Setting the value to ON or 1 will result in the video bandwidth being coupled to the resolution bandwidth. That is, when the resolution bandwidth changes, the video bandwidth changes. Setting the value to OFF or 0 will result in the video bandwidth being decoupled from the resolution bandwidth. That is, changing the resolution bandwidth will not change the video bandwidth

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: ON

[:SENSe]:BEAM <numeric_value>
[:SENSe]:BEAM?

Title: Measured Beam
Description: Sets or queries the beam number to measure and display.

Parameter(s): <numeric_value>
Query Return: Numeric
Default Value: 0
Range: 0 to 63

[:SENSe]:BEAM:TRACking:STATe <0 | 1 | ON | OFF>
[:SENSe]:BEAM:TRACking:STATe?

Title: Detected Beam Tracking State
Description: Sets or queries the state of the beam tracking functionality.

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF
[:SENSe]:CBWidth <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:CBWidth?

Title: Channel Bandwidth
Description: Sets or queries the channel bandwidth for the current demod measurement.

Full set of possible values are 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 MHz, though actual accepted values vary based on the current operating band and purchased options.

Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 100000000 Hz
Default Unit: Hz
Range: 5000000 Hz to 100000000 Hz

[:SENSe]:CBWidth:CATalog?

Title: Channel Bandwidth Catalog
Description: Queries a list of all valid channel bandwidth values based on current settings.

Data is returned in a comma-separated list of frequencies in Hz, e.g. "5000000,10000000"

[:SENSe]:CHANnel:SCSPacing:CATalog?

Title: Channel Subcarrier Spacing Catalog
Description: Queries a list of all valid channel subcarrier spacing values based on current settings.

Data is returned in a comma-separated list of frequencies in Hz, e.g. "15000,30000,60000"

[:SENSe]:CHPower:BANDwidth|BWIDth:INTegration <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:CHPower:BANDwidth|BWIDth:INTegration?

Title: CHPWR Integration Bandwidth
Description: Sets the integration bandwidth for channel power measurement. Integration bandwidth must be less than or equal to span

Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 10350000 Hz
Default Unit: Hz
Range: 10 Hz to 400000000000 Hz

[:SENSe]:CHPower:STATe <0 | 1 | ON | OFF>
[:SENSe]:CHPower:STATe?

Title: Channel Power State
Description: Sets the state of the channel power measurement, ON or OFF. When using :CONFigure:CHPower, the state is automatically set to ON

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF
[:SENSe]:CYCLicprefix <NORMal>  
[:SENSe]:CYCLicprefix?
  
Title: Cyclic Prefix  
Description: Sets or queries the cyclic prefix type. Only NORMal is available in 5GNR  
Parameter(s): <NORMal>  
Query Return: NORM  
Default Value: NORMal

[:SENSe]:DENSity:ACQuisition <numeric_value> {PS | NS | US | MS | S | MIN | HR}  
[:SENSe]:DENSity:ACQuisition?
  
Title: Density Acquisition Time  
Description: Density acquisition time for RTSA Mode  
Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}  
Query Return: Numeric (ms)  
Default Value: 50 ms  
Default Unit: ms  
Range: 50 ms to 5000 ms

[:SENSe]:DENSity:CSCale:AUTO <0 | 1 | ON | OFF>  
[:SENSe]:DENSity:CSCale:AUTO?
  
Title: RTSA Density Color Scale Auto  
Description: In RTSA mode, this toggles the functionality for automatically scaling the color scale for the density spectrum measurement.  
Parameter(s): <0 | 1 | ON | OFF>  
Query Return: 0 | 1  
Default Value: ON

[:SENSe]:DENSity:CSCale:HIGH <numeric_value>  
[:SENSe]:DENSity:CSCale:HIGH?
  
Title: RTSA Density Color Scale High  
Description: In RTSA mode, this indicates the percentage of hits needed at each point to be represented as the highest color of the density measurement's color scale (red).  
Parameter(s): <numeric_value>  
Query Return: Numeric  
Default Value: 100  
Range: 0 to 100
[:SENSe]:DENSity:CSCale:LOW <numeric_value>
[:SENSe]:DENSity:CSCale:LOW?

Title: RTSA Density Color Scale Low
Description: In RTSA mode, this indicates the percentage of hits needed at each point to be represented as the lowest color of the density measurement's color scale (blue).
Parameter(s): <numeric_value>
Query Return: Numeric
Default Value: 0
Range: 0 to 100

[:SENSe]:DENSity:DETection:MINimum?

Title: Minimum Detectable Signal Duration
Description: Gets the minimum duration (in ms) of a signal detectable by the system in RTSA mode.
Query Return: Numeric (ms)
Default Value: 5e-06 ms
Default Unit: ms
Range: 1e-06 ms to 5000000 ms

[:SENSe]:DENSity:DISPlay:RESolution <NORMal|HIGH>
[:SENSe]:DENSity:DISPlay:RESolution?

Title: Density Display Resolution
Description: This command sets the display resolution setting for the density measurement in RTSA mode.
Parameter(s): <NORMal|HIGH>
Query Return: NORM|HIGH
Default Value: HIGH

[:SENSe]:DENSity:FFT:COUNt?

Title: FFT Count
Description: Gets the current FFT count.
Query Return: Numeric
Default Value: 25000
Range: 32 to 4294967295
[:SENSe]:DENSITY:PERSISTence <numeric_value> {PS | NS | US | MS | S | MIN | HR}  
[:SENSe]:DENSITY:PERSISTence?

Title: Density Persistence Time
Description: Sets the density persistence time parameter in RTSA mode.
Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}
Query Return: Numeric (ms)
Default Value: 0 ms
Default Unit: ms
Range: 0 ms to 10000 ms

[:SENSe]:DENSITY:PERSISTence:STATE <VARiable|INFinite>  
[:SENSe]:DENSITY:PERSISTence:STATE?

Title: Density Persistence State
Description: This command toggles the persistence setting for the density measurement in RTSA mode.
Parameter(s): <VARiable|INFinite>
Query Return: VAR|INF
Default Value: VARiable

[:SENSe]:DENSITY:POI?

Title: Probability of Intercept
Description: Gets the current POI value.
Query Return: Numeric (ms)
Default Value: 0.004 ms
Default Unit: ms
Range: 1e-06 ms to 5000000 ms

[:SENSe]:DENSITY:STATE <0 | 1 | ON | OFF>  
[:SENSe]:DENSITY:STATE?

Title: Density Spectrum State
Description: Sets the state of the density spectrum measurement display.
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: ON
[:SENSe]:DETector[:FUNCTION] <POSitive|RMS|NEGative|SAMPle>
[:SENSe]:DETector[:FUNCTION]?

Title: Detection Mode
Description: Sets the detection method for calculating each display point. This command changes the detection method for the currently selected trace (see Select Trace command). To set the detection mode for any trace use the Trace Detector Type command. Each display point represents several measurements. The detection type determines how the display point is derived from its associated measurements. POSitive Peak detection displays the maximum value of the associated measurements. RMS detection displays the average power of the associated measurement. NEGative Peak detection displays the minimum value of the associated measurements. SAMPle detection selects one of the associated measurement points to display. In zero span and RTSA mode the SAMPle detection replaces RMS detection.

Parameter(s): <POSitive|RMS|NEGative|SAMPle>

[:SENSe]:DUPLex <TDD>
[:SENSe]:DUPLex?

Title: Duplex Type
Description: Sets or queries the duplex type. currently only TDD is available for 5GNR

Parameter(s): <TDD>
Query Return: TDD
Default Value: TDD

[:SENSe]:EIRPower:CLOSs <numeric_value> {DB}
[:SENSe]:EIRPower:CLOSs?

Title: EIRP Test Port Cable Loss
Description: This command sets or queries the test port cable loss for EIRP measurement.

Parameter(s): <numeric_value> {DB}
Query Return: Numeric (dB)
Default Value: 0 dB
Default Unit: dB
Range: 0 dB to 999 dB

[:SENSe]:EIRPower:DISTance <numeric_value>
[:SENSe]:EIRPower:DISTance?

Title: EIRP Measurement’s Distance
Description: This command sets or queries the EIRP measurement’s distance. Allowed unit types include m (meters) or ft (feet).
Note that if no unit is passed in, the instrument will assume that the incoming or outgoing unit is the unit type set through the [:SENSe]:EIRPower:DISTance:UNIT SCPI command.

Parameter(s): <numeric_value>
Default Value: 100 m
Default Unit: m
Range: 1 m to 1000 m
[:SENSe]:EIRPower:DISTance:UNIT <METers|FEET>

Title: EIRP Distance Units
Description: This command sets or queries the EIRP distance units. The query returns:
   MET - Meters
   FEET - Feet
Parameter(s): <METers|FEET>
Query Return: MET | FEET
Default Value: METers

[:SENSe]:EIRPower:MAXimum:COUNt?

Title: Maximum EIRP Count
Description: This command returns the current maximum EIRP count.

[:SENSe]:EIRPower:MAXimum:RESet

Title: Reset Maximum EIRP Count
Description: This command resets the maximum EIRP count.

[:SENSe]:EIRPower:PLOSs?

Title: EIRP Path Loss
Description: This command queries the EIRP total path loss between the base station gNB and test antenna.
Query Return: Numeric (dB)
Default Value: 0 dB
Default Unit: dB
Range: 0 dB to 999 dB

[:SENSe]:EIRPower:RAGain <numeric_value> {DB}
[:SENSe]:EIRPower:RAGain?

Title: EIRP Rx Antenna Gain
Description: This command sets or queries the EIRP Rx Antenna Gain in dBi.
Parameter(s): <numeric_value> {DB}
Query Return: Numeric (dB)
Default Value: 0 dB
Default Unit: dB
Range: 0 dB to 999 dB
[:SENSe]:EIRPower:STATe <0 | 1 | ON | OFF>
[:SENSe]:EIRPower:STATe?
   
   Title: EIRP State
   Description: Sets the state of the EIRP measurement, ON or OFF. When using :CONFigure:EIRPower, the state is automatically set to ON
   Parameter(s): <0 | 1 | ON | OFF>
   Query Return: 0 | 1
   Default Value: OFF

[:SENSe]:EIRPower:TAGain <numeric_value> {DB}
[:SENSe]:EIRPower:TAGain?
   
   Title: EIRP Tx Antenna Gain
   Description: This command sets or queries the EIRP Tx Antenna Gain in dBi.
   Parameter(s): <numeric_value> {DB}
   Query Return: Numeric (dB)
   Default Value: 0 dB
   Default Unit: dB
   Range: 0 dB to 999 dB
[:SENSe]:FETCh:SCANner?

Title: Fetch Cell Scanner
Description: Returns the cell scanner measurements in a json format. If a measurement is in progress, it blocks until complete
{
    "gps":{
        "coordinates":"37.14681, -121.65609, 128m",
        "time":"Fri Jun 28 19:56:45 2019 GMT"
    },
    "status":{
        "hardwareErrors":{
            "ADCOverRange":0,
            "DeviceAccess":0,
            "EEPROM":0,
            "IrregularData":0,
            "Limit":0,
            "LockLO1":0,
            "LockLO2":0,
            "NoCal":0,
            "Overpower":0,
            "SLOLock":0,
            "Saturation":0,
            "TgLockLo1":0
        },
        "statusMessage":"
    },
    "statusNumber":-64
},
"values":[
    {
        "cellId":0,
        "cellIdGroup":0,
        "frameStart":1920521,
        "sectorId":0,
        "timeOffset":-3490194.091145895,
        "values":[
            {
                "beamIndex":0,
                "beamPresent":0,
                "ssRsrp":null,
                "ssRsrc":null,
                "ssRsrq":null
            }
        ]
    }
]
"ssSnr":null
}, ...
{
"beamIndex":7,
"beamPresent":1,
"ssRsrp":-84.22420720274197,
"ssRsrq":null,
"ssSnr":null
}
]
]
]

[:SENSe]:FREQuency:CENTer <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:FREQuency:CENTer?

Title: Center Frequency
Description: Sets the center frequency. Note that changing the value of the center frequency will change the value of the coupled parameters Start Frequency and Stop Frequency. It may also change the value of the span.
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 3000000000 Hz
Default Unit: Hz
Range: -99999999995 Hz to 299999999995 Hz

[:SENSe]:FREQuency:OFFSet <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:FREQuency:OFFSet?

Title: Frequency Offset
Description: Set a frequency offset, which will be added to the start, stop, and center frequencies. This offset is for display purposes only and does not affect the frequency range being measured.
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 0 Hz
Default Unit: Hz
Range: -10000000000 Hz to 10000000000 Hz
[:SENSe]:FREQuency:SPAN <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:FREQuency:SPAN?

Title: Span
Description: Sets the frequency span. Setting the value of <freq> to 0 Hz is the equivalent of setting the span mode to zero span. Note that changing the value of the frequency span will change the value of the coupled parameters Start Frequency and Stop Frequency and may change the Center Frequency.

Note that this command is not available for Spectral Emission Mask measurement.

Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 400000000000 Hz
Default Unit: Hz
Range: 10 Hz to 400000000000 Hz

[:SENSe]:FREQuency:SPAN:FULL
Title: Set to Full Span
Description: Sets the frequency span to full span. Note that changing the value of the frequency span will change the value of the coupled parameters, Start Frequency and Stop Frequency and may change the Center Frequency.

[:SENSe]:FREQuency:SPAN:LAST
Title: Set to Last Span
Description: Sets the frequency span to the previous span value. Note that changing the value of the frequency span will change the value of the coupled parameters, Start Frequency and Stop Frequency and may change the Center Frequency.

[:SENSe]:FREQuency:STARt <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:FREQuency:STARt?

Title: Start Frequency
Description: Sets the start frequency. Note that in the spectrum analyzer, changing the value of the start frequency will change the value of the coupled parameters, Center Frequency and Span.

Note that this command is not available for Spectral Emission Mask measurement.

Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 0 Hz
Default Unit: Hz
Range: -100000000000 Hz to 299999999990 Hz
[:SENSe]:FREQuency:STEP[:INCRement] <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:FREQuency:STEP[:INCRement]?

Title: Frequency Step
Description: Set or query the step size to gradually increase or decrease frequency value. This command doesn't change any behavior in the backend but will be included in save/recall operations.

Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 1000000 Hz
Default Unit: Hz
Range: 1000 Hz to 1000000000 Hz

[:SENSe]:FREQuency:STOP <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:FREQuency:STOP?

Title: Stop Frequency
Description: Sets the stop frequency. Note that in the spectrum analyzer, changing the value of the stop frequency will change the value of the coupled parameters, Center Frequency and Span.
Note that this command is not available for Spectral Emission Mask measurement.

Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 6000000000 Hz
Default Unit: Hz
Range: -99999999990 Hz to 300000000000 Hz

[:SENSe]:GATE:DELay <numeric_value> {PS | NS | US | MS | S | MIN | HR}
[:SENSe]:GATE:DELay?

Title: Gate Delay
Description: Sets or queries the gate delay time. Available values are limited based on current mode.

Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}
Query Return: Numeric (ms)
Default Value: 0 ms
Default Unit: ms
Range: 0 ms to 199.999 ms
[:SENSe]:GATE:LENGTH <numeric_value> {PS | NS | US | MS | S | MIN | HR}
[:SENSe]:GATE:LENGTH?

Title: Gate Delay Length
Description: Sets or queries the length of the gate delay. Available values are limited based on current mode.
Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}
Query Return: Numeric (ms)
Default Value: 1 ms
Default Unit: ms
Range: 0.001 ms to 200 ms

[:SENSe]:GATE:PERiod <P1s|P20ms|P10ms>
[:SENSe]:GATE:PERiod?

Title: Gated Sweep Period Length
Description: Sets or queries the time period used for the Gated Sweep functionality. Available settings are: "P10ms" (10ms) and "P20ms" (20ms).
Parameter(s): <P1s|P20ms|P10ms>
Query Return: P1 | P20 | P10
Default Value: P20ms

[:SENSe]:GATE:STATe <0 | 1 | ON | OFF>
[:SENSe]:GATE:STATe?

Title: Gated Sweep State
Description: Sets or queries the status of the Gated Sweep functionality. Usage requires Option 0090.
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF

[:SENSe]:GATE:TRIGger <GPS>
[:SENSe]:GATE:TRIGger?

Title: Gated Sweep Trigger Source
Description: Sets or queries the trigger source used for the Gated Sweep functionality.
Parameter(s): <GPS>
Query Return: GPS
Default Value: GPS
[:SENSe]:GSCNumber <numeric_value>
[:SENSe]:GSCNumber?

Title: Global Sync Channel Number
Description: Sets or queries the Global Sync Channel Number for the current demod measurement. Accepted values vary based on the current operating band and absolute RF channel number. Inputting invalid values will set the closest valid value possible for the given circumstances.

When the operating band is not being used ([:SENSe]:OBAn is INValid), this value will not be settable. Attempts to set this when the system is in this state will return the error -221.

Parameter(s): <numeric_value>
Query Return: Numeric
Default Value: 2
Range: 2 to 26639

[:SENSe]:INTerference:BANDwidth|BWIDth:INTegration <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:INTerference:BANDwidth|BWIDth:INTegration?

Title: Interference Finder Integration Bandwidth
Description: Sets the integration bandwidth for interference finder measurement. Integration bandwidth must be less than or equal to span

Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 10350000 Hz
Default Unit: Hz
Range: 10 Hz to 400000000000 Hz

[:SENSe]:INTerference:MAX <numeric_value> {DBM}
[:SENSe]:INTerference:MAX?

Title: Interference Finder Max Level
Description: Sets the max level for interference finder measurement. The max level must be greater than the min level.

Parameter(s): <numeric_value> {DBM}
Query Return: Numeric (dBm)
Default Value: 10 dBm
Default Unit: dBm
Range: -149.9 dBm to 30 dBm
[:SENSe]:INTERference:MIN <numeric_value> \{DBM\}

Title: Interference Finder Min Level
Description: Sets the min level for interference finder measurement. The min level must be less than the max level.
Parameter(s): <numeric_value> \{DBM\}
Query Return: Numeric (dBm)
Default Value: -50 dBm
Default Unit: dBm
Range: -150 dBm to 29.9 dBm

[:SENSe]:INTERference:STATe <0 \| 1 \| ON \| OFF>

Title: Interference Finder State
Description: Sets the state of the interference finder measurement, ON or OFF. When using :CONFigure:INTERference, the state is automatically set to ON
Parameter(s): <0 \| 1 \| ON \| OFF>
Query Return: 0 \| 1
Default Value: OFF

[:SENSe]:MODE <SPECtrum\|NRADio\|RTSA\|LTE>

Title: Spa mode
Description: Set the operational mode of the Spa app.
SPECtrum for the default spectrum mode. NRADio for 5G measurements.
Parameter(s): <SPECtrum\|NRADio\|RTSA\|LTE>
Query Return: SPEC|NRAD|RTSA|LTE
Default Value: SPECtrum

[:SENSe]:MODE:CATalog?

Title: Spa Mode Catalog
Description: Returns a list of available modes for the Spa application. The response is a comma-separated list of mode names. See command [:SENSe]:MODE for the mode name specification.

[:SENSe]:NRADio:MAPPING:PATTern <P1|P2|AUTO>

Title: Mapping Pattern
Description: Sets or queries the Mapping Pattern used in the New Radio mode.
Available selections are: P1 (Mapping Pattern 1), or P2 (Mapping Pattern 2)
Parameter(s): <P1\|P2\|AUTO>
Query Return: P1\|P2\|AUTO
Default Value: AUTO
[:SENSe]:OBAND
<INV|N34|N38|N39|N40|N41|N51|N77|N78|N79|N257|N258|N260>
[:SENSe]:OBAND?

Title: Operating Band Number
Description: Sets or queries the operating band number for the current demod measurement. Sets via this command will also restrict available ARF and GS Channel numbers. Currently only supports bands: N34,N38,N39,N40,N41,N51,N77,N78,N79,N257,N258,N260
Parameter(s): <INV|N34|N38|N39|N40|N41|N51|N77|N78|N79|N257|N258|N260>
Query Return: INV|N34|N38|N39|N40|N41|N51|N77|N78|N79|N257|N258|N260
Default Value: INV

[:SENSe]:OBWidth:METHod <XDB|PERCent>
[:SENSe]:OBWidth:METHod?

Title: Occupied Bandwidth Method
Description: Sets the method for calculating occupied bandwidth. XDB calculates the occupied bandwidth based on points a specified number of dB below the carrier. Issue command [:SENSe]:OBWidth:XDB to set the number of dB to be used. PERCent calculates the occupied bandwidth based on points a specified percentage of the carrier power below the carrier. Issue command [:SENSe]:OBWidth:PERCent to set the percentage to be used. The measurement always gives a result, even if there is no signal. For example, the 100 dBc Occupied Bandwidth is the current full span.
Parameter(s): <XDB|PERCent>
Query Return: XDB|PERC
Default Value: PERCent

[:SENSe]:OBWidth:PERCent <numeric_value>
[:SENSe]:OBWidth:PERCent?

Title: Occupied Bandwidth Percent
Description: This command sets the percentage of carrier power used to measure the occupied bandwidth. This value is used in the measurement if :SENSe:OBWidth:METHod is set to PERCent.
Parameter(s): <numeric_value>
Query Return: Numeric
Default Value: 99
Range: 1e-06 to 99.999999

[:SENSe]:OBWidth:STATE <0 | 1 | ON | OFF>
[:SENSe]:OBWidth:STATE?

Title: Occupied Bandwidth State
Description: Sets the state of the occupied bandwidth measurement, ON or OFF. When using :CONFigure:OBWidth, the state is automatically set to ON
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF
[:SENSe]:OBWidth:XDB <numeric_value> {DB}
[:SENSe]:OBWidth:XDB?

Title: Occupied Bandwidth XDB
Description: This command sets the number of dB below the carrier used to measure the occupied bandwidth. This value is used in the measurement if :SENSe:OBWidth:METHod is set to XDB.
Parameter(s): <numeric_value> {DB}
Query Return: Numeric (dB)
Default Value: 3 dB
Default Unit: dB
Range: 0.001 dB to 100 dB
[:SENSe]:PCI?

Title: Get PCI Measurements

Description: Returns the last stored PCI measurement results. This command returns cell id, group id, corrected carrier frequency, detected beam, frame start, frequency error, sector id, group id, and time offset (in ns) as output in JSON format.

This command does not wait for the current measurement to complete before returning results.

An example is as follows:

```
{
"cellId": 0,
"cellIdGroup": 0,
"correctedCarrierFrequency": 4499999985.264854,
"detectedBeam": 4,
"frameStart": 233097,
"frequencyError": -14.735145792134368,
"ppmFrequencyError": 0.09346635883256266,
"sectorId": 0,
"status": {
"hardwareErrors": {
"ADCOverRange": 0,
"DeviceAccess": 0,
"EEPROM": 0,
"IrregularData": 0,
"Limit": 0,
"LockLO1": 0,
"LockLO2": 0,
"NoCal": 0,
"Overpower": 0,
"SLOLock": 0,
"Saturation": 0,
"TgLockLo1": 0
},
"statusMessage": "statusPciDone",
"statusNumber": 10
},
"gps":{
"coordinates":"37.14681, -121.65609, 128m",
"time":"Fri Jun 28 19:56:45 2019 GMT"
},
"timeOffset": -634782.9687499882
```
[:SENSe]:POWer:RF:ATTenuation <numeric_value> {DB}
[:SENSe]:POWer:RF:ATTenuation?

Title: Input Attenuation
Description: Sets the input attenuation. Note that issuing this command will set the automatic input attenuation OFF. Actual minimum and maximum values vary, depending on model and options.
Parameter(s): <numeric_value> {DB}
Query Return: Numeric (dB)
Default Value: 30 dB
Default Unit: dB
Range: 0 dB to 65 dB

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

Title: RF Attenuation Auto
Description: Sets the input attenuation coupling. Setting the value to ON or 1 will result in the input attenuation being coupled to the reference level. Setting the value to OFF or 0 will result in the input attenuation being uncoupled from the reference level. That is, changing the reference level will not change the input attenuation. When this command is issued, the input attenuator setting itself will not change. The default value is ON. That is, sending :SENS:POW:ATT:AUTO is equivalent to sending :SENS:POW:ATT:AUTO ON.
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: ON

[:SENSe]:POWer:RF:GAIN:AUTO <0 | 1 | ON | OFF>
[:SENSe]:POWer:RF:GAIN:AUTO?

Title: Auto Gain Ranging
Description: Sets the state of the auto gain-ranging functionality.
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: ON

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

Title: Preamp
Description: Sets the state of the preamp. Note that this may cause a change in the reference level and/or attenuation.
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF
[SENSe]:SCAN?

Title: Get Cell Scanner

Description: Returns the cell scanner measurements in a json format. Unlike [:SENSe]:FETCH:SCANner this command does not block and will return the previous result.

```json
{
    "gps": {
        "coordinates": "37.14681, -121.65609, 128m",
        "time": "Fri Jun 28 19:56:45 2019 GMT"
    },
    "status": {
        "hardwareErrors": {
            "ADCOverRange": 0,
            "DeviceAccess": 0,
            "EEPROM": 0,
            "IrregularData": 0,
            "Limit": 0,
            "LockLO1": 0,
            "LockLO2": 0,
            "NoCal": 0,
            "Overpower": 0,
            "SLOLock": 0,
            "Saturation": 0,
            "TgLockLo1": 0
        },
        "statusMessage": "",
        "statusNumber": -64
    },
    "values": [
        {
            "cellId": 0,
            "cellIdGroup": 0,
            "frameStart": 1920521,
            "sectorId": 0,
            "timeOffset": -3490194.091145895,
            "values": [
                {
                    "beamIndex": 0,
                    "beamPresent": 0,
                    "ssRsrp": null,
```
"ssRsrq":null,
"ssSlnr":null
}
{
"beamIndex":7,
"beamPresent":1,
"ssRsp":-84.22420720274197,
"ssRsrq":null,
"ssSlnr":null
}
}
]

[:SENSe]:SCANner:STATe <0 | 1 | ON | OFF>
[:SENSe]:SCANner:STATe?

Title: Demod Scanner State Command
Description: Turns on cell scanner, disables other measurements
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF

[:SENSe]:SEMask:CENTer:BWIDth <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe]:SEMask:CENTer:BWIDth?

Title: Center Channel Bandwidth
Description: Set or query the bandwidth of the central channel of the Spectral Emission Mask measurement. The center channel is used to calculate the reference power when reference power calculation is set to AUTO.
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 100000000 Hz
Default Unit: Hz
Range: 10000 Hz to 200000000 Hz
**:SENSe**:SEMask:MASK <GT38|LT38>
**:SENSe**:SEMask:MASK?

Title: Spectral Mask
Description: Sets the preprogrammed spectral mask to be used for the Spectral Emission Mask measurement. Available selections are specified in the following table: Spectral Mask
Description GT38 5G NR P > 38 dBm LT38 5G NR P < 38 dBm

Parameter(s): <GT38|LT38>
Query Return: GT38 | LT38
Default Value: GT38

**:SENSe**:SEMask:RPOWer <numeric_value> {DBM}
**:SENSe**:SEMask:RPOWer?

Title: Manual Reference Power
Description: Set or query the manual reference power value used in the Spectral Emission Mask measurement when reference power calculation method (**:SENSe**:SEMask:RPOWer:STATe) is set to OFF or 0. When the reference power calculation method is set to ON or 1, this manual reference power value will be unused.

Parameter(s): <numeric_value> {DBM}
Query Return: Numeric (dBm)
Default Value: 0 dBm
Default Unit: dBm
Range: -200 dBm to 200 dBm

**:SENSe**:SEMask:RPOWer:STATe <0 | 1 | ON | OFF>
**:SENSe**:SEMask:RPOWer:STATe?

Title: Reference Power Calculation
Description: Set or query the method for how the reference power is calculated in the Spectral Emission Mask measurement. Setting the value to ON or 1, the reference power will be obtained automatically by measuring the channel power of the center channel bandwidth. Setting the value to OFF or 0, the reference power will be the value set using the manual reference power command (**:SENSe**:SEMask:RPOWer).

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: ON

**:SENSe**:SEMask:STATe <0 | 1 | ON | OFF>
**:SENSe**:SEMask:STATe?

Title: Spectral Emission Mask State
Description: Sets the state of the Spectral Emission Mask measurement, ON or OFF. When using :CONFigure:SEMask, the state is automatically set to ON.

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF
[:SENSe]:SSB?

**Title:** Get SSB Measurements

**Description:** Returns the last stored SSB measurement results.

This command returns the beam numbers with the best EVM and power, followed by Power and EVM results for PSS, SSS, PBCH, PBCH DM-RS and SS Signal Quality Results in a json format. This command does not wait for the current measurement to complete before returning results.

eg:

```json
{
    "bestEvmBeam":5,
    "bestPowerBeam":0,
    "status": {,
    "hardwareErrors": {,
    "ADCOverRange": 0,
    "DeviceAccess": 0,
    "EEPROM": 0,
    "IrregularData": 0,
    "Limit": 0,
    "LockLO1": 0,
    "LockLO2": 0,
    "NoCal": 0,
    "Overpower": 0,
    "SLOLock": 0,
    "Saturation": 0,
    "TgLockLo1": 0
    },
    "statusMessage": "statusPciDone",
    "statusNumber": 10
},
"gps":{
    "coordinates":"37.14681, -121.65609, 128m",
    "time":"Fri Jun 28 19:56:45 2019 GMT"
},
"values":{
    "dmRsPbch":{},
    "peakEvm":{
    "percent":11.926020622253418,
    "subcarrierNumber":1529,
```
"symbolNumber":3
},
"power":-31.813847928749347,
"rmsEvm":3.813983917236328
},
"pbch":{
"peakEvm":{
"percent":13.430730819702148,
"subcarrierNumber":1638,
"symbolNumber":5
},
"power":-31.8139914869584,
"rmsEvm":3.736370325088501
},
"pss":{
"peakEvm":{
"percent":12.912864685058594,
"subcarrierNumber":1638,
"symbolNumber":2
},
"power":-31.704519932556128,
"rmsEvm":1.7515575885772705
},
"ssRsrp":-31.750750515723816,
"ssRsrq":-10.728772378478801,
"ssSlnr":-13.878087163543444,
"sss":{
"peakEvm":{
"percent":11.369827270507812,
"subcarrierNumber":1638,
"symbolNumber":4
},
"power":-31.750750515723816,
"rmsEvm":2.5253000259399414
}
[[:SENSe]:SSB:OFFSet <numeric_value> {HZ | KHZ | MHZ | GHZ}]

[:SENSe]:SSB:OFFSet?

Title: SSB Frequency Offset
Description: Sets or queries the SS Block frequency offset from the current center frequency in Hz.
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 0 Hz
Default Unit: Hz
Range: -200000000000 Hz to 200000000000 Hz

[[:SENSe]:SSB:OFFSet:AUTO:ABORt]

Title: SSB Autodetection Abort
Description: Aborts the current SSB Autodetection operation. System may take a few seconds to terminate the current operation. The [:SENSe]:SSB:OFFSet:AUTO:STATus query will return "ABOR" when complete.

[[:SENSe]:SSB:OFFSet:AUTO:STARt]

Title: SSB Autodetection Start
Description: Starts the SSB Autodetection operation.

[[:SENSe]:SSB:OFFSet:AUTO:STATus?]

Title: SSB Autodetection Status
Description: Queries the current status of the SSB Autodetection operation. Valid values are:
INACtive: Operation has not been performed with the current set of parameters. ACTive: Operation is in progress. PASS: Operation has completed successfully, and the new SSB Offset has been applied. FAIL: Operation has completed, but did not find a valid SSB. ABORted: Operation was aborted before completion.
Query Return: INAC | ACT | PASS | FAIL | ABOR
Default Value: INACtive
[:SENSe][:SSB]:SCSPacing <numeric_value> {HZ | KHZ | MHZ | GHZ}
[:SENSe][:SSB]:SCSPacing?

Title: SSB Subcarrier Spacing
Description: Sets or queries the SS Block subcarrier spacing for the current demod measurement. Full set of possible values are 15, 30, 120, 240 kHz.
Parameter(s): <numeric_value> {HZ | KHZ | MHZ | GHZ}
Query Return: Numeric (Hz)
Default Value: 30000 Hz
Default Unit: Hz
Range: 15000 Hz to 240000 Hz

[:SENSe][:SSB]:SCSPacing:CATalog?

Title: SSB Subcarrier Spacing Catalog
Description: Queries a list of all valid SS block subcarrier spacing values based on current settings. Data is returned in a comma-separated list of frequencies in Hz, e.g. "15000,30000,60000"

[:SENSe]:SWEep:TIMe <numeric_value> {PS | NS | US | MS | S | MIN | HR}
[:SENSe]:SWEep:TIMe?

Title: Sweep Time
Description: Sets the value of the minimum sweep time parameter. The sweep will complete in the shortest time possible greater than the specified time. To sweep as fast as possible, enter the minimum value allowed for the sweep time. Applies to zero span sweeps only.
Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}
Query Return: Numeric (ms)
Default Value: 30000 ms
Default Unit: ms
Range: 0.02 ms to 60000 ms

[:SENSe]:SYNCtype <SS>
[:SENSe]:SYNCtype?

Title: Sync Type
Description: Sets or queries the sync type, currently only SS is available for 5GNR
Parameter(s): <SS>
Query Return: SS
Default Value: SS
[:SENSe]:TDOMain:DISPlay:LENGth <numeric_value> {PS | NS | US | MS | S | MIN | HR}
[:SENSe]:TDOMain:DISPlay:LENGth?

Title: Time Domain Display Length
Description: Sets or queries the duration of the Time Domain measurements display's measurement. Available values are limited to 100us - 200ms.
Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}
Query Return: Numeric (ms)
Default Value: 20 ms
Default Unit: ms
Range: 0.1 ms to 200 ms

[:SENSe]:TDOMain:DISPlay:STARt <numeric_value> {PS | NS | US | MS | S | MIN | HR}
[:SENSe]:TDOMain:DISPlay:STARt?

Title: Time Domain Display Start Time
Description: Sets or queries the start time of the display for the Time Domain measurement. Available values are limited to 0 - 199.9ms.
Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}
Query Return: Numeric (ms)
Default Value: 0 ms
Default Unit: ms
Range: 0 ms to 199.9 ms

[:SENSe]:TDOMain:STATe <0 | 1 | ON | OFF>
[:SENSe]:TDOMain:STATe?

Title: Time Domain State
Description: Enables and disables time domain mode
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF
:STATus:OPERation[:EVENt]?

Title: Get Operation Status
Description: This command requests information about the current status of the instrument. Each bit of the return value represents some operation. Only a subset of the bits are implemented for each application. The number returned is the decimal representation of the bit-wise OR of the enabled bits:

<table>
<thead>
<tr>
<th>Bit</th>
<th>Decimal Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>Not implemented</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Not implemented</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Not implemented</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>Not implemented</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>Not implemented</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>Not implemented</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
<td>Not implemented</td>
</tr>
<tr>
<td>7</td>
<td>128</td>
<td>Not implemented</td>
</tr>
<tr>
<td>8</td>
<td>256</td>
<td>Sweep Complete</td>
</tr>
</tbody>
</table>

This bit is set to 0 when the command :INITiate[:IMMediate] is sent to trigger a sweep. It will have a value of 1 when the sweep has completed.

<table>
<thead>
<tr>
<th>9</th>
<th>512</th>
<th>I/Q Capture</th>
</tr>
</thead>
</table>

This bit indicates whether the instrument is currently capturing I/Q data by being set to 1. This bit will be set to 0 when the capture is completed normally (in block mode), or is aborted, either due to the ABORt command or some other command which invalidates the capture.

<table>
<thead>
<tr>
<th>10</th>
<th>1024</th>
<th>Not implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2048</td>
<td>Not implemented</td>
</tr>
<tr>
<td>12</td>
<td>4096</td>
<td>Not implemented</td>
</tr>
<tr>
<td>13</td>
<td>8192</td>
<td>Not implemented</td>
</tr>
<tr>
<td>14</td>
<td>16384</td>
<td>Not implemented</td>
</tr>
<tr>
<td>15</td>
<td>0</td>
<td>Will always be 0</td>
</tr>
</tbody>
</table>

:THReshold:SINR <numeric_value> {DB}

Title: SINR Threshold
Description: Sets or queries SINR threshold for display. Beams with SINR below this threshold will not be displayed in the UI.
Parameter(s): <numeric_value> {DB}
Query Return: Numeric (dB)
Default Value: 6 dB
Default Unit: dB
Range: -50 dB to 50 dB
:TRACe<n>:DETector[:FUNCTION] <POSitive|RMS|NEGative|SAMPle>

:TRACe<n>:DETector[:FUNCTION]?

Title: Trace Detector Type

Description: Sets the detection method for the specific trace. The detection type determines how the display point is derived from its associated measurements. POSitive Peak detection displays the maximum value of the associated measurements. RMS detection displays the average power of the associated measurements. NEGative Peak detection displays the minimum value of the associated measurements. SAMPlE detection selects one of the associated measurement points to display. This command will be ignored when spectrogram is enabled by DISPlay:VIEW. In zero span and RTSA mode the SAMPlE detection replaces RMS detection.

Parameter(s): <POSitive|RMS|NEGative|SAMPle>

Query Return: POS|RMS|NEG|SAMP

TRACe Suffix

Range: 1-6, Default = 1

Default Value: POSitive

:TRACe<n>:DISPlay[:STATE] <0 | 1 | ON | OFF>

:TRACe<n>:DISPlay[:STATE]?

Title: Trace Display State

Description: The trace visibility state. If it is OFF, the :TRAC:DATA? command will return nan.

Parameter(s): <0 | 1 | ON | OFF>

Query Return: 0 | 1

TRACe Suffix

Range: 1-6, Default = 1

Default Value: ON

:TRACe<n>:DISPlay:VIEW:SPECTrogram:ELAPsed?

Title: Spectrogram Elapsed

Description: Provides the index and time values for the specified trace based on which trace from the spectrogram history it represents.

TRACe Suffix

Range: 1-6, Default = 1

:TRACe<n>:DISPlay:VIEW:SPECTrogram:POSition <numeric_value>

:TRACe<n>:DISPlay:VIEW:SPECTrogram:POSition?

Title: Spectrogram Trace Position

Description: The command sets the spectrogram history index that specific trace referencing to.

Parameter(s): <numeric_value>

Query Return: Numeric

TRACe Suffix

Range: 1-6, Default = 1

Default Value: 0

Range: 0 to 600
:**TRACE<n>:DISPLAY:VIEW:SPECTrogram:TIME <numeric_value>**

**Title:** Spectrogram Trace Time

**Description:** The command select the spectrogram history trace base on elapsed time from the newest trace.

**Parameter(s):** <numeric_value>

**Query Return:** Numeric (ms)

**TRACe Suffix**

**Range:** 1-6, Default = 1

**Default Value:** 0 ms

**Default Unit:** ms

**Range:** 0 ms to 100000000 ms

:**TRACE<n>:SWEep:COUNt [:CURRent] ?**

**Title:** Trace Sweep Count

**Description:** The trace sweep count returns current sweep count which can be useful for multiple-sweep measurements like average and min/max hold.

**Query Return:** Numeric

**TRACe Suffix**

**Range:** 1-6, Default = 1

**Default Value:** 0

**Range:** 0 to 4000000000

:**TRACE<n>:TYPE

<NORMAL|MINimum|MAXimum|AVERage|RMAXimum|RMINimum|RAVerage>**

:**TRACE<n>:TYPE?**

**Title:** Trace Type

**Description:** Specifies how successive sweeps are combined to produce the resulting display value. Setting the TYPE to NORMAL will cause the displayed value for a point to be the current measured value for that point. Setting the TYPE to AVERAGE will cause the displayed value for a point to be the average of the last <integer> measured values where <integer> is set by [:SENSe]:AVERage:COUNt. Setting the TYPE to MAXIMUM will cause the displayed value for a point is the maximum measured value for that point over sweeps. Setting the TYPE to MINIMUM will cause the displayed value for a point is the minimum measured value for that point over sweeps. Setting the TYPE to RMAXIMUM will cause the displayed value for a point to be the maximum of the last <integer> measured values where <integer> is set by [:SENSe]:AVERage:COUNt. Setting the TYPE to RMINIMUM will cause the displayed value for a point to be the minimum of the last <integer> measured values where <integer> is set by [:SENSe]:AVERage:COUNt. This command will be ignored when spectrogram is enabled by DISPLAY:VIEW.

**Parameter(s):** <NORMAL|MINimum|MAXimum|AVERage|RMAXimum|RMINimum|RAVerage>

**Query Return:** NORM | MIN | MAX | AVER | RMAX | RMIN | RAV

**TRACe Suffix**

**Range:** 1-6, Default = 1

**Default Value:** NORMAL
:TRACe<n>:UPDate[:STATE] <0 | 1 | ON | OFF>
:TRACe<n>:UPDate[:STATE]?

Title: Trace Update State
Description: The trace update state determines whether the trace is updated in every sweep.
Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
TRACe Suffix
Range: 1-6, Default = 1
Default Value: ON

:TRACe:CLEar <numeric_value>

Title: Trace Clear
Description: This command clears the trace's history and current sweep data. Trace history refers to the previous trace data used to calculate trace types such as min/max hold and averaging.
Parameter(s): <numeric_value>

:TRACe:CLEar:ALL

Title: All Traces Clear
Description: This command clears the trace history and current sweep data for all traces. Trace history refers to the previous data used to calculate trace types such as min/max hold and averaging.

:TRACe[:DATA]? <numeric_value>

Title: Trace Data
Description: This command transfers trace data from the instrument to the controller. Data is transferred from the instrument as an IEEE definite length arbitrary block response, which has the form <header><block>.

This command takes a single integer parameter specifying the trace number to transfer. If the parameter value is out of the range of valid trace numbers, the first trace (1) will be transferred. The binary block header specifies the number of data bytes. It looks like #AX, where A is the number of digits in X and X is the number of bytes in the <block>.

The first character is the literal ascii hash ' #' 043.
The second character (A) is a single ascii digit '1' to '9' describing the number of bytes in the length section (X). This number is called nlength.
The next nlength bytes make up an ascii string of digits '1' to '9' describing the length of the <block> data.
For example, if the first 6 bytes are #49999, then the nlength is 4. The 4 bytes of length are 9999. After that follows the <block>, which would be 9999 bytes in size.
The format of the block data depends on the current data format setting (FORMat[:TRACe][:DATA]). The number of amplitudes returned is equal to the current number of display points (DISPlay:POINtcount).
The query command will return a #0 if data is invalid for the active trace.
Parameter(s): <numeric_value>
**Title:** Trace Data All

**Description:** This command transfers trace data from the instrument to the controller for all traces with display state ON (see Trace Display State commands). The traces are returned back to back with no delimiter between traces using the same IEEE definite length arbitrary block response of the Trace Data command. However, after the usual header this command includes additional header information to support parsing the following data. This additional header consists of a two byte integer indicating the number of display points per trace as well as a two byte trace flags value. The bits in the two byte trace flags value are mapped to a trace number and indicate whether that trace is included in the following data. Bit 0 is the least significant bit and is unused. Bits 1 through N are mapped to traces 1 through N. If the bit value is 1, the trace data for that trace is included in the following data. If the bit value is 0, the trace data for that trace is not included in the following data. For example, a trace flags value of 0x4C indicates that trace data for traces 2, 3, and 6 are included in the following data. The traces are returned in increasing order. The format of the data follows the Trace Data Format setting.

**Parameter(s):** `<PACKed|ASCii>`

**Query Return:** PACK|ASC

**Default Value:** PACKed

---

**Title:** Preset All Trace

**Description:** This command preset all traces which turn Traces 2-6 off and set Trace 1 to Clear/Write, Active, Peak Detector.

---

**Title:** Select Trace

**Description:** The selected trace will be used by operations that use a single trace. The max number of traces available to select is model specific.

To display the trace, see TRACe<n>:DISPlay[:STATe]

To update the trace state, see TRACe<n>:UPDate[:STATe]

**Parameter(s):** `<numeric_value>`

**Query Return:** Numeric

**Default Value:** 1

**Range:** 1 to 6
:TRACe:SPECTrogram:DETector[:FUNCTION] <POSitive|RMS|NEGative|SAMPle>

Title: Spectrogram Detector Type

Description: Sets the detection method for the spectrogram trace. The detection type determines how the display point is derived from its associated measurements. POSitive Peak detection displays the maximum value of the associated measurements. RMS detection displays the average power of the associated measurements. NEGative Peak detection displays the minimum value of the associated measurements. SAMPle detection selects one of the associated measurement points to display. This command will be ignored when spectrogram is disabled by DISPlay:VIEW. In RTSA mode the SAMPle detection replaces RMS detection.

Parameter(s): <POSitive|RMS|NEGative|SAMPle>

Query Return: POS|RMS|NEG|SAMP

Default Value: POSitive

:TRACe:SPECTrogram:TYPE
<NORMal|MINimum|MAXimum|AVERage|RMAXimum|RMINimum|RAVerage>

:TRACe:SPECTrogram:TYPE?

Title: Spectrogram Trace Type

Description: Specifies how successive sweeps are combined to produce the resulting display value. Setting the TYPE to NORMal will cause the displayed value for a point to be the current measured value for that point. Setting the TYPE to AVERage will cause the displayed value for a point to be the average of the last <integer> measured values where <integer> is set by [:SENSe]:AVERage:COUNt. Setting the TYPE to MAXimum will cause the displayed value for a point to be the maximum measured value for that point over sweeps. Setting the TYPE to MINimum will cause the displayed value for a point to be the minimum measured value for that point over sweeps. Setting the TYPE to RMAXimum will cause the displayed value for a point to be the maximum of the last <integer> measured values where <integer> is set by [:SENSe]:AVERage:COUNt. Setting the TYPE to RMINimum will cause the displayed value for a point to be the minimum of the last <integer> measured values where <integer> is set by [:SENSe]:AVERage:COUNt. This command will be ignored when spectrogram is disabled by DISPlay:VIEW.

Parameter(s): <NORMal|MINimum|MAXimum|AVERage|RMAXimum|RMINimum|RAVerage>

Query Return: NORM|MIN|MAX|AVER|RMAX|RMIN|RAV

Default Value: NORMal
:TRACe:STATus? <numeric_value>

Title: Trace Status
Description: This command returns a response of the same format as a valid TRACe[:DATA] response, except that instead of amplitude, each comma-delimited value is a decimal integer representing the bitwise-OR of one or more status bits. Each bit of the integer is set according to the table below to indicate that the corresponding trace point has the indicated status:

- OkStatus = 0x0
- ADCOverrange = 0x1
- Saturation = 0x2
- SLOLockFailure = 0x4
- LO1LockFailure = 0x8
- LO2LockFailure = 0x10
- TGLOLockFailure = 0x20
- LimitFailure = 0x40
- OverpowerFailure = 0x1000
- DeviceAccessFailure = 0x10000 Failed to communicate with the device.
- EPROMFailure = 0x20000 Failed to access device EEPROM.
- DataTransIrregular = 0x40000 Data transfer irregular.
- NoCalibration = 0x80000 Data is not calibrated.

Parameter(s): <numeric_value>

:TRIGger[:SEQuence]:ATRigger <numeric_value> {PS | NS | US | MS | S | MIN | HR}
:TRIGger[:SEQuence]:ATRigger?

Title: Trigger Auto Period
Description: The trigger auto period is the amount of time that must pass without a trigger event before a measurement is triggered automatically.

Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}
Query Return: Numeric (ms)
Default Value: 1000 ms
Default Unit: ms
Range: 0.001 ms to 5000 ms

:TRIGger[:SEQuence]:ATRigger:STATe <0 | 1 | ON | OFF>
:TRIGger[:SEQuence]:ATRigger:STATe?

Title: Trigger Auto State
Description: The trigger auto state indicates whether or not a measurement should be triggered automatically after the Trigger Auto Period elapses.

Parameter(s): <0 | 1 | ON | OFF>
Query Return: 0 | 1
Default Value: OFF
:TRIGger[:SEQUence]:DELay <numeric_value> {PS | NS | US | MS | S | MIN | HR}

Title: Trigger Delay

Description: The trigger delay is the amount of time between when an external trigger event happens and when the measurement starts.

Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}

Query Return: Numeric (ms)

Default Value: 0 ms

Default Unit: ms

Range: -1000 ms to 1670 ms

:TRIGger[:SEQUence]:DELay:STATe <0 | 1 | ON | OFF>

:TRIGger[:SEQUence]:DELay:STATe?

Title: Trigger Delay State

Description: The trigger delay state turns trigger delay on/off.

Parameter(s): <0 | 1 | ON | OFF>

Query Return: 0 | 1

Default Value: OFF

:TRIGger[:SEQUence]:HOLDoff <numeric_value> {PS | NS | US | MS | S | MIN | HR}

:TRIGger[:SEQUence]:HOLDoff?

Title: Trigger Holdoff

Description: The trigger holdoff is the amount of time between when a measurement ends and when to start looking for the next external trigger event.

Parameter(s): <numeric_value> {PS | NS | US | MS | S | MIN | HR}

Query Return: Numeric (ms)

Default Value: 0 ms

Default Unit: ms

Range: 0 ms to 5000 ms

:TRIGger[:SEQUence]:HOLDoff:STATe <0 | 1 | ON | OFF>

:TRIGger[:SEQUence]:HOLDoff:STATe?

Title: Trigger Holdoff State

Description: The trigger holdoff state turns trigger holdoff on/off.

Parameter(s): <0 | 1 | ON | OFF>

Query Return: 0 | 1

Default Value: OFF
:\TRIGGER[:SEQUence]:PORT<n>[:DIREction] <IN|OUT>
:\TRIGGER[:SEQUence]:PORT<n>[:DIREction]?

Title: Trigger Port Direction
Description: This command configures the direction of the trigger ports, which can behave as either trigger in or trigger out. The command suffix selects which of the two trigger ports to configure. Note that port 1 doubles as a reference out port and cannot be a reference out and trigger port at the same time. To use port one as a trigger port the reference output state must be turned off (see the 10MHz Reference Output State) command.

Parameter(s): <IN|OUT>
PORT Suffix Range: 1-2, Default = 1

:\TRIGGER[:SEQUence]:SLOPe <POSitive|NEGative|ANY>
:\TRIGGER[:SEQUence]:SLOPe?

Title: Trigger Slope
Description: The trigger slope indicates whether the trigger point is on the rising or the falling edge of the external trigger signal.

Parameter(s): <POSitive|NEGative|ANY>
Query Return: POS|NEG|ANY
Default Value: POSitive

:\TRIGGER[:SEQUence]:SOURce <EXT|EXT1|EXT2|IMMEDIATE|VIDeo>
:\TRIGGER[:SEQUence]:SOURce?

Title: Trigger Source
Description: The trigger source indicates whether or not to look for a trigger condition before making measurements.
IMMEDIATE trigger source means that sweeps will be triggered without looking for a trigger event (free-run). VIDeo trigger is only valid for zero span operation. External trigger options with a suffix number in them are only available on instruments with more than one trigger port and in this case omitting the number will be the same as using EXT1. For products that support trigger port direction settings, the ports will only be available as trigger sources if the trigger direction for that port is set to IN.

Parameter(s): <EXT|EXT1|EXT2|IMMEDIATE|VIDeo>
Query Return: EXT|EXT1|EXT2|IMM|VID
Default Value: IMMEDIATE
:TRIGger[:SEQuence]:VIDeo:HYSTeresis <numeric_value> {DB}
:TRIGger[:SEQuence]:VIDeo:HYSTeresis?

Title: Trigger Video Hysteresis
Description: A relative amplitude value in dBm centered around the video trigger level which the
input signal must cross for a trigger event to occur when trigger source is set to video
(TRIG:SOUR VID).
Parameter(s): <numeric_value> {DB}
Query Return: Numeric (dB)
Default Value: 0 dB
Default Unit: dB
Range: 0 dB to 200 dB

:TRIGger[:SEQuence]:VIDeo:LEVEL <numeric_value> {DBM}
:TRIGger[:SEQuence]:VIDeo:LEVEL?

Title: Trigger Video Level
Description: The amplitude value in dBm which the input signal must cross for a trigger event to
occur when trigger source is video (TRIG:SOUR VID).
Parameter(s): <numeric_value> {DBM}
Query Return: Numeric (dBm)
Default Value: 0 dBm
Default Unit: dBm
Range: -150 dBm to 30 dBm

:UNIT:CHPower:PSDensity <DBMHz|DBMMhz>
:UNIT:CHPower:PSDensity?

Title: Power Spectral Density Units
Description: Sets the power spectral density units to be either dbm/Hz or dbm/MHz
Parameter(s): <DBMHz|DBMMhz>
Query Return: DBMH | DBMM
Default Value: DBMHz

:UNIT:POWer <DBM>
:UNIT:POWer?

Title: Measurement Units
Description: Sets the default amplitude units for input, output and display.
Parameter(s): <DBM>
Query Return: DBM
Default Value: DBM
Appendix A — SCPI Error Table

This section lists the error code/messages returned from the device when an error occurs during the execution of the SCPI command.

Error messages are classified by error number as listed in table below.

<table>
<thead>
<tr>
<th>Error Number</th>
<th>Error String</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>EEPROM read/write error</td>
<td>EEPROM read and/or write failed</td>
</tr>
<tr>
<td>10</td>
<td>Hardware communication error</td>
<td>Failed to communicate with device hardware.</td>
</tr>
<tr>
<td>2</td>
<td>Option mismatch</td>
<td>Operation failed due to option mismatch.</td>
</tr>
<tr>
<td>1</td>
<td>Model mismatch</td>
<td>Operation failed due to option mismatch.</td>
</tr>
<tr>
<td>0</td>
<td>No error</td>
<td>The queue is completely empty. Every error/event in the queue has been read or the queue was purposely cleared by power-on, *CLS, etc.</td>
</tr>
<tr>
<td>-100</td>
<td>Command error</td>
<td>Command error</td>
</tr>
<tr>
<td>-101</td>
<td>Invalid character</td>
<td>A syntactic element contains a character which is invalid for that type.</td>
</tr>
<tr>
<td>-102</td>
<td>Syntax error</td>
<td>An unrecognized command or data type was encountered.</td>
</tr>
<tr>
<td>-103</td>
<td>Invalid separator</td>
<td>The parser was expecting a separator and encountered an illegal character.</td>
</tr>
<tr>
<td>-104</td>
<td>Data type error</td>
<td>The parser recognized a data element different than one allowed.</td>
</tr>
<tr>
<td>-108</td>
<td>Parameter not allowed</td>
<td>More parameters were received than expected for the header.</td>
</tr>
<tr>
<td>-109</td>
<td>Missing parameter</td>
<td>Fewer parameters were received than required for the header.</td>
</tr>
<tr>
<td>-110</td>
<td>Command header error</td>
<td>An error was detected in the header.</td>
</tr>
<tr>
<td>-120</td>
<td>Numeric data error</td>
<td>Error is generated when parsing a data element which appears to be numeric, including the non-decimal numeric types.</td>
</tr>
<tr>
<td>-121</td>
<td>Invalid character in number</td>
<td>An invalid character for the data type being parsed was encountered.</td>
</tr>
<tr>
<td>-123</td>
<td>Exponent too large</td>
<td>The magnitude of the exponent was larger than 32000.</td>
</tr>
<tr>
<td>-124</td>
<td>Too many digits</td>
<td>The mantissa of a decimal numeric data element contained more than 255 digits excluding leading zeros.</td>
</tr>
<tr>
<td>-131</td>
<td>Invalid suffix</td>
<td>The suffix does not follow the syntax or suffix is inappropriate for this device.</td>
</tr>
<tr>
<td>-141</td>
<td>Invalid character data</td>
<td>Either the character data element contains an invalid character or the particular element received is not valid for the header.</td>
</tr>
<tr>
<td>-160</td>
<td>Block data error</td>
<td>Error is generated when parsing a block data element.</td>
</tr>
<tr>
<td>-171</td>
<td>Invalid Expression</td>
<td>The expression data element was invalid; for example, unmatched parentheses or an illegal character.</td>
</tr>
<tr>
<td>-200</td>
<td>Execution error</td>
<td>Execution error</td>
</tr>
<tr>
<td>-213</td>
<td>Init ignored</td>
<td>Indicates that a request for a measurement initiation was ignored as another measurement was already in progress.</td>
</tr>
<tr>
<td>-221</td>
<td>Settings Conflict</td>
<td>The processed parameter could not be set due to the current device state.</td>
</tr>
</tbody>
</table>
# SCPI Error Table

<table>
<thead>
<tr>
<th>Error Number</th>
<th>Error String</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-222</td>
<td>Data Out of Range</td>
<td>The processed parameter is outside of the instrument's defined range.</td>
</tr>
<tr>
<td>-224</td>
<td>Illegal parameter value</td>
<td>Indicates that an exact value, from a list of possibles, was expected.</td>
</tr>
<tr>
<td>-230</td>
<td>Invalid trace data</td>
<td>Data corrupt or stale</td>
</tr>
<tr>
<td>-233</td>
<td>Invalid version</td>
<td>Indicates that the version does not match the version expected by the device.</td>
</tr>
<tr>
<td>-251</td>
<td>Missing mass storage</td>
<td>Indicates that a legal program command or query could not be executed because of missing mass storage.</td>
</tr>
<tr>
<td>-256</td>
<td>File name not found</td>
<td>Indicates that a legal program command or query could not be executed because the file name on the device was not found.</td>
</tr>
<tr>
<td>-300</td>
<td>Device-specific error</td>
<td>Device-specific error</td>
</tr>
<tr>
<td>-340</td>
<td>Calibration Failed</td>
<td>Calibration Failed</td>
</tr>
<tr>
<td>-350</td>
<td>Queue overflow</td>
<td>A specific code entered into the queue in lieu of the code that caused the error. This code indicates that there is no room in the queue and an error occurred but was not recorded.</td>
</tr>
<tr>
<td>-363</td>
<td>Input buffer overrun</td>
<td>Software or hardware input buffer on incoming port overflows with data caused by improper or nonexistent pacing.</td>
</tr>
<tr>
<td>-400</td>
<td>Query error</td>
<td>Query error</td>
</tr>
</tbody>
</table>
Appendix B — SCPI Command Reference

Remote Programming Setup and Interface ................................................................. 1-1
SCPI Command Types .................................................................................................. 1-9
  *CLS ......................................................................................................................... 1-9
  *IDN? ....................................................................................................................... 1-9
  *RST ......................................................................................................................... 1-9
Status System Reporting ............................................................................................... 1-10
SCPI Command Programming Examples ...................................................................... 1-14
SCPI Commands .......................................................................................................... 1-16
Common Commands ................................................................................................... 2-1
  *CLS ......................................................................................................................... 2-1
  *ESE <numeric_value> ......................................................................................... 2-1
  *ESE? ...................................................................................................................... 2-1
  *ESR? ...................................................................................................................... 2-1
  *IDN? ...................................................................................................................... 2-2
  *OPC ....................................................................................................................... 2-2
  *OPC? ...................................................................................................................... 2-2
  *RST ......................................................................................................................... 2-2
  *SRE <numeric_value> ......................................................................................... 2-2
  *SRE? ...................................................................................................................... 2-2
  *STB? ....................................................................................................................... 2-3
  *WAI ........................................................................................................................ 2-3
System Commands ....................................................................................................... 2-3
  :DIAGnostic:MEmory? ......................................................................................... 2-3
  :FETCh:GPS? ......................................................................................................... 2-3
  :FETCh:GPS:FULL? ............................................................................................... 2-4
  :FETCh:GPS:LAST? ............................................................................................... 2-4
  :INStument:CATalog:ACTive? ............................................................................. 2-4
  :INStument:CATalog:FULL? ................................................................................. 2-4
  :MMEMemory:CATalog:DIReCtory? <string>,<string> ........................................ 2-5
  :MMEMemory:CATalog:MSUSs? .......................................................................... 2-5
  :MMEMemory:CDIRectory <string> ....................................................................... 2-5
  :MMEMemory:CDIRectory? .................................................................................... 2-5
  :MMEMemory:COpy <string>,<string>,<string>,<string> ........................................ 2-6
  :MMEMemory:CREate:DIReCtory <string>,<string> ............................................ 2-6
  :MMEMemory:DATA <string>,<string>,<block data> ........................................... 2-7
  :MMEMemory:DATA? <string>,<string> ............................................................... 2-7
  :MMEMemory:DELeTe:DIReCtory <string>,<string> ............................................. 2-7
  :MMEMemory:DELeTe:FILe <string>,<string> ..................................................... 2-8
  :MMEMemory:EJECt <string> ................................................................................. 2-8
  :MMEMemory:LOAD:STATE <numeric_value>,<string>,<string> ..................... 2-9
  :MMEMemory:LOAD:TRACe <string>,<string>,<string> ..................................... 2-9
  :MMEMemory:MSIS <string> .................................................................................. 2-9
  :MMEMemory:MSIS? ............................................................................................ 2-9
  :MMEMemory:STORe:SCReen .............................................................................. 2-10
  :MMEMemory:STORe:SCReen? ............................................................................. 2-10
  :MMEMemory:STORe:STATE <numeric_value>,<string>,<string> .................... 2-10
  [:SENSe]:BIAS:EXTernal:CURREnt? ................................................................. 2-11
  [:SENSe]:BIAS:EXTernal:STATe <0 | 1 | ON | OFF> ......................................... 2-11
  [:SENSe]:BIAS:EXTernal:STATE? ...................................................................... 2-11
  [:SENSe]:BIAS:EXTernal:TRIPPed[:STATE]? .................................................... 2-11
  [:SENSe]:BIAS:EXTernal:TRIPPed[:STATE]:CLEar .......................................... 2-11
  [:SENSe]:BIAS:EXTernal:VOLTage <numeric_value> ......................................... 2-12
  [:SENSe]:BIAS:EXTernal:VOLTage? .................................................................... 2-12
SCPI Command Reference

:SYSTem:TIME:SYNC <AUTO|MANual> .................................................. 2-25
:SYSTem:TIME:SYNC? ................................................................. 2-25
:SYSTem:TIME:ZONE <string> ...................................................... 2-25
:SYSTem:UNIT:NAMe <string> ....................................................... 2-26
:SYSTem:UNIT:NAMe? ................................................................. 2-26
:TEST:SELFtest? ............................................................... 2-26

SPA Commands ................................................................. 2-26

:ABORT ................................................................................... 2-26

:CALCulate<n>:LIMIT<n>:COMMent <string> .................................. 2-26
:CALCulate<n>:LIMIT<n>:COMMent? ............................................ 2-26
:CALCulate<n>:LIMIT<n>:CONTrol{DATA} <numeric_value> {HZ | KHZ | MHZ | GHZ}, {<numeric_value> {HZ | KHZ | MHZ | GHZ}}, ... 2-27
:CALCulate<n>:LIMIT<n>:CONTrol{DATA}? .................................... 2-27
:CALCulate<n>:LIMIT<n>:CONTrol:MODE <ABSolute|RELative> ............. 2-28
:CALCulate<n>:LIMIT<n>:CONTrol:SHIFT <numeric_value> {DB} .......................... 2-28
:CALCulate<n>:LIMIT<n>:COPY <numeric_value> ........................................ 2-29
:CALCulate<n>:LIMIT<n>:DELete ................................................. 2-29
:CALCulate<n>:LIMIT<n>:FAIL? ................................................ 2-29
:CALCulate<n>:LIMIT<n>:LOWer{DATA} <numeric_value> {DBM}, {<numeric_value> {DBM}}, ... 2-30
:CALCulate<n>:LIMIT<n>:LOWer{DATA}? ...................................... 2-30
:CALCulate<n>:LIMIT<n>:LOWer:MODE <ABSolute|RELative> ............. 2-30
:CALCulate<n>:LIMIT<n>:LOWer:SHIFT <numeric_value> {DB} .............. 2-31
:CALCulate<n>:LIMIT<n>:LOWer:STATE <0 | 1 | ON | OFF> ............... 2-31
:CALCulate<n>:LIMIT<n>:LOWer:STATE? ....................................... 2-31
:CALCulate<n>:LIMIT<n>:NAME <string> ...................................... 2-32
:CALCulate<n>:LIMIT<n>:NAME? ............................................... 2-32
:CALCulate<n>:LIMIT<n>:STATE <0 | 1 | ON | OFF> ............................ 2-32
:CALCulate<n>:LIMIT<n>:STATE? ............................................. 2-32
:CALCulate<n>:LIMIT<n>:TRACE<n>:CHECK <0 | 1 | ON | OFF> .......... 2-32
:CALCulate<n>:LIMIT<n>:UPPer{DATA} <numeric_value> {DBM}, {<numeric_value> {DBM}}, ... 2-33
:CALCulate<n>:LIMIT<n>:UPPer{DATA}? ...................................... 2-33
:CALCulate<n>:LIMIT<n>:UPPer:MODE <ABSolute|RELative> ............... 2-33
:CALCulate<n>:LIMIT<n>:UPPer:MODE? ....................................... 2-33
:CALCulate<n>:LIMIT<n>:UPPer:SHIFT <numeric_value> {DB} .......... 2-34
:CALCulate<n>:LIMIT<n>:UPPer:STATE <0 | 1 | ON | OFF> ................. 2-34
:CALCulate<n>:LIMIT<n>:UPPer:STATE? .................................... 2-34
:CALCulate<n>:LIMIT<n>:ACTive? ........................................... 2-34
:CALCulate:ACPower:LIMit:ADJacent:ABSolute <numeric_value> {DBM} ... 2-35
:CALCulate:ACPower:LIMit:ADJacent:RELative <numeric_value> {DBM} ... 2-35
:CALCulate:ACPower:LIMit:ALTernate:ABSolute <numeric_value> {DBM} ... 2-35
:CALCulate:ACPower:LIMit:ALTernate:RELative <numeric_value> {DBM} ... 2-35
CALCulate:ACPower:LIMit:MAIN <numeric_value> {DBM} .......................................................... 2-36
CALCulate:ACPower:LIMit:MAIN? .......................................................... 2-36
CALCulate:ACPower:LIMit:MODE <ABSolute|RELative> .......................................................... 2-36
CALCulate:ACPower:LIMit:MODE? .......................................................... 2-36
CALCulate:ACPower:LIMit:STATE <0 | 1 | ON | OFF> .......................................................... 2-37
CALCulate:ACPower:LIMit:STATE? .......................................................... 2-37
CALCulate:CHPower:LIMit <numeric_value> {DBM} .......................................................... 2-37
CALCulate:CHPower:LIMit? .......................................................... 2-37
CALCulate:CHPower:LIMit:FAIL? .......................................................... 2-37
CALCulate:CHPower:LIMit:PSDensity <numeric_value> {DBM} .......................................................... 2-37
CALCulate:CHPower:LIMit:PSDensity? .......................................................... 2-37
CALCulate:CHPower:LIMit:PSDensity:STATE <0 | 1 | ON | OFF> .......................................................... 2-37
CALCulate:EIRPower:LIMit:LOWer <numeric_value> .......................................................... 2-38
CALCulate:EIRPower:LIMit:LOWer:STATe <0 | 1 | ON | OFF> .......................................................... 2-38
CALCulate:EIRPower:LIMit:LOWer:STATe? .......................................................... 2-38
CALCulate:MARKer<n>:MODE <POSition|DELTa|FIXed> .......................................................... 2-43
CALCulate:MARKer<n>:MOVE:RIGHt .......................................................... 2-43
CALCulate:MARKer<n>:MOVE:LEFT .......................................................... 2-43
CALCulate:MARKer<n>:MAXimum .......................................................... 2-42
CALCulate:MARKer<n>:MAXimum:RIGHt .......................................................... 2-43
CALCulate:MARKer<n>:MAXimum:LEFT .......................................................... 2-42
CALCulate:MARKer<n>:MAXimum:NEXT .......................................................... 2-42
CALCulate:MARKer<n>:MAXimum:RIGHT .......................................................... 2-43
CALCulate:MARKer<n>:MODE <POSition|DELTa|FIXed> .......................................................... 2-43
CALCulate:MARKer<n>:MOVE:LEFT .......................................................... 2-43
CALCulate:MARKer<n>:MOVE:RIGHT .......................................................... 2-43
CALCulate:MARKer<n>:REFerence <numeric_value> .......................................................... 2-43
CALCulate:MARKer<n>:REFerence? .......................................................... 2-43
CALCulate:INTerference:LIMit <numeric_value> {DBM} .......................................................... 2-39
CALCulate:INTerference:LIMit? .......................................................... 2-39
CALCulate:INTerference:LIMit:FAIL? .......................................................... 2-39
CALCulate:INTerference:LIMit:STATE <0 | 1 | ON | OFF> .......................................................... 2-40
CALCulate:INTerference:LIMit:STATE? .......................................................... 2-40
CALCulate:LIMit<n>:ENVelope:UPDate:Y .......................................................... 2-40
CALCulate:LIMit<n>:LOWer:ENVelope:CREate .......................................................... 2-40
CALCulate:LIMit<n>:LOWer:ENVelope:POINts? .......................................................... 2-40
CALCulate:LIMit<n>:UPPer:ENVelope:CREate .......................................................... 2-40
CALCulate:LIMit<n>:UPPer:ENVelope:POINts? .......................................................... 2-40
CALCulate:LIMit:ALARm <0 | 1 | ON | OFF> .......................................................... 2-41
CALCulate:LIMit:ALARm? .......................................................... 2-41
CALCulate:LIMit:ALARm:FAIL? .......................................................... 2-41
CALCulate:LIMit:ALARm:STATE <0 | 1 | ON | OFF> .......................................................... 2-41
CALCulate:LIMit:ALARm:STATE? .......................................................... 2-41
CALCulate:LIMit:ENVelope:OFFSet <numeric_value> {DBM} .......................................................... 2-41
CALCulate:LIMit:ENVelope:OFFSet? .......................................................... 2-41
CALCulate:LIMit:ENVelope:POINt <numeric_value> .......................................................... 2-41
CALCulate:LIMit:ENVelope:POINt? .......................................................... 2-41
CALCulate:LIMit:ENVelope:SHAPe <SQUare|SLOPe> .......................................................... 2-42
CALCulate:LIMit:ENVelope:SHAPe? .......................................................... 2-42
CALCulate:LIMit:ENVelope:SHAPe .......................................................... 2-41
CALCulate:LIMit:ENVelope:SHAPe? .......................................................... 2-41
CALCulate:LIMit:ENVelope:SHAPe .......................................................... 2-41
CALCulate:MARKer<n>:FUNCTION <OFF|NOISe|FCOunter> .......................................................... 2-42
CALCulate:MARKer<n>:FUNCTION? .......................................................... 2-42
CALCulate:MARKer<n>:MAXimum .......................................................... 2-42
CALCulate:MARKer<n>:MAXimum:LEFT .......................................................... 2-42
CALCulate:MARKer<n>:MAXimum:NEXT .......................................................... 2-42
CALCulate:MARKer<n>:MAXimum:RIGHT .......................................................... 2-43
CALCulate:MARKer<n>:MODE <POSition|DELTa|FIXed> .......................................................... 2-43
CALCulate:MARKer<n>:MOVE:LEFT .......................................................... 2-43
CALCulate:MARKer<n>:MOVE:RIGHT .......................................................... 2-43
CALCulate:MARKer<n>:REFerence <numeric_value> .......................................................... 2-43
CALCulate:MARKer<n>:REFerence? .......................................................... 2-43

SCPI Command Reference
SCPI Command Reference

:CALCulate:MARKer<n>[SET]:CENTer ........................................ 2-44
:CALCulate:MARKer<n>[SET]:LEVEL ........................................ 2-44
:CALCulate:MARKer<n>[:STATe] <0 | 1 | ON | OFF> .................... 2-44
:CALCulate:MARKer<n>[:STATe]? ........................................... 2-44
:CALCulate:MARKer<n>[:TRACe] <numeric_value> ....................... 2-44
:CALCulate:MARKer<n>[:TRACe]? .......................................... 2-44
:CALCulate:MARKer<n>:X <numeric_value> {PS | NS | US | MS | S | MIN | HR} 2-45
:CALCulate:MARKer<n>:X? ................................................. 2-45
:CALCulate:MARKer<n>:Y <numeric_value> {DBM} ....................... 2-45
:CALCulate:MARKer<n>:Y? ............................................... 2-45
:CALCulate:MARKer:APReset .............................................. 2-46
:CALCulate:MARKer[:DATA]:ALL? ...................................... 2-46
:CALCulate:MARKer:PEAK:EXCursion <numeric_value> {DB} ......... 2-46
:CALCulate:MARKer:PEAK:EXCursion[:STATe] <0 | 1 | ON | OFF> 2-46
:CALCulate:MARKer:PEAK:EXCursion[:STATe]? ........................ 2-46
:CALCulate:MARKer:PEAK:THReshold <numeric_value> {DBM} ....... 2-46
:CALCulate:MARKer:PEAK:THReshold[:STATe] <0 | 1 | ON | OFF> 2-47
:CALCulate:MARKer:PEAK:THReshold[:STATe]? ......................... 2-47
:CALCulate:OBW:LiMit <numeric_value> {HZ | KHZ | MHZ | GHZ} .. 2-47
:CALCulate:OBW:LiMit? ................................................ 2-47
:CALCulate:OBW:LiMit[:STATe] <0 | 1 | ON | OFF> .................... 2-47
:CALCulate:OBW:LiMit[:STATe]? ....................................... 2-47
:CONFigure:ACPower ................................................... 2-47
:CONFigure:CHPower ...................................................... 2-48
:CONFigure:EIRPower .................................................... 2-48
:CONFigure:INTerference ................................................ 2-48
:CONFigure:OBWidth ...................................................... 2-48
:CONFigure:SEMask .................................................. 2-48
:DIAGnostic:SWEep:TIME? .............................................. 2-48
:DISPlay:POINtcount <numeric_value> ................................ 2-49
:DISPlay:POINtcnt? ....................................................... 2-49
:DISPlay:VIEW <NORMal|SPECTrogram> .................................. 2-49
:DISPlay:VIEW? ........................................................... 2-49
:DISPlay:VIEW:LTE <NORMal|SUMMary> .................................. 2-49
:DISPlay:VIEW:NRA DIo <NORMal|SBEam|MBEam|QView|SCANner|TABLe> 2-49
:DISPlay:VIEW:NRADi o? ................................................... 2-49
:DISPlay:VIEW:RTSA <NORMal|SPECTrogram> .......................... 2-50
:DISPlay:VIEW:RTSA? ..................................................... 2-50
:DISPlay:VIEW:SPECTrogram:ADJust ................................ 2-50
:DISPlay:VIEW:SPECTrogram:BOTTom <numeric_value> {DBM} .... 2-50
:DISPlay:VIEW:SPECTrogram:HISTORY[:DATA]? <numeric_value> 2-51
:DISPlay:VIEW:SPECTrogram:HUE <numeric_value> .................. 2-51
:DISPlay:VIEW:SPECTrogram:REFERENCE <numeric_value> {DBM} 2-52
:DISPlay:VIEW:SPECTrogram:SCALe:PDIVision <numeric_value> {PS | NS | US | MS | S | MIN | HR} 2-52
SCPI Command Reference

[:SENSe]:AVERage:COUNt <numeric_value> 2-75
[:SENSe]:ARFChannel? 2-75
[:SENSe]:ARFChannel <numeric_value> 2-75
[:SENSe]:ACPower:STATe? 2-75
[:SENSe]:AVERage:TYPE <NORMal|MINimum|MAXimum|AVERage|RMAXimum|RMINimum|RAVerage> 2-76
[:SENSe]:AVERage:COUNt? 2-75
[:SENSe]:BANDwidth|BWIDth[:RESolution]? 2-76
[:SENSe]:BANDwidth|BWIDth[:RESolution]? 2-77
[:SENSe]:ACPower:BANDwidth|BWIDth:SPACing? 2-74
[:SENSe]:ACPower:BANDwidth|BWIDth:SPACing <numeric_value> {HZ | KHZ | MHZ | GHZ} 2-74
[:SENSe]:OUTPut:ROSCillator:STATe? 2-71
[:SENSe]:OUTPut:ROSCillator:STATe <0 | 1 | ON | OFF> 2-71
[:SENSe]:OUTPut:IF:STATe <0 | 1 | ON | OFF> 2-70
[:SENSe]:OUTPut:IF:FILTer? 2-70
[:SENSe]:OUTPut:IF:FILTer <K750|M7P5|M14|M30|M100> 2-70
[:SENSe]:OUTPut:ROSCillator:STATe <0 | 1 | ON | OFF> 2-71
[:SENSe]:OUTPut:ROSCillator:STATe? 2-71
[:SENSe]:BANDwidth|BWIDth:VIDeo:TYPE? 2-78
[:SENSe]:BANDwidth|BWIDth:VIDeo:TYPE <LINear|LOGarithmic> 2-78
[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio? 2-78
[:SENSe]:BANDwidth|BWIDth:VIDeo <numeric_value> {HZ | KHZ | MHZ | GHZ} 2-78
[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO <0 | 1 | ON | OFF> 2-79
[:SENSe]:BANDwidth|BWIDth[:RESolution]:AUTO? 2-79
[:SENSe]:BANDwidth|BWIDth:VIDeo:TYPE? 2-78
[:SENSe]:BANDwidth|BWIDth:VIDeo:TYPE <LINear|LOGarithmic> 2-78
[:SENSe]:BANDwidth|BWIDth:VIDeo:AUTO <0 | 1 | ON | OFF> 2-79
[:SENSe]:BANDwidth|BWIDth:VIDeo:AUTO? 2-79

:MMEMory:STOEvent:TIMer:INTerval <numeric_value> {PS | NS | US | MS | S | MIN | HR} 2-68
:MMEMory:STOEvent:TIMer:INTerval? 2-68
:MMEMory:STOEvent:TIMer[:STATE] <0 | 1 | ON | OFF> 2-69
:MMEMory:STORe:LIMt <string>,<string>,<string> 2-69
:MMEMory:STORe:RAM <numeric_value>,<numeric_value>,<numeric_value>,<string> 2-69
:MMEMory:STORe:TRACe:CSV <string>,<string>,<string> 2-70
:OUTPut:IF:FILTer <K750|M7P5|M14|M30|M100> 2-70
:OUTPut:IF:STATe <0 | 1 | ON | OFF> 2-70
:OUTPut:IF:STATe? 2-70
:OUTPut:ROSCillator:STATe <0 | 1 | ON | OFF> 2-71
:READ:ACPower? 2-71
:READ:CHPower? 2-71
:READ:CHPower:CHPower? 2-72
:READ:CHPower:DENSity? 2-72
:READ:EIRPower? 2-72
:READ:EIRPower:DATA? 2-72
:READ:Interference:MAXimum? 2-73
:READ:Interference:POWer? 2-73
:READ:SEMask? 2-73
[:SENSe]:ACPower:BANDwidth|BWIDth:ADJacent <numeric_value> {HZ | KHZ | MHZ | GHZ} 2-73
[:SENSe]:ACPower:BANDwidth|BWIDth:ADJacent? 2-73
[:SENSe]:ACPower:BANDwidth|BWIDth:ALTernate <numeric_value> {HZ | KHZ | MHZ | GHZ} 2-74
[:SENSe]:ACPower:BANDwidth|BWIDth:ALTernate? 2-74
[:SENSe]:ACPower:BANDwidth|BWIDth:MAIN <numeric_value> {HZ | KHZ | MHZ | GHZ} 2-74
[:SENSe]:ACPower:BANDwidth|BWIDth:MAIN? 2-74
[:SENSe]:ACPower:BANDwidth|BWIDth:SPACing <numeric_value> {HZ | KHZ | MHZ | GHZ} 2-74
[:SENSe]:ACPower:BANDwidth|BWIDth:SPACing? 2-74
[:SENSe]:ACPower:STATe <0 | 1 | ON | OFF> 2-75
[:SENSe]:ACPower:STATe? 2-75
[:SENSe]:ARFChannel <numeric_value> 2-75
[:SENSe]:ARFChannel? 2-75
[:SENSe]:AVERage:COUNt <numeric_value> 2-75
[:SENSe]:AVERage:COUNt? 2-75
[:SENSe]:AVERage:TYPE <NORMal|MINimum|MAXimum|AVERage|RMAXimum|RMINimum|RAVerage> 2-76
[:SENSe]:AVERage:TYPE? 2-76
[:SENSe]:BANDwidth|BWIDth[:RESolution] <numeric_value> {HZ | KHZ | MHZ | GHZ} 2-76
[:SENSe]:BANDwidth|BWIDth[:RESolution]? 2-76
[:SENSe]:BANDwidth|BWIDth[:RESolution] <numeric_value> {HZ | KHZ | MHZ | GHZ} 2-77
[:SENSe]:BANDwidth|BWIDth[:RESolution]? 2-77
[:SENSe]:BANDwidth|BWIDth[:RESolution]:RATio <numeric_value> 2-77
[:SENSe]:BANDwidth|BWIDth[:RESolution]:RATio? 2-77
[:SENSe]:BANDwidth|BWIDth:VIDeo <numeric_value> {HZ | KHZ | MHZ | GHZ} 2-77
[:SENSe]:BANDwidth|BWIDth:VIDeo? 2-77
[:SENSe]:BANDwidth|BWIDth:VIDeo <numeric_value> {HZ | KHZ | MHZ | GHZ} 2-78
[:SENSe]:BANDwidth|BWIDth:VIDeo? 2-78
[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio <numeric_value> 2-78
[:SENSe]:BANDwidth|BWIDth:VIDeo:RATio? 2-78
[:SENSe]:BANDwidth|BWIDth:VIDeo:TYPE <LINear|LOGarithmic> 2-78
[:SENSe]:BANDwidth|BWIDth:VIDeo:TYPE? 2-78
[:SENSe]:BANDwidth[:RESolution]:AUTO <0 | 1 | ON | OFF> 2-79
[:SENSe]:BANDwidth[:RESolution]:AUTO? 2-79
[:SENSe]:BANDwidth:VIDeo:AUTO <0 | 1 | ON | OFF> 2-79
[:SENSe]:BANDwidth:VIDeo:AUTO? 2-79
[:SENSe]:FREQuency:OFFSet? ................................................. 2-88
[:SENSe]:FREQuency:SPAN <numeric_value> {HZ | KHZ | MHZ | GHZ} .......................................................... 2-89
[:SENSe]:FREQuency:SPAN? ................................................. 2-89
[:SENSe]:FREQuency:SPAN:FULL ........................................... 2-89
[:SENSe]:FREQuency:SPAN:LAST .......................................... 2-89
[:SENSe]:FREQuency:START <numeric_value> {HZ | KHZ | MHZ | GHZ} .......................................................... 2-89
[:SENSe]:FREQuency:START? ............................................... 2-89
[:SENSe]:FREQuency:STEP[:INCrement] <numeric_value> {HZ | KHZ | MHZ | GHZ} ................................................. 2-90
[:SENSe]:FREQuency:STEP[:INCrement]? ................................ 2-90
[:SENSe]:FREQuency:STOP <numeric_value> {HZ | KHZ | MHZ | GHZ} .......................................................... 2-90
[:SENSe]:FREQuency:STOP? ................................................. 2-90
[:SENSe]:GATE:DELay <numeric_value> {PS | NS | MS | S | MIN | HR} .......................................................... 2-90
[:SENSe]:GATE:DELay? .................................................... 2-90
[:SENSe]:GATE:LENGTH <numeric_value> {PS | NS | US | MS | S | MIN | HR} ..................................................... 2-91
[:SENSe]:GATE:LENGTH? .................................................. 2-91
[:SENSe]:GATE:PERiod? .................................................... 2-91
[:SENSe]:GATE:STATe <0 | 1 | ON | OFF> .......................................................... 2-91
[:SENSe]:GATE:STATe? .................................................... 2-91
[:SENSe]:GATE:TRIGger <GPS> .......................................... 2-91
[:SENSe]:GATE:TRIGger? .................................................. 2-91
[:SENSe]:GSCNumber <numeric_value> ................................ 2-92
[:SENSe]:GSCNumber? ..................................................... 2-92
[:SENSe]:INTERference:BANDwidth|BWIDth:INTEGRation <numeric_value> {HZ | KHZ | MHZ | GHZ} ................................................. 2-92
[:SENSe]:INTERference:BANDwidth|BWIDth:INTEGRation? ..................................................... 2-92
[:SENSe]:INTERference:MAX <numeric_value> {DBM} .......................................................... 2-92
[:SENSe]:INTERference:MAX? ............................................. 2-92
[:SENSe]:INTERference:MIN <numeric_value> {DBM} .......................................................... 2-93
[:SENSe]:INTERference:MIN? ............................................. 2-93
[:SENSe]:INTERference:STATE <0 | 1 | ON | OFF> ...................... 2-93
[:SENSe]:INTERference:STATE? .......................................... 2-93
[:SENSe]:MODE <SPECTrum|NRADio|RTSA|LTE> ......................... 2-93
[:SENSe]:MODE? ............................................................ 2-93
[:SENSe]:MODE:CATalog? .................................................. 2-93
[:SENSe]:NBANd <INValid|N34|N38|N39|N40|N41|N51|N77|N78|N79|N257|N258|N260> ..................................................... 2-94
[:SENSe]:OBANd? ............................................................. 2-94
[:SENSe]:OBANd <INValid|N34|N38|N39|N40|N41|N51|N77|N78|N79|N257|N258|N260> ..................................................... 2-94
[:SENSe]:OBANd? ............................................................. 2-94
[:SENSe]:OBWidth:METHod <XDB|PERCent> .......................................................... 2-94
[:SENSe]:OBWidth:METHod? .................................................. 2-94
[:SENSe]:OBWidth:PERCent <numeric_value> ......................... 2-94
[:SENSe]:OBWidth:PERCent? .................................................. 2-94
[:SENSe]:OBWidth:STATe <0 | 1 | ON | OFF> .......................................................... 2-94
[:SENSe]:OBWidth:STATe? .................................................. 2-94
[:SENSe]:OBWidth:XDB <numeric_value> {DB} .......................................................... 2-95
[:SENSe]:OBWidth:XDB? .................................................... 2-95
[:SENSe]:PCI? ................................................................. 2-96
[:SENSe]:POWer:RF:ATTenuation <numeric_value> {DB} .......................................................... 2-97
[:SENSe]:POWer:RF:ATTenuation? ........................................... 2-97
[:SENSe]:POWer:RF:ATTenuation:AUTO <0 | 1 | ON | OFF> ............ 2-97
[:SENSe]:POWer:RF:ATTenuation:AUTO? .................................... 2-97
[:SENSe]:POWer:RF:GAIN:AUTO <0 | 1 | ON | OFF> ..................... 2-97
[:SENSe]:POWer:RF:GAIN:AUTO? ............................................. 2-97
[:SENSe]:POWer:RF:GAIN:STATe <0 | 1 | ON | OFF> ..................... 2-97
[:SENSe]:POWer:RF:GAIN:STATe? ............................................. 2-97
[:SENSe]:SCAN? .............................................................. 2-98
[SENSe]:SCAnner:STATe <0 | 1 | ON | OFF>  .............................................................. 2-99
[SENSe]:SCAnner:STATe?  ................................................................. 2-99
[SENSe]:SEMask:CENTer:BWIDth <numeric_value> {HZ | KHZ | MHZ | GHZ}  .................................................. 2-99
[SENSe]:SEMask:CENTer:BWIDth?  .................................................... 2-99
[SENSe]:SEMask:MASK <GT38|LT38>  .................................................. 2-100
[SENSe]:SEMask:MASK?  ................................................................. 2-100
[SENSe]:SEMask:RPOWer <numeric_value> {DBM} ........................................ 2-100
[SENSe]:SEMask:RPOWer?  .............................................................. 2-100
[SENSe]:SEMask:RPOWer:STATe <0 | 1 | ON | OFF> .................................. 2-100
[SENSe]:SEMask:RPOWer:STATe? ......................................................... 2-100
[SENSe]:SEMask:STATe <0 | 1 | ON | OFF> ........................................... 2-100
[SENSe]:SEMask:STATe? ................................................................. 2-100
[SENSe]:SSB:OFFSet <numeric_value> {HZ | KHZ | MHZ | GHZ} . ......................... 2-103
[SENSe]:SSB:OFFSet? ................................................................. 2-103
[SENSe]:SSB:OFFSet:AUTO:ABORt .................................................... 2-103
[SENSe]:SSB:OFFSet:AUTO:STASte ................................................... 2-103
[SENSe]:SSB:OFFSet:AUTO:STATus? ................................................ 2-103
[SENSe]:SSB:SCSPacing <numeric_value> {HZ | KHZ | MHZ | GHZ}  ................. 2-104
[SENSe]:SSB:SCSPacing? ............................................................ 2-104
[SENSe]:SSB:SCSPacing:CATalog? ............................................... 2-104
[SENSe]:SWEep:TIMe <numeric_value> {PS | NS | US | MS | S | MIN | HR}  ............ 2-104
[SENSe]:SWEep:TIMe? ............................................................. 2-104
[SENSe]:SYNctype <SS> ................................................................. 2-104
[SENSe]:SYNctype? ................................................................. 2-104
[SENSe]:TDOMain:DISPlay:LENGth <numeric_value> {PS | NS | US | MS | S | MIN | HR} 2-105
[SENSe]:TDOMain:DISPlay:LENGth? ............................................... 2-105
[SENSe]:TDOMain:DISPlay:STARt <numeric_value> {PS | NS | US | MS | S | MIN | HR} 2-105
[SENSe]:TDOMain:DISPlay:STARt? .................................................. 2-105
[SENSe]:TDOMain:STATe <0 | 1 | ON | OFF> ...................................... 2-105
[SENSe]:TDOMain:STATe? .............................................................. 2-105
[SENSe]:SYNCtype <SS> ................................................................. 2-106
[SENSe]:SYNCtype? ................................................................. 2-106
:THReshold:SINR <numeric_value> {DB} ............................................. 2-106
:THReshold:SINR? ................................................................. 2-106
:TRACe<n>:DEToector:[FUNCTION] <POSitive|RMS|NEGative|SAMPle> ............. 2-107
:TRACe<n>:DEToector:[FUNCTION]? ............................................... 2-107
:TRACe<n>:DISPlay:[STATe] <0 | 1 | ON | OFF> .................................. 2-107
:TRACe<n>:DISPlay:[STATe]? ........................................................ 2-107
:TRACe<n>:DISPlay:VIEW:SPECTrogram:POSition <numeric_value> .............. 2-107
:TRACe<n>:SWEep:COUNt:[CURRent]? ............................................. 2-108
:TRACe<n>:TYPE <NORMAL|MINimum|MAXimum|AVERage|RMAXimum|RMINimum|RAVerage> 2-108
:TRACe<n>:TYPE? .............................................................. 2-108
:TRACe<n>:UPDate:[STATe] <0 | 1 | ON | OFF> .................................. 2-109
:TRACe<n>:UPDate:[STATe]? ....................................................... 2-109
:TRACe:CLEar <numeric_value> ..................................................... 2-109
:TRACe:CLEar:ALL ................................................................. 2-109
:TRACe:[DATA] <numeric_value> ................................................... 2-109
:TRACe[DATA]:ALL? ................................................................. 2-109
:TRACe:PRESet:ALL ................................................................. 2-110
:TRACe:SELECT <numeric_value> ................................................... 2-110
:TRACe:SELECT? ................................................................. 2-110
:TRACe:SPECTrogram:DEToector:[FUNCTION] <POSitive|RMS|NEGative|SAMPle> 2-111
:TRACe:SPECTrogram:DETector[:FUNCTION]? .................................................. 2-111
:TRACe:SPECTrogram:TYPE <NORMAL|MINimum|MAXimum|AVERage|RMAXimum|RMInimum|RAVerage> 2-111
:TRACe:SPECTrogram:TYPE? ................................................................. 2-111
:TRIGger[:SEQUence]:ATRigger <numeric_value> {PS | NS | US | MS | S | MIN | HR} ........ 2-112
:TRIGger[:SEQUence]:ATRigger? ............................................................ 2-112
:TRIGger[:SEQUence]:ATRigger:STATe <0 | 1 | ON | OFF> .................................. 2-112
:TRIGger[:SEQUence]:ATRigger:STATe? ...................................................... 2-112
:TRIGger[:SEQUence]:DELay <numeric_value> {PS | NS | US | MS | S | MIN | HR} .......... 2-113
:TRIGger[:SEQUence]:DELay? ................................................................. 2-113
:TRIGger[:SEQUence]:DELay:STATe <0 | 1 | ON | OFF> .................................. 2-113
:TRIGger[:SEQUence]:DELay:STATe? ......................................................... 2-113
:TRIGger[:SEQUence]:HOLDoff <numeric_value> {PS | NS | US | MS | S | MIN | HR} .......... 2-113
:TRIGger[:SEQUence]:HOLDoff? .............................................................. 2-113
:TRIGger[:SEQUence]:HOLDoff:STATe <0 | 1 | ON | OFF> .................................. 2-113
:TRIGger[:SEQUence]:HOLDoff:STATe? ...................................................... 2-113
:TRIGger[:SEQUence]:PORT<n>[:DIRection] <IN|OUT> .................................... 2-114
:TRIGger[:SEQUence]:PORT<n>[:DIRection]?............................................ 2-114
:TRIGger[:SEQUence]:SLOPe <POSitive|NEGative|ANY> ........................................ 2-114
:TRIGger[:SEQUence]:SLOPe? ................................................................. 2-114
:TRIGger[:SEQUence]:SOURce <EXT|EXT1|EXT2|IMMediate|VIDeo> ...................... 2-114
:TRIGger[:SEQUence]:SOURce? ............................................................... 2-114
:TRIGger[:SEQUence]:VIDeo:HYSTeresis <numeric_value> {DB} ......................... 2-115
:TRIGger[:SEQUence]:VIDeo:HYSTeresis? ................................................ 2-115
:TRIGger[:SEQUence]:VIDeo:LEVel <numeric_value> {DBM} ............................... 2-115
:TRIGger[:SEQUence]:VIDeo:LEVel? ........................................................ 2-115
:UNIT:CHPower:PSDensity <DBMHz|DBMMhz> .............................................. 2-115
:UNIT:CHPower:PSDensity? ................................................................. 2-115
:UNIT:POWer <DBM> ........................................................................ 2-115
:UNIT:POWer? .................................................................................. 2-115