NADC, PDC Programming Commands

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Contents

1. NADC Programming Commands

SCPI Command Subsystems 6
CALCulate Subsystem 7
Adjacent Channel Power Measurement Limit Test 7
Query the Current Measurement Status 7
Calculate Data Query 7
Error Vector Magnitude Measurement First 10 Symbols EVM Limit 7
Error Vector Magnitude Measurement I/Q Origin Offset Error Limit 8
Error Vector Magnitude Measurement Peak EVM Limit 8
Error Vector Magnitude Measurement RMS EVM Limit 8
Error Vector Magnitude Measurement Limit Testing Control 9
CALCulate:MARKers Subsection. 10
CONFigure Subsystem 16
Configure Query 16
DISPlay Subsystem 17
Adjacent Channel Power Measurement View Selection 17
Error Vector Magnitude Measurement View Selection 17
Select Display Format 17
Turn a Trace Display On/Off 17
FETCh Subsystem 19
MEASure Group of Commands 20
Measure Commands 20
Configure Commands 21
Fetch Commands. 21
Read Commands 22
Adjacent Channel Power (ACP) Measurement 23
Error Vector Magnitude Measurement 25
Spectrum (Frequency Domain) Measurement 27
Waveform (Time Domain) Measurement 29
READ Subsystem 31
SENSe Subsystem 32
Adjacent Channel Power Measurement 32
Burst Type 36
Slot number 36
Slot Auto 36
Correction for Base Station RF Port External Attenuation 37
Correction for Mobile Station RF Port External Attenuation 37
Error Vector Magnitude Measurement 38
RF Port Input Attenuation 41
RF Port Power Range Auto 41
RF Port Power Range Maximum Total Power 41
Radio Test Device 43
Radio Traffic Rate 43
Spectrum (Frequency-Domain) Measurement 44
Burst Sync Delay 54
Burst Search Threshold 54
Waveform (Time-Domain) Measurement 55

2. PDC Programming Commands

Contents

SCPI Command Subsystems. 62
CALCulate Subsystem 63
Adjacent Channel Power Measurement Limit Test 63
Query the Current Measurement Status 63
Calculate Data Query 63
Error Vector Magnitude Measurement I/Q Origin Offset Error Limit 63
Error Vector Magnitude Measurement Peak EVM Limit 64
Error Vector Magnitude Measurement RMS EVM Limit 64
Error Vector Magnitude Measurement Limit Testing Control 64
CALCulate:MARKers Subsection 65
Occupied Bandwidth Measurement Frequency Band Limit 71
Occupied Bandwidth Measurement Limit Test 71
CONFigure Subsystem 72
Configure Query 72
DISPlay Subsystem 73
Adjacent Channel Power Measurement View Selection 73
Error Vector Magnitude Measurement View Selection 73
Select Display Format 73
Turn a Trace Display On/Off 73
FETCh Subsystem 75
MEASure Group of Commands. 76
Measure Commands. 76
Configure Commands. 77
Fetch Commands 77
Read Commands. 78
Adjacent Channel Power (ACP) Measurement 79
Error Vector Magnitude Measurement 81
Occupied Bandwidth Measurement 83
Spectrum (Frequency Domain) Measurement 85
Waveform (Time Domain) Measurement 87
READ Subsystem 89
SENSe Subsystem 90
Adjacent Channel Power Measurement 90
Burst Type 94
Slot number 94
Slot Auto 94
Correction for Mobile Station RF Port External Attenuation 95
Error Vector Magnitude Measurement 96
Occupied Bandwidth Measurement 99
RF Port Input Attenuation 101
RF Port Power Range Auto 101
RF Port Power Range Maximum Total Power 101
Radio Test Device 102
Radio Traffic Rate 102
Spectrum (Frequency-Domain) Measurement 103
Burst Sync Delay 113
Burst Search Threshold 113
Waveform (Time-Domain) Measurement 114

1 NADC Programming Commands

These commands are only available when the NADC mode has been selected using **INSTrument:SELect**. If NADC mode is selected, commands that are unique to another mode are not available.

SCPI Command Subsystems

CALCulate on page 7

CONFigure on page 16

DISPlay on page 17

FETCh on page 19

MEASure on page 20

READ on page 31

SENSe on page 32

CALCulate Subsystem

This subsystem is used to perform post-acquisition data processing. In effect, the collection of new data triggers the CALCulate subsystem. In this instrument, the primary functions in this subsystem are markers and limits.

Adjacent Channel Power Measurement Limit Test

:CALCulate:ACP:LIMit[:TEST] OFF|ON|0|1

:CALCulate:ACP:LIMit[:TEST]?

Turn limit test on or off.

Factory Preset and *RST: On

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Query the Current Measurement Status

:CALCulate:CLIMits:FAIL?

Checks if the current measurement is outside its limits. It returns a 0 (zero) if it is passing or a 1 (one) if it is failing.

Front Panel Access: None

Calculate Data Query

:CALCulate:DATA[n]?

Returns the designated measurement data for the currently selected measurement and sub-opcode.

n = any valid sub-opcode for the current measurement. See the "MEASure Group of Commands" on page 20 for information on the data that can be returned for each measurement.

Error Vector Magnitude Measurement First 10 Symbols EVM Limit

:CALCulate:EVM:LIMit:F10 <percent>

:CALCulate:EVM:LIMit:F10?

Set the first 10 symbols EVM limit in percent. This function is only for mobile testing.

Factory Preset and *RST: 25.0%

Range: 0 to 50%

Remarks: You must be in the NADC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement I/Q Origin Offset Error Limit

:CALCulate:EVM:LIMit:IQOOffset <dB>

:CALCulate:EVM:LIMit:IQOOffset?

Set the I/Q origin offset error limit in dB.

Factory Preset and *RST: –20 dB

Range: –100 dB to 0 dB

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Peak EVM Limit

:CALCulate:EVM:LIMit:PEAK <percent>

:CALCulate:EVM:LIMit:PEAK?

Set the peak EVM limit in percent.

Factory Preset and *RST: 40.0%

Range: 0 to 50%

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement RMS EVM Limit

:CALCulate:EVM:LIMit:RMS <percent>

:CALCulate:EVM:LIMit:RMS?

Set the RMS EVM limit in percent.

Factory Preset and *RST: 12.5%

Range: 0 to 50%

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Limit Testing Control

:CALCulate:EVM:LIMit[:TEST] OFF|ON|0|1

:CALCulate:EVM:LIMit[:TEST]?

Turn limit test on or off.

Factory Preset and *RST: On

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

CALCulate:MARKers Subsection

Each measurement has its own instrument state for marker parameters. Therefore, the marker settings in each measurement are saved if you exit the measurement and are then recalled when you change back to that measurement.

In using the marker commands it is necessary to specify the measurement in the SCPI command. It is highly recommended that you use the marker commands only on the current measurement. Many marker commands will return invalid results, when used on a measurement that is not current. (This is true for commands that do more than simply setting or querying an instrument parameter.) No error is reported for these invalid results.

NADC Mode - valid <measurement> key words

- ACP - adjacent channel power measurement
- EVM - error vector magnitude measurement
- SPECtrum - spectrum (frequency domain) measurement
- WAVeform - waveform (time domain) measurement

Example:

Suppose you are using the Spectrum measurement. To position marker 2 at the maximum peak value, of the trace that marker 2 is currently on, the command is:

```
:CALCulate:SPECtrum:MARKer2:MAXimum
```

Markers All Off on All Traces

```
:CALCulate:<measurement>:MARKer:AOFF
```

Turns off all markers on all the traces.

Example: **CALC:SPEC:MARK:AOFF**

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime, WAVeform)

Front Panel Access: **Marker, More, Marker All Off**

Marker Function

```
:CALCulate:<measurement>:MARKer[1]|2|3|4:FUNCtion
BPOWer|NOISe|OFF
```

```
:CALCulate:<measurement>:MARKer[1]|2|3|4:FUNCtion?
```

Selects the marker function for the specified marker.

Some measurements may only have one or two markers available. Also,

they may not have both noise and band-power markers. For example, the WAVeform measurement only uses two markers and only has band-power markers.

Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

BPOWer is the integrated power between the two markers for traces in the frequency domain and is the mean power between the two markers for traces in the time domain.

NOISe is the noise power spectral density in a 1 Hz bandwidth. It is averaged over 32 horizontal trace points.

OFF turns off the marker functions

Example: **CALC:SPEC:MARK3:FUNC Noise**

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime, WAVeform)

Front Panel Access: **Marker, Marker Function**

Marker Function Result

:CALCulate:<measurement>:MARKer[1]|2|3|4:FUNCtion:RESult?

Quires the result of the currently active marker function.

Some measurements may only have one or two markers available. Also, they may not have both noise and band-power markers. For example, the WAVeform measurement only uses two markers and only has band-power markers.

Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

Example: **CALC:SPEC:MARK:FUNC:RES?**

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime, WAVeform)

Front Panel Access: **Marker, Marker Function**

Marker Peak (Maximum) Search

:CALCulate:<measurement>:MARKer[1]|2|3|4:MAXimum

Places the selected marker on the highest point on the trace that is assigned to that particular marker number. Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a

marker to a particular trace.

Example: **CALC:SPEC:MARK1:MAX**

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum and AREFerence)

Front Panel Access: **Search**

Marker Peak (Minimum) Search

:CALCulate:<measurement>:MARKer[1]|2|3|4:MINimum

Places the selected marker on the lowest point on the trace that is assigned to that particular marker number. Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

Example: **CALC:SPEC:MARK2:MIN**

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime)

Front Panel Access: **Search, More, Min Search**

Marker Mode

:CALCulate:<measurement>:MARKer[1]|2|3|4:MODE POSition|DELTa

:CALCulate:<measurement>:MARKer[1]|2|3|4:MODE?

Selects the marker mode to be position or delta

Some measurements may only have one or two markers available. Also, they may not have both position and delta markers. Several measurements only have position markers.

Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

Example: **CALC:SPEC:MARK:MODE DELTA**

Remarks: For the delta mode only markers 1 and 2 are valid.

The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum and AREFerence)

Front Panel Access: **Marker, Marker [Delta]**

Marker On/Off

:CALCulate:<measurement>:MARKer[1]|2|3|4[:STATe] OFF|ON|0|1

:CALCulate:<measurement>:MARKer[1]|2|3|4[:STATe]?

Turns the selected marker on or off.

Some measurements may only have one or two markers available. Also, they may not have both noise and band-power markers. For example, the WAVeform measurement only uses two markers and only has band-power markers.

Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

Example: **CALC:SPEC:MARK2: on**

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, WAVeform)

The WAVeform measurement only has two markers available.

Front Panel Access: **Marker, Select** then **Marker Normal** or **Marker On Off**

Marker to Trace

:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe <trace_name>|<trace_name>

:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe?

Assigns the specified marker to the designated trace. Not all measurement data can have traces assigned to it.

Example: **CALC:SPEC:MARK2:TRACE RFENvelope**

Range: The names of valid traces are dependent upon the selected measurement. See the "MEASure Group of Commands" on page 20 for more detailed information about the available traces. Note that the trace name assignment is independent of the window number.

Measurement	Available Traces
SPECtrum - (frequency domain)	RFENvelope (*n*=2)[a] IQ (*n*=3)[a] SPECtrum (*n*=4)[a] ASPectrum (*n*=7)[a]
WAVEform - (time domain)	RFENvelope (*n*=2)[a] IQ (*n*=8)[a]

Measurement	Available Traces
ACP - adjacent channel power	no markers
EVM - error vector magnitude	EVM (*n*=2)[a] MERRor (*n*=3)[a] PERRor (*n*=4)[a]

a. The *n* number indicates the sub-opcode that corresponds to this trace. Detailed descriptions of the trace data can be found in the MEASure subsystem documentation by looking up the sub-opcode for the appropriate measurement.

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime)

Front Panel Access: **Marker, Marker Trace**

Marker X Value

:CALCulate:<measurement>:MARKer[1]|2|3|4:X <param>

:CALCulate:<measurement>:MARKer[1]|2|3|4:X?

Position the designated marker on its assigned trace at the specified X value. The value is in the X-axis units (which is often frequency or time). Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

The query returns the current X value of the designated marker.

Example: **CALC:SPEC:MARK2:X 1.2e6 Hz**

Default Unit: Matches the units of the trace on which the marker is positioned

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime, WAVeform)

Front Panel Access: **Marker, <active marker>, RPG**

Marker X Position

:CALCulate:<measurement>:MARKer[1]|2|3|4:X:POSition <integer>

:CALCulate:<measurement>:MARKer[1]|2|3|4:X:POSition?

Position the designated marker on its assigned trace at the specified X position. A trace is composed of a variable number of measurement

points. This number changes depending on the current measurement conditions. The current number of points must be identified before using this command to place the marker at a specific location. Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

The query returns the current X position for the designated marker.

Example: **CALC:SPEC:MARK:X:POS 500**

Range: 0 to a maximum of (3 to 920,000)

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime)

Front Panel Access: **Marker, <active marker>, RPG**

Marker Readout Y Value

:CALCulate:<measurement>:MARKer[1]|2|3|4:Y?

Readout the current Y value for the designated marker on its assigned trace. The value is in the Y-axis units for the trace (which is often dBm). Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

Example: **CALC:SPEC:MARK1:Y -20 dB**

Default Unit: Matches the units of the trace on which the marker is positioned

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime)

CONFigure Subsystem

:CONFigure:<measurement>

The CONFigure commands are used with several other commands and are documented in the section on the "MEASure Group of Commands" on page 20.

Configure Query

:CONFigure?

The CONFigure? query returns the current measurement name.

DISPlay Subsystem

The DISPlay controls the selection and presentation of textual, graphical, and TRACe information. Within a DISPlay, information may be separated into individual WINDows.

Adjacent Channel Power Measurement View Selection

:DISPlay:ACP:VIEW BGRaph|SPECtrum

:DISPlay:ACP:VIEW?

Select the view either bar graph mode or spectrum mode.

Factory Preset and *RST: BGRaph

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement View Selection

:DISPlay:EVM:VIEW POLar|CONStln|QUAD

:DISPlay:EVM:VIEW?

Select the view of EVM measurement

Factory Preset and *RST: POLar

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Select Display Format

:DISPlay:FORMat:TILE

Selects the viewing format that displays multiple windows of the current measurement data simultaneously.

Front Panel Access: **Next Window**

Turn a Trace Display On/Off

:DISPlay:TRACe[n][:STATe] OFF|ON|0|1

:DISPlay:TRACe[n][:STATe]?

Controls whether the specified trace is visible or not.

n is a sub-opcode that is valid for the current measurement. See the "MEASure Group of Commands" on page 20 for more information about sub-opcodes.

Factory Preset and *RST: On

Range: The valid traces and their sub-opcodes are dependent upon the selected measurement. The trace name assignment is independent of the window number.

Measurement	Available Traces and Sub-opcodes
SPECtrum - (frequency domain)	RFENvelope (*n*=2)[a] IQ (*n*=3)[a] SPECtrum (*n*=4)[a] ASPectrum (*n*=7)[a]
WAVEform - (time domain)	RFENvelope (*n*=2)[a] IQ (*n*=8)[a]
ACP - adjacent channel power	no markers
EVM - error vector magnitude	EVM (*n*=2)[a] MERRor (*n*=3)[a] PERRor (*n*=4)[a]

a. The *n* number indicates the sub-opcode that corresponds to this trace. Detailed descriptions of the trace data can be found in the MEASure subsystem documentation by looking up the sub-opcode for the appropriate measurement.

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Front Panel Access: **Display, Display Traces**

FETCh Subsystem

:FETCh:<measurement>[n]?

The FETCh? commands are used with several other commands and are documented in the section on the "MEASure Group of Commands" on page 20.

MEASure Group of Commands

This group includes commands used to make measurements and return results. The different commands can be used to provide fine control of the overall measurement process. Most measurements should be done in single measurement mode, rather than doing the measurement continuously.

Each measurement sets the instrument state that is appropriate for that measurement. Other commands are available for each **Mode** to allow changing settings, view, limits, etc. Refer to:

SENSe:<measurement>, SENSe:CHANnel, SENSe:CORRection, SENSe:FREQuency, SENSe:POWer, SENSe:RADio, SENSe:SNYC
CALCulate:<measurement>, CALCulate:CLIMits/DATA
DISPlay:<measurement>
TRIGger

Measure Commands

:MEASure:<measurement>[n]?

This is a fast single-command way to make a measurement using the factory default instrument settings. These are the settings and units that conform to the Standard.

- Stops the current measurement and sets up the instrument for the specified measurement using the factory defaults
- Initiates the data acquisition for the measurement
- Blocks other SCPI communication, waiting until the measurement is complete before returning results.
- After the data is valid it returns the scalar results, or the trace data, for the specified measurement.

  If the optional [n] value is not included, or is set to 1, the scalar measurement results will be returned. If the [n] value is set to a value other than 1, the selected trace data results will be returned. See each command for details of what types of scalar results or trace data results are available. The binary data formats should be used for handling large blocks of data since they are smaller and faster then the ASCII format.

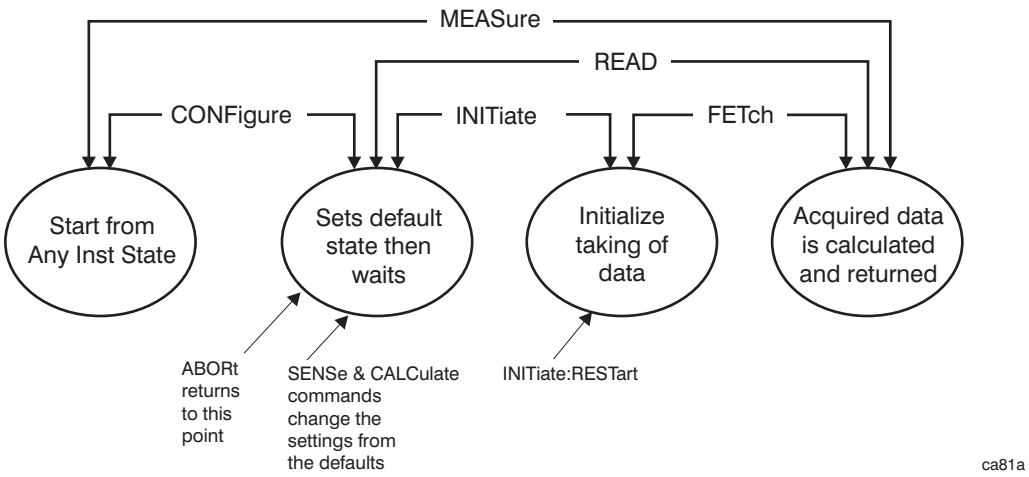
If you need to change some of the measurement parameters from the factory default settings you can set up the measurement with the CONFigure command. Use the commands in the SENSe:<measurement> and CALCulate:<measurement> subsystems to change the settings. Then you can use the READ? command, or the INITiate and FETCh? commands, to initiate the measurement and

query the results. See Figure 1-1.

If you need to repeatedly make a given measurement with settings other than the factory defaults, you can use the commands in the SENSe:<measurement> and CALCulate:<measurement> subsystems to set up the measurement. Then use the READ? command or INITiate and FETCh? commands, to initiate the measurement and query results.

Measurement settings persist if you initiate a different measurement and then return to a previous one. Use READ:<measurement>? if you want to use those persistent settings. If you want to go back to the default settings, use MEASure:<measurement>?.

Figure 1-1 Measurement Group of Commands



Configure Commands

:CONFigure:<measurement>

This command sets up the instrument for the specified measurement using the factory default instrument settings and stops the current measurement. It does not initiate the taking of measurement data.

The CONFigure? query returns the current measurement name.

Fetch Commands

:FETCh:<measurement>[n]?

This command puts valid data into the output buffer, but does not initiate data acquisition. Use the INITiate[:IMMediate] command to acquire data before you use the FETCh command. You can only fetch results from the measurement that is currently selected.

If the optional [n] value is not included, or is set to 1, the scalar measurement results will be returned. If the [n] value is set to a value

other than 1, the selected trace data results will be returned. See each command for details of what types of scalar results or trace data results are available. The binary data formats should be used for handling large blocks of data since they are smaller and faster then the ASCII format.

Read Commands

:READ:<measurement>[n]?

- Does not preset the measurement to the factory defaults. (The MEASure? command does preset.) It uses the settings from the last measurement.
- Initiates the measurement and puts valid data into the output buffer. If a measurement other than the current one is specified, the instrument will switch to that measurement before it initiates the measurement and returns results.
- Blocks other SCPI communication, waiting until the measurement is complete before returning the results

  If the optional [n] value is not included, or is set to 1, the scalar measurement results will be returned. If the [n] value is set to a value other than 1, the selected trace data results will be returned. See each command for details of what types of scalar results or trace data results are available. The binary data formats should be used when handling large blocks of data since they are smaller and faster then the ASCII format.

Measurement settings persist if you initiate a different measurement and then return to a previous one. Use READ:<measurement>? if you want to use those persistent settings. If you want to go back to the default settings, use MEASure:<measurement>?.

Adjacent Channel Power (ACP) Measurement

This measures the total rms power in the specified channel and in 5 offset channels. You must be in the NADC or PDC mode to use these commands. Use INSTrument:SELect to set the mode.

The general functionality of CONFigure, FETCh, MEASure, and READ are described at the beginning of this section. See the SENSe:ACP information for more measurement related commands.

:CONFigure:ACP

:FETCh:ACP[n]?

:READ:ACP[n]?

:MEASure:ACP[n]?

Measurement results available:

n	Results Returned
0	Returns unprocessed I/Q trace data, as a data array of comma-separated trace points, in volts.
1(default)	Returns 22 comma-separated scalar results, in the following order: Center freq – absolute power (dBm) Center freq – absolute power (W) Negative offset freq(1) – relative power (dB) Negative offset freq(1) – absolute power (dBm) Positive offset freq(1) – relative power (dB) Positive offset freq(1) – absolute power (dBm) . . . . Positive offset freq(5) – relative power (dB) Positive offset freq(5) – absolute power (dBm)
2	Returns 10 comma-separated scalar values of the pass/fail (1=passed, or 0=failed) results determined by testing the absolute power of the offset frequencies: Negative offset frequency(1) absolute power Positive offset frequency(1) absolute power . . . . Negative offset frequency(5) absolute power Positive offset frequency(5) absolute power
3	Returns 10 comma-separated scalar values of the pass/fail (1=passed, or 0=failed) results determined by testing the relative power of the offset frequencies: Negative offset frequency(1) relative power Positive offset frequency(1) relative power . . . . Negative offset frequency(5) relative power Positive offset frequency(5) relative power

n	Results Returned
4	Returns the frequency-domain spectrum trace (data array) for the entire frequency range being measured. In order to return spectrum data, the NADC display must be in the spectrum display mode.

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement

This measures the vector error of the magnitude of each symbol. You must be in the NADC or PDC mode to use these commands. Use INSTrument:SELect to set the mode.

The general functionality of CONFigure, FETCh, MEASure, and READ are described at the beginning of this section. See the SENSe:EVM information for more measurement related commands.

:CONFigure:EVM

:FETCh:EVM[n]?

:READ:EVM[n]?

:MEASure:EVM[n]?

Measurement results available:

n	Results Returned
0	Returns unprocessed I/Q trace data, as a data array of comma-separated trace points, in volts.
1 (default)	NADC returns the following 8 comma-separated scalar results, in order. 1. RMS EVM – a floating point number (in percent) of EVM over the entire measurement area. 2. Peak EVM error – a floating point number (in percent) of peak EVM in the measurement area. 3. Symbol position of the peak EVM error – an integer number of the symbol position where the peak EVM error is detected. 4. First 10 symbols EVM error – a floating point number (in percent) of EVM over the first 10 symbols. 5. Magnitude error – a floating point number (in percent) of average magnitude error over the entire measurement area. 6. Phase error – a floating point number (in degree) of average phase error over the entire measurement area. 7. Frequency error – a floating point number (in Hz) of the frequency error in the measured signal. 8. I/Q origin offset – a floating point number (in dB) of the I and Q error (magnitude squared) offset from the origin.
2	Returns series of floating point numbers (in percent) that represent each sample in the EVM trace. The first number is the symbol 0 decision point and there are 5 points per symbol. Therefore, the decision points are at 0, 5, 10, 15. . . .

n	Results Returned
3	Returns series of floating point numbers (in percent) that represent each sample in the magnitude error trace. The first number is the symbol 0 decision point and there are 5 points per symbol. Therefore, the decision points are at 0, 5, 10, 15. . . .
4	Returns series of floating point numbers (in degree) that represent each sample in the phase error trace. The first number is the symbol 0 decision point and there are 5 points per symbol. Therefore, the decision points are at 0, 5, 10, 15. . . .
5	Returns series of floating point numbers that alternately represent I and Q pairs of the corrected measured trace. The magnitude of each I and Q pair are normalized to 1.0. The first number is the in-phase (I) sample of symbol 0 decision point and the second is the quadrature-phase (Q) sample of symbol 0 decision point. As in the EVM, there are 5 points per symbol, so that: 1st number = I of the symbol 0 decision point 2nd number = Q of the symbol 0 decision point . . . . 11th number = I of the symbol 1 decision point 12th number = Q of the symbol 1 decision point . . . . 10xNth + 1 number = I of the symbol N decision point 10xNth + 2 number = Q of the symbol N decision point
6	NADC returns the following 4 comma-separated scalar values of 1 or 0, in the order given. The pass/fail results (1=passed, or 0=failed) are determined by testing the EVM, peak EVM, first 10 symbols EVM and IQ origin offsets. Test result of EVM Test result of peak EVM Test result of first 10 symbols EVM Test result of IQ origin offset

Remarks: You must be in the PDC mode to use this command. Use INSTrument:SELect to set the mode.

Spectrum (Frequency Domain) Measurement

This measures the amplitude of your input signal with respect to the frequency. It provides spectrum analysis capability using FFT (fast Fourier transform) measurement techniques. You must select the appropriate mode using INSTrument:SELect, to use these commands.

The general functionality of CONFigure, FETCh, MEASure, and READ are described at the beginning of this section. See the SENSe:SPECtrum information for more measurement related commands.

:CONFigure:SPECtrum

:FETCh:SPECtrum[n]?

:READ:SPECtrum[n]?

:MEASure:SPECtrum[n]?

Measurement Results Available

n	Results Returned
0	Returns unprocessed I/Q trace data, as a series of comma-separated trace points, in volts. The I values are listed first in each pair, using the 0 through even-indexed values. The Q values are the odd-indexed values.
not specified or n=1	Returns the following comma-separated scalar results: 1. **FFT peak** is the FFT peak amplitude. 2. **FFT frequency** is the FFT frequency of the peak amplitude. 3. **FFT points** is the Number of points in the FFT spectrum. 4. **First FFT frequency** is the frequency of the first FFT point of the spectrum. 5. **FFT spacing** is the frequency spacing between the FFT points of the spectrum. 6. **Time domain points** is the number of points in the time domain trace used for the FFT. 7. **First time point** is the time of the first time domain point, where time zero is the trigger event. 8. **Time spacing** is the time spacing between the time domain points. 9. **Time domain** returns a 1, if time domain is complex (I/Q), or 0 if it is real. (raw ADC samples) 10. **Scan time** is the total scan time of the time domain trace used for the FFT. 11. **Current average count** is the current number of data measurements that have already been combined, in the averaging calculation.

n	Results Returned
2, **Service** mode only	Returns the trace data of the log-magnitude versus time. (That is, the RF envelope.)
3	Returns the I and Q trace data. It is represented by I and Q pairs (in volts) versus time.
4	Returns spectrum trace data. That is, the trace of log-magnitude versus frequency. (The trace is computed using a FFT.)
5, **Service** mode only	Returns the averaged trace data of log-magnitude versus time. (That is, the RF envelope.)
6	Not used.
7	Returns the averaged spectrum trace data. That is, the trace of the averaged log-magnitude versus frequency.
8	Not used.
9	Returns a trace containing the shape of the FFT window.
10, **Service** mode only	Returns trace data of the phase of the FFT versus frequency.

Front Panel Access: **Measure, Spectrum (Freq Domain)**

After the measurement is selected, press **Restore Meas Defaults** to restore factory defaults.

Waveform (Time Domain) Measurement

This measures the power in your input signal with respect to time and is equivalent to zero-span operation in a traditional spectrum analyzer. You must select the appropriate mode using INSTrument:SELect, to use these commands.

The general functionality of CONFigure, FETCh, MEASure, and READ are described at the beginning of this section. See the SENSe:WAVeform information for more measurement related commands.

:CONFigure:WAVeform

:FETCh:WAVeform[n]?

:READ:WAVeform[n]?

:MEASure:WAVeform[n]?

Measurement Results Available

n	Results Returned
0, or 8	Returns unprocessed I/Q trace data, as a series of comma-separated trace points, in volts. The I values are listed first in each pair, using the 0 through even-indexed values. The Q values are the odd-indexed values.
not specified or n=1	Returns the following comma-separated scalar results: 1. **Sample time** is a floating point number representing the time between samples when using the trace queries (n=0,2,etc). 2. **Mean power** is the mean power (in dBm). This is either the power across the entire trace, or the power between markers if the markers are enabled. If averaging is on, the power is for the latest acquisition. 3. **Mean power averaged** is the power (in dBm) for N averages, if averaging is on. This is either the power across the entire trace, or the power between markers if the markers are enabled. If averaging is on, the power is for the latest acquisition. If averaging is off, the value of the mean power averaged is the same as the value of the mean power. 4. **Number of samples** is the number of data points in the captured signal. This number is useful when performing a query on the signal (i.e. when n=0,2,etc.). 5. **Peak-to-mean ratio** has units of dB. The peak is defined to be the maximum level of the signal (non-averaged). The mean is the mean power (non-averaged). If averaging is on, the peak-to-mean ratio is invalid. 6. **Maximum value** is the maximum of the most recently acquired data (in dBm). 7. **Minimum value** is the minimum of the most recently acquired data (in dBm).

n	Results Returned
2	Returns comma-separated trace points of the entire captured trace data. These data points are floating point numbers representing the power of the signal (in dBm). There are N data points, where N is the **number of samples**. The period between the samples is defined by the **sample time**.

Front Panel Access: **Measure, Waveform (Time Domain)**

After the measurement is selected, press **Restore Meas Defaults** to restore factory defaults.

READ Subsystem

:READ:<measurement>[n]?

The READ? commands are used with several other commands and are documented in the section on the “MEASure Group of Commands” on page 20.

SENSe Subsystem

Sets the instrument state parameters so that you can measure the input signal.

Adjacent Channel Power Measurement

Commands for querying the adjacent channel power measurement results and for setting to the default values are found in the "MEASure Group of Commands" on page 20. The equivalent front panel keys for the parameters described in the following commands, are found under the **Meas Setup** key, after the **ACP** measurement has been selected from the **MEASURE** key menu.

Adjacent Channel Power Measurement Average Count

[:SENSe]:ACP:AVERage:COUNt <integer>

[:SENSe]:ACP:AVERage:COUNt?

Set the number of data acquisitions that will be averaged. After the specified number of average counts, the average mode (termination control) setting determines the average action.

Factory Preset and *RST: 10

Range: 1 to 10,000

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Averaging State

[:SENSe]:ACP:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:ACP:AVERage[:STATe]?

Turn average on or off.

Factory Preset and *RST: ON

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Averaging Termination Control

[:SENSe]:ACP:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:ACP:AVERage:TCONtrol?

Select the type of termination control used to averaging. This

determines the averaging action after the specified number of data acquisitions (average count) is reached.

EXPonential – Each successive data acquisition after the average count is reached, is exponentially weighted and combined with the existing average.

REPeat – After reaching the average count, the averaging is reset and a new average is started.

Factory Preset and *RST: EXPonential

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Offset Frequency Absolute Limit

[:SENSe]:ACP:LIST:ALIMit <abs_power>{, <abs_power>}

[:SENSe]:ACP:LIST:ALIMit?

Set the absolute limit on offset frequencies.

Factory Preset and *RST: NADC, 0 dBm, 0 dBm, –13 dBm, 0 dBm, 0 dBm

PDC, 0 dBm, 0 dBm, 0 dBm, 0 dBm, 0 dBm

Range: –200 to 50 dBm

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Offset Frequency

[:SENSe]:ACP:LIST[:FREQuency] <offset freq>{,<offset freq>}

[:SENSe]:ACP:LIST[:FREQuency]?

Define the 5 offset frequencies.

Factory Preset and *RST: NADC, 30 kHz, 60 kHz, 90 kHz, 120 kHz, 0 Hz

PDC, 50 kHz, 100 kHz, 0 kHz, 0 Hz, 0 Hz

Range: 0 to 200 kHz

Default Unit: Hz

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Offset Frequency Power Mode

[:SENSe]:ACP:LIST:POWer INTeg|PEAK{,INTeg|PEAK}

[:SENSe]:ACP:LIST:POWer?

Define the power measurement mode for each of the offset frequencies.

Factory Preset and *RST: INTeg, INTeg, INTeg, INTeg, INTeg

Remarks: You must be in the NADC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Offset Frequency Relative Limit

[:SENSe]:ACP:LIST:RLIMit <rel_power>{, <rel_power>}

[:SENSe]:ACP:LIST:RLIMit?

Set the relative limit on offset frequencies.

Factory Preset and *RST: NADC, –26 dB, –45 dB, –45 dB, 0 dB, 0 dB

PDC, –45 dB, –60 dB, 0 dB, 0 dB, 0 dB

Range: –200 to 50 dB

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Offset Frequency Control

[:SENSe]:ACP:LIST:STATe OFF|ON|0|1{, OFF|ON|0|1}

[:SENSe]:ACP:LIST:STATe?

Turn measurement on or off for the custom offset frequencies.

Factory Preset and *RST: NADC, On, On, On, Off, Off

PDC, On, On, Off, Off, Off

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Offset Frequency Test Mode

[:SENSe]:ACP:LIST:TEST ABSolute|AND|RELative|OR {, ABSolute|AND|RELative|OR}

[:SENSe]:ACP:LIST:TEST?

Define the type of testing to be done for the custom offset frequencies.

Factory Preset and *RST: RELative, RELative, OR, AND, AND

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Trigger Source

[:SENSe]:ACP:TRIGger:SOURce EXTernal[1]|EXTernal2|FRAMe|IMMediate|RFBurst

[:SENSe]:ACP:TRIGger:SOURce?

Select the trigger source used to control the data acquisitions.

EXTernal[1] – front panel external trigger input.

EXTernal2 – rear panel external trigger input.

IMMediate – the next data acquisition is immediately taken, capturing the signal asynchronously (also called free run).

RFBurst – internal wideband RF burst envelope trigger that has automatic level control for periodic burst signals.

IF – internal IF envelope trigger.

Factory Preset and *RST: IMMediate for BS

RFBurst for MS

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Burst Type

[:SENSe]:CHANnel:BURSt TCH|CCH

[:SENSe]:CHANnel:BURSt?

Set the burst type for mobile station testing.

TCH – burst for traffic channel

CCH – burst for control channel

Factory Preset and *RST: TCH

Remarks: The command is only applicable for mobile station testing, device=MS.

You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Slot number

[:SENSe]:CHANnel:SLOT <integer>

[:SENSe]:CHANnel:SLOT?

Select the slot number that you want to search for. SENS:CHAN:SLOT:AUTO must be set to off.

Factory Preset and *RST: PDC - 0

NADC - 1

Range: PDC - 0 to 5

NADC 1 to 6

Remarks: The command is only applicable for mobile station testing, device=MS.

You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Slot Auto

[:SENSe]:CHANnel:SLOT:AUTO OFF|ON|0|1

[:SENSe]:CHANnel:SLOT:AUTO?

Select auto or manual control for slot searching. With auto on, the measurement is made on the first burst found to have one of the valid slot in the range. With auto off, the measurement is made on the 1st burst found to have the slot number that is indicated by the sync word.

Factory Preset

and *RST: On

Remarks: The command is only applicable for mobile station testing, device=MS.

You must be in the NADC or PDC mode to use this command.Use INSTrument:SELect to set the mode.

Correction for Base Station RF Port External Attenuation

[:SENSe]:CORRection:BS[:RF]:LOSS <rel_power>

[:SENSe]:CORRection:BS[:RF]:LOSS?

Set the correction equal to the external attenuation used when measuring base stations.

Factory Preset and *RST: 0 dB

Range: CDMA, 0 to 100 dB

NADC or PDC, –50 to 50 dB

Default Unit: dB

Remarks: You must be in the CDMA, NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Value is global to the current mode.

Correction for Mobile Station RF Port External Attenuation

[:SENSe]:CORRection:MS[:RF]:LOSS <rel_power>

[:SENSe]:CORRection:MS[:RF]:LOSS?

Set the correction equal to the external attenuation used when measuring mobile stations.

Factory Preset and *RST: 0 dB

Range: –50 to 50 dB

Default Unit: dB

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Value is global to the current mode.

Error Vector Magnitude Measurement

Commands for querying the error vector magnitude measurement results and for setting to the default values are found in the "MEASure Group of Commands" on page 20. The equivalent front panel keys for the parameters described in the following commands, are found under the **Meas Setup** key, after the **EVM** measurement has been selected from the **MEASURE** key menu.

Error Vector Magnitude Measurement Average Count

[:SENSe]:EVM:AVERage:COUNt <integer>

[:SENSe]:EVM:AVERage:COUNt?

Set the number of data acquisitions that will be averaged. After the specified number of average counts, the average mode (termination control) setting determines the average action.

Factory Preset and *RST: 10

Range: 1 to 10,000

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Averaging State

[:SENSe]:EVM:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:EVM:AVERage[:STATe]?

Turn average on or off.

Factory Preset and *RST: On

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Averaging Termination Control

[:SENSe]:EVM:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:EVM:AVERage:TCONtrol?

Select the type of termination control used to averaging. This determines the averaging action after the specified number of data acquisitions (average count) is reached.

EXPonential – Each successive data acquisition after the average count is reached, is exponentially weighted and combined with the existing average.

REPeat – After reaching the average count, the averaging is reset

and a new average is started.

Factory Preset and *RST: EXPonential

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Burst Synchronization Source

[:SENSe]:EVM:BSYNc:SOURce RFAMplitude|SWORd|NONE

[:SENSe]:EVM:BSYNc:SOURce?

Select the method of synchronizing the measurement to the bursts.

RFAMplitude – The RF amplitude burst sync approximates the start and stop of the useful part of the burst without demodulation of the burst.

SWORd – The burst sync performs a demodulation of the burst and determines the start and stop of the useful part of the burst based on the midamble sync sequence.

NONE – The measurement is performed without searching burst.

Factory Preset and *RST: NONE for BS

SWORd for MS

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Points/Symbol

[:SENSe]:EVM:TRACe:PPSYmbol <integer>

[:SENSe]:EVM:TRACe:PPSYmbol?

Select the points/symbol for EVM measurement. Only 1 or 5 are valid entries.

Factory Preset and *RST: 5

Range: 1, 5

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Trigger Source

[:SENSe]:EVM:TRIGger:SOURce EXTernal[1]|EXTernal2|IMMediate|RFBurst|IF|FRAMe

[:SENSe]:EVM:TRIGger:SOURce?

Select the trigger source used to control the data acquisitions.

EXTernal[1] – front panel external trigger input

EXTernal2 – rear panel external trigger input

IMMediate – the next data acquisition is immediately taken, capturing the signal asynchronously (also called free run)

RFBurst – internal wideband RF burst envelope trigger that has automatic level control for periodic burst signals

IF – internal IF envelope trigger

FRAMe – internal frame trigger

Factory Preset and *RST: IMMediate for BS

RFBurst for MS

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

RF Port Input Attenuation

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

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

Set the RF input attenuator. This value is set at its auto value if input attenuation is set to auto.

Factory Preset and *RST: 0 dB

Default Unit: dB

Remarks: You must be in the NADC, PDC, or Service mode to use this command. Use INSTrument:SELect to set the mode.

Front Panel Access: **Input, Input Atten**

RF Port Power Range Auto

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

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

Select the RF port power range to be set either automatically or manually.

On - power range is automatically set as determined by the actual measured power level at the start of a measurement.

Off - power range is manually set

Factory Preset and *RST: On

Remarks: Global to the current mode.

You must be in the GSM, CDMA, NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Front Panel Access: **Input, Max Total Pwr (at UUT)**

RF Port Power Range Maximum Total Power

[:SENSe]:POWer[:RF]:RANge[:UPPer] <power>

[:SENSe]:POWer[:RF]:RANge[:UPPer]?

Set the maximum expected total power level at the radio unit under test. This value is ignored if RF port power range is set to auto.

Factory Preset

and *RST:	–15.0 dBm
Range:	CDMA or GSM, –100 to 39.7 dBm
	NADC or PDC, –200 to 50 dBm
Default Unit:	dBm
Remarks:	Global to the current mode. This is coupled to the RF Input Attenuation
	You must be in the CDMA, GSM, NADC, or PDC mode to use this command. Use INSTrument:SELect to set the mode.
Front Panel Access:	**Input, Max Total Pwr (at UUT)**

Radio Test Device

[:SENSe]:RADio:DEVice BS|MS

[:SENSe]:RADio:DEVice?

Select the type of radio device to be tested.

BS – Base station transmitter test

MS – Mobile station transmitter test

Factory Preset and *RST: BS

Remarks: You must be in the NADC, PDC or CDMA mode to use this command. Use INSTrument:SELect to set the mode.

Front Panel Access: **Mode Setup, Radio, Device**

Radio Traffic Rate

[:SENSe]:RADio:TRATe FULL|HALF

[:SENSe]:RADio:TRATe?

Select the traffic rate.

FULL – full traffic rate (a slot is every 20 ms)

HALF – half traffic rate (a slot is every 40 ms)

Factory Preset and *RST: FULL

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Spectrum (Frequency-Domain) Measurement

Commands for querying the spectrum measurement results and for setting to the default values are found in the "MEASure Group of Commands" on page 20. The equivalent front panel keys for the parameters described in the following commands, are found under the **Meas Setup** key, after the **Spectrum (Freq Domain)** measurement has been selected from the **MEASURE** key menu.

Spectrum Measurement Data Acquisition Packing

[:SENSe]:SPECtrum:ACQuisition:PACKing AUTO|LONG|MEDium|SHORt

[:SENSe]:SPECtrum:ACQuisition:PACKing?

Select the amount of data acquisition packing. This is an advanced control that normally does not need to be changed.

Factory Preset and *RST: Auto

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement ADC Dither

[:SENSe]:SPECtrum:ADC:DITHer[:STATe] AUTO|ON|OFF|2|1|0

[:SENSe]:SPECtrum:ADC:DITHer[:STATe]?

Turn the ADC dither on or off. This is an advanced control that normally does not need to be changed.

Factory Preset and *RST: Auto

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement ADC Range

[:SENSe]:SPECtrum:ADC:RANGe AUTO|APEak|APLock|M6|P0|P6|P12|P18|P24|

[:SENSe]:SPECtrum:ADC:RANGe?

Select the range for the gain-ranging that is done in front of the ADC. This is an advanced control that normally does not need to be changed. Auto peak ranging is the default for this measurement. If you are measuring a CW signal please see the description below.

- AUTO - auto range

  For FFT spectrums - auto ranging should not be not be used. An exception to this would be if you know that your signal is

"bursty". Then you might use auto to maximize the time domain dynamic range as long as you are not very interested in the FFT data.

- APEak - auto peak range

  For CW signals, the default of auto-peak ranging can be used, but a better FFT measurement of the signal can be made by selecting one of the manual ranges that are available: M6, P0 - P24. Auto peaking can cause the ADC range gain to move monotonically down during the data capture. This movement should have negligible effect on the FFT spectrum, but selecting a manual range removes this possibility. Note that if the CW signal being measured is close to the auto-ranging threshold, the noise floor may shift as much as 6 dB from sweep to sweep.

- APLock - auto peak lock the range

  — For CW signals, auto-peak lock ranging may be used. It will find the best ADC measurement range for this particular signal and will not move the range as auto-peak can. Note that if the CW signal being measured is close to the auto-ranging threshold, the noise floor may shift as much as 6 dB from sweep to sweep.
  — For "bursty" signals, auto-peak lock ranging should not be used. The measurement will fail to operate, since the wrong (locked) ADC range will be chosen often and overloads will occur in the ADC.

- M6 - manually selects an ADC range that subtracts 6 dB of fixed gain across the range. Manual ranging is best for CW signals.
- P0 to 24 - manually selects ADC ranges that add 0 to 24 dB of fixed gain across the range. Manual ranging is best for CW signals.

Factory Preset and *RST: Auto peak

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Average Clear

[:SENSe]:SPECtrum:AVERage:CLEAr

The average data is cleared and the average counter is reset.

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Number of Averages

[:SENSe]:SPECtrum:AVERage:COUNt <integer>

[:SENSe]:SPECtrum:AVERage:COUNt?

Set the number of 'sweeps' that will be averaged. After the specified number of 'sweeps' (average counts), the averaging mode (terminal control) setting determines the averaging action.

Factory Preset and *RST: 10

Range: 1 to 10,000

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Averaging State

[:SENSe]:SPECtrum:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:SPECtrum:AVERage[:STATe]?

Turn averaging on or off.

Factory Preset and *RST: On

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Averaging Mode

[:SENSe]:SPECtrum:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:SPECtrum:AVERage:TCONtrol?

Select the type of terminal control used for averaging. This determines the averaging action after the specified number of 'sweeps' (average count) is reached.

EXPonential - Each successive data acquisition after the average count is reached, is exponentially weighted and combined with the existing average.

REPeat - After reaching the average count, the averaging is reset and a new average is started.

Factory Preset and *RST: Exponential

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Averaging Type

[:SENSe]:SPECtrum:AVERage:TYPE LOG|MAXimum|MINimum|RMS|SCALar

[:SENSe]:SPECtrum:AVERage:TYPE?

Select the type of averaging.

LOG - The log of the power is averaged. (This is also known as video averaging.)

MAXimum - The maximum values are retained.

MINimum - The minimum values are retained.

RMS - The power is averaged, providing the rms of the voltage.

SCALar - The voltage is averaged.

Factory Preset and *RST: RMS

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement pre-ADC Bandpass Filter

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PADC[:STATe] OFF|ON|0|1

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PADC[:STATe]?

Turn the pre-ADC bandpass filter on or off. This is an advanced control that normally does not need to be changed.

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement pre-FFT BW

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PFFT <freq>

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PFFT?

Set the pre-FFT bandwidth. This is an advanced control that normally does not need to be changed.

Factory Preset and *RST: 30 kHz

Range: 1 kHz to 5 MHz

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement pre-FFT BW Auto

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

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PFFT:AUTO?

Select auto or manual control of the pre-FFT BW. This is an advanced control that normally does not need to be changed.

AUTO - couples the pre-FFT BW to the frequency span.

MANual - the pre-FFT BW is uncoupled from the frequency span.

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Pre-FFT BW Filter Type

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PFFT:TYPE FLAT|GAUSsian

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PFFT:TYPE?

Select the type of pre-FFT filter that is used. This is an advanced control that normally does not need to be changed.

FLAT - a filter with a flat amplitude response, which provides the best amplitude accuracy.

GAUSsian - a filter with Gaussian characteristics, which provides the best pulse response.

Factory Preset and *RST: Flat Top

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Resolution BW

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

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

Set the resolution bandwidth for the FFT. This is the bandwidth used for resolving the FFT measurement. It is not the pre-FFT bandwidth. This value is ignored if the function is auto-coupled.

Factory Preset and *RST: 30 kHz

Range: 1 kHz to 5 MHz

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Resolution BW Auto

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

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

Select auto or manual control of the resolution BW.

AUTO - couples the resolution BW to the frequency span

MANual - the resolution BW is uncoupled from the frequency span

Factory Preset and *RST: Auto

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Decimation of Spectrum Display

[:SENSe]:SPECtrum:DECimate[:FACTor] <integer>

[:SENSe]:SPECtrum:DECimate[:FACTor]?

Set the amount of data decimation done by the hardware and/or the software. For example, if 4 is selected, three out of every four data points will be thrown away. So every 4th data point will be kept.

Factory Preset and *RST: 1

Range: 0 to 1000, where 0 is equivalent to selecting AUTO with SENSe:SPECtrum:DECimate:STATe.

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Control Decimation of Spectrum Display

[:SENSe]:SPECtrum:DECimate:STATe AUTO|MANual

[:SENSe]:SPECtrum:DECimate:STATe?

Selects automatic or manually controlled decimation. This is the amount of data that is ignored by the hardware in order to decrease the number of acquired points in a long capture time.

AUTO - decimation will automatically be set to either 1 (no decimation) or 2, depending on the bandwidth being used.

MANual - allows you to select the desired amount of decimation. Too much decimation will result in aliasing of the FFT spectra.

Factory Preset and *RST: Auto

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement FFT Length

[:SENSe]:SPECtrum:FFT:LENgth <integer>

[:SENSe]:SPECtrum:FFT:LENgth?

Set the FFT length. This value is only used if length control is set to manual. The value must be greater than or equal to the window length value. Any amount greater than the window length is implemented by zero-padding. This is an advanced control that normally does not need to be changed.

Factory Preset

and *RST: 1024

Range: 8 to 1,048,576

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement FFT Length Auto

[:SENSe]:SPECtrum:FFT:LENgth:AUTO OFF|ON|0|1

[:SENSe]:SPECtum:FFT:LENGth:AUTO?

Select auto or manual control of the FFT and window lengths.

This is an advanced control that normally does not need to be changed.

AUTO - the window lengths are coupled to resolution bandwidth, window type (FFT), pre-FFT bandwidth (sample rate) and SENSe:SPECtrum:FFT:RBWPoints.

MANual - lets you set SENSe:SPECtrum:FFT:LENGth and SENSe:SPECtrum:FFT:WINDow:LENGth.

Factory Preset and *RST: Auto

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement FFT Minimum Points in Resolution BW

[:SENSe]:SPECtrum:FFT:RBWPoints <real>

[:SENSe]:SPECtum:FFT:RBWPoints?

Set the minimum number of data points that will be used inside the resolution bandwidth. The value is ignored if length control is set to manual. This is an advanced control that normally does not need to be changed.

Factory Preset and *RST: 1.30

Range: info

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Window Length

[:SENSe]:SPECtrum:FFT:WINDow:LENgth <integer>

[:SENSe]:SPECtrum:FFT:WINDow:LENgth?

Set the FFT window length. This value is only used if length control is set to manual. This is an advanced control that normally does not need to be changed.

Factory Preset and *RST: 256

Range: 8 to 1,048,576

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement FFT Window

[:SENSe]:SPECtrum:FFT:WINDow[:TYPE] BH4Tap|BLACkman|FLATtop|GAUSsian|HAMMing|HANNing|KB70|KB90 |KB110|UNIForm

[:SENSe]:SPECtrum:FFT:WINDow[:TYPE]?

Select the FFT window type.

BH4Tap - Blackman Harris with 4 taps

BLACkman - Blackman

FTOP - flat top, the default (for high amplitude accuracy)

GAUSsian - Gaussian with alpha of 3.5

HAMMing - Hamming

HANNing - Hanning

KB70, 90, and 110 - Kaiser Bessel with sidelobes at –70, –90, or –110 dBc

UNIForm - no window is used. (This is the unity response.)

Factory Preset and *RST: Flat top

Remarks: This selection affects the acquisition point quantity and the FFT size, based on the resolution bandwidth selected.

To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Frequency Span

[:SENSe]:SPECtrum:FREQuency:SPAN <freq>

[:SENSe]:SPECtrum:FREQuency:SPAN?

Set the frequency span to be measured.

Factory Preset and *RST: 5 MHz

Range: 10 Hz to 10 MHz (15 MHz when Service mode is selected)

Default Unit: Hz

Remarks: The actual measured span will generally be slightly wider due to the finite resolution of the FFT.

To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Trigger Source

[:SENSe]:SPECtrum:TRIGger:SOURce EXTernal[1]|EXTernal 2|FRAMe|IF|LINE|IMMediate|RFBurst

[:SENSe]:SPECtrum:TRIGger:SOURce?

Select the trigger source used to control the data acquisitions.

EXTernal[1] - front panel external trigger input

EXTernal 2 - rear panel external trigger input

FRAMe - internal frame timer

IF - internal IF envelope trigger

LINE - internal line trigger

IMMediate - the next data acquisition is immediately taken (also called Free Run).

RFBurst - internal wideband RF burst envelope trigger that has automatic level control for periodic burst signals.

Factory Preset and *RST: Immediate (Free Run), for Basic mode and CDMA mode
RF burst, for GSM mode

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Video/IQ Decimation

[:SENSe]:SPECtrum:VDECimate <integer>

[:SENSe]:SPECtrum:VDECimate?

Set amount of video (IQ data) decimation.The decimation process allows you to ignore some of the data to work with a smaller set of data. Decimation by 3 keeps every third sample, throwing away the two in between. Similarly, decimation by 5 keeps every fifth sample, throwing away the four in between.

Using zero (0) decimation selects the automatic mode. The measurement will then automatically choose decimation by "1" or "2" as is appropriate for the bandwidth being used. This is an advanced control that normally does not need to be changed.

Factory Preset and *RST:	0, the auto mode
Range:	0 to 1000
Remarks:	To use this command, the appropriate mode should be selected with INSTrument:SELect.

Burst Sync Delay

[:SENSe]:SYNC:BURSt:DELay <time>

[:SENSe]:SYNC:BURSt:DELay?

Set the delay for the burst measurement position from the reference position that is determined by sync word or the burst rising/falling edges.

Factory Preset and *RST: 0 sec

Range: –500 ms to 500 ms

Default Unit: seconds

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Burst Search Threshold

[:SENSe]:SYNC:BURSt:STHReshold <rel_power>

[:SENSe]:SYNC:BURSt:STHReshold?

Set the relative power threshold from the peak power, which is used to determine the burst rising edge and falling edge.

Factory Preset and *RST: –30 dB

Range: –200 to –0.01 dB

Default Unit: dB

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Front Panel Access: **Mode Setup, Trigger, Burst Search Threshold**

Waveform (Time-Domain) Measurement

Commands for querying the waveform measurement results and for setting to the default values are found in the "MEASure Group of Commands" on page 20. The equivalent front panel keys for the parameters described in the following commands, are found under the **Meas Setup** key, after the **Waveform (Time Domain)** measurement has been selected from the **MEASURE** key menu.

Waveform Measurement pre-ADC Bandpass Filter

[:SENSe]:WAVeform:ADC:FILTer:[:STATe] OFF|ON|0|1

[:SENSe]:WAVeform:ADC:FILTer:[:STATe]?

Turn the pre-ADC bandpass filter on or off. This is an Advanced control that normally does not need to be changed.

Preset: Off

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement ADC Range

[:SENSe]:WAVeform:ADC:RANGe
AUTO|APEak|APLock|GROund|M6|P0|P6|P12|P18|P24|

[:SENSe]:WAVeform:ADC:RANGe?

Select the range for the gain-ranging that is done in front of the ADC. This is an Advanced control that normally does not need to be changed.

AUTO - auto range

APEak - auto peak range

APLock - auto peak lock

GROund - ground

M6 - subtracts 6 dB of fixed gain across the range

P0 to 24 - adds 0 to 24 dB of fixed gain across the range

Factory Preset and *RST: Auto

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Number of Averages

[:SENSe]:WAVeform:AVERage:COUNt <integer>

[:SENSe]:WAVeform:AVERage:COUNt?

Set the number of sweeps that will be averaged. After the specified

number of sweeps (average counts), the averaging mode (terminal control) setting determines the averaging action.

Factory Preset and *RST: 10

Range: 1 to 10,000

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Averaging State

[:SENSe]:WAVeform:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:WAVeform:AVERage[:STATe]?

Turn averaging on or off.

Factory Preset and *RST: Off

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Averaging Mode

[:SENSe]:WAVeform:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:WAVeform:AVERage:TCONtrol?

Select the type of terminal control used for averaging. This determines the averaging action after the specified number of 'sweeps' (average count) is reached.

EXPonential - Each successive data acquisition after the average count is reached, is exponentially weighted and combined with the existing average.

REPeat - After reaching the average count, the averaging is reset and a new average is started.

Factory Preset and *RST: Exponential

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Averaging Type

[:SENSe]:WAVeform:AVERage:TYPE LOG|MAXimum|MINimum|RMS|SCALar

[:SENSe]:WAVeform:AVERage:TYPE?

Select the type of averaging.

LOG - The log of the power is averaged. (This is also known as video

averaging.)

MAXimum - The maximum values are retained.

MINimum - The minimum values are retained.

RMS - The power is averaged, providing the rms of the voltage.

Factory Preset and *RST: RMS

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Resolution BW

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

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

Set the resolution bandwidth. This value is ignored if the function is auto-coupled.

Factory Preset and *RST: 20 kHz in Basic mode
500 kHz in GSM mode
2 MHz in CDMA mode

20 kHz

Range: 1 kHz to 5 MHz

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Resolution BW Filter Type

[:SENSe]:WAVeform:BANDwidth|BWIDth[:RESolution]:TYPE FLATtop|GAUSsian

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

Select the type of Resolution BW filter that is used. This is an Advanced control that normally does not need to be changed.

FLATtop - a filter with a flat amplitude response, which provides the best amplitude accuracy.

GAUSsian - a filter with Gaussian characteristics, which provides the best pulse response.

Factory Preset and *RST: Gaussian

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Decimation of Waveform Display

[:SENSe]:WAVeform:DECimate[:FACTor] <integer>

[:SENSe]:WAVeform:DECimate[:FACTor]?

Set the amount of data decimation done by the hardware and/or the firmware. For example, if 4 is selected, three out of every four data points will be thrown away. So every 4th data point will be kept.

Factory Preset and *RST: 1

Range: 1 to 4

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Control Decimation of Waveform Display

[:SENSe]:WAVeform:DECimate:STATe OFF|ON|0|1

[:SENSe]:WAVeform:DECimate:STATe?

Set the amount of data decimation done by the hardware in order to decrease the number of acquired points in a long capture time. This is the amount of data that the measurement ignores.

Factory Preset and *RST: Off

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Sweep (Acquisition) Time

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

[:SENSe]:WAVeform:SWEep:TIME?

Set the measurement acquisition time. It is used to specify the length of the time capture record.

Factory Preset and *RST: 2.0 ms

Range: 10 µs to 100 s

Default Unit: seconds

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Trigger Source

[:SENSe]:WAVeform:TRIGger:SOURce EXTernal[1]|EXTernal 2|LINE|IF|IMMediate|RFBurst

[:SENSe]:WAVeform:TRIGger:SOURce?

Select the trigger source used to control the data acquisitions.

EXTernal[1] - front panel external trigger input

EXTernal 2 - rear panel external trigger input

FRAMe - internal frame timer

LINE - internal line trigger

IMMediate - the next data acquisition is immediately taken (also called Free Run).

RFBurst - internal wideband RF burst envelope trigger that has automatic level control for periodic burst signals.

VIDeo - internal IF Envelope trigger

Factory Preset and *RST: Immediate (Free Run), for Basic mode and CDMA mode
RF burst, for GSM mode

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

2 PDC Programming Commands

These commands are only available when the PDC mode has been selected using **INSTrument:SELect**. If PDC mode is selected, commands that are unique to another mode are not available.

SCPI Command Subsystems

CALCulate on page 63

CONFigure on page 72

DISPlay on page 73

FETCh on page 75

MEASure on page 76

READ on page 89

SENSe on page 90

CALCulate Subsystem

This subsystem is used to perform post-acquisition data processing. In effect, the collection of new data triggers the CALCulate subsystem. In this instrument, the primary functions in this subsystem are markers and limits.

Adjacent Channel Power Measurement Limit Test

:CALCulate:ACP:LIMit[:TEST] OFF|ON|0|1

:CALCulate:ACP:LIMit[:TEST]?

Turn limit test on or off.

Factory Preset and *RST: On

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Query the Current Measurement Status

:CALCulate:CLIMits:FAIL?

Checks if the current measurement is outside its limits. It returns a 0 (zero) if it is passing or a 1 (one) if it is failing.

Front Panel Access: None

Calculate Data Query

:CALCulate:DATA[n]?

Returns the designated measurement data for the currently selected measurement and sub-opcode.

n = any valid sub-opcode for the current measurement. See the "MEASure Group of Commands" on page 76 for information on the data that can be returned for each measurement.

Error Vector Magnitude Measurement I/Q Origin Offset Error Limit

:CALCulate:EVM:LIMit:IQOOffset <dB>

:CALCulate:EVM:LIMit:IQOOffset?

Set the I/Q origin offset error limit in dB.

Factory Preset

and *RST: –20 dB

Range: –100 dB to 0 dB

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Peak EVM Limit

:CALCulate:EVM:LIMit:PEAK <percent>

:CALCulate:EVM:LIMit:PEAK?

Set the peak EVM limit in percent.

Factory Preset and *RST: 40.0%

Range: 0 to 50%

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement RMS EVM Limit

:CALCulate:EVM:LIMit:RMS <percent>

:CALCulate:EVM:LIMit:RMS?

Set the RMS EVM limit in percent.

Factory Preset and *RST: 12.5%

Range: 0 to 50%

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Limit Testing Control

:CALCulate:EVM:LIMit[:TEST] OFF|ON|0|1

:CALCulate:EVM:LIMit[:TEST]?

Turn limit test on or off.

Factory Preset and *RST: On

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

CALCulate:MARKers Subsection

Each measurement has its own instrument state for marker parameters. Therefore, the marker settings in each measurement are saved if you exit the measurement and are then recalled when you change back to that measurement.

In using the marker commands it is necessary to specify the measurement in the SCPI command. It is highly recommended that you use the marker commands only on the current measurement. Many marker commands will return invalid results, when used on a measurement that is not current. (This is true for commands that do more than simply setting or querying an instrument parameter.) No error is reported for these invalid results.

PDC Mode - valid <measurement> key words

- ACP - adjacent channel power measurement
- EVM - error vector magnitude measurement
- OBW - occupied bandwidth measurement
- SPECtrum - spectrum (frequency domain) measurement
- WAVeform - waveform (time domain) measurement

Example:

Suppose you are using the Spectrum measurement. To position marker 2 at the maximum peak value, of the trace that marker 2 is currently on, the command is:

```
:CALCulate:SPECtrum:MARKer2:MAXimum
```

Markers All Off on All Traces

```
:CALCulate:<measurement>:MARKer:AOFF
```

Turns off all markers on all the traces.

Example: **CALC:SPEC:MARK:AOFF**

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime, WAVeform)

Front Panel Access: **Marker, More, Marker All Off**

Marker Function

```
:CALCulate:<measurement>:MARKer[1]|2|3|4:FUNCtion
BPOWer|NOISe|OFF
```

```
:CALCulate:<measurement>:MARKer[1]|2|3|4:FUNCtion?
```

Selects the marker function for the specified marker.

Some measurements may only have one or two markers available. Also, they may not have both noise and band-power markers. For example, the WAVeform measurement only uses two markers and only has band-power markers.

Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

BPOWer is the integrated power between the two markers for traces in the frequency domain and is the mean power between the two markers for traces in the time domain.

NOISe is the noise power spectral density in a 1 Hz bandwidth. It is averaged over 32 horizontal trace points.

OFF turns off the marker functions

Example: **CALC:SPEC:MARK3:FUNC Noise**

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime, WAVeform)

Front Panel Access: **Marker, Marker Function**

Marker Function Result

:CALCulate:<measurement>:MARKer[1]|2|3|4:FUNCtion:RESult?

Quires the result of the currently active marker function.

Some measurements may only have one or two markers available. Also, they may not have both noise and band-power markers. For example, the WAVeform measurement only uses two markers and only has band-power markers.

Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

Example: **CALC:SPEC:MARK:FUNC:RES?**

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime, WAVeform)

Front Panel Access: **Marker, Marker Function**

Marker Peak (Maximum) Search

:CALCulate:<measurement>:MARKer[1]|2|3|4:MAXimum

Places the selected marker on the highest point on the trace that is assigned to that particular marker number. Use

:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe to assign a marker to a particular trace.

Example: **CALC:SPEC:MARK1:MAX**

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum and AREFerence)

Front Panel Access: **Search**

Marker Peak (Minimum) Search

:CALCulate:<measurement>:MARKer[1]|2|3|4:MINimum

Places the selected marker on the lowest point on the trace that is assigned to that particular marker number. Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

Example: **CALC:SPEC:MARK2:MIN**

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime)

Front Panel Access: **Search, More, Min Search**

Marker Mode

:CALCulate:<measurement>:MARKer[1]|2|3|4:MODE POSition|DELTa

:CALCulate:<measurement>:MARKer[1]|2|3|4:MODE?

Selects the marker mode to be position or delta

Some measurements may only have one or two markers available. Also, they may not have both position and delta markers. Several measurements only have position markers.

Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

Example: **CALC:SPEC:MARK:MODE DELTA**

Remarks: For the delta mode only markers 1 and 2 are valid.

The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum and AREFerence)

Front Panel Access: **Marker, Marker [Delta]**

Marker On/Off

:CALCulate:<measurement>:MARKer[1]|2|3|4[:STATe] OFF|ON|0|1

:CALCulate:<measurement>:MARKer[1]|2|3|4[:STATe]?

Turns the selected marker on or off.

Some measurements may only have one or two markers available. Also, they may not have both noise and band-power markers. For example, the WAVeform measurement only uses two markers and only has band-power markers.

Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

Example: **CALC:SPEC:MARK2: on**

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, WAVeform)

The WAVeform measurement only has two markers available.

Front Panel Access: M**arker, Select** then **Marker Normal** or **Marker On Off**

Marker to Trace

:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe <trace_name>|<trace_name>

:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe?

Assigns the specified marker to the designated trace. Not all measurement data can have traces assigned to it.

Example: **CALC:SPEC:MARK2:TRACE RFENvelope**

Range: The names of valid traces are dependent upon the selected measurement. See the "MEASure Group of Commands" on page 76 for more detailed information about the available traces. Note that the trace name assignment is independent of the window number.

Measurement	Available Traces
SPECtrum - (frequency domain)	RFENvelope (*n*=2)[a] IQ (*n*=3)[a] SPECtrum (*n*=4)[a] ASPectrum (*n*=7)[a]
WAVEform - (time domain)	RFENvelope (*n*=2)[a] IQ (*n*=8)[a]

Measurement	Available Traces
ACP - adjacent channel power	no markers
EVM - error vector magnitude	EVM (*n*=2)[a] MERRor (*n*=3)[a] PERRor (*n*=4)[a]
OBW - occupied bandwidth	no markers

a. The *n* number indicates the sub-opcode that corresponds to this trace. Detailed descriptions of the trace data can be found in the MEASure subsystem documentation by looking up the sub-opcode for the appropriate measurement.

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime)

Front Panel Access: **Marker, Marker Trace**

Marker X Value

:CALCulate:<measurement>:MARKer[1]|2|3|4:X <param>

:CALCulate:<measurement>:MARKer[1]|2|3|4:X?

Position the designated marker on its assigned trace at the specified X value. The value is in the X-axis units (which is often frequency or time). Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

The query returns the current X value of the designated marker.

Example: **CALC:SPEC:MARK2:X 1.2e6 Hz**

Default Unit: Matches the units of the trace on which the marker is positioned

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime, WAVeform)

Front Panel Access: **Marker, <active marker>, RPG**

Marker X Position

:CALCulate:<measurement>:MARKer[1]|2|3|4:X:POSition <integer>

:CALCulate:<measurement>:MARKer[1]|2|3|4:X:POSition?

Position the designated marker on its assigned trace at the specified X position. A trace is composed of a variable number of measurement points. This number changes depending on the current measurement conditions. The current number of points must be identified before using this command to place the marker at a specific location. Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

The query returns the current X position for the designated marker.

Example: **CALC:SPEC:MARK:X:POS 500**

Range: 0 to a maximum of (3 to 920,000)

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime)

Front Panel Access: **Marker, <active marker>, RPG**

Marker Readout Y Value

:CALCulate:<measurement>:MARKer[1]|2|3|4:Y?

Readout the current Y value for the designated marker on its assigned trace. The value is in the Y-axis units for the trace (which is often dBm). Use **:CALCulate:<measurement>:MARKer[1]|2|3|4:TRACe** to assign a marker to a particular trace.

Example: **CALC:SPEC:MARK1:Y -20 dB**

Default Unit: Matches the units of the trace on which the marker is positioned

Remarks: The keyword for the current measurement must be specified in the command. (Some examples include: SPECtrum, AREFerence, PVTime)

Occupied Bandwidth Measurement Frequency Band Limit

:CALCulate:OBW:LIMit:FBLimit <freq>

:CALCulate:OBW:LIMit:FBLimit?

Set the frequency band limit in Hz.

Factory Preset and *RST: 32.0 kHz

Range: 10 kHz to 60 kHz

Default Unit: Hz

Remarks: You must be in the PDC mode to use this command. Use INSTrument:SELect to set the mode.

Occupied Bandwidth Measurement Limit Test

:CALCulate:OBW:LIMit[:TEST] OFF|ON|0|1

:CALCulate:OBW:LIMit[:TEST]?

Turn limit testing on or off.

Factory Preset and *RST: ON

Remarks: You must be in the PDC mode to use this command. Use INSTrument:SELect to set the mode.

CONFigure Subsystem

:CONFigure:<measurement>

The CONFigure commands are used with several other commands and are documented in the section on the "MEASure Group of Commands" on page 76.

Configure Query

:CONFigure?

The CONFigure? query returns the current measurement name.

DISPlay Subsystem

The DISPlay controls the selection and presentation of textual, graphical, and TRACe information. Within a DISPlay, information may be separated into individual WINDows.

Adjacent Channel Power Measurement View Selection

:DISPlay:ACP:VIEW BGRaph|SPECtrum

:DISPlay:ACP:VIEW?

Select the view either bar graph mode or spectrum mode.

Factory Preset and *RST: BGRaph

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement View Selection

:DISPlay:EVM:VIEW POLar|CONStln|QUAD

:DISPlay:EVM:VIEW?

Select the view of EVM measurement

Factory Preset and *RST: POLar

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Select Display Format

:DISPlay:FORMat:TILE

Selects the viewing format that displays multiple windows of the current measurement data simultaneously.

Front Panel Access: **Next Window**

Turn a Trace Display On/Off

:DISPlay:TRACe[n][:STATe] OFF|ON|0|1

:DISPlay:TRACe[n][:STATe]?

Controls whether the specified trace is visible or not.

n is a sub-opcode that is valid for the current measurement. See the "MEASure Group of Commands" on page 76 for more information about sub-opcodes.

Factory Preset and *RST: On

Range: The valid traces and their sub-opcodes are dependent upon the selected measurement. The trace name assignment is independent of the window number.

Measurement	Available Traces and Sub-opcodes
SPECtrum - (frequency domain)	RFENvelope (*n*=2)[a] IQ (*n*=3)[a] SPECtrum (*n*=4)[a] ASPectrum (*n*=7)[a]
WAVEform - (time domain)	RFENvelope (*n*=2)[a] IQ (*n*=8)[a]
ACP - adjacent channel power	no markers
EVM - error vector magnitude	EVM (*n*=2)[a] MERRor (*n*=3)[a] PERRor (*n*=4)[a]
OBW - occupied bandwidth	no markers

a. The *n* number indicates the sub-opcode that corresponds to this trace. Detailed descriptions of the trace data can be found in the MEASure subsystem documentation by looking up the sub-opcode for the appropriate measurement.

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Front Panel Access: **Display, Display Traces**

FETCh Subsystem

:FETCh:<measurement>[n]?

The FETCh? commands are used with several other commands and are documented in the section on the “MEASure Group of Commands” on page 76.

MEASure Group of Commands

This group includes commands used to make measurements and return results. The different commands can be used to provide fine control of the overall measurement process. Most measurements should be done in single measurement mode, rather than doing the measurement continuously.

Each measurement sets the instrument state that is appropriate for that measurement. Other commands are available for each **Mode** to allow changing settings, view, limits, etc. Refer to:

SENSe:<measurement>, SENSe:CHANnel, SENSe:CORRection, SENSe:FREQuency, SENSe:POWer, SENSe:RADio, SENSe:SNYC
CALCulate:<measurement>, CALCulate:CLIMits/DATA
DISPlay:<measurement>
TRIGger

Measure Commands

:MEASure:<measurement>[n]?

This is a fast single-command way to make a measurement using the factory default instrument settings. These are the settings and units that conform to the Standard.

- Stops the current measurement and sets up the instrument for the specified measurement using the factory defaults
- Initiates the data acquisition for the measurement
- Blocks other SCPI communication, waiting until the measurement is complete before returning results.
- After the data is valid it returns the scalar results, or the trace data, for the specified measurement.

  If the optional [n] value is not included, or is set to 1, the scalar measurement results will be returned. If the [n] value is set to a value other than 1, the selected trace data results will be returned. See each command for details of what types of scalar results or trace data results are available. The binary data formats should be used for handling large blocks of data since they are smaller and faster then the ASCII format.

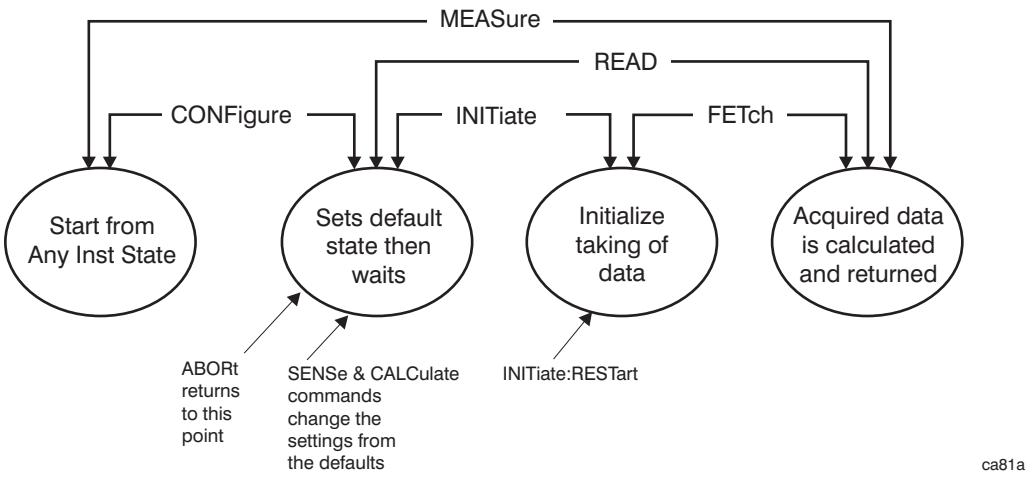
If you need to change some of the measurement parameters from the factory default settings you can set up the measurement with the CONFigure command. Use the commands in the SENSe:<measurement> and CALCulate:<measurement> subsystems to change the settings. Then you can use the READ? command, or the INITiate and FETCh? commands, to initiate the measurement and

query the results. See Figure 2-1.

If you need to repeatedly make a given measurement with settings other than the factory defaults, you can use the commands in the SENSe:<measurement> and CALCulate:<measurement> subsystems to set up the measurement. Then use the READ? command or INITiate and FETCh? commands, to initiate the measurement and query results.

Measurement settings persist if you initiate a different measurement and then return to a previous one. Use READ:<measurement>? if you want to use those persistent settings. If you want to go back to the default settings, use MEASure:<measurement>?.

Figure 2-1 Measurement Group of Commands



Configure Commands

:CONFigure:<measurement>

This command sets up the instrument for the specified measurement using the factory default instrument settings and stops the current measurement. It does not initiate the taking of measurement data.

The CONFigure? query returns the current measurement name.

Fetch Commands

:FETCh:<measurement>[n]?

This command puts valid data into the output buffer, but does not initiate data acquisition. Use the INITiate[:IMMediate] command to acquire data before you use the FETCh command. You can only fetch results from the measurement that is currently selected.

If the optional [n] value is not included, or is set to 1, the scalar measurement results will be returned. If the [n] value is set to a value

other than 1, the selected trace data results will be returned. See each command for details of what types of scalar results or trace data results are available. The binary data formats should be used for handling large blocks of data since they are smaller and faster then the ASCII format.

Read Commands

:READ:<measurement>[n]?

- Does not preset the measurement to the factory defaults. (The MEASure? command does preset.) It uses the settings from the last measurement.
- Initiates the measurement and puts valid data into the output buffer. If a measurement other than the current one is specified, the instrument will switch to that measurement before it initiates the measurement and returns results.
- Blocks other SCPI communication, waiting until the measurement is complete before returning the results

  If the optional [n] value is not included, or is set to 1, the scalar measurement results will be returned. If the [n] value is set to a value other than 1, the selected trace data results will be returned. See each command for details of what types of scalar results or trace data results are available. The binary data formats should be used when handling large blocks of data since they are smaller and faster then the ASCII format.

Measurement settings persist if you initiate a different measurement and then return to a previous one. Use READ:<measurement>? if you want to use those persistent settings. If you want to go back to the default settings, use MEASure:<measurement>?.

Adjacent Channel Power (ACP) Measurement

This measures the total rms power in the specified channel and in 5 offset channels. You must be in the NADC or PDC mode to use these commands. Use INSTrument:SELect to set the mode.

The general functionality of CONFigure, FETCh, MEASure, and READ are described at the beginning of this section. See the SENSe:ACP information for more measurement related commands.

:CONFigure:ACP

:FETCh:ACP[n]?

:READ:ACP[n]?

:MEASure:ACP[n]?

Measurement results available:

n	Results Returned
0	Returns unprocessed I/Q trace data, as a data array of comma-separated trace points, in volts.
1(default)	Returns 22 comma-separated scalar results, in the following order: Center freq – absolute power (dBm) Center freq – absolute power (W) Negative offset freq(1) – relative power (dB) Negative offset freq(1) – absolute power (dBm) Positive offset freq(1) – relative power (dB) Positive offset freq(1) – absolute power (dBm) . . . . Positive offset freq(5) – relative power (dB) Positive offset freq(5) – absolute power (dBm)
2	Returns 10 comma-separated scalar values of the pass/fail (1=passed, or 0=failed) results determined by testing the absolute power of the offset frequencies: Negative offset frequency(1) absolute power Positive offset frequency(1) absolute power . . . . Negative offset frequency(5) absolute power Positive offset frequency(5) absolute power
3	Returns 10 comma-separated scalar values of the pass/fail (1=passed, or 0=failed) results determined by testing the relative power of the offset frequencies: Negative offset frequency(1) relative power Positive offset frequency(1) relative power . . . . Negative offset frequency(5) relative power Positive offset frequency(5) relative power

n	Results Returned
4	Returns the frequency-domain spectrum trace (data array) for the entire frequency range being measured. In order to return spectrum data, the NADC display must be in the spectrum display mode.

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement

This measures the vector error of the magnitude of each symbol. You must be in the NADC or PDC mode to use these commands. Use INSTrument:SELect to set the mode.

The general functionality of CONFigure, FETCh, MEASure, and READ are described at the beginning of this section. See the SENSe:EVM information for more measurement related commands.

:CONFigure:EVM

:FETCh:EVM[n]?

:READ:EVM[n]?

:MEASure:EVM[n]?

Measurement results available:

n	Results Returned
0	Returns unprocessed I/Q trace data, as a data array of comma-separated trace points, in volts.
1 (default)	PDC returns the following 7 comma-separated scalar results, in order. 1. RMS EVM – a floating point number (in percent) of EVM over the entire measurement area. 2. Peak EVM error – a floating point number (in percent) of peak EVM in the measurement area. 3. Symbol position of the peak EVM error – an integer number of the symbol position where the peak EVM error is detected. 4. Magnitude error – a floating point number (in percent) of average magnitude error over the entire measurement area. 5. Phase error – a floating point number (in degree) of average phase error over the entire measurement area. 6. Frequency error – a floating point number (in Hz) of the frequency error in the measured signal. 7. I/Q origin offset – a floating point number (in dB) of the I and Q error (magnitude squared) offset from the origin.
2	Returns series of floating point numbers (in percent) that represent each sample in the EVM trace. The first number is the symbol 0 decision point and there are 5 points per symbol. Therefore, the decision points are at 0, 5, 10, 15. . . .
3	Returns series of floating point numbers (in percent) that represent each sample in the magnitude error trace. The first number is the symbol 0 decision point and there are 5 points per symbol. Therefore, the decision points are at 0, 5, 10, 15. . . .

n	Results Returned
4	Returns series of floating point numbers (in degree) that represent each sample in the phase error trace. The first number is the symbol 0 decision point and there are 5 points per symbol. Therefore, the decision points are at 0, 5, 10, 15. . . .
5	Returns series of floating point numbers that alternately represent I and Q pairs of the corrected measured trace. The magnitude of each I and Q pair are normalized to 1.0. The first number is the in-phase (I) sample of symbol 0 decision point and the second is the quadrature-phase (Q) sample of symbol 0 decision point. As in the EVM, there are 5 points per symbol, so that: 1st number = I of the symbol 0 decision point 2nd number = Q of the symbol 0 decision point . . . . 11th number = I of the symbol 1 decision point 12th number = Q of the symbol 1 decision point . . . . 10xNth + 1 number = I of the symbol N decision point 10xNth + 2 number = Q of the symbol N decision point
6	PDC returns the following 3 comma-separated scalar values of 1 or 0, in the order given. The pass/fail results (1=passed, or 0=failed) are determined by testing the EVM, peak EVM, and IQ origin offsets. Test result of EVM Test result of peak EVM Test result of IQ origin offset

Remarks: You must be in the PDC mode to use this command. Use INSTrument:SELect to set the mode.

Occupied Bandwidth Measurement

This measures the bandwidth of the carrier signal in the occupied part of the channel. You must be in the PDC mode to use these commands. Use INSTrument:SELect to set the mode.

The general functionality of CONFigure, FETCh, MEASure, and READ are described at the beginning of this section. See the SENSe:OBW information for more measurement related commands.

:CONFigure:OBW

:FETCh:OBW[n]?

:READ:OBW[n]?

:MEASure:OBW[n]?

Measurement results available:

n	Results Returned
0	Returns unprocessed I/Q trace data, as a data array of comma-separated trace points, in volts.
1 (default)	Returns 2 comma-separated scalar results, in the following order: Occupied bandwidth - kHz Absolute Carrier Power - dBm
2	Returns the frequency-domain spectrum trace (data array) for the entire frequency range being measured

Remarks: You must be in the PDC mode to use this command. Use INSTrument:SELect to set the mode.

Spectrum (Frequency Domain) Measurement

This measures the amplitude of your input signal with respect to the frequency. It provides spectrum analysis capability using FFT (fast Fourier transform) measurement techniques. You must select the appropriate mode using INSTrument:SELect, to use these commands.

The general functionality of CONFigure, FETCh, MEASure, and READ are described at the beginning of this section. See the SENSe:SPECtrum information for more measurement related commands.

:CONFigure:SPECtrum

:FETCh:SPECtrum[n]?

:READ:SPECtrum[n]?

:MEASure:SPECtrum[n]?

Measurement Results Available

n	Results Returned
0	Returns unprocessed I/Q trace data, as a series of comma-separated trace points, in volts. The I values are listed first in each pair, using the 0 through even-indexed values. The Q values are the odd-indexed values.
not specified or n=1	Returns the following comma-separated scalar results: 1. **FFT peak** is the FFT peak amplitude. 2. **FFT frequency** is the FFT frequency of the peak amplitude. 3. **FFT points** is the Number of points in the FFT spectrum. 4. **First FFT frequency** is the frequency of the first FFT point of the spectrum. 5. **FFT spacing** is the frequency spacing between the FFT points of the spectrum. 6. **Time domain points** is the number of points in the time domain trace used for the FFT. 7. **First time point** is the time of the first time domain point, where time zero is the trigger event. 8. **Time spacing** is the time spacing between the time domain points. 9. **Time domain** returns a 1, if time domain is complex (I/Q), or 0 if it is real. (raw ADC samples) 10. **Scan time** is the total scan time of the time domain trace used for the FFT. 11. **Current average count** is the current number of data measurements that have already been combined, in the averaging calculation.

n	Results Returned
2, **Service** mode only	Returns the trace data of the log-magnitude versus time. (That is, the RF envelope.)
3	Returns the I and Q trace data. It is represented by I and Q pairs (in volts) versus time.
4	Returns spectrum trace data. That is, the trace of log-magnitude versus frequency. (The trace is computed using a FFT.)
5, **Service** mode only	Returns the averaged trace data of log-magnitude versus time. (That is, the RF envelope.)
6	Not used.
7	Returns the averaged spectrum trace data. That is, the trace of the averaged log-magnitude versus frequency.
8	Not used.
9	Returns a trace containing the shape of the FFT window.
10, **Service** mode only	Returns trace data of the phase of the FFT versus frequency.

Front Panel Access: **Measure, Spectrum (Freq Domain)**

After the measurement is selected, press **Restore Meas Defaults** to restore factory defaults.

Waveform (Time Domain) Measurement

This measures the power in your input signal with respect to time and is equivalent to zero-span operation in a traditional spectrum analyzer. You must select the appropriate mode using INSTrument:SELect, to use these commands.

The general functionality of CONFigure, FETCh, MEASure, and READ are described at the beginning of this section. See the SENSe:WAVeform information for more measurement related commands.

:CONFigure:WAVeform

:FETCh:WAVeform[n]?

:READ:WAVeform[n]?

:MEASure:WAVeform[n]?

Measurement Results Available

n	Results Returned
0, or 8	Returns unprocessed I/Q trace data, as a series of comma-separated trace points, in volts. The I values are listed first in each pair, using the 0 through even-indexed values. The Q values are the odd-indexed values.
not specified or n=1	Returns the following comma-separated scalar results: 1. **Sample time** is a floating point number representing the time between samples when using the trace queries (n=0,2,etc). 2. **Mean power** is the mean power (in dBm). This is either the power across the entire trace, or the power between markers if the markers are enabled. If averaging is on, the power is for the latest acquisition. 3. **Mean power averaged** is the power (in dBm) for N averages, if averaging is on. This is either the power across the entire trace, or the power between markers if the markers are enabled. If averaging is on, the power is for the latest acquisition. If averaging is off, the value of the mean power averaged is the same as the value of the mean power. 4. **Number of samples** is the number of data points in the captured signal. This number is useful when performing a query on the signal (i.e. when n=0,2,etc.). 5. **Peak-to-mean ratio** has units of dB. The peak is defined to be the maximum level of the signal (non-averaged). The mean is the mean power (non-averaged). If averaging is on, the peak-to-mean ratio is invalid. 6. **Maximum value** is the maximum of the most recently acquired data (in dBm). 7. **Minimum value** is the minimum of the most recently acquired data (in dBm).

n	Results Returned
2	Returns comma-separated trace points of the entire captured trace data. These data points are floating point numbers representing the power of the signal (in dBm). There are N data points, where N is the **number of samples**. The period between the samples is defined by the **sample time**.

Front Panel Access: **Measure, Waveform (Time Domain)**

After the measurement is selected, press **Restore Meas Defaults** to restore factory defaults.

READ Subsystem

:READ:<measurement>[n]?

The READ? commands are used with several other commands and are documented in the section on the “MEASure Group of Commands” on page 76.

SENSe Subsystem

Sets the instrument state parameters so that you can measure the input signal.

Adjacent Channel Power Measurement

Commands for querying the adjacent channel power measurement results and for setting to the default values are found in the "MEASure Group of Commands" on page 76. The equivalent front panel keys for the parameters described in the following commands, are found under the **Meas Setup** key, after the **ACP** measurement has been selected from the **MEASURE** key menu.

Adjacent Channel Power Measurement Average Count

[:SENSe]:ACP:AVERage:COUNt <integer>

[:SENSe]:ACP:AVERage:COUNt?

Set the number of data acquisitions that will be averaged. After the specified number of average counts, the average mode (termination control) setting determines the average action.

Factory Preset and *RST: 10

Range: 1 to 10,000

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Averaging State

[:SENSe]:ACP:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:ACP:AVERage[:STATe]?

Turn average on or off.

Factory Preset and *RST: ON

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Averaging Termination Control

[:SENSe]:ACP:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:ACP:AVERage:TCONtrol?

Select the type of termination control used to averaging. This

determines the averaging action after the specified number of data acquisitions (average count) is reached.

EXPonential – Each successive data acquisition after the average count is reached, is exponentially weighted and combined with the existing average.

REPeat – After reaching the average count, the averaging is reset and a new average is started.

Factory Preset and *RST: EXPonential

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Offset Frequency Absolute Limit

[:SENSe]:ACP:LIST:ALIMit <abs_power>{, <abs_power>}

[:SENSe]:ACP:LIST:ALIMit?

Set the absolute limit on offset frequencies.

Factory Preset and *RST: NADC, 0 dBm, 0 dBm, –13 dBm, 0 dBm, 0 dBm

PDC, 0 dBm, 0 dBm, 0 dBm, 0 dBm, 0 dBm

Range: –200 to 50 dBm

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Offset Frequency

[:SENSe]:ACP:LIST[:FREQuency] <offset freq>{,<offset freq>}

[:SENSe]:ACP:LIST[:FREQuency]?

Define the 5 offset frequencies.

Factory Preset and *RST: NADC, 30 kHz, 60 kHz, 90 kHz, 120 kHz, 0 Hz

PDC, 50 kHz, 100 kHz, 0 kHz, 0 Hz, 0 Hz

Range: 0 to 200 kHz

Default Unit: Hz

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Offset Frequency Relative Limit

[:SENSe]:ACP:LIST:RLIMit <rel_power>{, <rel_power>}

[:SENSe]:ACP:LIST:RLIMit?

Set the relative limit on offset frequencies.

Factory Preset and *RST: NADC, –26 dB, –45 dB, –45 dB, 0 dB, 0 dB

PDC, –45 dB, –60 dB, 0 dB, 0 dB, 0 dB

Range: –200 to 50 dB

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Offset Frequency Control

[:SENSe]:ACP:LIST:STATe OFF|ON|0|1{, OFF|ON|0|1}

[:SENSe]:ACP:LIST:STATe?

Turn measurement on or off for the custom offset frequencies.

Factory Preset and *RST: NADC, On, On, On, Off, Off

PDC, On, On, Off, Off, Off

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Offset Frequency Test Mode

[:SENSe]:ACP:LIST:TEST ABSolute|AND|RELative|OR {, ABSolute|AND|RELative|OR}

[:SENSe]:ACP:LIST:TEST?

Define the type of testing to be done for the custom offset frequencies.

Factory Preset and *RST: RELative, RELative, OR, AND, AND

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Adjacent Channel Power Measurement Trigger Source

[:SENSe]:ACP:TRIGger:SOURce EXTernal[1]|EXTernal2|IMMediate|RFBurst|IF

[:SENSe]:ACP:TRIGger:SOURce?

Select the trigger source used to control the data acquisitions.

EXTernal[1] – front panel external trigger input.

EXTernal2 – rear panel external trigger input.

IMMediate – the next data acquisition is immediately taken, capturing the signal asynchronously (also called free run).

RFBurst – internal wideband RF burst envelope trigger that has automatic level control for periodic burst signals.

IF – internal IF envelope trigger.

Factory Preset and *RST: IMMediate for BS

RFBurst for MS

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Burst Type

[:SENSe]:CHANnel:BURSt TCH|CCH

[:SENSe]:CHANnel:BURSt?

Set the burst type for mobile station testing.

TCH – burst for traffic channel

CCH – burst for control channel

Factory Preset and *RST: TCH

Remarks: The command is only applicable for mobile station testing, device=MS.

You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Slot number

[:SENSe]:CHANnel:SLOT <integer>

[:SENSe]:CHANnel:SLOT?

Select the slot number that you want to search for. SENS:CHAN:SLOT:AUTO must be set to off.

Factory Preset and *RST: PDC - 0

NADC - 1

Range: PDC - 0 to 5

NADC 1 to 6

Remarks: The command is only applicable for mobile station testing, device=MS.

You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Slot Auto

[:SENSe]:CHANnel:SLOT:AUTO OFF|ON|0|1

[:SENSe]:CHANnel:SLOT:AUTO?

Select auto or manual control for slot searching. With auto on, the measurement is made on the first burst found to have one of the valid slot in the range. With auto off, the measurement is made on the 1st burst found to have the slot number that is indicated by the sync word.

Factory Preset

and *RST: On

Remarks: The command is only applicable for mobile station testing, device=MS.

You must be in the NADC or PDC mode to use this command.Use INSTrument:SELect to set the mode.

Correction for Mobile Station RF Port External Attenuation

[:SENSe]:CORRection:MS[:RF]:LOSS <rel_power>

[:SENSe]:CORRection:MS[:RF]:LOSS?

Set the correction equal to the external attenuation used when measuring mobile stations.

Factory Preset and *RST: 0 dB

Range: –50 to 50 dB

Default Unit: dB

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Value is global to the current mode.

Error Vector Magnitude Measurement

Commands for querying the error vector magnitude measurement results and for setting to the default values are found in the "MEASure Group of Commands" on page 76. The equivalent front panel keys for the parameters described in the following commands, are found under the **Meas Setup** key, after the **EVM** measurement has been selected from the **MEASURE** key menu.

Error Vector Magnitude Measurement Average Count

[:SENSe]:EVM:AVERage:COUNt <integer>

[:SENSe]:EVM:AVERage:COUNt?

Set the number of data acquisitions that will be averaged. After the specified number of average counts, the average mode (termination control) setting determines the average action.

Factory Preset and *RST: 10

Range: 1 to 10,000

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Averaging State

[:SENSe]:EVM:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:EVM:AVERage[:STATe]?

Turn average on or off.

Factory Preset and *RST: On

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Averaging Termination Control

[:SENSe]:EVM:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:EVM:AVERage:TCONtrol?

Select the type of termination control used to averaging. This determines the averaging action after the specified number of data acquisitions (average count) is reached.

EXPonential – Each successive data acquisition after the average count is reached, is exponentially weighted and combined with the existing average.

REPeat – After reaching the average count, the averaging is reset

and a new average is started.

Factory Preset and *RST: EXPonential

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Burst Synchronization Source

[:SENSe]:EVM:BSYNc:SOURce RFAMplitude|SWORd|NONE

[:SENSe]:EVM:BSYNc:SOURce?

Select the method of synchronizing the measurement to the bursts.

RFAMplitude – The RF amplitude burst sync approximates the start and stop of the useful part of the burst without demodulation of the burst.

SWORd – The burst sync performs a demodulation of the burst and determines the start and stop of the useful part of the burst based on the midamble sync sequence.

NONE – The measurement is performed without searching burst.

Factory Preset and *RST: NONE for BS

SWORd for MS

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Points/Symbol

[:SENSe]:EVM:TRACe:PPSYmbol <integer>

[:SENSe]:EVM:TRACe:PPSYmbol?

Select the points/symbol for EVM measurement. Only 1 or 5 are valid entries.

Factory Preset and *RST: 5

Range: 1, 5

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Error Vector Magnitude Measurement Trigger Source

[:SENSe]:EVM:TRIGger:SOURce EXTernal[1]|EXTernal2|IMMediate|RFBurst|IF|FRAMe

[:SENSe]:EVM:TRIGger:SOURce?

Select the trigger source used to control the data acquisitions.

EXTernal[1] – front panel external trigger input

EXTernal2 – rear panel external trigger input

IMMediate – the next data acquisition is immediately taken, capturing the signal asynchronously (also called free run)

RFBurst – internal wideband RF burst envelope trigger that has automatic level control for periodic burst signals

IF – internal IF envelope trigger

FRAMe – internal frame trigger

Factory Preset and *RST: IMMediate for BS

RFBurst for MS

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Occupied Bandwidth Measurement

Commands for querying the occupied bandwidth measurement results and for setting to the default values are found in the "MEASure Group of Commands" on page 76. The equivalent front panel keys for the parameters described in the following commands, are found under the **Meas Setup** key, after the **Occupied BW** measurement has been selected from the **MEASURE** key menu.

Occupied Bandwidth Measurement Average Count

[:SENSe]:OBW:AVERage:COUNt <integer>

[:SENSe]:OBW:AVERage:COUNt?

Set the number of data acquisitions that will be averaged. After the specified number of average counts, the average mode (termination control) setting determines the average action.

Factory Preset and *RST: 10

Range: 1 to 10,000

Remarks: You must be in the PDC mode to use this command. Use INSTrument:SELect to set the mode.

Occupied Bandwidth Measurement Averaging State

[:SENSe]:OBW:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:OBW:AVERage[:STATe]?

Turn averaging on or off.

Factory Preset and *RST: ON

Remarks: You must be in the PDC mode to use this command. Use INSTrument:SELect to set the mode.

Occupied Bandwidth Measurement Averaging Termination Control

[:SENSe]:OBW:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:OBW:AVERage:TCONtrol?

Select the type of termination control used when averaging. This determines the averaging action after the specified number of data acquisitions (average count) is reached.

EXPonential – Each successive data acquisition after the average count is reached, is exponentially weighted and combined with the existing average.

REPeat – After reaching the average count, the averaging is reset

and a new average is started.

Factory Preset and *RST: EXPonential

Remarks: You must be in the PDC mode to use this command. Use INSTrument:SELect to set the mode.

Occupied Bandwidth Measurement Trigger Source

[:SENSe]:OBW:TRIGger:SOURce EXTernal[1]|EXTernal2|IMMediate|RFBurst|IF

[:SENSe]:OBW:TRIGger:SOURce?

Select the trigger source used to control the data acquisitions.

EXTernal[1] – rear panel external trigger input.

EXTernal2 – front panel external trigger input.

IMMediate – the next data acquisition is immediately taken, capturing the signal asynchronously (also called free run).

RFBurst – internal wideband RF burst envelope trigger that has automatic level control for periodic burst signals.

IF – internal IF Envelope trigger.

Factory Preset and *RST: IMMediate for BS

RFBurst for MS

Remarks: You must be in the PDC mode to use this command. Use INSTrument:SELect to set the mode.

RF Port Input Attenuation

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

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

Set the RF input attenuator. This value is set at its auto value if input attenuation is set to auto.

Factory Preset and *RST: 0 dB

Default Unit: dB

Front Panel Access: **Input, Input Atten**

RF Port Power Range Auto

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

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

Select the RF port power range to be set either automatically or manually.

On - power range is automatically set as determined by the actual measured power level at the start of a measurement.

Off - power range is manually set

Factory Preset and *RST: On

Remarks: Global to the current mode.

You must be in the GSM, CDMA, NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Front Panel Access: **Input, Max Total Pwr (at UUT)**

RF Port Power Range Maximum Total Power

[:SENSe]:POWer[:RF]:RANge[:UPPer] <power>

[:SENSe]:POWer[:RF]:RANge[:UPPer]?

Set the maximum expected total power level at the radio unit under test. This value is ignored if RF port power range is set to auto.

Factory Preset and *RST: –15.0 dBm

Range: CDMA or GSM, –100 to 39.7 dBm

NADC or PDC, –200 to 50 dBm

Default Unit: dBm

Remarks: Global to the current mode. This is coupled to the RF Input Attenuation

You must be in the CDMA, GSM, NADC, or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Front Panel Access: **Input, Max Total Pwr (at UUT)**

Radio Test Device

[:SENSe]:RADio:DEVice BS|MS

[:SENSe]:RADio:DEVice?

Select the type of radio device to be tested.

BS – Base station transmitter test

MS – Mobile station transmitter test

Factory Preset and *RST: BS

Remarks: You must be in the NADC, PDC or CDMA mode to use this command. Use INSTrument:SELect to set the mode.

Front Panel Access: **Mode Setup, Radio, Device**

Radio Traffic Rate

[:SENSe]:RADio:TRATe FULL|HALF

[:SENSe]:RADio:TRATe?

Select the traffic rate.

FULL – full traffic rate (a slot is every 20 ms)

HALF – half traffic rate (a slot is every 40 ms)

Factory Preset and *RST: FULL

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Spectrum (Frequency-Domain) Measurement

Commands for querying the spectrum measurement results and for setting to the default values are found in the "MEASure Group of Commands" on page 76. The equivalent front panel keys for the parameters described in the following commands, are found under the **Meas Setup** key, after the **Spectrum (Freq Domain)** measurement has been selected from the **MEASURE** key menu.

Spectrum Measurement Data Acquisition Packing

[:SENSe]:SPECtrum:ACQuisition:PACKing AUTO|LONG|MEDium|SHORt

[:SENSe]:SPECtrum:ACQuisition:PACKing?

Select the amount of data acquisition packing. This is an advanced control that normally does not need to be changed.

Factory Preset and *RST: Auto

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement ADC Dither

[:SENSe]:SPECtrum:ADC:DITHer[:STATe] AUTO|ON|OFF|2|1|0

[:SENSe]:SPECtrum:ADC:DITHer[:STATe]?

Turn the ADC dither on or off. This is an advanced control that normally does not need to be changed.

Factory Preset and *RST: Auto

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement ADC Range

[:SENSe]:SPECtrum:ADC:RANGe AUTO|APEak|APLock|M6|P0|P6|P12|P18|P24|

[:SENSe]:SPECtrum:ADC:RANGe?

Select the range for the gain-ranging that is done in front of the ADC. This is an advanced control that normally does not need to be changed. Auto peak ranging is the default for this measurement. If you are measuring a CW signal please see the description below.

- AUTO - auto range

  For FFT spectrums - auto ranging should not be not be used. An exception to this would be if you know that your signal is

"bursty". Then you might use auto to maximize the time domain dynamic range as long as you are not very interested in the FFT data.

- APEak - auto peak range

  For CW signals, the default of auto-peak ranging can be used, but a better FFT measurement of the signal can be made by selecting one of the manual ranges that are available: M6, P0 - P24. Auto peaking can cause the ADC range gain to move monotonically down during the data capture. This movement should have negligible effect on the FFT spectrum, but selecting a manual range removes this possibility. Note that if the CW signal being measured is close to the auto-ranging threshold, the noise floor may shift as much as 6 dB from sweep to sweep.

- APLock - auto peak lock the range

  — For CW signals, auto-peak lock ranging may be used. It will find the best ADC measurement range for this particular signal and will not move the range as auto-peak can. Note that if the CW signal being measured is close to the auto-ranging threshold, the noise floor may shift as much as 6 dB from sweep to sweep.
  — For "bursty" signals, auto-peak lock ranging should not be used. The measurement will fail to operate, since the wrong (locked) ADC range will be chosen often and overloads will occur in the ADC.

- M6 - manually selects an ADC range that subtracts 6 dB of fixed gain across the range. Manual ranging is best for CW signals.

- P0 to 24 - manually selects ADC ranges that add 0 to 24 dB of fixed gain across the range. Manual ranging is best for CW signals.

Factory Preset and *RST: Auto peak

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Average Clear

[:SENSe]:SPECtrum:AVERage:CLEAr

The average data is cleared and the average counter is reset.

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Number of Averages

[:SENSe]:SPECtrum:AVERage:COUNt <integer>

[:SENSe]:SPECtrum:AVERage:COUNt?

Set the number of 'sweeps' that will be averaged. After the specified number of 'sweeps' (average counts), the averaging mode (terminal control) setting determines the averaging action.

Factory Preset and *RST: 10

Range: 1 to 10,000

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Averaging State

[:SENSe]:SPECtrum:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:SPECtrum:AVERage[:STATe]?

Turn averaging on or off.

Factory Preset and *RST: On

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Averaging Mode

[:SENSe]:SPECtrum:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:SPECtrum:AVERage:TCONtrol?

Select the type of terminal control used for averaging. This determines the averaging action after the specified number of 'sweeps' (average count) is reached.

EXPonential - Each successive data acquisition after the average count is reached, is exponentially weighted and combined with the existing average.

REPeat - After reaching the average count, the averaging is reset and a new average is started.

Factory Preset and *RST: Exponential

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Averaging Type

[:SENSe]:SPECtrum:AVERage:TYPE LOG|MAXimum|MINimum|RMS|SCALar

[:SENSe]:SPECtrum:AVERage:TYPE?

Select the type of averaging.

LOG - The log of the power is averaged. (This is also known as video averaging.)

MAXimum - The maximum values are retained.

MINimum - The minimum values are retained.

RMS - The power is averaged, providing the rms of the voltage.

SCALar - The voltage is averaged.

Factory Preset and *RST: RMS

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement pre-ADC Bandpass Filter

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PADC[:STATe] OFF|ON|0|1

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PADC[:STATe]?

Turn the pre-ADC bandpass filter on or off. This is an advanced control that normally does not need to be changed.

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement pre-FFT BW

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PFFT <freq>

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PFFT?

Set the pre-FFT bandwidth. This is an advanced control that normally does not need to be changed.

Factory Preset and *RST: 30 kHz

Range: 1 kHz to 5 MHz

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement pre-FFT BW Auto

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

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PFFT:AUTO?

Select auto or manual control of the pre-FFT BW. This is an advanced control that normally does not need to be changed.

AUTO - couples the pre-FFT BW to the frequency span.

MANual - the pre-FFT BW is uncoupled from the frequency span.

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Pre-FFT BW Filter Type

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PFFT:TYPE FLAT|GAUSsian

[:SENSe]:SPECtrum:BANDwidth|BWIDth:PFFT:TYPE?

Select the type of pre-FFT filter that is used. This is an advanced control that normally does not need to be changed.

FLAT - a filter with a flat amplitude response, which provides the best amplitude accuracy.

GAUSsian - a filter with Gaussian characteristics, which provides the best pulse response.

Factory Preset and *RST: Flat Top

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Resolution BW

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

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

Set the resolution bandwidth for the FFT. This is the bandwidth used for resolving the FFT measurement. It is not the pre-FFT bandwidth. This value is ignored if the function is auto-coupled.

Factory Preset and *RST: 30 kHz

Range: 1 kHz to 5 MHz

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Resolution BW Auto

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

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

Select auto or manual control of the resolution BW.

AUTO - couples the resolution BW to the frequency span

MANual - the resolution BW is uncoupled from the frequency span

Factory Preset and *RST: Auto

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Decimation of Spectrum Display

[:SENSe]:SPECtrum:DECimate[:FACTor] <integer>

[:SENSe]:SPECtrum:DECimate[:FACTor]?

Set the amount of data decimation done by the hardware and/or the software. For example, if 4 is selected, three out of every four data points will be thrown away. So every 4th data point will be kept.

Factory Preset and *RST: 1

Range: 0 to 1000, where 0 is equivalent to selecting AUTO with SENSe:SPECtrum:DECimate:STATe.

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Control Decimation of Spectrum Display

[:SENSe]:SPECtrum:DECimate:STATe AUTO|MANual

[:SENSe]:SPECtrum:DECimate:STATe?

Selects automatic or manually controlled decimation. This is the amount of data that is ignored by the hardware in order to decrease the number of acquired points in a long capture time.

AUTO - decimation will automatically be set to either 1 (no decimation) or 2, depending on the bandwidth being used.

MANual - allows you to select the desired amount of decimation. Too much decimation will result in aliasing of the FFT spectra.

Factory Preset and *RST: Auto

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement FFT Length

[:SENSe]:SPECtrum:FFT:LENGth <integer>

[:SENSe]:SPECtrum:FFT:LENGth?

Set the FFT length. This value is only used if length control is set to manual. The value must be greater than or equal to the window length value. Any amount greater than the window length is implemented by zero-padding. This is an advanced control that normally does not need to be changed.

Factory Preset

and *RST: 1024

Range: 8 to 1,048,576

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement FFT Length Auto

[:SENSe]:SPECtrum:FFT:LENGth:AUTO OFF|ON|0|1

[:SENSe]:SPECtum:FFT:LENGth:AUTO?

Select auto or manual control of the FFT and window lengths.

This is an advanced control that normally does not need to be changed.

AUTO - the window lengths are coupled to resolution bandwidth, window type (FFT), pre-FFT bandwidth (sample rate) and SENSe:SPECtrum:FFT:RBWPoints.

MANual - lets you set SENSe:SPECtrum:FFT:LENGth and SENSe:SPECtrum:FFT:WINDow:LENGth.

Factory Preset and *RST: Auto

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement FFT Minimum Points in Resolution BW

[:SENSe]:SPECtrum:FFT:RBWPoints <real>

[:SENSe]:SPECtum:FFT:RBWPoints?

Set the minimum number of data points that will be used inside the resolution bandwidth. The value is ignored if length control is set to manual. This is an advanced control that normally does not need to be changed.

Factory Preset and *RST: 1.30

Range: info

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Window Length

[:SENSe]:SPECtrum:FFT:WINDow:LENgth <integer>

[:SENSe]:SPECtrum:FFT:WINDow:LENgth?

Set the FFT window length. This value is only used if length control is set to manual. This is an advanced control that normally does not need to be changed.

Factory Preset and *RST: 256

Range: 8 to 1,048,576

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement FFT Window

[:SENSe]:SPECtrum:FFT:WINDow[:TYPE] BH4Tap|BLACkman|FLATtop|GAUSsian|HAMMing|HANNing|KB70|KB90 |KB110|UNIForm

[:SENSe]:SPECtrum:FFT:WINDow[:TYPE]?

Select the FFT window type.

BH4Tap - Blackman Harris with 4 taps

BLACkman - Blackman

FTOP - flat top, the default (for high amplitude accuracy)

GAUSsian - Gaussian with alpha of 3.5

HAMMing - Hamming

HANNing - Hanning

KB70, 90, and 110 - Kaiser Bessel with sidelobes at –70, –90, or –110 dBc

UNIForm - no window is used. (This is the unity response.)

Factory Preset and *RST: Flat top

Remarks: This selection affects the acquisition point quantity and the FFT size, based on the resolution bandwidth selected.

To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Frequency Span

[:SENSe]:SPECtrum:FREQuency:SPAN <freq>

[:SENSe]:SPECtrum:FREQuency:SPAN?

Set the frequency span to be measured.

Factory Preset and *RST: 5 MHz

Range: 10 Hz to 10 MHz (15 MHz when Service mode is selected)

Default Unit: Hz

Remarks: The actual measured span will generally be slightly wider due to the finite resolution of the FFT.

To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Trigger Source

[:SENSe]:SPECtrum:TRIGger:SOURce EXTernal[1]|EXTernal 2|FRAMe|IF|LINE|IMMediate|RFBurst

[:SENSe]:SPECtrum:TRIGger:SOURce?

Select the trigger source used to control the data acquisitions.

EXTernal[1] - front panel external trigger input

EXTernal 2 - rear panel external trigger input

FRAMe - internal frame timer

IF - internal IF envelope trigger

LINE - internal line trigger

IMMediate - the next data acquisition is immediately taken (also called Free Run).

RFBurst - internal wideband RF burst envelope trigger that has automatic level control for periodic burst signals.

Factory Preset and *RST: Immediate (Free Run), for Basic mode and CDMA mode
RF burst, for GSM mode

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Spectrum Measurement Video/IQ Decimation

[:SENSe]:SPECtrum:VDECimate <integer>

[:SENSe]:SPECtrum:VDECimate?

Set amount of video (IQ data) decimation.The decimation process allows you to ignore some of the data to work with a smaller set of data. Decimation by 3 keeps every third sample, throwing away the two in between. Similarly, decimation by 5 keeps every fifth sample, throwing away the four in between.

Using zero (0) decimation selects the automatic mode. The measurement will then automatically choose decimation by "1" or "2" as is appropriate for the bandwidth being used. This is an advanced control that normally does not need to be changed.

Factory Preset and *RST:	0, the auto mode
Range:	0 to 1000
Remarks:	To use this command, the appropriate mode should be selected with INSTrument:SELect.

Burst Sync Delay

[:SENSe]:SYNC:BURSt:DELay <time>

[:SENSe]:SYNC:BURSt:DELay?

Set the delay for the burst measurement position from the reference position that is determined by sync word or the burst rising/falling edges.

Factory Preset and *RST: 0 sec

Range: –500 ms to 500 ms

Default Unit: seconds

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Burst Search Threshold

[:SENSe]:SYNC:BURSt:STHReshold <rel_power>

[:SENSe]:SYNC:BURSt:STHReshold?

Set the relative power threshold from the peak power, which is used to determine the burst rising edge and falling edge.

Factory Preset and *RST: –30 dB

Range: –200 to –0.01 dB

Default Unit: dB

Remarks: You must be in the NADC or PDC mode to use this command. Use INSTrument:SELect to set the mode.

Front Panel Access: **Mode Setup, Trigger, Burst Search Threshold**

Waveform (Time-Domain) Measurement

Commands for querying the waveform measurement results and for setting to the default values are found in the "MEASure Group of Commands" on page 76. The equivalent front panel keys for the parameters described in the following commands, are found under the **Meas Setup** key, after the **Waveform (Time Domain)** measurement has been selected from the **MEASURE** key menu.

Waveform Measurement pre-ADC Bandpass Filter

[:SENSe]:WAVeform:ADC:FILTer:[:STATe] OFF|ON|0|1

[:SENSe]:WAVeform:ADC:FILTer:[:STATe]?

Turn the pre-ADC bandpass filter on or off. This is an Advanced control that normally does not need to be changed.

Preset: Off

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement ADC Range

[:SENSe]:WAVeform:ADC:RANGe
AUTO|APEak|APLock|GROund|M6|P0|P6|P12|P18|P24|

[:SENSe]:WAVeform:ADC:RANGe?

Select the range for the gain-ranging that is done in front of the ADC. This is an Advanced control that normally does not need to be changed.

AUTO - auto range

APEak - auto peak range

APLock - auto peak lock

GROund - ground

M6 - subtracts 6 dB of fixed gain across the range

P0 to 24 - adds 0 to 24 dB of fixed gain across the range

Factory Preset and *RST: Auto

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Number of Averages

[:SENSe]:WAVeform:AVERage:COUNt <integer>

[:SENSe]:WAVeform:AVERage:COUNt?

Set the number of sweeps that will be averaged. After the specified

number of sweeps (average counts), the averaging mode (terminal control) setting determines the averaging action.

Factory Preset and *RST: 10

Range: 1 to 10,000

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Averaging State

[:SENSe]:WAVeform:AVERage[:STATe] OFF|ON|0|1

[:SENSe]:WAVeform:AVERage[:STATe]?

Turn averaging on or off.

Factory Preset and *RST: Off

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Averaging Mode

[:SENSe]:WAVeform:AVERage:TCONtrol EXPonential|REPeat

[:SENSe]:WAVeform:AVERage:TCONtrol?

Select the type of terminal control used for averaging. This determines the averaging action after the specified number of 'sweeps' (average count) is reached.

EXPonential - Each successive data acquisition after the average count is reached, is exponentially weighted and combined with the existing average.

REPeat - After reaching the average count, the averaging is reset and a new average is started.

Factory Preset and *RST: Exponential

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Averaging Type

[:SENSe]:WAVeform:AVERage:TYPE LOG|MAXimum|MINimum|RMS|SCALar

[:SENSe]:WAVeform:AVERage:TYPE?

Select the type of averaging.

LOG - The log of the power is averaged. (This is also known as video

averaging.)

MAXimum - The maximum values are retained.

MINimum - The minimum values are retained.

RMS - The power is averaged, providing the rms of the voltage.

Factory Preset and *RST: RMS

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Resolution BW

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

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

Set the resolution bandwidth. This value is ignored if the function is auto-coupled.

Factory Preset and *RST: 20 kHz in Basic mode
500 kHz in GSM mode
2 MHz in CDMA mode

20 kHz

Range: 1 kHz to 5 MHz

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Resolution BW Filter Type

[:SENSe]:WAVeform:BANDwidth|BWIDth[:RESolution]:TYPE FLATtop|GAUSsian

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

Select the type of Resolution BW filter that is used. This is an Advanced control that normally does not need to be changed.

FLATtop - a filter with a flat amplitude response, which provides the best amplitude accuracy.

GAUSsian - a filter with Gaussian characteristics, which provides the best pulse response.

Factory Preset and *RST: Gaussian

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Decimation of Waveform Display

[:SENSe]:WAVeform:DECimate[:FACTor] <integer>

[:SENSe]:WAVeform:DECimate[:FACTor]?

Set the amount of data decimation done by the hardware and/or the firmware. For example, if 4 is selected, three out of every four data points will be thrown away. So every 4th data point will be kept.

Factory Preset and *RST: 1

Range: 1 to 4

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Control Decimation of Waveform Display

[:SENSe]:WAVeform:DECimate:STATe OFF|ON|0|1

[:SENSe]:WAVeform:DECimate:STATe?

Set the amount of data decimation done by the hardware in order to decrease the number of acquired points in a long capture time. This is the amount of data that the measurement ignores.

Factory Preset and *RST: Off

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Sweep (Acquisition) Time

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

[:SENSe]:WAVeform:SWEep:TIME?

Set the measurement acquisition time. It is used to specify the length of the time capture record.

Factory Preset and *RST: 2.0 ms

Range: 10 µs to 100 s

Default Unit: seconds

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.

Waveform Measurement Trigger Source

[:SENSe]:WAVeform:TRIGger:SOURce EXTernal[1]|EXTernal 2|LINE|IF|IMMediate|RFBurst

[:SENSe]:WAVeform:TRIGger:SOURce?

Select the trigger source used to control the data acquisitions.

EXTernal[1] - front panel external trigger input

EXTernal 2 - rear panel external trigger input

FRAMe - internal frame timer

LINE - internal line trigger

IMMediate - the next data acquisition is immediately taken (also called Free Run).

RFBurst - internal wideband RF burst envelope trigger that has automatic level control for periodic burst signals.

VIDeo - internal IF Envelope trigger

Factory Preset and *RST: Immediate (Free Run), for Basic mode and CDMA mode
RF burst, for GSM mode

Remarks: To use this command, the appropriate mode should be selected with INSTrument:SELect.