

Measurement Guide

WCDMA Analyzer

MS2090A Field Master Pro™

MS2080A Field Master™

MS27201A Remote Spectrum Monitor

MS27200A Spectrum Monitor Module

MS2089A Site Master™

WCDMA FDD Analyzer

Option 871

GNSS Receiver

Option 31

Gated Sweep

Option 90

Note

Not all instrument models offer every option or every measurement within a given option. Refer to the Technical Data Sheet of your instrument for available options and supported measurements.

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Chapter 1 — General Information

1-1 Introduction

This measurement guide describes the WCDMA analyzer and its measurement setup functions, including selecting the analyzer and setting up frequency, bandwidth, amplitude, span, and markers. WCDMA analyzer supports WCDMA, adjacent channel power, spectral emissions mask, and occupied bandwidth measurements. Refer to [Chapter 3](#) for detailed information.

Related Manuals

For additional information and literature covering your product, visit the product page of your instrument and select the Library tab:

<https://www.anritsu.com/en-us/test-measurement/products/ms2090a>

<https://www.anritsu.com/en-us/test-measurement/products/ms2080a>

<https://www.anritsu.com/en-us/test-measurement/products/ms2720xa>

<https://www.anritsu.com/en-us/test-measurement/products/ms27200a>

<https://www.anritsu.com/en-us/test-measurement/products/ms208xa>

Product Information, Compliance, and Safety

Read the Product Information, Compliance, and Safety Guide for important safety, legal, and regulatory notices before operating the equipment:

- Field Master Series and Site Master Series – PN: 10100-00069
- Remote Spectrum Monitor and Spectrum Monitor Module – PN: 10100-00064

User Guide

For a complete overview of the instrument hardware and system functions, refer to your instrument user guide. The user guide provides information on the following topics:

- Listing of all related documentation such as measurement guides, programming and maintenance manuals.
- Instrument Care, maintenance and calibration
- External Connections to the top and side panels
- Power Requirements and Battery Information
- System settings such as Wi-Fi, GNSS(GPS), date/time, language settings, etc.
- Other advanced settings and tools such as file management, screenshot settings, port setup, and option configuration.
- Diagnostics and software updates

1-2 Option Descriptions

This section provides a brief overview of the available options covered in this guide.

Note

Not all instrument models offer every option. Some options are available as a time-limited trial. For example, Option 9871 (WCDMA) is offered as a 90-day time limited option by ordering Option 9871. The option start time begins when the user first activates the option. Please refer to the Technical Data Sheet of your instrument for information on purchasing and activating time limited options

WCDMA Analyzer (Option 871)

WCDMA measurement setups typically conform to the 3GPP and device manufacturer standards. Refer to [Chapter 3, “WCDMA FDD Analyzer Measurements”](#) for more information.

Gated Sweep (Option 90)

Refer to [“Setting Up Markers”](#) section for more information.

GNSS Receiver (Option 31)

This option supports external GPS Antenna that is sold separately. It now supports combinations of GPS, GLONASS, Galileo and BeiDou satellite systems. Note that this is a required option which is activated by connecting the instrument with GPS antenna and turning On the GNSS (GPS) settings. Refer to instrument's user guide for more information.

Other Options and Features

For descriptions of other options and features not covered in this guide, refer to your instrument user guide or the product page for a comprehensive list of available documentation.

1-3 Document Conventions

The following conventions are used throughout the instrument and documentation set.

User Interface Navigation

The instrument user interface consists of menus, buttons, toolbars, and dialog boxes. Elements in navigation paths are separated as follows: MARKER > PEAK SEARCH > NEXT PEAK.

Illustrations

Screen-captured images contained in this document are provided as examples. The chapters included in this measurement guide provide information on advanced measurement features, instrument settings and menu overviews, for a featured option. The actual displays, screen menus, and measurement details may differ based on the instrument, model, firmware version, installed options, and current instrument settings.

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Chapter 2 — WCDMA Analyzer Overview (Option 871)

2-1 Introduction

This chapter provides an overview of the WCDMA FDD analyzer user interface and describes the main graphical displays and menus presented in the WCDMA FDD analyzer application.

2-2 Selecting the Applications/Modes

The instrument applications are selected from the 9-dot icon or the current measurement icon. To select an application, press the 9-dot icon in the title bar or the current measurement icon to display the available applications and the corresponding modes, illustrated in [Figure 2-1](#). Simply touch the desired icon to load the application or mode. The applications available for selection depend on the options that are installed and activated on your instrument. Some measurement modes and views are accessed via other measurement setup menus.

Note that not all applications/modes are included in all instruments. Refer to your instrument's technical data sheet.

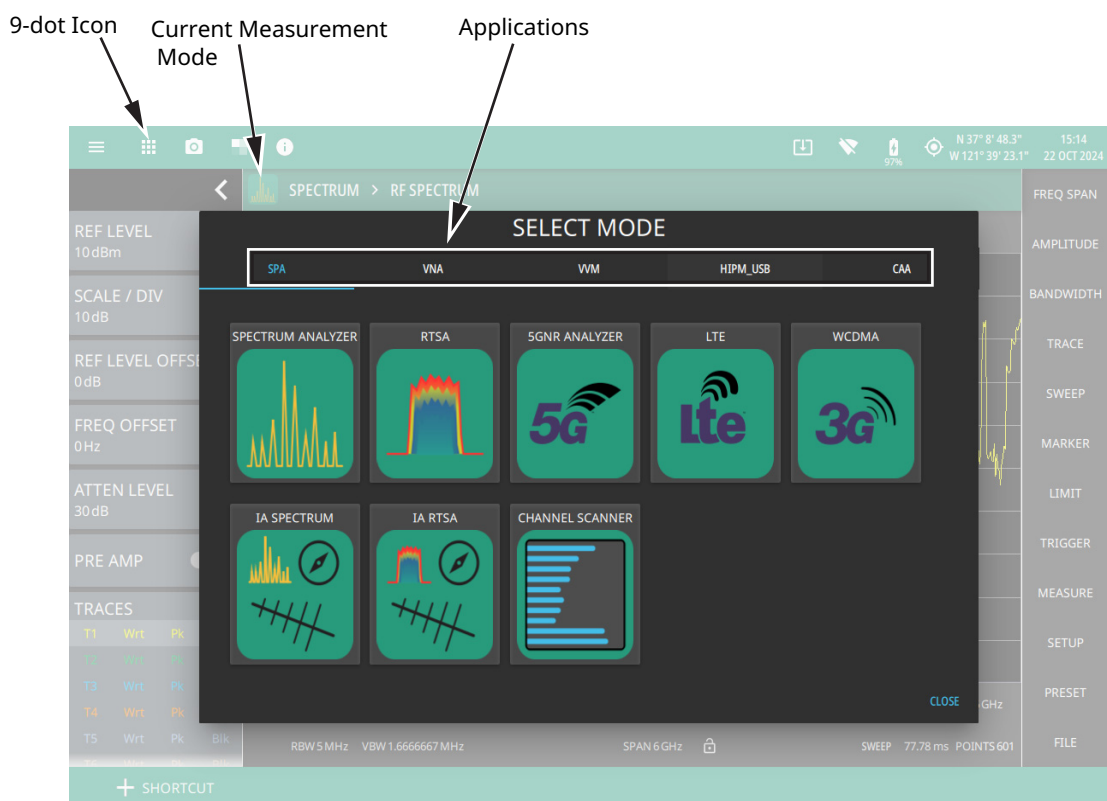


Figure 2-1. Instrument Applications and Modes

2-3 Main Menu

The main menu is the primary access point for all instrument controls and measurement selections. The main function for each main menu button is described below.

FREQ SPAN	FREQ SPAN: Contains all frequency control settings such as center frequency, start and stop frequency, span, frequency offset, and frequency step. Refer to Section 3-2 “Setting Frequency and Bandwidth Parameters” on page 3-2.
AMPLITUDE	AMPLITUDE: Provides access to all amplitude-related settings including reference level, graticule scale, and attenuator/preamp settings. Refer to Section 3-3 “Setting Amplitude” on page 3-3.
BANDWIDTH	BANDWIDTH: Provides access to resolution and video bandwidth settings and Auto ratios, and sets the bandwidth filter types. Refer to Section 3-4 “Setting Bandwidth Parameters” on page 3-6.
TRACE	TRACE: Provides trace- and detection-related controls to set trace behaviors, presets, and access to the trace/detector settings table. When in Spectrogram view, also provides spectrogram cursor controls. Refer to Section 3-5 “Setting Trace Parameters” on page 3-7.
SWEEP	SWEEP: Provides controls for sweep behaviors, number of measurement points, and gated sweep settings (with Option 90). Refer to Section 3-6 “Setting Sweep Parameters” on page 3-14.
MARKER	MARKER: Used to enable and set all marker-related parameters and provides access to the marker table. Refer to Section 3-7 “Setting Up Markers” on page 3-15.
LIMIT	LIMIT: Not used in the WCDMA analyzer.
TRIGGER	TRIGGER: Not used in the WCDMA analyzer.
MEASURE	MEASURE: Used to select measurements such as WCDMA demodulation summary, channel power, channel spectrum, and views such as time alignment error and resource block power. Refer to “MEASURE Menu (WCDMA)” on page 3-21.
SETUP	SETUP: Measurement controls for setting advanced measurements. Refer to Section 3-8 “WCDMA Measurement Setup” on page 3-20.
PRESET	PRESET: Opens the PRESET menu with selective trace, marker, limits, and measurement preset commands, or an all inclusive analyzer preset command. Refer to Section 3-14 “Presetting the Analyzer” on page 3-40.
FILE	FILE: Used to save and recall instrument setups and measurements. Refer to Section 3-15 “Saving and Recalling Measurements” on page 3-41.

Figure 2-2. Main Menu

Using Menus

Instrument setup, control, and measurement functions are performed through the use of menus. Menu behaviors are summarized below:

- Pressing a main menu button opens an associated menu.
- The name of the button pressed in the main menu is reflected in the title bar of the resulting menu.
- Menu buttons can change for various measurement settings, instrument setup parameters, and measurement views.
- Pressing the corresponding main menu button for a menu closes the menu.
- Touching status data, a parameter field, or label in the display area opens the corresponding menu and the associated keypad for editing that parameter setting.
- Pressing ACCEPT, CANCEL, or the X in the upper right corner closes the menu or keypad.

Chapter 3 — WCDMA FDD Analyzer Measurements

3-1 Introduction

This chapter gives a brief overview of the Wideband Code Division Multiple Access (WCDMA) FDD analyzer and its measurement capabilities for Field Master series, Site Master series and Remote Spectrum Monitor instruments. The purpose of this chapter is to provide a starting point for making WCDMA measurements. This chapter describes measurement setup, including selecting the analyzer and setting up frequency, bandwidth, amplitude, span, and markers. After measurements are taken, refer to [Section 3-15 “Saving and Recalling Measurements”](#) for a description of saving, recalling, and managing measurement files. For detailed information about other specific measurements, refer to the appropriate section in this chapter.

A basic understanding of the measurement concepts presented in Spectrum Analyzer measurement guide (PN:10580-00447) is recommended before performing the measurements in this chapter. WCDMA measurements include the use of additional functions beyond frequency, span, amplitude, and marker functions. [Section 3-2](#) through [Section 3-7](#) explain general setup procedures and settings. [Section 3-9](#) through [Section 3-13](#) provide example WCDMA measurements that are available in the WCDMA analyzer.

WCDMA measurement setups typically conform to the 3GPP and device manufacturer standards. The instrument is designed to make setting up your measurement as easy as possible. Simply refer to the specification for the measurement and base station settings that you are testing, select the measurement, and enter the base station measurement setup parameters.

WCDMA signal analyzer offers the following measurements:

RF Measurements

The following display types are provided for RF measurements:

- [WCDMA Channel Power](#)
- [WCDMA Occupied Bandwidth](#)
- [WCDMA Adjacent Channel Power](#)
- [WCDMA Spectrum Emission Mask](#)
- [Setting Up Markers](#)

Modulation Measurements

WCDMA modulation measurements can be viewed in:

- [WCDMA Demod Summary](#)

3-2 Setting Frequency and Bandwidth Parameters

Frequency and channel bandwidth parameters are set using the [“FREQUENCY Menu” on page 3-2](#). The channel center frequency and bandwidth can be set manually.

FREQUENCY Menu

Access the FREQUENCY menu from main menu and is available in all WCDMA measurements.

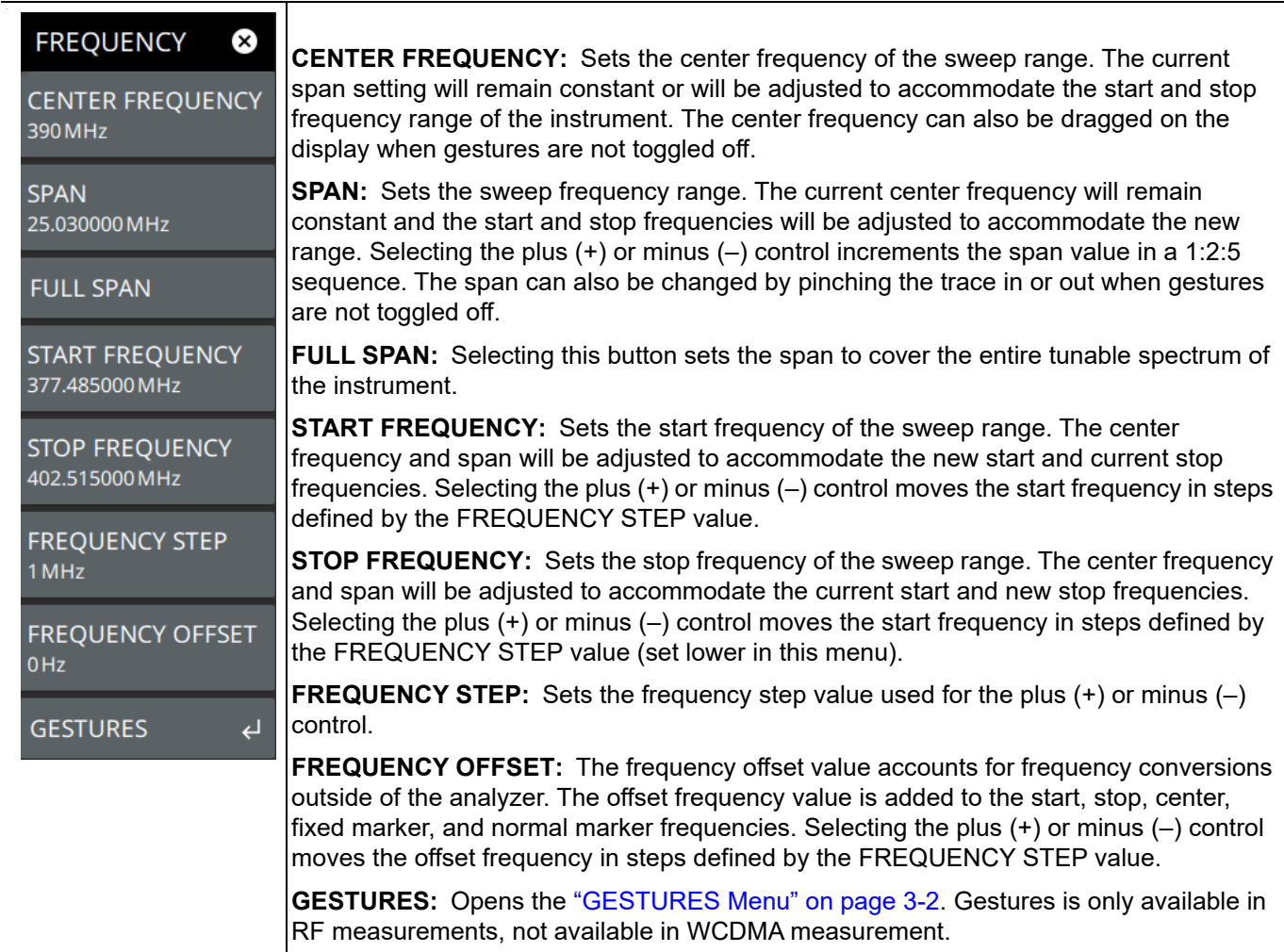


Figure 3-1. FREQUENCY Menu (WCDMA Measurements)

GESTURES Menu

The GESTURES menu is only available in RF measurements (trace displays).

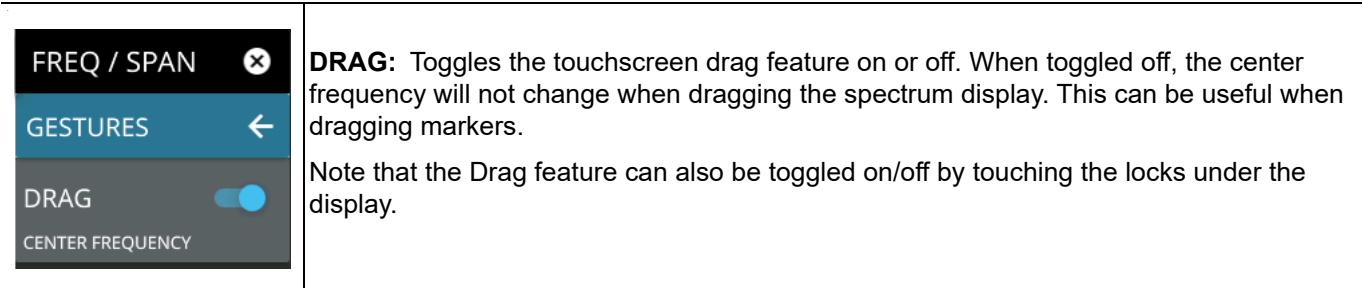


Figure 3-2. GESTURES Menu (WCDMA Measurements)

3-3 Setting Amplitude

Amplitude-related parameters are set using the [“AMPLITUDE Menu” on page 3-5](#).

Setting Amplitude Parameters

The WCDMA measurement has two different types of amplitude settings, one for the data capture used to decode the signal internally, and one for the display. The amplitude range refers to the amplitude level used to capture the data. The amplitude reference level is typically an absolute reference level set at the top of the graticule for the power level being measured. Signal levels above this set value will be outside of the display range and may overdrive and saturate the input circuit (refer to [“Indications of Excessive Signal Level” on page 3-4](#)). To set the current amplitude reference level:

1. To automatically set optimum settings, press **AMPLITUDE > AUTO RANGE**. The instrument will dynamically update the attenuation and preamp settings for the capture. **AUTO RANGE** helps ensure that harmonics and spurs are not introduced into the measurements while giving enough power to accurately decode the signal. When auto range is on, the amplifier and preamp cannot be set manually and the reference level is only used to adjust the top end of the y-axis of the plot or graph.
2. To manually set the range and reference level, press **AMPLITUDE > REF LEVEL**, then enter the desired reference level in dBm, or use the **AUTO REF LEVEL** (available when **AUTO RANGE** is disabled). This will set the attenuation and preamp for both the plot and the capture.

Reference Level Offset for External Loss or External Gain

To obtain accurate measurements, you can compensate for any external attenuation or gain by using a reference level offset. The compensation factor is in dB. External attenuation can be created by using an external cable or an external high power attenuator. External gain is typically from an amplifier.

To adjust the reference level for either gain or loss:

1. Press **AMPLITUDE > REF LEVEL OFFSET**.
2. Enter a positive dB value to account for gain or enter a negative dB value to account for loss.
3. The new reference level offset value will be displayed on the instrument and the reference level is adjusted accordingly.

Attenuator Functions

The spectrum analyzer includes a step attenuator at the RF input. This attenuator is used to reduce large signals to levels that make best use of the analyzer's dynamic range. Normally, the input attenuation automatically adjusts as a function of reference level. In the **AMPLITUDE** menu, the **ATTEN LEVEL** allows manual adjustment of the input attenuation. When auto attenuation is selected, both the reference level and the attenuation are increased. The following actions, listed in decreasing order of effectiveness, can facilitate the detection of low-level CW signals:

- Decrease the reference level and attenuation. Refer to [“AMPLITUDE Menu” on page 3-5](#).
- Turn on the preamplifier.

For RF-based measurements:

- Reduce RBW and or VBW (RBW/VBW = 10 is often optimal for this purpose). Refer to [“Setting Bandwidth Parameters” on page 3-6](#).
- Use trace averaging if VBW is already set to 1 Hz.

Indications of Excessive Signal Level

The instrument has built-in features to help prevent input overload. These include auto attenuation and reference level. The instrument will also indicate when a received signal is too high for the current setup by displaying an “ADC Overrange” notification in the title bar (Figure 3-3). Before proceeding with the measurements, adjust the reference level, the attenuation level, and disable the preamplifier if necessary. Adjusting the resolution bandwidth and frequency range may also help when measuring small signals that are near large signals.



Figure 3-3. ADC Overrange

Overpower Warning

The Field Master Series MS2080A/MS2070A and Site Master MS2089A instruments are equipped with an in-built overpower protection hardware in order to manage considerably high range of input power. If the input power range exceeds beyond 5 watts, the protection relay gets activated and a notification alert is displayed as shown in the Figure 3-4. Proceed by removing the high power input source to avoid to damaging the RF circuitry.

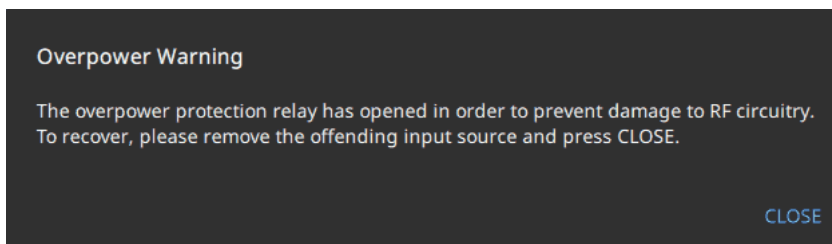


Figure 3-4. Overpower Warning

AMPLITUDE Menu

The AMPLITUDE menu is available in all WCDMA measurements.

AMPLITUDE AUTO RANGE REF LEVEL -20 dBm AUTO REF LEVEL SCALE / DIV 10 dB Y AXIS UNIT dBm AUTO ATTEN ATTEN LEVEL 15 dB REF LEVEL OFFSET 0 dB PRE AMP GESTURES	AUTO RANGE: The instrument will dynamically update the attenuation and preamp settings for the measurement. Auto range helps ensure that harmonics and spurs are not introduced into the measurements. OFFSET REF LEVEL: The reference level is the top graticule line on the measurement display. If the reference level offset is not zero, the offset reference level is displayed at this menu location. If auto range is enabled, the reference level is graphical only and will have no impact on attenuation or preamp. AUTO REF LEVEL: Auto reference level will change the reference value so as to place the highest signal amplitude at about two graticule lines from the top. This feature is not available when auto range is enabled. SCALE/DIV: The scale can be set from 1 dB per division to 15 dB per division. The default setting is 10 dB. Y AXIS UNIT: Selects the y-axis amplitude units of dBm, dBW, or dBμV, etc. AUTO ATTEN: Input attenuation can be either tied to the reference level (on) or manually selected (off). When input attenuation is tied to the reference level, attenuation is increased as higher reference levels are selected to make sure the instrument input circuits are not saturated by large signals that are likely to be present when high reference levels are required. Auto attenuation is not available when auto range is enabled. ATTEN LEVEL: Manually sets the attenuation level. This feature is not available when auto range or auto attenuation is enabled. REF LEVEL OFFSET: Reference level offset compensates for the presence of external input attenuation or gain. The default offset value is 0 dB. The reference level on the Y-axis will reflect the new offset value. For example, if the reference level was 0 dBm and an offset value of −10 dB is applied, the offset reference level will be 10 dBm. PRE AMP: Turns the low-noise front-end preamplifier on or off. To ensure accurate measurement results, the largest signal into the instrument input when the preamplifier is turned on should be less than −40 dBm. The preamplifier cannot be turned on if auto attenuation is on and reference level is above −40 dBm. GESTURES: Opens the “GESTURES Menu” on page 3-2. Not shown in WCDMA Modulation measurements.
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Figure 3-5. AMPLITUDE Menu (WCDMA Measurements)

3-4 Setting Bandwidth Parameters

BANDWIDTH Menu

The BANDWIDTH menu is only available for RF measurements (trace display). See the [“WCDMA Measurement Setup”](#) on page 3-20.

BANDWIDTH AUTO RBW RBW 1 MHz AUTO VBW VBW 1 MHz VBW TYPE Linear RBW:VBW 3 SPAN:RBW 100	AUTO RBW: When toggle on, the instrument selects the resolution bandwidth based on the current span width. The ratio of span width to RBW can be specified using the SPAN:RBW button. When toggled off (manual), the RBW label at the left edge of the X-axis will be preceded by the “#” symbol. RBW: The current resolution bandwidth is displayed under the RBW button. The RBW can be changed using the keypad or the slider controls. Bandwidth values increment in a 1:3:10 sequence, from 1 Hz to 3 Hz to 10 Hz or from 10 Hz to 30 Hz to 100 Hz, for example. Refer to your instrument technical data sheet for the resolution bandwidth range. AUTO VBW: When toggled on, the instrument selects the video bandwidth based on the resolution bandwidth. The ratio of video bandwidth to resolution bandwidth can be set using the RBW:VBW button. When toggled off (manual), the VBW label at the left edge of the X-axis will be preceded by the “#” symbol. VBW: The current video bandwidth is displayed under the VBW button. The VBW can be changed using the keypad or slider controls. Bandwidth values increment in a 1:3:10 sequence, from 1 Hz to 3 Hz to 10 Hz or from 10 Hz to 30 Hz to 100 Hz, for example. Refer to your instrument technical data sheet for the video bandwidth range. VBW TYPE: Toggles between linear averaging (arithmetic mean) and logarithmic averaging (geometric mean). RBW:VBW: This parameter displays the ratio between resolution bandwidth and video bandwidth. To change the ratio, press this button and use the keypad or the slider controls. SPAN:RBW: Displays the ratio between the span and the resolution bandwidth. The default value is 100, meaning that the span will be 100 times the resolution bandwidth. To change the ratio, press this button and use the keypad or slider controls.
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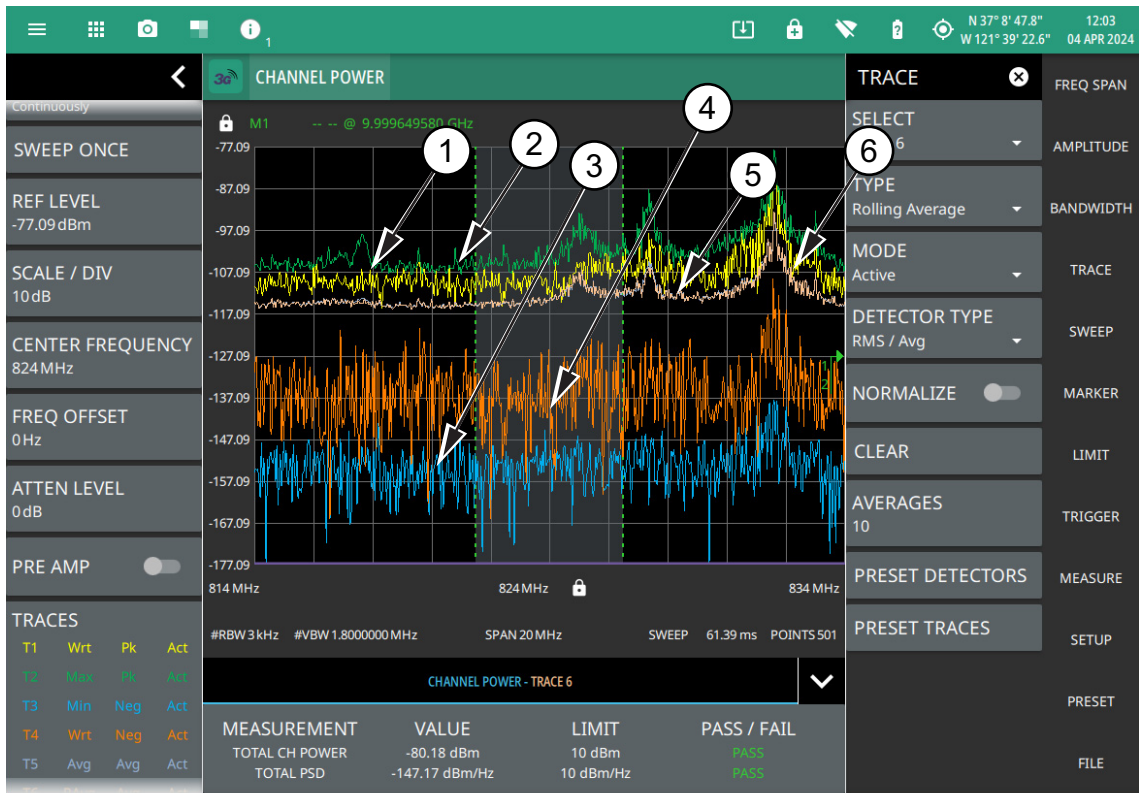
Figure 3-6. BANDWIDTH Menu (WCDMA RF Measurements)

3-5 Setting Trace Parameters

The instrument can display up to 6 traces simultaneously. Traces can be enabled from the TRACE menu by selecting the trace from the available selections, or you can select a trace in the Status panel to make it active. Each trace can have a separate trace type, mode, and detector. When working with traces in RF spectrum view, refer to “TRACE Menu” on page 3-10.

Traces in WCDMA

The figure below shows all six traces enabled on a signal, each with a different trace or detector type setting. The left side status panel shows a trace setup summary table. Touching one of the trace rows in the table will enable the trace and open the TRACE menu.



1. Clear/Write and Peak Detection: This is the default trace setting. The trace is cleared during each sweep and the largest measurement point is used for each display point.
2. Max Hold and Peak Detection: Each trace point retains its maximum value and the largest measurement point is used for each display point.
3. Min Hold and Negative Detection: Each trace point retains its minimum value and the smallest measurement point is used for each display point.
4. Clear/Write and Negative Detection: Trace points are cleared during each sweep and the smallest measurement point is used for each display point.
5. Average and RMS/Average Detection: The trace points are an average of the previous N sweeps, where N is the AVERAGES setting. RMS/Average detection depends on the video bandwidth type setting (BANDWIDTH > VBW TYPE): When VBW/AVERAGE type is set to Linear, this method detects the average power of measurement points that go into the display point. When VBW/AVERAGE type is set to Logarithmic, the traditional average of log (power) is displayed.
6. Rolling Average: The rolling average of the last N traces, where N is the AVERAGES setting.

Figure 3-7. Traces – RF Spectrum View

Trace Math

The figure below shows the instrument with trace 5 and 6 enabled on a signal, each with a different trace or detector type setting. The left side status panel shows a trace setup summary table. Touching one of the trace rows in the table will enable the trace and open the TRACE menu. In trace math, the T2-T1 or T1-T2 operation performs a division of the linear powers (watts) of trace 2 divided by trace 1 and vice versa, this is equivalent to the subtraction of the log powers (dBm). The operation does not change depending on the amplitude units and the resulting math trace is always in dB. When a math trace enabled, a secondary Y axis appears on the right side of the trace window. Most measurements are incompatible with dB values and will stop updating when a math trace is the active trace. Limit lines on math traces interpret their values as (dB).



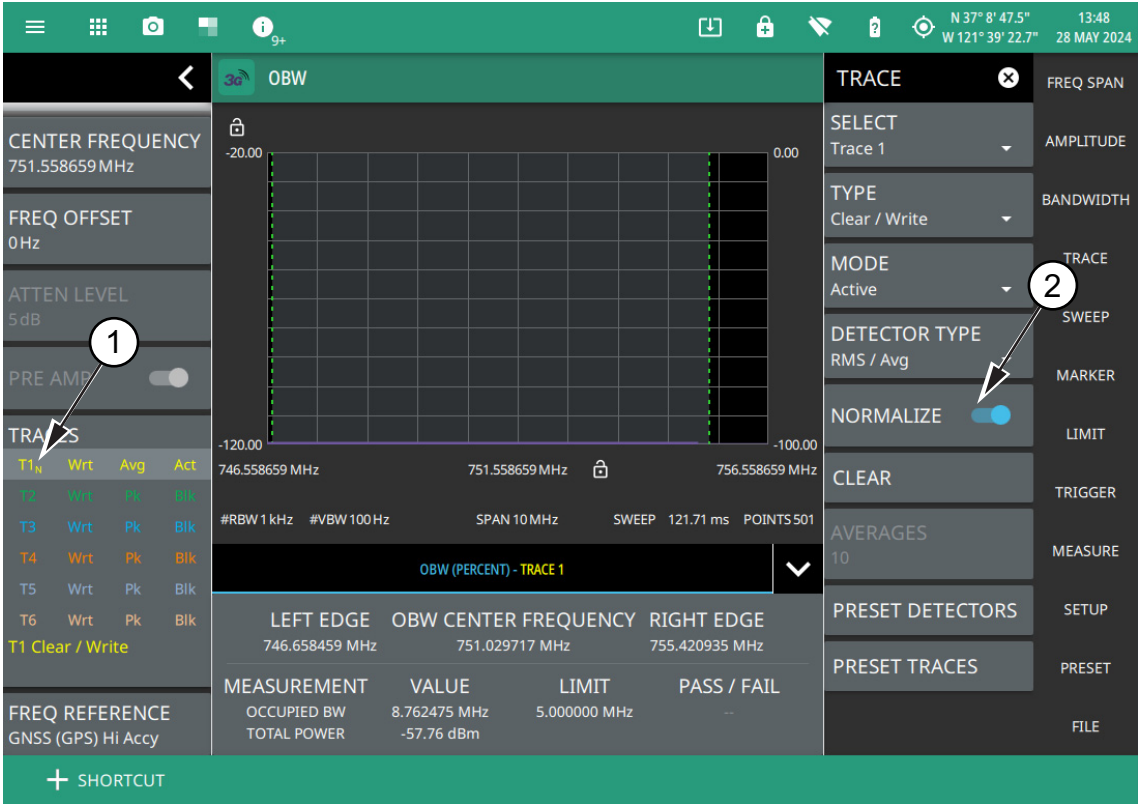
7. T1-T2: Appears only when Trace 5 is enabled. When selected displays the difference between T1 and T2, in addition to the second Y axis on the right hand side.
8. T2-T1: Appears only when Trace 6 is enabled. When selected displays the difference between T2 and T1, in addition to the second Y axis on the right hand side.
9. Second reference level: Appears only when Trace 5 or 6 are selected and Trace Type is set as either T1-T2 or T2-T1.

Figure 3-8. Trace Math – WCDMA Channel Power Measurement

Trace Normalization

The purpose of trace normalization is to bring the measured traces onto a common scale, allowing meaningful comparisons between different traces or measurements taken at different times or locations. By normalizing the traces, you can effectively remove the influence of factors such as different instrument sensitivities or attenuations, ensuring that the relative amplitudes of signals in the spectrum are accurately represented.

Trace normalization is used to compensate for frequency response errors due to connecting cables and test fixtures when measuring the response of frequency sensitive devices such as filters and amplifiers.



1. T1_N: The selected normalized Trace is indicated with the letter 'N' as a subscript in the trace care of the status panel.
2. NORMALIZE: Turn the NORMALIZE toggle on to view normalized trace.

Figure 3-9. Trace Normalization

TRACE Menu

The TRACE menu is only available for RF measurements (trace display). Refer to [Section 3-8 “WCDMA Measurement Setup”](#).

TRACE ✕ SELECT Trace 6 ▼ TYPE T2-T1 ▼ MODE Active ▼ DETECTOR TYPE RMS / Avg ▼ NORMALIZE ☒ CLEAR AVERAGES 10 PRESET DETECTORS PRESET TRACES	SELECT: Selects traces 1 through 6. Selecting a trace that is off turns the trace on. The trace type will be Clear/Write, the trace mode will be Active, and the detector type will be Peak. Selecting a trace will draw the trace on top of all other traces. This feature is not available in the spectrogram measurement view because all spectrogram data is created from a single trace. TYPE: Selects one of the following types of traces: • Clear/Write: Clears the trace after each sweep is complete and writes a new trace. • Average: The exponential average of all N traces, where N is the AVERAGES number set below. The number of sweeps is displayed in the status panel TRACES table. • Max Hold: Represents the maximum value since sweeping began. The number of sweeps is displayed in the status panel TRACES table. • Min Hold: Represents the minimum value since sweeping began. The number of sweeps is displayed in the status panel TRACES table. • Rolling Average: Is the rolling average of the last N traces, where N is the AVERAGES number set below. The number of sweeps is displayed in the status panel TRACES table. • Rolling Max Hold: Is the maximum rolling average value of the last N traces, where N is the AVERAGES number set below. The number of sweeps is displayed in the status panel TRACES table. • Rolling Min Hold: Is the minimum value of the last N traces, where N is the AVERAGES number set below. The number of sweeps is displayed in the status panel TRACES table. TRACE MODE: Selects one of the following trace modes: • Active: Displays the selected trace as it is updating. • Hold/View: Displays the trace and it is not updating. It displays the last sweep from when the trace mode was set to hold/view. If the frequency or bandwidth settings are changed while a trace is in hold/view mode, the data will be blanked from the screen. In order to see data again, set the trace mode to active. • Blank: Does not display the trace and is not updating. It is the same as if the trace was off. NORMALIZE: Toggles the trace normalization on/off. Note that when the toggle is turned on selected trace in the status panel is indicated by a subscript of the letter 'N'. Refer to Figure 3-9, “Trace Normalization”
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Figure 3-10. TRACE Menu (WCDMA) (1 of 2)

DETECTOR TYPE: Selects one of three detector types. Several detection methods tailor the function of the instrument to meet specific measurement requirements. There are often more measurement points across the screen than display points. The various detection methods are different ways of dealing with how measurement points will be shown at each display point.

- **Peak:** This method causes the highest amplitude measurement point to be shown for each display point, assuring that a narrow peak is not missed.
- **RMS/Avg:** In the default case, when the VBW/AVERAGE type is set to Linear, this method detects the average power of measurement points that go into the display point. When VBW/AVERAGE type is set to Log, the traditional average of log (power), such as dBm, is displayed for the detector, as well as for VBW and trace average.
- **Negative:** This method causes the lowest amplitude measurement point to be shown for each display point. This method is also useful when looking at modulated signals, to see if some frequencies are not being used.
- **Sample:** Shows the transient amplitude of the center of sampled data for each display point. This method is useful when measuring low-level signals and noise measurements. Only available in zero span and RSSI measurements. When Sample detector is selected, all traces must use sample detection.

CLEAR: Clears the currently active trace data.

AVERAGES: Sets the number of trace sweeps (N) to average. Available when the trace type is set to one of the averaging modes.

PRESET DETECTORS: Sets all trace detectors to Peak.

PRESET TRACES: Presets cursor and trace setup to Clear/Write, Active, with Peak Detector.

Figure 3-10. TRACE Menu (WCDMA) (2 of 2)

Trace Detector Types

The figure below illustrates how the available detector types determine a trace data point from the sampled data

Peak Detector

Shows the maximum amplitude of sampled data for each display point, assuring that a narrow peak is not missed.

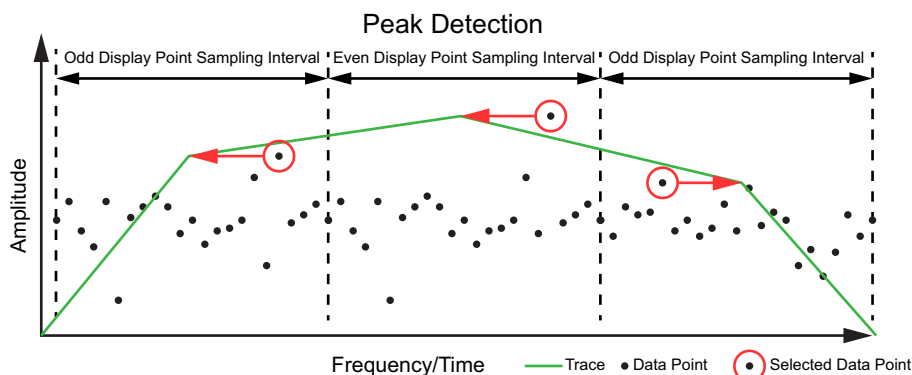


Figure 3-11. Peak Detector Type

RMS/Avg

In the default case, when the VBW/AVERAGE type is set to Linear, this method shows the linear average amplitude of sampled data for each display point, before converting to display units. When VBW/AVERAGE type is set to Log, this method shows the traditional average of log (power), such as dBm for each display point, before converting to display units. Not available in zero span.

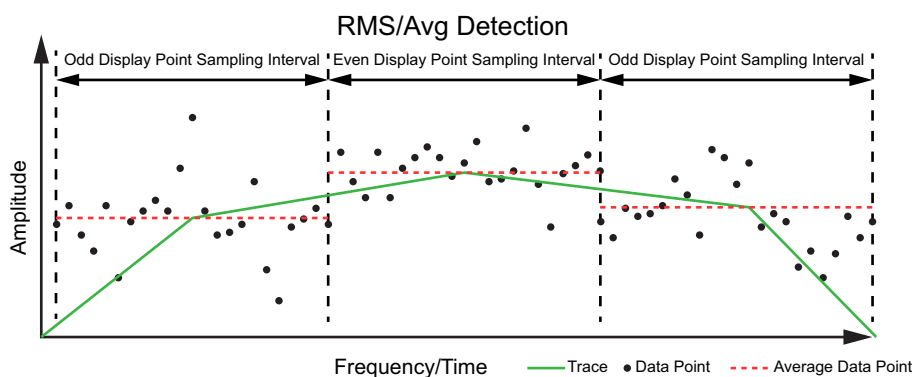


Figure 3-12. RMS/Avg Detector Type

Negative

Shows the minimum amplitude of sampled data for each display point. This method is also useful when measuring modulated signals to see if some frequencies are not being used.

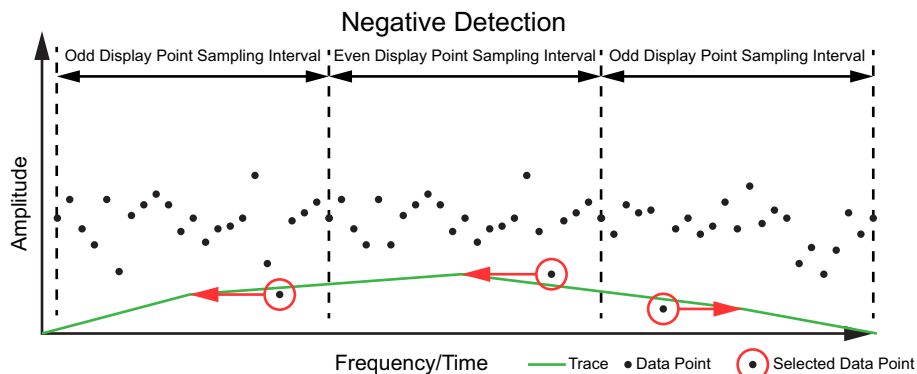


Figure 3-13. Negative Detector Type

Sample

Shows the transient amplitude of the center of sampled data for each display point. This method is useful when measuring low-level signals and noise measurements. Only available in zero span and RSSI measurements.

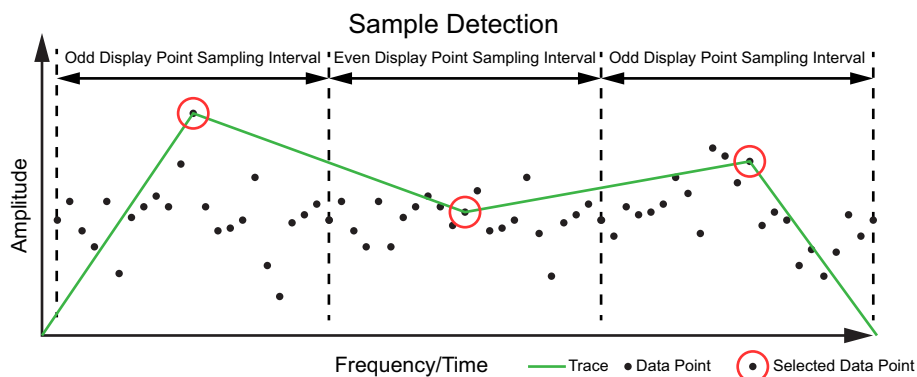


Figure 3-14. Sample Detector Type

Note When Sample detector is selected, all traces must use sample detection.

3-6 Setting Sweep Parameters

When setting up an WCDMA Demod Summary measurement, sweep parameters are set using the “[SWEEP Menu – WCDMA Demod Summary Measurements](#)” on page 3-14. When setting up an WCDMA RF measurement, sweep parameters are set using the “[SWEEP Menu – WCDMA RF Measurements](#)” on page 3-14.

SWEEP Menu – WCDMA Demod Summary Measurements

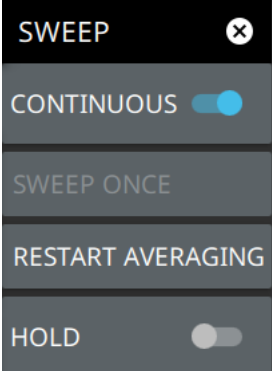
	CONTINUOUS: Toggles between continuous sweep and single sweep. In single sweep, the results of a sweep are displayed on the screen while the instrument awaits a trigger event to start a new sweep. The current state of the instrument is displayed in the status panel. With average/hold number (in TRACE menu) set to 1, or averaging is off, or no trace in trace average or hold, a single sweep is equivalent to a single measurement. A single sweep is taken after the trigger condition is met and the analyzer stops sweeping once that sweep has completed. To take one more sweep without resetting the average count, press the SWEEP ONCE button. This sweep control is also available in the status panel. SWEEP ONCE: When sweep is set to single sweep, SWEEP ONCE triggers a single measurement sweep. RESTART AVERAGING: Restarts the average frequency error value of the all the frequency measurements made. HOLD: Hold will hold the current data display while the analyzer continues to capture and analyze data in the background.
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Figure 3-15. SWEEP Menu - WCDMA Demod Summary Measurements

SWEEP Menu – WCDMA RF Measurements

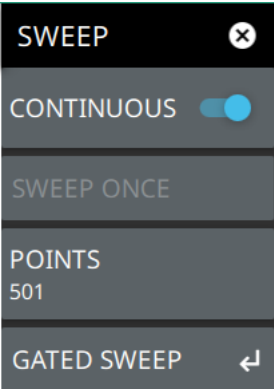
	CONTINUOUS: Toggles between continuous sweep and single sweep. In single sweep, the results of a sweep are displayed on the screen while the instrument awaits a trigger event to start a new sweep. The current state of the instrument is displayed in the status panel. With average/hold number (in TRACE menu) set to 1, or averaging is off, or no trace in trace average or hold, a single sweep is equivalent to a single measurement. A single sweep is taken after the trigger condition is met and the analyzer stops sweeping once that sweep has completed. To take one more sweep without resetting the average count, press the SWEEP ONCE button. This sweep control is also available in the status panel. SWEEP ONCE: When sweep is set to single sweep, SWEEP ONCE triggers a single measurement sweep. POINTS: Sets the number of data points per sweep and displayed in each trace. The current value of points is displayed parenthetically, next to the sweep time in the lower-right corner of the display. Using more points provides greater resolution. Using fewer points compacts the data and decreases the time required to access a trace. GATED SWEEP: Opens the GATED SWEEP menu. Gated Sweep menus remain accessible in WCDMA mode if the option is installed, but because WCDMA is not a TDD technology there is no application for the gated sweep function when performing WCDMA measurements.
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Figure 3-16. SWEEP Menu - WCDMA RF Measurements

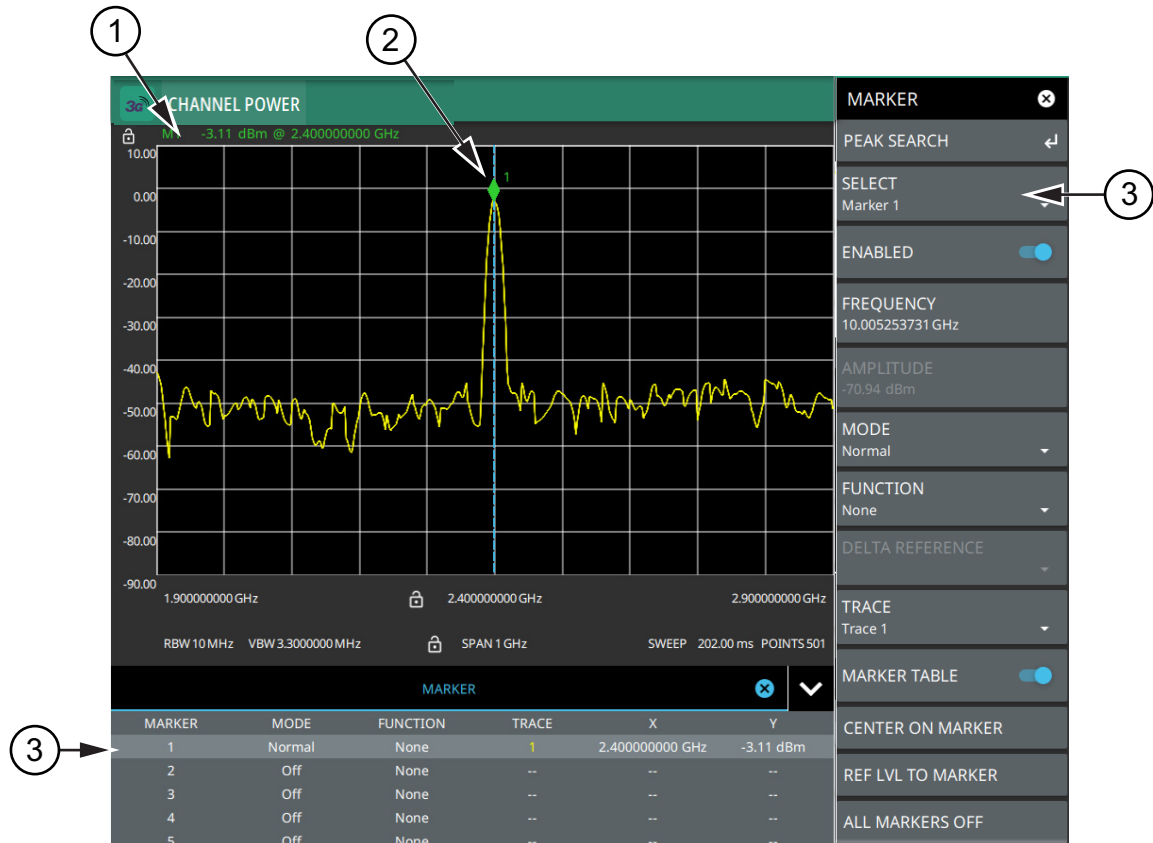
3-7 Setting Up Markers

Marker parameters are set using the “[MARKER Menu](#)” on page 3-17.

Note

Markers are only available in WCDMA spectrum-based measurements. For example, non-spectrum-based measurements such as Demod Summary the Marker menu is not available.

Refer to the figure below when working with this section.



1. Normal spectrum view marker information display.
2. Marker located on trace. The active marker is indicated with solid green fill, other markers will show with a hollow fill, fixed markers show as a green X.
3. Selected marker in the MARKER menu and in the marker table. The marker table shows all of the marker parameters and measurement values. You can edit marker parameters from the marker table as well as from the MARKER menu.

Figure 3-17. Marker Table and Marker Settings Panels

Placing a Normal Marker

1. Press MARKER to display markers. If markers were off, Marker 1 will automatically be made active at the current center frequency.
2. Select another marker using MARKER > SELECT, then select one of 12 available markers. If the marker was off, the marker will be made active and placed at the center frequency. If the marker was on, it will be made the active marker. You can enable all 12 markers and place them separately on traces, cursors, or set them as a fixed marker at a static frequency and amplitude.
3. Place a marker by first selecting it as the active marker, then do one of the following:

- a. Enter a new FREQUENCY value.
- b. Drag the marker on the trace (note that anywhere on the vertical dashed blue line can be touched to drag a marker's position).
- c. Use the PEAK SEARCH menu and the desired peak search function to automatically find signal peaks (refer to [“MARKER PEAK SEARCH Menu” on page 3-18](#)).

Placing a Fixed Marker

Fixed markers are set up the same as normal markers above, but are set to Fixed using the MODE button. In addition to setting a fixed frequency, you can set a fixed amplitude. Fixed markers are typically used as a reference marker when measuring amplitude differences relative to an absolute value.

Placing a Delta Marker

When a delta marker is on, its position data is relative to its reference marker. For example, Delta Marker 3 displays x-axis and y-axis data relative to Marker 3. To set a delta marker and its reference:

1. Activate a marker and place it in a reference location as described previously.
2. Select another marker using MARKER > SELECT, then select one of 12 available markers.
3. Set the second marker's MODE to Delta.
4. Place the active delta marker by:
 - a. Entering a new FREQUENCY value.
 - b. Dragging the marker on the trace (note that anywhere on the vertical dashed blue line can be touched to drag a marker's position).
 - c. Use the PEAK SEARCH menu and the desired peak search function to automatically find signal peaks (refer to [“MARKER PEAK SEARCH Menu” on page 3-18](#)).

A delta marker is labeled with a green delta symbol between the each marker number. For example, delta Marker 2 relative to Marker 1 is displayed as “2 Δ 1”.

MARKER Menu

MARKER 	PEAK SEARCH: Opens the “MARKER PEAK SEARCH Menu” on page 3-18.
PEAK SEARCH 	SELECT: Turns on the selected marker if it is off or makes it the active marker if it is already turned on. Pressing the MARKER menu button for the first time will turn on Marker 1 as a normal marker at the center frequency, and open the MARKER menu. Pressing the MARKER menu button thereafter opens the MARKER menu to the current active marker, which is displayed in the upper left-hand corner of the screen. When a marker is turned on, it is a normal marker positioned at the center frequency of the selected trace.
SELECT Marker 2 	
ENABLED 	ENABLED: Enables the selected marker.
FREQUENCY 10.182884111 GHz	FREQUENCY: Displays the marker frequency. For delta markers, the frequency is relative to the reference marker. Change the marker frequency by pressing on the marker and dragging it to the desired location. You can also change the marker frequency by touching the value to open the keypad.
AMPLITUDE -39.61 dBm	AMPLITUDE: Displays the current marker amplitude. If the marker is a fixed marker, the amplitude value can be changed by dragging the marker to the desired location or by directly entering the amplitude.
MODE Normal 	MODE: Select marker preference: Normal: A Normal marker is also known as a tracking marker. The frequency is fixed but the amplitude value varies from sweep to sweep. Delta (Δ): A Delta (Δ) marker displays the delta frequency and amplitude between itself and a reference marker. If Marker 1 is selected to be a Delta marker, then Marker 2 is turned on as a reference marker for Marker 1 and it becomes a Fixed marker at the same location. The reference marker can then be switched to a Normal marker if desired. Fixed: A Fixed marker has a fixed amplitude and fixed frequency, which are defined by the user and not related to the trace or sweep data.
FUNCTION Off 	FUNCTION: Sets the function of the currently selected marker to None or Noise. For more information about using marker functions, refer to “Marker Functions” on page 3-19.
DELTA REFERENCE 	DELTA REFERENCE: Selects the reference marker for a delta marker. A delta marker cannot be its own reference. Only Fixed and Normal markers may be used as a reference for Delta markers.
TRACE Trace 1 	TRACE: Selects the trace number to which the marker is currently attached.
MARKER TABLE 	MARKER TABLE: Toggle on or off the marker table displayed below the screen. Refer to “Marker Table” on page 3-19.
CENTER ON MARKER	CENTER ON MARKER: Sets the center frequency to the currently active marker's frequency value.
REF LVL TO MARKER	REF LVL TO MARKER: Sets the reference level to the currently active marker's amplitude value.
ALL MARKERS OFF	ALL MARKERS OFF: Turns all markers off, but markers will retain their last frequency position once re-enabled.
PRESET MARKERS 	PRESET MARKERS: Presets marker selections to default values.

Figure 3-18. MARKER Menu

MARKER PEAK SEARCH Menu

MARKER PEAK SEARCH SELECT Marker 1 PEAK SEARCH NEXT PEAK NEXT PEAK LEFT NEXT PEAK RIGHT NEXT POINT LEFT NEXT POINT RIGHT THRESHOLD 0 dBm EXCURSION 0 dB	SELECT: If the selected marker is off it will be turned on and the selected marker positioned at the peak of Trace 1. If the selected marker is on, then it will become the active marker and any subsequent actions in the PEAK SEARCH menu will apply to the selected marker. If no markers are on, pressing the PEAK SEARCH button on the control panel will turn on Marker 1 at the peak of Trace 1. Pressing the PEAK SEARCH button also opens the PEAK SEARCH menu. PEAK SEARCH: Moves the selected marker to the highest peak. NEXT PEAK: Moves the selected marker to the next highest peak regardless of location. NEXT PEAK LEFT: Moves the selected marker to the next peak left of its current position. NEXT PEAK RIGHT: Moves the selected marker to the next peak right of its current position. NEXT POINT LEFT: Moves the selected marker one display point to the left of its current position. Useful for fine tuning the position of a marker. NEXT POINT RIGHT: Moves the selected marker one display point to the right of its current position. Useful for fine tuning the position of a marker. THRESHOLD: If turned on, sets the threshold that a peak has to achieve to be considered a peak. EXCURSION: If turned on, sets the excursion value that a peak amplitude must rise and fall over the peak threshold to qualify as peak.
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Figure 3-19. PEAK SEARCH Menu

Marker Functions

Noise Markers

Noise Markers use an averaging routine applied to multiple data-point groups to calculate the readout, which is typically comparable to using 1 Hz bandwidth filtering. Because the noise marker routine uses groups of data points for the calculation, the noise marker should not be placed in close proximity to measurable signals. You can observe this effect by moving the marker further away from a signal until the marker readout stabilizes to a more consistent value. Noise markers should be used with an RMS/Avg detector type for proper measurement. When a noise marker function is selected, the marker amplitude value is displayed in dBm/Hz, which is the noise level within the resolution bandwidth filter. Delta markers can also be put into a noise function, but the reference marker must also be a noise marker. If they are different functions, one will be updated to match the other. Fixed markers are not allowed to be set to a noise function, so if a noise marker is changed to fixed mode, the function will automatically be set to off.

Marker Table

The Marker table display is useful for displaying many marker parameters at once. The example shown is for the WCDMA Channel Power measurement. The marker table shows the marker mode and corresponding X and Y values, and the trace to which it is selected. The selected marker is displayed with a highlighted background. Table controls are located on the right of the header. Press the down or up arrow to collapse or expand the table, press X to close the table.

CHANNEL POWER				MARKER		X	Y
MARKER	MODE	FUNCTION	TRACE				
1	Normal	Noise	1			5.800000010 GHz	-142.43 dBm/Hz
2	Normal	Off	3			6.152000010 GHz	-66.84 dBm
3	Normal	Off	1			62.690807800 GHz	-67.91 dBm
4	Off	Off	--			--	--
5	Off	Off	--			--	--
6	Off	Off	--			--	--

Figure 3-20. Marker Table

1. You can select and change a marker's parameters by selecting the marker from either the MARKER menu or the MARKER table.
2. The currently selected marker's value is shown at the top left of the spectrum window with its current amplitude and frequency values.
3. The selected marker is highlighted on the trace display.

3-8 WCDMA Measurement Setup

WCDMA base station validation qualifies the performance of the base stations with essential measurements that are in full compliance with 3GPP. The WCDMA analyzer features smart measurements that make configuring these measurements and views for WCDMA compliance testing easy:

- WCDMA demod summary measurements:

- Primary Scrambling Code
- Code Group
- Frequency Error
- Time Offset
- Sync Status
- Count
- Average
- Standard Deviation
- Minimum
- Maximum
- CHP
- P-CPICH Power
- P-CCPCH Power
- S-CCPCH Power
- PICH Power
- P-CPICH EVM
- Carrier Frequency
- Channel Power
- Occupied Bandwidth
- Scrambling Code

- Channel Power (CP)
- Adjacent Channel Power (ACP)
- Spectral Emission Mask (SEM)
- Occupied Bandwidth (OBW)

MEASURE Menu (WCDMA)

Access Measure menu from main menu.

MEASURE ✕ MEASUREMENT Demod Summary ▾ VIEW Summary ▾ SETUP	MEASUREMENT: Selects the desired measurement type from the following list: • WCDMA: Displays the current beam measurement status in a quick-view summary that includes the PCI and received power measurement summaries. See Section 3-9 “WCDMA Demod Summary” on page 3-22. • Channel Power: Provides an RF channel power measurement that includes the total channel power, power spectral density (PSD), and pass/fail compliance testing. See Section 3-10 “WCDMA Channel Power” on page 3-27. • OBW: The occupied bandwidth table and channel lines are added to the measurement display. Refer to Section 3-11 “WCDMA Occupied Bandwidth” on page 3-30. • ACP: The ACP table and channel lines are added to the measurement display. Refer to Section 3-12 “WCDMA Adjacent Channel Power” on page 3-33. • SEM: The spectrum emissions mask table and a spectrum mask is added to the measurement display. Refer to Section 3-13 “WCDMA Spectrum Emission Mask” on page 3-36. VIEW: WCDMA measurement supports the following two views: • “WCDMA Demod Summary View” on page 3-22 • “WCDMA Summary Table View” on page 3-24 SETUP: Opens one of the measurement SETUP menus. The WCDMA SETUP menus can be access directly via the SETUP or MEASURE menus after the desired measurement has been selected. The setup menu depends on the current measurement and view selected. • “SETUP MENU (WCDMA Demod Summary)” on page 3-26 • “SETUP Menu (Channel Power)” on page 3-28 • “SETUP Menu (Occupied BW)” on page 3-31 • “SETUP Menu (ACP)” on page 3-34 • “SETUP Menu (SEM)” on page 3-37
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Figure 3-21. WCDMA MEASURE Menu

3-9 WCDMA Demod Summary

WCDMA demod summary measurements are used for compliance testing of 3GPP WCDMA networks and can evaluate active antenna systems for dynamic physical layer attributes and received power levels of the transmitted signal.

WCDMA Demod Summary View

An example WCDMA Demod Summary measurement is shown in [Figure 3-22](#).

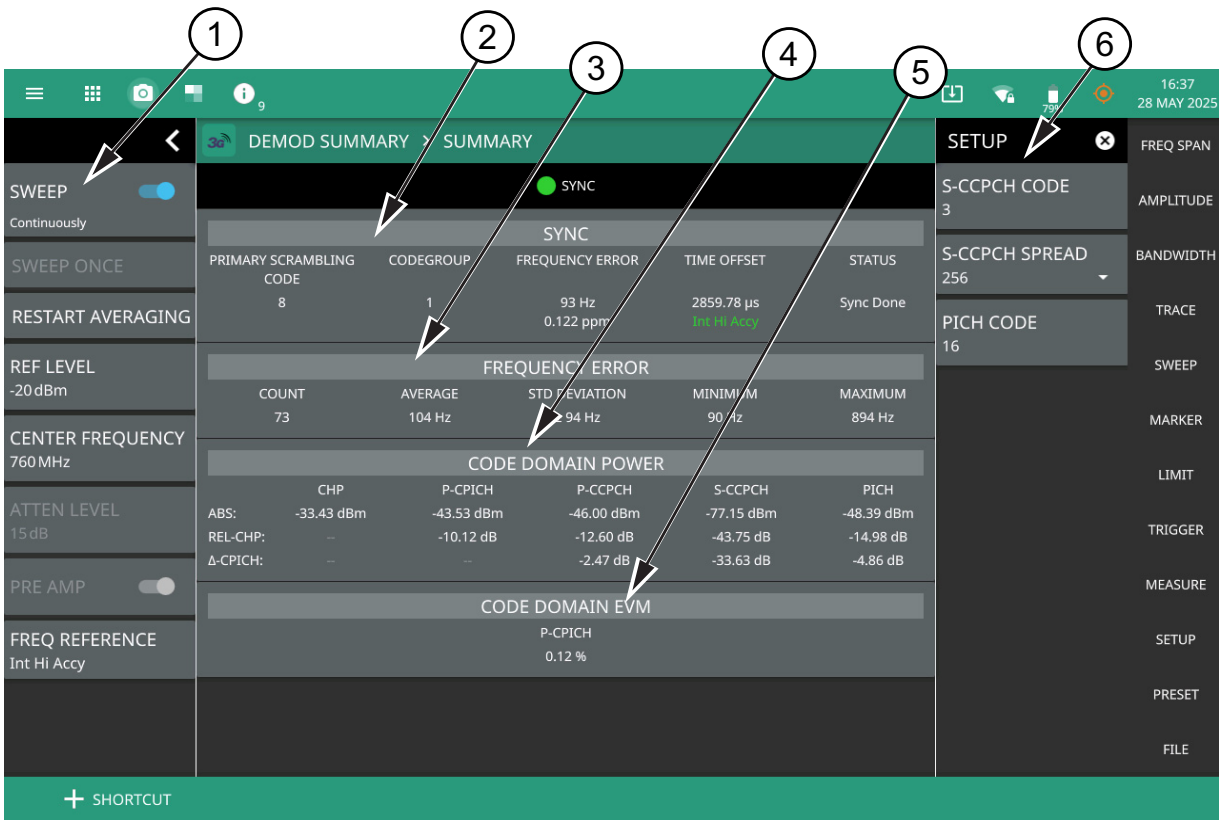


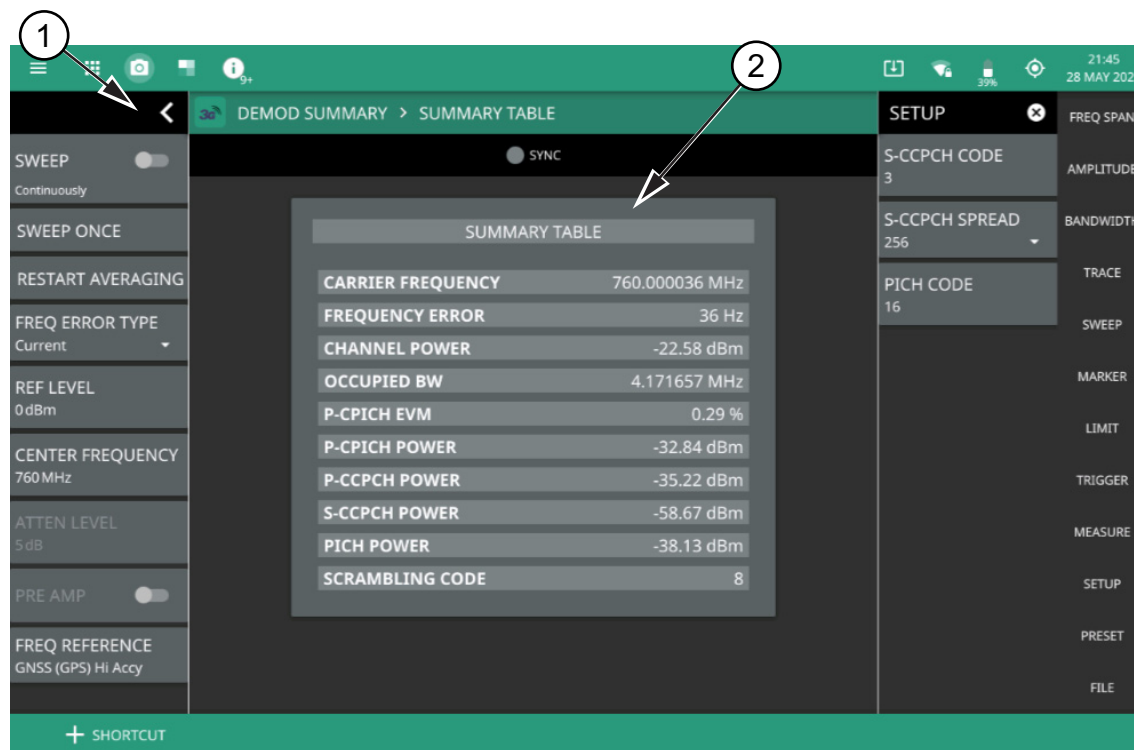
Figure 3-22. WCDMA FDD Demod Summary Measurement (1 of 2)

1. **WCDMA Analyzer Status Panel:** Each measurement features a unique status panel that displays settings and information relevant to the current measurement and view settings. This panel provides quick access to the sweep setting, center frequency and reference level. See [“STATUS PANEL \(WCDMA Demod Summary\)” on page 3-25](#).
 2. **SYNC:** This section consists of primary scrambling code, code group, frequency error and a sync status.
 3. **Frequency Error:** This section shows the frequency error of all the measured signals. It is the difference between the measured carrier frequency and the specified carrier frequency. This measurement is only as accurate as the frequency reference that is used and is typically only useful with a good external frequency reference or GNSS (GPS). It consists of the following data:
 - Count: The total number of frequency measurements included in the averaging measurement.
 - Average: The average value of all frequency measurements made.
 - Standard Deviation: The measure of the spread of frequency measurements. The standard deviation is the average difference of all measurements from the average frequency measurement. Typically 68% of all measurements will fall within the standard deviation value shown.
 - Minimum: The single lowest frequency value measured.
 - Maximum: The single highest frequency value measured.
 4. **Code Domain Power:** This section shows the code domain power. It consists of the following data:
 - CHP: Channel power limit is the amplitude of limit on channel power.
 - P-CPICH: It is the power of common pilot channel (CPICH) for WCDMA code domain demodulation measurements.
 - P-CCPCH: It is the channelization code number of the Primary Common Control Physical Channel (P-CCPCH) for WCDMA code domain demodulation measurements.
 - S-CCPCH: It is the channelization code number of the S-CCPCH channel for WCDMA code domain demodulation measurements.
 - PICH: It is the channelization code number of the Paging Indicator Channel (PICH) channel for WCDMA code domain demodulation measurements.
 5. **Code Domain EVM:** It is a specific type of EVM measurement that assesses the modulation quality of the signal across individual code channels section. It is represented as the percentage of P-CPICH EVM power.
 6. **Setup Menu:** The setup menu includes S-CCPCH code, S-CCPH spreading factor drop-down and PICH code. See [“SETUP MENU \(WCDMA Demod Summary\)” on page 3-26](#).
-

Figure 3-22. WCDMA FDD Demod Summary Measurement (2 of 2)

WCDMA Summary Table View

The WCDMA Demod summary table displays the measured values of carrier frequency which is calculated as the sum of center frequency and frequency error, channel power, occupied bandwidth and scrambling code, as shown in [Figure 3-23](#).



1. **Status Panel:** Each measurement features a unique status panel that displays settings and information relevant to the current measurement and view settings. This panel provides quick access to the center frequency, frequency error type, and band configuration. See [“STATUS PANEL \(WCDMA Demod Summary\)”](#) on page 3-25.
2. **SUMMARY TABLE:** This field indicates the current beam summary page.
 - Carrier Frequency: The sum of center frequency and frequency error.
 - Frequency Error: Frequency error is the difference between the received center frequency and the specified center frequency. This is tied to external frequency reference accuracy and is typically useful only with a good external frequency reference. To view average frequency error, select AVERAGE from FREQ ERROR TYPE drop-down in the status panel.
 - Channel Power: The total power transmitted within a specified frequency or channel bandwidth.
 - Occupied BW: The bandwidth containing 99% of the total integrated power within the transmitted spectrum around the selected center frequency.
 - P-CPICH EVM: It is the percentage of P-CPICH EVM power.
 - P-CPICH Power: It is the power of common pilot channel for WCDMA code domain demodulation measurements.
 - P-CCPCH Power: It is the channelization code number of the P-CCPCH channel for WCDMA code domain demodulation measurements.
 - S-CCPCH Power: It is the channelization code number of the S-CCPCH channel for WCDMA code domain demodulation measurements.
 - PICH Power: It is the power of PICH channel for WCDMA code domain demodulation measurements
 - Scrambling Code: Identifies and distinguishes the cells and sectors in a WCDMA network.

Figure 3-23. WCDMA Summary Table View

Note

Option 871, WCDMA measurement is designed to support direct cable connection only, Over-the-Air (OTA) measurements are not supported.

STATUS PANEL (WCDMA Demod Summary)

The status panel illustrated in this section is unique to the current analyzer and to the particular measurement and view that is selected.

Figure 3-24 shows the WCDMA status panel that covers the WCDMA demod summary measurements.

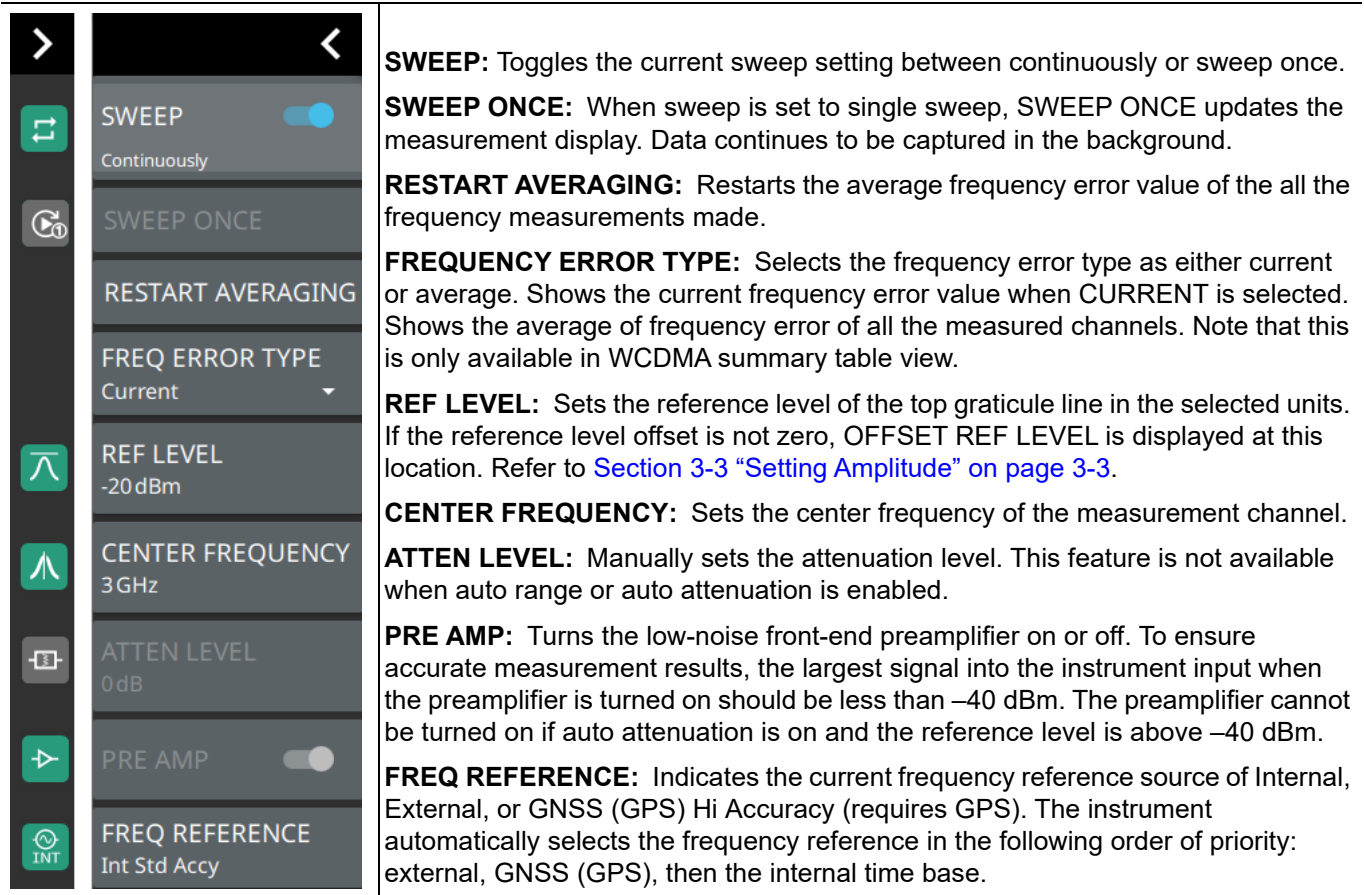


Figure 3-24. Status Panel with Minimized Icons (Demod Summary)

SETUP MENU (WCDMA Demod Summary)

The setup menu illustrated in this section is unique to the current analyzer and to the particular measurement and view that is selected. [Figure 3-25](#) shows the WCDMA setup menu that covers the WCDMA demod summary measurements.

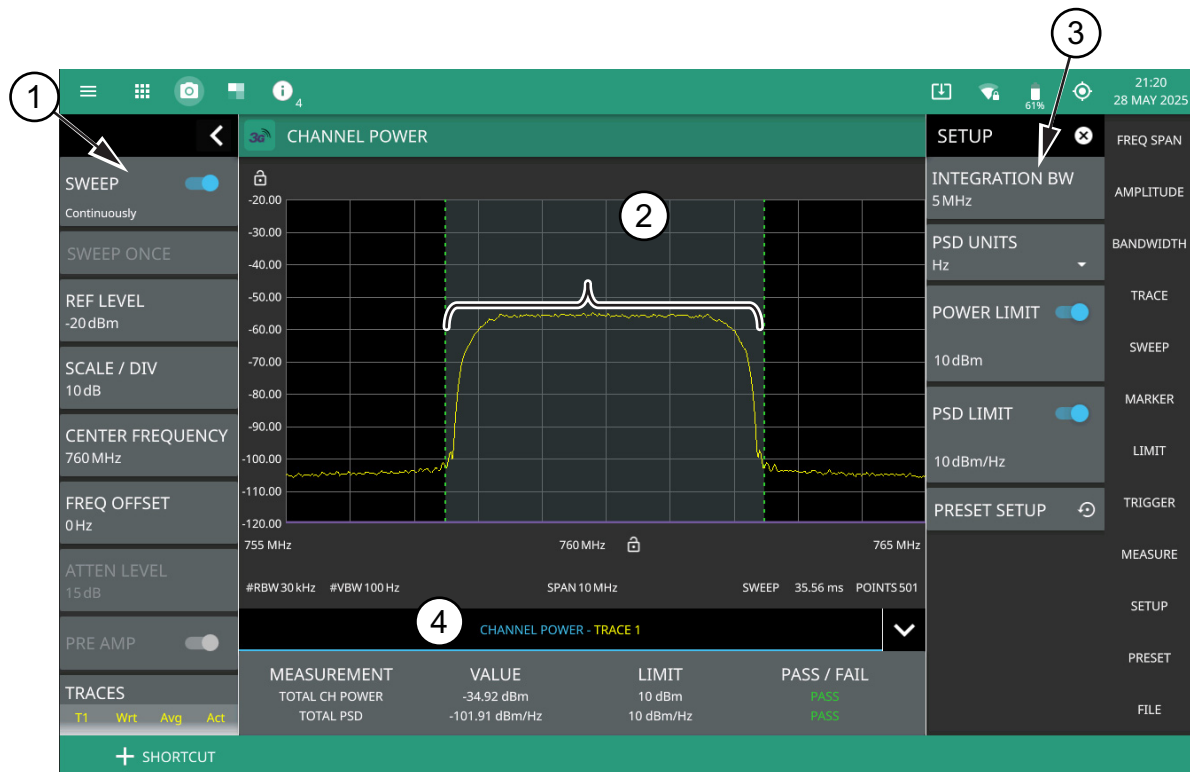
SETUP S-CCPCH CODE 3 S-CCPCH SPREAD 256 PICH CODE 16	S-CCPCH: It is the channelization code number of the S-CCPCH channel for W-CDMA code domain demodulation measurements. S-CCPCH SPREAD: It is the spreading factor of the S-CCPCH channel for W-CDMA code domain demodulation measurements. PICH CODE: It is the channelization code number of the PICH channel for W-CDMA code domain demodulation measurements.
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Figure 3-25. Setup Menu (Demod Summary)

3-10 WCDMA Channel Power

Channel power measurements are one of most common measurements for a radio transmitter. This test measures the output power of a transmitter within the specified channel bandwidth. Out-of-specification power measurements indicate system faults, which can be in the power amplifiers or in filter circuits. Channel power measurements can be used to validate transmitter performance, comply with government regulations, or to keep overall system interference at a minimum.

The channel power measurement is a test performed to measure the power transmitted within a specified frequency or channel bandwidth. The total RF power and power spectral density (PSD) is determined from a channel power measurement. An example of a channel power measurement is shown in [Figure 3-26](#).



- WCDMA Analyzer Status Panel:** Each measurement features a unique status panel that displays settings and information relevant to the current measurement and view settings. This panel provides quick access to the MIMO antenna selection and status, sweep setting, and frequency and bandwidth configuration. See [“STATUS PANEL \(Channel Power\)”](#) on page 3-29.
- Channel Power:** Channel power is integrated over the shaded region where the dashed green lines indicate the upper and lower frequency thresholds.
- SETUP Menu:** The channel power settings are configured in the SETUP menu. See [“SETUP Menu \(Channel Power\)”](#) on page 3-28.
- Channel Power Summary:** This area shows the channel power measurement summary data and pass/fail test results, when enabled:
 - The total channel power value and the test limit are expressed in dBm with a pass/fail result.
 - The total PSD limit is expressed in dBm with a pass/fail result.
 - Tapping this summary area opens the setup menu.

Figure 3-26. WCDMA Channel Power Measurement

SETUP Menu (Channel Power)

The channel power SETUP menu is available in MEASURE > MEASUREMENT > Channel Power > SETUP. Once the channel power measurement is selected, the SETUP menu can be quickly accessed by tapping on the summary display area below the spectrum display.

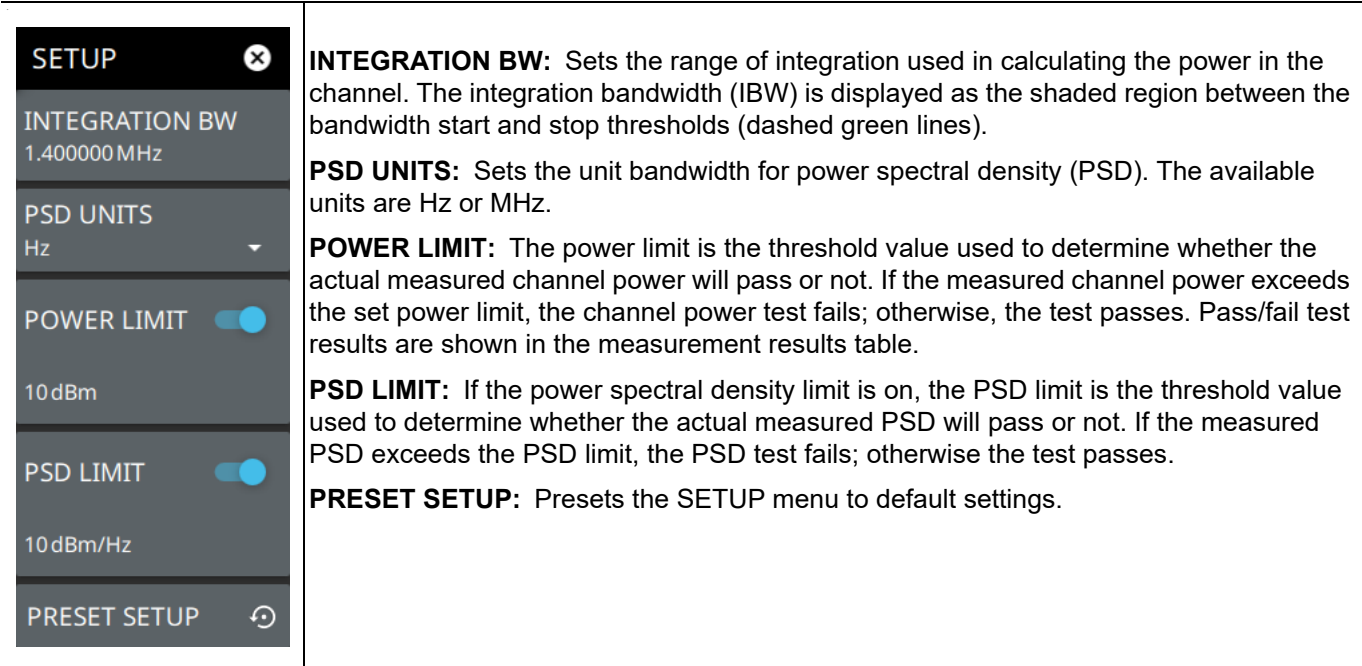
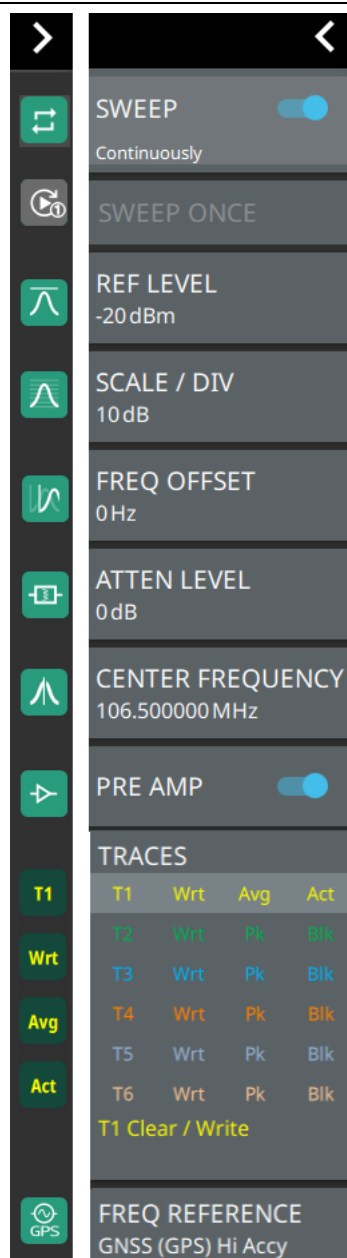


Figure 3-27. WCDMA SETUP Menu (Channel Power)

STATUS PANEL (Channel Power)

The status panel illustrated in this section is unique to the current analyzer and to the particular measurement and view that is selected.

Figure 3-28 shows the WCDMA status panel that covers the WCDMA channel power measurements.



SWEEP: Toggles the current sweep setting between continuously or sweep once.

SWEEP ONCE: When sweep is set to single sweep, SWEEP ONCE updates the measurement display. Data continues to be captured in the background.

REF LEVEL: Sets the reference level of the top graticule line in the selected units. If the reference level offset is not zero, OFFSET REF LEVEL is displayed at this location. Refer to [Section 3-3 “Setting Amplitude” on page 3-3](#).

SCALE/DIV: Sets the graticule scale/division for log-based units. This setting does not apply to linear units.

FREQ OFFSET: Accounts for frequency conversions outside of the analyzer.

ATTEN LEVEL: When auto attenuation is off, sets input attenuation.

CENTER FREQUENCY: Sets the center frequency of the sweep range. The current span setting will remain constant or will be adjusted to accommodate the start and stop frequency range of the instrument. The center frequency can also be dragged on the display when gestures are not toggled off.

PRE AMP: Turns the low-noise front-end preamplifier on or off. To ensure accurate measurement results, the largest signal into the instrument input when the preamplifier is turned on should be less than -40 dBm. The preamplifier cannot be turned on if auto attenuation is on and the reference level is above -40 dBm.

TRACES: Displays the current status of up to six traces in a quick-view summary. The summary information includes the trace number, type, mode, and detector type. The active trace will show a highlighted background with the mode and detector type restated under the table. Pressing a trace in the summary panel activates the pressed trace and opens the TRACE menu, which allows you to select and set up an individual trace as desired. Refer to [Section 3-6 “Setting Sweep Parameters” on page 3-14](#).

FREQ REFERENCE: Indicates the current frequency reference source of Internal, External, or GNSS (GPS) Hi Accuracy (requires GPS). The instrument automatically selects the frequency reference in the following order of priority: external, GNSS (GPS), then the internal time base.

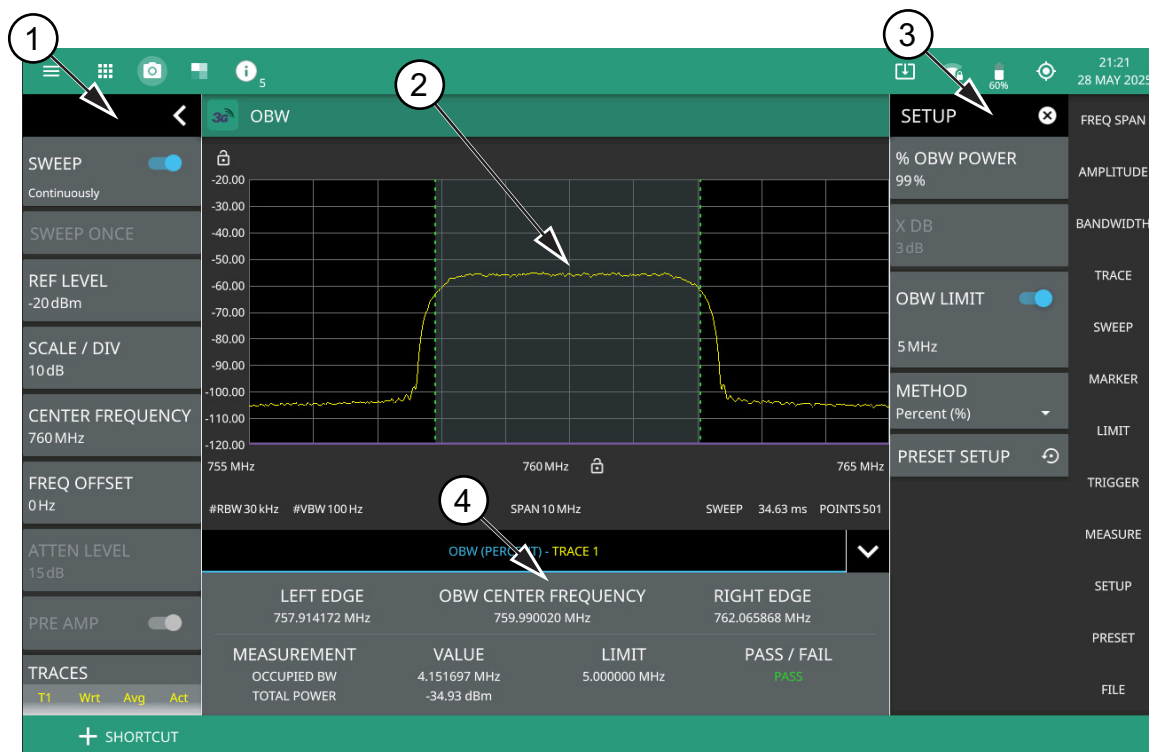
Figure 3-28. Status Panel and Minimized Status Panel Icons (Channel Power)

3-11 WCDMA Occupied Bandwidth

Occupied bandwidth measurements are set up using the [“SETUP Menu \(Occupied BW\)”](#) on page 3-31.

Occupied Bandwidth (OBW) is a common measurement performed on radio transmitters. This measurement calculates the bandwidth containing the total integrated power occupied in a given signal bandwidth. There are two different methods of calculation depending on the technique used to modulate the carrier.

- **% Integrated Power Method:** The occupied frequency bandwidth is calculated as the bandwidth containing the specified percentage of the transmitted power.
- **> dBc Method:** The occupied frequency bandwidth is defined as the bandwidth between the upper and lower frequency points at which the signal level is a desired number of dB below the peak carrier level.



1. The status panel provides quick access to common spectrum analyzer settings. See [“STATUS PANEL \(Occupied BW\)”](#) on page 3-32.
2. Dashed vertical lines and a shaded region define the main channel.
3. All occupied bandwidth measurement parameters are set via the SETUP menu. See [“SETUP Menu \(Occupied BW\)”](#) on page 3-31.
4. Occupied bandwidth measurement results are shown in a table at the bottom of the display.

Figure 3-29. WCDMA Occupied Bandwidth (OBW) Measurement

Frequency and span settings for many signal standards can be set as follows:

1. Select MEASURE on the main menu.
2. Select OBW from the MEASUREMENT button.
3. Select SETUP and then do the following:
 - Set the % OBW power or set X DB (dBc) power value
 - Select the METHOD (Percent (%) or dBc (X DB))

- Toggle OBW limit testing if you wish to see pass/fail test results

Occupied bandwidth is a constant measurement; after it is turned on, it remains on until a different measurement is selected or the sweep is paused. OBW is calculated at the end of each sweep.

SETUP Menu (Occupied BW)

The occupied bandwidth SETUP menu is available in MEASURE > MEASUREMENT > OBW > SETUP. Once the OBW measurement is selected, the SETUP menu can be quickly accessed by tapping on the summary display area below the spectrum display.

SETUP

% OBW POWER

99 %

X DB

3 dB

OBW LIMIT

10 kHz

METHOD

PERCENT (%)

PRESET SETUP

% OBW POWER: Sets the percentage of the total power that is measured within the occupied bandwidth for the current measurement. The resulting occupied bandwidth and total power values are displayed in the measurements results table.

X dB: Sets the x dB value used for the "x dB bandwidth" measurement. The occupied bandwidth is the frequency range between two points on the signal that are x dB down from the highest signal point within the OBW span.

OBW LIMIT: Enables limit checking at the specified frequency. The limit test results show as a green PASS or a red FAIL in the measurement table.

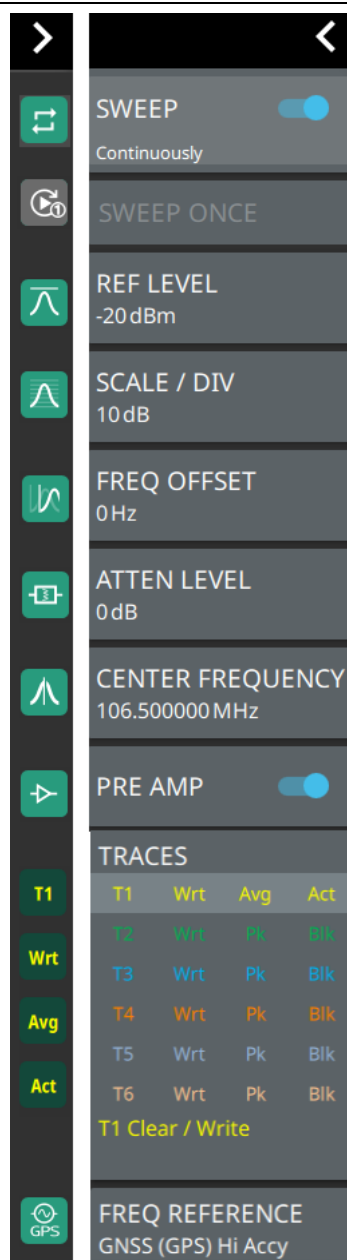
METHOD: Select the measurement method to be PERCENT (%) or X (dB).

PRESET SETUP: Sets all OBW setup parameters to default. Turns off limits.

Figure 3-30. SETUP Menu (Occupied BW)

STATUS PANEL (Occupied BW)

Below is the status panel with the corresponding minimized status panel icons for occupied bandwidth measurement.



SWEEP: Toggles the current sweep setting between continuously or sweep once.

SWEEP ONCE: When sweep is set to single sweep, SWEEP ONCE updates the measurement display. Data continues to be captured in the background.

REF LEVEL: Sets the reference level of the top graticule line in the selected units. If the reference level offset is not zero, OFFSET REF LEVEL is displayed at this location. Refer to [Section 3-3 "Setting Amplitude" on page 3-3](#).

SCALE/DIV: Sets the graticule scale/division for log-based units. This setting does not apply to linear units.

FREQ OFFSET: Accounts for frequency conversions outside of the analyzer.

ATTEN LEVEL: When auto attenuation is off, sets input attenuation.

CENTER FREQUENCY: Sets the center frequency of the sweep range. The current span setting will remain constant or will be adjusted to accommodate the start and stop frequency range of the instrument. The center frequency can also be dragged on the display when gestures are not toggled off.

PRE AMP: Turns the low-noise front-end preamplifier on or off. To ensure accurate measurement results, the largest signal into the instrument input when the preamplifier is turned on should be less than -40 dBm. The preamplifier cannot be turned on if auto attenuation is on and the reference level is above -40 dBm.

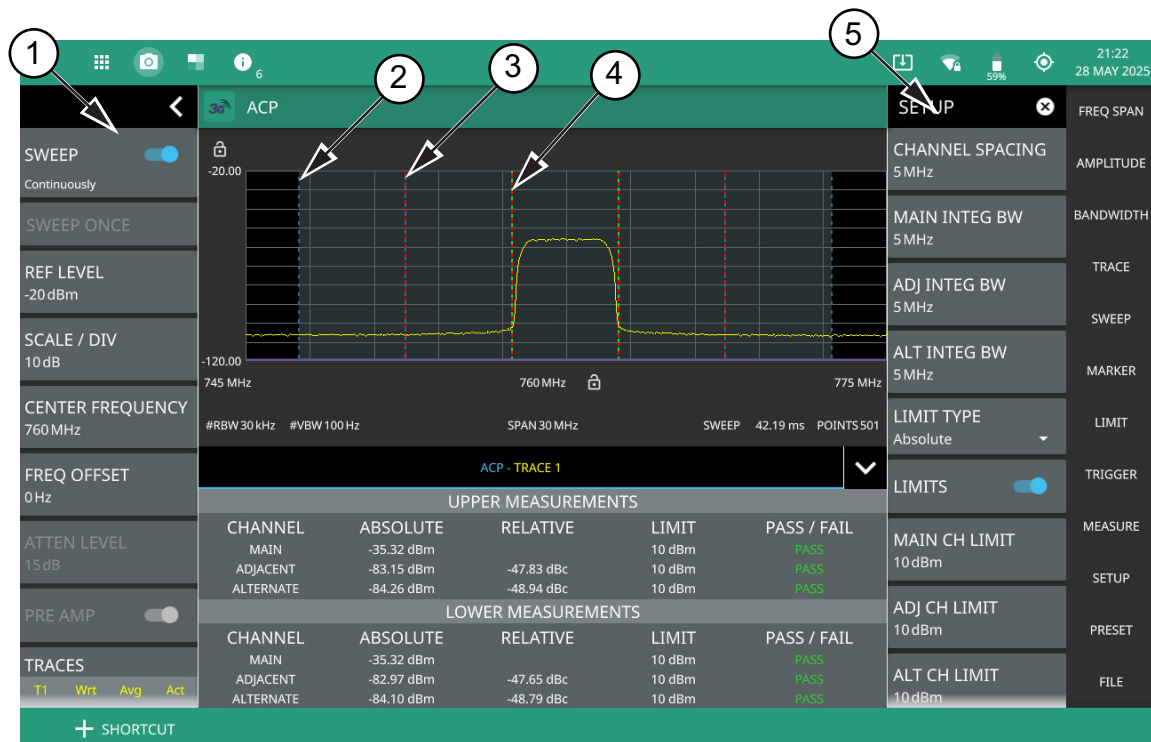
TRACES: Displays the current status of up to six traces in a quick-view summary. The summary information includes the trace number, type, mode, and detector type. The active trace will show a highlighted background with the mode and detector type restated under the table. Pressing a trace in the summary panel activates the pressed trace and opens the TRACE menu, which allows you to select and set up an individual trace as desired. Refer to [Section 3-5 "Setting Trace Parameters" on page 3-7](#).

FREQ REFERENCE: Indicates the current frequency reference source of Internal, External, or GNSS (GPS) Hi Accuracy (requires GPS). The instrument automatically selects the frequency reference in the following order of priority: external, GNSS (GPS), then the internal time base.

Figure 3-31. Status Panel and Minimized Status Panel Icons (WCDMA OBW Measurement)

3-12 WCDMA Adjacent Channel Power

Adjacent Channel Power (ACP) measurements are set up using the “[SETUP Menu \(ACP\)](#)” on [page 3-34](#). Adjacent channel power is a measure of the power that leaks into adjacent transmit channels. The ACP measurement measures the power present in the transmit channel (refer to “[WCDMA Channel Power](#)” on [page 3-27](#)) along with the adjacent transmit channels that have been configured in the SETUP menu.



1. The status panel provides quick access to common spectrum analyzer settings. See “[STATUS PANEL \(ACP\)](#)” on [page 3-35](#).
2. Blue integration bandwidth edge of lower alternate channels.
3. Red integration bandwidth edge of lower adjacent and alternate channels.
4. Green integration bandwidth edge of lower main and adjacent channels.
5. All adjacent channel power measurement parameters are set via the SETUP menu. See “[SETUP Menu \(ACP\)](#)” on [page 3-34](#).

Figure 3-32. WCDMA Adjacent Channel Power Ratio Measurement

Frequency and span settings for many signal standards can be set as follows:

1. Select MEASURE on the main menu.
2. Select ACP from the MEASUREMENT button.
3. Select SETUP and choose appropriate parameters for the following:
 - Channel spacing
 - Main integration bandwidth
 - Adjacent integration bandwidth
 - Alternate integration bandwidth
 - Limit Type

- Main channel limit
- Adjacent channel limit
- Alternate channel limit

Adjacent channel power is a constant measurement; after it is turned on, it remains on until a different measurement is selected or the sweep is paused. ACP is calculated at the end of each sweep.

SETUP Menu (ACP)

The Adjacent Channel Power SETUP menu is available in MEASURE > MEASUREMENT > ACP > SETUP. Once the ACP measurement is selected, the SETUP menu can be quickly accessed by tapping on the summary display area below the spectrum window.

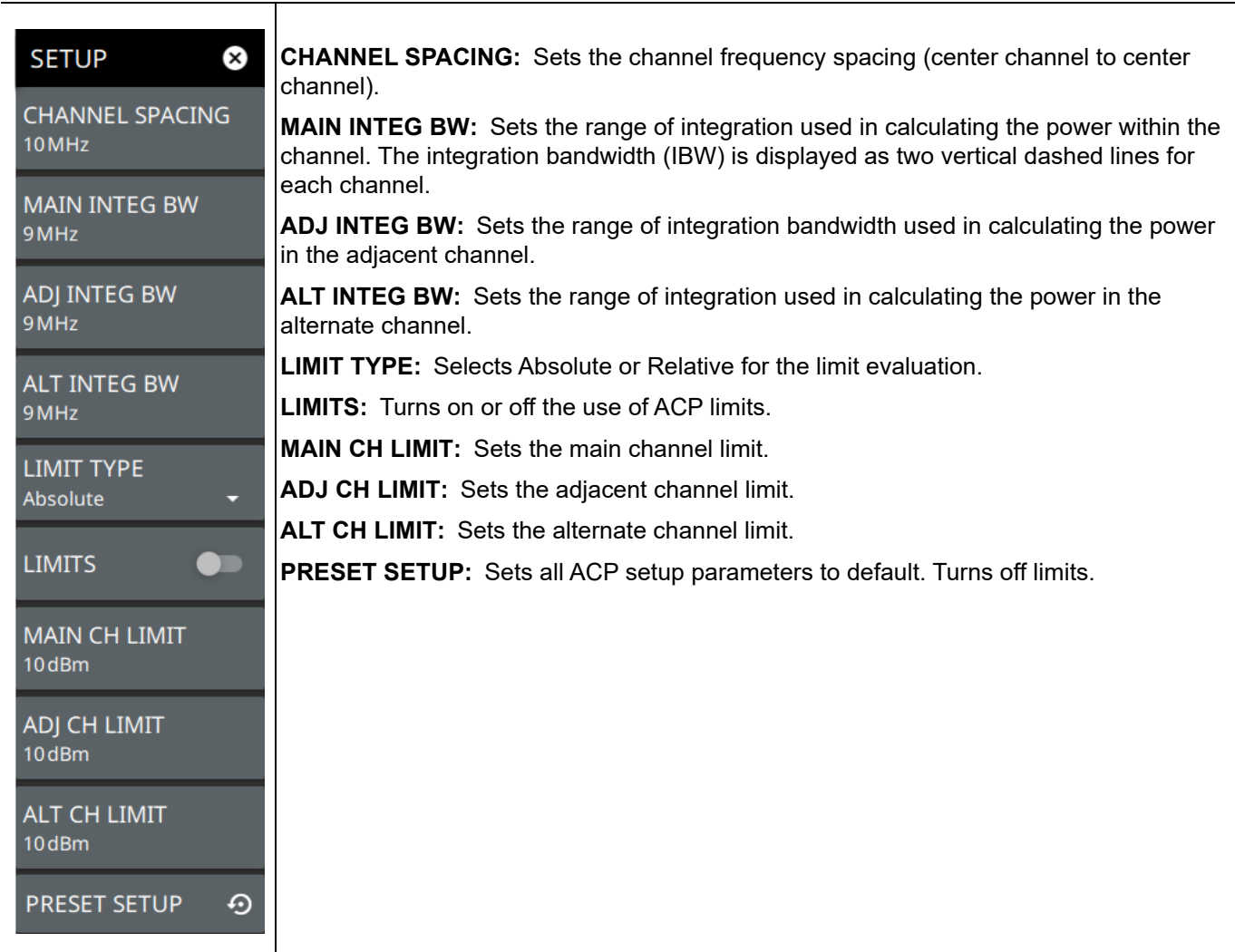
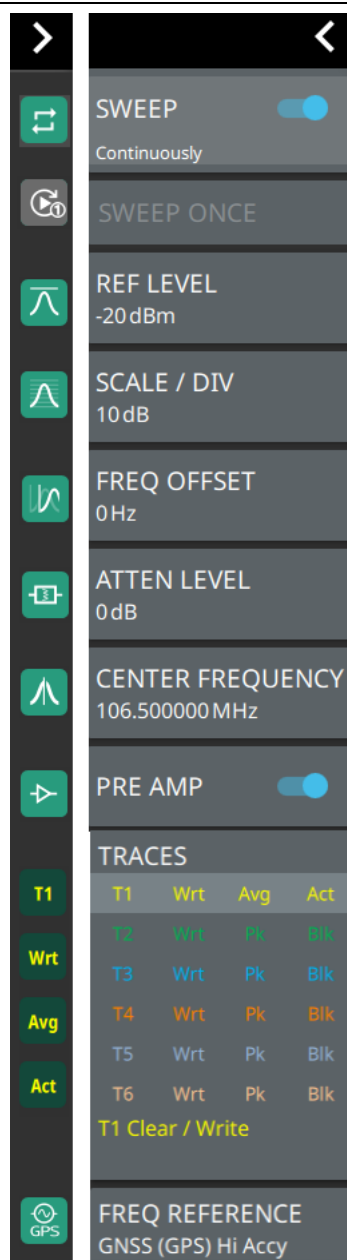


Figure 3-33. SETUP Menu (ACP)

STATUS PANEL (ACP)

Below is the status panel with the corresponding minimized status panel icons for adjacent channel power measurement.



SWEEP: Toggles the current sweep setting between continuously or sweep once.

SWEEP ONCE: When sweep is set to single sweep, SWEEP ONCE updates the measurement display. Data continues to be captured in the background.

REF LEVEL: Sets the reference level of the top graticule line in the selected units. If the reference level offset is not zero, OFFSET REF LEVEL is displayed at this location. Refer to [Section 3-3 "Setting Amplitude" on page 3-3](#).

SCALE/DIV: Sets the graticule scale/division for log-based units. This setting does not apply to linear units.

FREQ OFFSET: Accounts for frequency conversions outside of the analyzer.

ATTEN LEVEL: When auto attenuation is off, sets input attenuation.

CENTER FREQUENCY: Sets the center frequency of the sweep range. The current span setting will remain constant or will be adjusted to accommodate the start and stop frequency range of the instrument. The center frequency can also be dragged on the display when gestures are not toggled off.

PRE AMP: Turns the low-noise front-end preamplifier on or off. To ensure accurate measurement results, the largest signal into the instrument input when the preamplifier is turned on should be less than -40 dBm. The preamplifier cannot be turned on if auto attenuation is on and the reference level is above -40 dBm.

TRACES: Displays the current status of up to six traces in a quick-view summary. The summary information includes the trace number, type, mode, and detector type. The active trace will show a highlighted background with the mode and detector type restated under the table. Pressing a trace in the summary panel activates the pressed trace and opens the TRACE menu, which allows you to select and set up an individual trace as desired. Refer to [Section 3-5 "Setting Trace Parameters" on page 3-7](#).

FREQ REFERENCE: Indicates the current frequency reference source of Internal, External, or GNSS (GPS) Hi Accuracy (requires GPS). The instrument automatically selects the frequency reference in the following order of priority: external, GNSS (GPS), then the internal time base.

Figure 3-34. Status Panel and Minimized Status Panel Icons (ACP)

3-13 WCDMA Spectrum Emission Mask

The spectrum emission mask (SEM) measurement is a relative measurement method to identify the power level of out-of-band spurious emissions outside of the in-channel bandwidth signal. The SEM measures the power ratio between in-band and adjacent channels. The SEM measurement then identifies the emissions that interfere with other channels. Then, the spurious signal levels of pairs of offset frequencies are identified and related to the carrier power.

The spectral emission mask measurement supports the testing for “Operating Band Unwanted Emissions” described in the 3GPP base station conformance testing document. There is support for WCDMA masks which are automatically built based on the current carrier frequency/channel and BW values. The instrument indicates if the signal is within the specified limits by displaying PASS or FAIL. The emission mask information is also displayed in a table format with different frequency ranges and whether the signal PASSED/FAILED in that region.

Measurement parameters are set up using the “[SETUP Menu \(SEM\)](#)” on [page 3-37](#). Selecting the SEM measurement does the following:

- Disables all other measurements
- Adds a predefined WCDMA emission mask
- Sets the span to the mask width
- Sets the detection method to RMS

A spectrum emission mask measurement showing the KCA 30 ≤P<39 dBm mask setting is illustrated in [Figure 3-35](#).

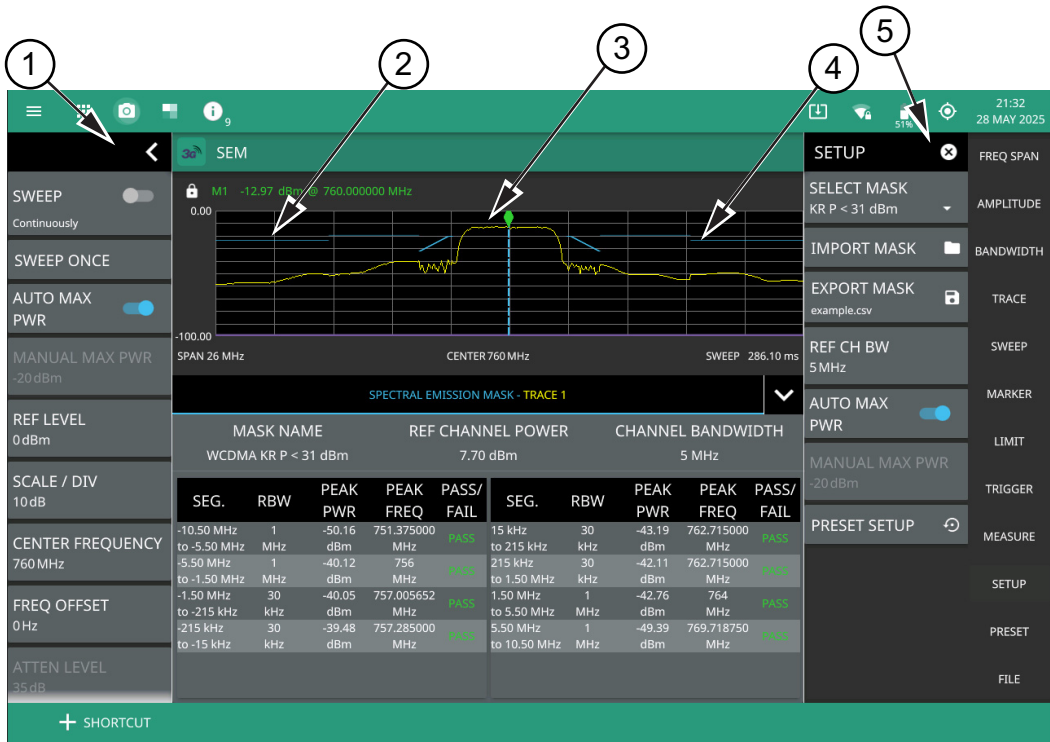


Figure 3-35. WCDMA SEM Measurement

1. The status panel provides quick access to common spectrum analyzer settings. See [“STATUS PANEL \(SEM\)” on page 3-39](#).
2. SEM Mask
3. Spectrum Emission
4. SEM Mask
5. All SEM measurement parameters are set via the SETUP menu. See [“SETUP Menu \(SEM\)” on page 3-37](#).

Figure 3-35. WCDMA SEM Measurement

Spectrum Emission Mask Measurement Basic Setup

1. Select MEASURE > MEASUREMENT > SEM from the right side menu.
2. Select SETUP and select a desired mask.
3. Enter the reference channel bandwidth.
4. Toggle AUTO MAX PWR or set MANUAL MAX POWER.
5. The SEM measurement results are displayed in a table with pass/fail results.

SETUP Menu (SEM)

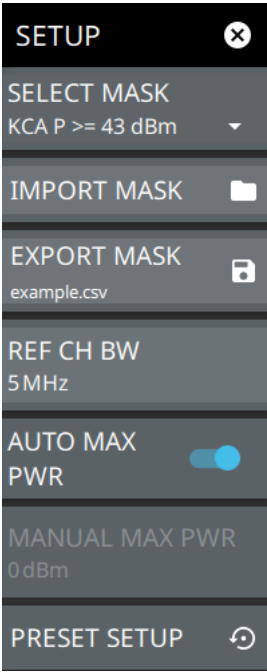
	SELECT MASK: Selects the desired upper/lower or custom emission mask. Choose the desired mask from the list. IMPORT MASK: Used to import a custom user mask. EXPORT MASK: Exports an example user mask as a comma separated value file (see “Example Custom Signal Emission Mask” on page 3-37) or exports the currently selected custom mask. REF CH BW: Sets the reference channel bandwidth for the measurement. AUTO MAX PWR: Toggles automatic max power. Some segments in the mask are dependent on the main channel power. Enabling this automatically calculates the reference channel power by measuring the channel power of the center channel bandwidth. When disabled, the reference power must be entered manually below. MANUAL MAX PWR: Used to manually enter the reference channel power for masks that have limits dependent on main channel power. PRESET SETUP: Presets all values on the SETUP menu to default values.
--	--

Figure 3-36. SETUP Menu (SEM)

Example Custom Signal Emission Mask

To create a custom SEM, use the following steps:

1. Export the existing mask as a csv file by pressing the EXPORT MASK button in the SEM SETUP menu.
2. From the FILES menu, move the exported file to a USB device and then to a computer for editing.

3. If this is the first time exporting the file, the following data should be in the file:

```
# Example Custom Signal Emission Mask
# Start Frequency, Stop Frequency, RBW, VBW, Is Start Amplitude Relative, Is
# Stop Amplitude Relative, Start Amplitude, Stop Amplitude
-3.5e6, -2.1e6, 100e6, 100e6, 0, 0, -9.5, -9.5
-2.1e6, -0.7e6, 100e6, 100e6, 0, 0, -9.5, 0.5
0.7e6, 2.1e6, 100e6, 100e6, 0, 0, 0.5, -9.5
2.1e6, 3.5e6, 100e6, 100e6, 0, 0, -9.5, -9.5
```

4. Change each of the values as desired. Note that the values must be entered in the listed order of the file header.
5. Save the file to a USB device and insert it into the instrument.
6. Select the IMPORT MASK button in the SEM SETUP menu and select the new file from the USB drive. The file name of the imported mask file will be displayed on the EXPORT MASK button.
7. Select the SELECT MASK button and select Custom.

STATUS PANEL (SEM)

Below is the status panel with the corresponding minimized status panel icons that is unique only to spectral emission mask measurement.

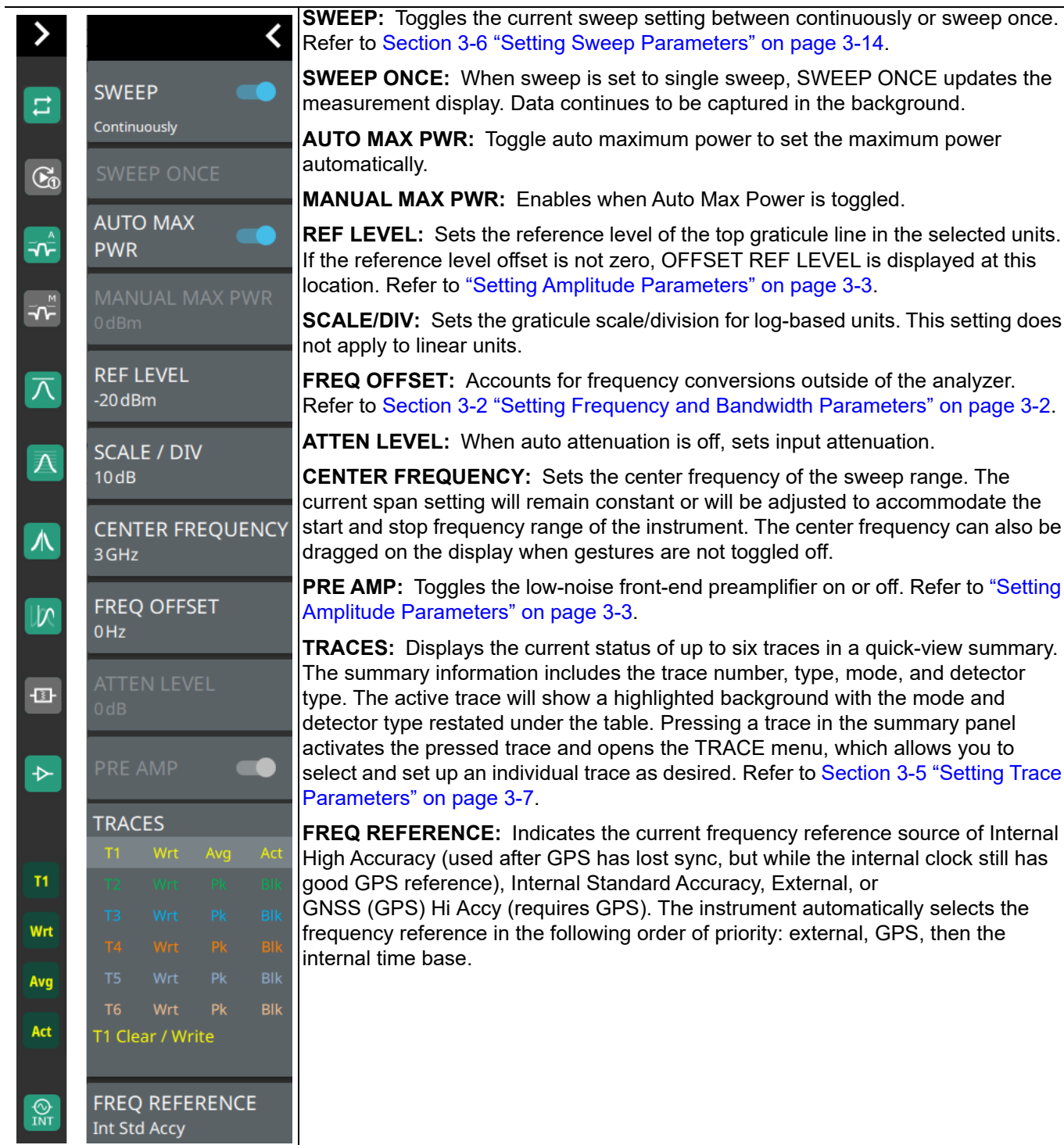


Figure 3-37. Status Panel with Minimized Status Panel Icons (SEM)

3-14 Presetting the Analyzer

The PRESET menu sets certain settings to the default state. Preset only affects the current analyzer settings, such as those for the spectrum analyzer or for the WCDMA analyzer. Preset does not affect user files or system settings such as networking settings. For other reset options, such as a complete factory reset of the instrument, refer to “Reset Settings” the Instrument Overview chapter of the user guide. To recover from system software faults, refer to Appendix A, “Instrument Messages and Troubleshooting” chapter of the instrument user guide.

PRESET Menu

PRESET PRESET MARKERS PRESET SETUP PRESET MODE	PRESET MARKERS: Presets all values on the MARKER menu to default values. Not available in WCDMA Demod Summary measurement. PRESET SETUP: Presets all values on the SETUP menu to default values. PRESET MODE: Presets all of the current analyzer settings to default values.
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Figure 3-38. PRESET Menu

3-15 Saving and Recalling Measurements

The instrument can save measurement setups, native trace and CSV trace data, limit line setups, and screenshots. You can recall setup, native trace, and limit line files. For other file operations such as copy, move, and directory management, refer to “File Management” section in Instrument Overview chapter of the instrument user guide.

Saving a Measurement

To save a measurement or setup, refer to [Figure 3-39](#):

1. Press FILE > SAVE AS...
2. If desired, press the save location to change the destination.
3. Enter the desired file name using the touchscreen keyboard.
4. Select the type of file to save from the selection list.
5. Press SAVE to save the file.

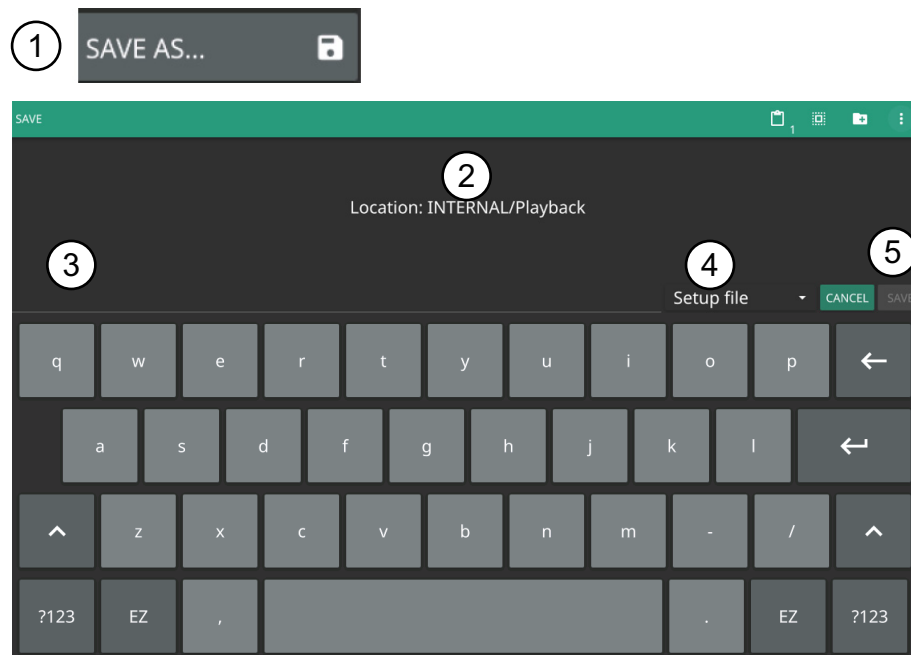


Figure 3-39. File Save Dialog

Once a file has been saved, the QUICK SAVE feature can be used to quickly save the same type of file with an incrementing number appended to the end of the original file name.

Recalling a Measurement

You can recall a saved setup, native trace measurement, and a limit line. When recalling a setup, the instrument setup and operating state will be restored as it was when the setup was saved. When recalling a trace measurement, the instrument setup and on-screen measurement data will be restored as it was when the trace data was saved.

To recall a measurement or setup, refer to [Figure 3-40](#):

1. Press FILE > RECALL...
2. Select the file location.
3. Use the file type filter to shorten the list if needed.
4. Select the desired file from the displayed list.
5. Press OPEN to recall the file.

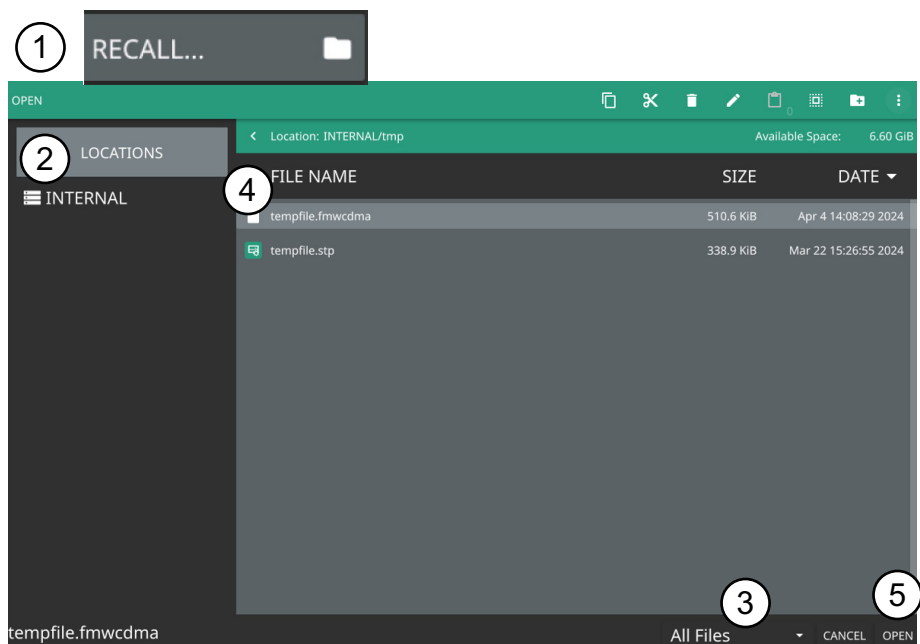


Figure 3-40. File Open Dialog

When a measurement is recalled, the trace or sweep state will be set to hold. To restore active measurements, disable SWEEP > HOLD and/or set TRACE > MODE > Active.

FILE Menu

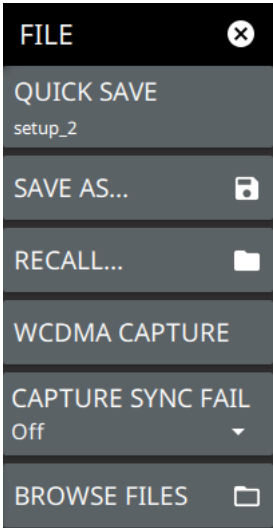
	QUICK SAVE: saves a setup file immediately with the name shown in the button. The number in the name is incremented automatically so that the new name is ready for the next setup file to be saved. SAVE AS: Opens the Save dialog to manually enter a file location, enter a file name, and to set the file type to be saved. Depending on the selected measurement, you can save the following: • Setup: Saves the current instrument setup (stp file type). • Trace: Saves the measurement point (trace) data and the current instrument setup (fmwcdma file type). • Trace CSV: Saves the visible trace point data in comma separated value format (csv file type). This format is useful for further analysis using other software tools. • Screenshot: Saves a screenshot of the current measurement (png file type). • Trace + Screenshot: Saves both the current measurement and screenshot files (both fmwcdma and png file types). RECALL: Opens the Recall File dialog to retrieve a file from a desired location. Only supported files will be displayed depending on the currently set measurement. When trace data is recalled, the instrument will change the settings to match the settings of the saved trace. The data will be recalled to the appropriate trace. That trace will be in a Hold mode. To exit the recalled data, simply change the trace mode back to Active. WCDMA CAPTURE: Initiates a digitized WCDMA data capture at the selected bandwidth. WCDMA captures are saved to the internal storage space in the captures folder (bin file type). This feature is meant to help identify WCDMA signal characteristics during early development. CAPTURE SYNC FAIL: Automatically initiates a digitized WCDMA data capture when synchronization fails. The setting can be configured to capture just a single event or repeat events. WCDMA captures are saved to the internal storage space. BROWSE FILES: Refer to “File Management” section of Instrument Overview chapter of the user guide.
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Figure 3-41. FILE Menu



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Anritsu Company
490 Jarvis Drive
Morgan Hill, CA 95037-2809
USA
<http://www.anritsu.com>