TD-SCDMA Modulation Analysis Guide with HSDPA/8PSK

Agilent Technologies PSA Series

Options 212 and 213

This manual provides documentation for the following instruments:
Spectrum Analyzers:
E4440A (3 Hz – 26.5 GHz)
E4443A (3 Hz – 6.7 GHz)
E4445A (3 Hz – 13.2 GHz)
E4446A (3 Hz – 44.0 GHz)
E4447A (3 Hz – 42.98 GHz)
E4448A (3 Hz – 50.0 GHz)

Agilent Technologies

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1 Introduction

This chapter provides overall information on the TD-SCDMA communications system Options 212 and 213, and describes TD-SCDMA modulation analysis measurements made by the analyzer. Installation instructions for adding this option to your analyzer are provided in this section, in case you purchased this option separately.

What Does the Agilent PSA Series Option 212 and 213 Do?

This instrument can be used for testing a TD-SCDMA transmitter, including measuring HSDPA/8PSK signals, adhering to the following standards documents:

- 3GPP TS 25.223 Spreading and modulation (TDD) (Release 7)
- 3GPP TS 25.308 High Speed Downlink Packet Access (HSDPA) (Release 7)

TD-SCDMA is a wireless multiple access technology, which combines aspects of code division multiple access (CDMA) and time division multiple access (TDMA).

The PSA series Options 212 and 213 provides a one-analyzer solution to perform essential demodulation measurements on complex TD-SCDMA signals. Option 212 performs modulation analysis measurements and quickly quantifies modulation quality and associated parameters. Results such as composite EVM, constellation diagram, and code domain power are available. Option 213 is a sub-option to Option 212 used to measure HSDPA and 8PSK signals and requires Option 212. All the measurements, results, and views available in Option 212 are still available when Option 213 is enabled.

Option B7J (Digital Demodulation Hardware) is required and either Option 1DS (RF pre-amplifier, up to 3 GHz) or Option 110 (mw/mmw pre-amplifier, above 3 GHz) is highly recommended.

You can use the PSA with Option 212 and 213 to automatically make measurements using the measurement methods and limits defined in the standards documents. You may perform measurements on both uplink and downlink signals. The measurements display detailed results that allow you to analyze TD-SCDMA system performance. You may alter the measurement parameters for specialized analysis.

For infrastructure test, the instrument will test transmitters of base stations in a non-interfering manner by means of a coupler or power splitter. For subscriber unit test, mobiles may be measured by way of a splitter or coupler when the mobile is actively linked to a base station or base station simulator. An alternative method of mobile measurement requires that the mobile be placed in a special test mode.

Using the PSA and Option 212 and 213, you can make the following measurements:

- “Code Domain Measurements” on page 29
- “Modulation Accuracy (Composite EVM) Measurements” on page 42
- “Spectrum Analysis Measurement (Frequency Domain)” see *PSA Basic Guide*
- “Waveform Measurement (Time Domain)” see *PSA Basic Guide*

For more information on individual measurements, see Chapter 2 , “Making Measurements,” on page 25.

Installing Optional Measurement Personalities

When you install a measurement personality, you need to follow a three step process:

1. Determine whether your memory capacity is sufficient to contain all the options you want to load. If not, decide which options you want to install now, and consider upgrading your memory. Details follow in "Do You Have Enough Memory to Load All Your Personality Options?" on page 17.
2. Install the measurement personality firmware into the instrument memory. Details follow in "Loading an Optional Measurement Personality" on page 21.
3. Enter a license key that activates the measurement personality. Details follow in "Obtaining and Installing a License Key" on page 21.

Adding measurement personalities requires the purchase of an upgrade kit for the desired option. The upgrade kit contains the measurement personality firmware and an entitlement certificate that is used to generate a license key from the internet website. A separate license key is required for each option on a specific instrument serial number and host ID.

For the latest information on Agilent Spectrum Analyzer options and upgrade kits, visit the following Internet URL:

http://www.agilent.com/find/sa_upgrades

Do You Have Enough Memory to Load All Your Personality Options?

If you do not have memory limitations then you can skip ahead to the next section "Loading an Optional Measurement Personality" on page 21. If after installing your options you get error messages relating to memory issues, you can return to this section to learn more about how to optimize your configuration.

If you have 64 MBytes of memory installed in your instrument, you should have enough memory to install at least four optional personalities, with plenty of memory for data and states.

The optional measurement personalities require different amounts of memory. So the number of personalities that you can load varies. This is also impacted by how much data you need to save. If you are having memory errors you must swap the applications in/out of memory as needed. If you only have 48 MBytes of memory, you can upgrade your hardware to 64 MBytes.

Additional memory can be added to any PSA Series analyzer by installing Option 115. With this option installed, you can install all currently available measurement personalities in your analyzer and still have memory space to store more state and trace files than would otherwise be possible.

To see the size of your installed memory for PSA Series Spectrum Analyzers:

1. Ensure that the spectrum analyzer is in spectrum analyzer mode because this can affect the screen size.
2. Press **System**, **More**, **Show Hdwr**.
3. Read `Flash Memory` size in the table. If Option 115 is installed (PSA only), the table will also show `Compact Flash Type` and `Compact Flash Size`.

PSA Flash Memory Size	Available Memory Without Option B7J and Option 122 or 140	Available Memory With Option B7J and Option 122 or 140
64 Mbytes	32.5 MBytes	30.0 MBytes
48 Mbytes	16.9 MBytes	14.3 MBytes

PSA Compact Flash Memory Size	Available Additional Memory for Measurement Personalities
512 Mbytes (Opt. 115)	512 MBytes

If you have 48 MBytes of memory, and you want to install more than 3 optional personalities, you may need to manage your memory resources. The following section, “How to Predict Your Memory Requirements” on page 19, will help you decide how to configure your installed options to provide optimal operation.

How to Predict Your Memory Requirements

If you plan to install many optional personalities, you should review your memory requirements, so you can determine whether you have enough memory (unless you have a PSA Series with Option 115). There is an Agilent "Memory Calculator" available online that can help you do this, or you can make a calculated approximation using the information that follows. You will need to know your instrument's installed memory size as determined in the previous section and then select your desired applications.

NOTE If you have a PSA Series analyzer with Option 115, there is adequate memory to install all of the available optional personalities in your instrument.

For PSA Series see: http://www.agilent.com/find/psa_firmware

Select the "Memory Calculator" link. You can try any combination of available personalities to see if your desired configuration is compatible with your installed memory.

NOTE After loading all your optional measurement personalities, you should have a reserve of ~2 MBytes memory to facilitate mode switching. Less available memory will increase mode switching time. For example, if you employ excessive free memory by saving files of states and/or data, your mode switching time can increase to more than a minute.

You can manually estimate your total memory requirements by adding up the memory allocations described in the following steps. Compare the desired total with the available memory that you identified in the previous section.

1. Program memory - Select option requirements from the table "Measurement Personality Options and Memory Required" on page 20.
2. For PSA only: shared libraries require 7.72 MBytes
3. For PSA only: recommended mode swap space is 2 MBytes
4. Screens - .gif files need 20-25 kB each
5. State memory - State file sizes range from 21 kB for SA mode to 40 kB for W-CDMA. The state of every mode accessed since power-on will be saved in the state file. File sizes can exceed 150 kB each when several modes are accessed, for each state file saved.

TIP State memory retains settings for all states accessed before the **Save State** command. To reduce this usage to a minimum, reduce the modes accessed before the **Save State** is executed. You can set the PSA to boot into a selected mode by accessing the desired mode, then pressing the **System**, **Power On/Preset**, **Power On** keys and toggle the setting to **Last**.

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Measurement Personality Options and Memory Required

Personality Options for PSA Series Spectrum Analyzers [a]	Option	File Size (PSA Rev: A.09)
cdmaOne measurement personality	**BAC**	1.91 Mbytes
NADC and PDC measurement personalities (not available separately)	**BAE**	2.43 Mbytes
W-CDMA or W-CDMA, HSDPA, HSUPA measurement personality	**BAF**, **210**	5.38 Mbytes[b]
cdma2000 or cdma2000 w/ 1xEV-DV measurement personality	**B78**, **214**	4.00 Mbytes[b]
1xEV-DO measurement personality	**204**	5.61 Mbytes[b]
GSM (with EDGE) measurement personality	**202**	3.56 Mbytes[b]
Shared measurement library[b]	n/a	7.72 Mbytes
Phase Noise measurement personality	**226**	2.82 Mbytes[c]
Noise Figure measurement personality	**219**	4.68 Mbytes[c]
Basic measurement personality with digital demod hardware	**B7J**	Cannot be deleted (2.64 Mbytes)
Programming Code Compatibility Suite[d] (8560 Series, 8590 Series, and 8566/8568)	**266**	1.18 Mbytes[c]
TD-SCDMA Power measurement personality	**211**	5.47 Mbytes[c]
TD-SCDMA Modulation Analysis or TD-SCDMA Modulation Analysis w/ HSDPA/8PSK measurement personality	**212, 213**	1.82 Mbytes
Flexible Digital Modulation Analysis	**241**	2.11 Mbytes[b]
WLAN measurement personality	**217**	3.24 Mbytes[b]
External Source Control	**215**	0.72 Mbytes[c]
Measuring Receiver Personality (available with Option 23A - Trigger support for AM/FM/PM and Option 23B - CCITT filter)	**233**	2.91 Mbytes[c]

a. Available as of the print date of this guide.
b. Many PSA Series personality options use a 7.72 Mbyte shared measurement library. If you are loading multiple personalities that use this library, you only need to add this memory allocation once.
c. Shared measurement library allocation not required.
d. This is a no charge option that does not require a license key.

Memory Upgrade Kits

The PSA 64 MByte Memory Upgrade kit part number is E4440AU-ANE. The PSA Compact Flash Upgrade kit part number is E4440AU-115.

For more information about memory upgrade kits contact your local sales/service office, or see:
http://www.agilent.com/find/sa_upgrades

Loading an Optional Measurement Personality

You must use a PC to load the desired personality option into the instrument memory. Loading can be done from a firmware CD-ROM or by downloading the update program from the internet. An automatic loading program comes with the files and runs from your PC.

You can check the Agilent internet website for the latest firmware versions available for downloading:

For PSA, see http://www.agilent.com/find/psa_firmware

NOTE When you add a new option, or update an existing option, you will get the updated versions of all your current options as they are all reloaded simultaneously. This process may also require you to update the instrument core firmware so that it is compatible with the new option.

Depending on your installed hardware memory, you may not be able to fit all of the available measurement personalities in instrument memory at the same time. You may need to delete an existing option file from memory and load the one you want. Use the automatic update program that is provided with the files. Refer to the table showing “Measurement Personality Options and Memory Required” on page 20. The approximate memory requirements for the options are listed in this table. These numbers are worst case examples. Some options share components and libraries, therefore the total memory usage of multiple options may not be exactly equal to the combined total.

Obtaining and Installing a License Key

If you purchase an optional personality that requires installation, you will receive an “Entitlement Certificate” which may be redeemed for a license key specific to one instrument. Follow the instructions that accompany the certificate to obtain your license key.

To install a license key for the selected personality option, use the following procedure:

NOTE You can also use this procedure to reinstall a license key that has been deleted during an uninstall process, or lost due to a memory failure.

1. Press **System**, **More**, **More**, **Licensing**, **Option** to accesses the alpha editor. Use this alpha editor to enter letters (upper-case), and the front-panel numeric keys to enter numbers for the option designation. You will validate your option entry in the active function area of the display. Then, press the **Enter** key.

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2. Press **License Key** to enter the letters and digits of your license key. You will validate your license key entry in the active function area of the display. Then, press the **Enter** key.

3. Press the **Activate License** key.

Viewing a License Key

Measurement personalities purchased with your instrument have been installed and activated at the factory before shipment. The instrument requires a **License Key** unique to every measurement personality purchased. The license key is a hexadecimal number specific to your measurement personality, instrument serial number and host ID. It enables you to install, or reactivate that particular personality.

Use the following procedure to display the license key unique to your personality option that is already installed in your instrument:

Press **System**, **More**, **More**, **Licensing**, **Show License.** The **System**, **Personality** key displays the personalities loaded, version information, and whether the personality is licensed.

NOTE *You will want to keep a copy of your license key in a secure location. Press **System**, **More**, then **Licensing**, **Show License**, and print out a copy of the display that shows the license numbers. If you should lose your license key, call your nearest Agilent Technologies service or sales office for assistance.*

Using the Delete License Key

This key will make the option unavailable for use, but will not delete it from memory. Write down the 12-digit license key for the option before you delete it. If you want to use that measurement personality later, you will need the license key to reactivate the personality firmware.

NOTE Using the **Delete License** key does not remove the personality from the instrument memory, and does not free memory to be available to install another option. If you need to free memory to install another option, refer to the instructions for loading firmware updates located at the URL: **http://www.agilent.com/find/psa/**

1. Press **System**, **More**, **More**, **Licensing**, **Option**. Pressing the **Option** key will activate the alpha editor menu. Use the alpha editor to enter the letters (upper-case) and the front-panel numeric keyboard to enter the digits (if required) for the option, then press the **Enter** key. As you enter the option, you will see your entry in the active function area of the display.

2. Press **Delete License** to remove the license key from memory.

Ordering Optional Measurement Personalities

When you order a personality option, you will receive an entitlement certificate. Then you will need to go to the web site to redeem your entitlement certificate for a license key. You will need to provide your instrument serial number and host ID, and the entitlement certificate number.

Required Information:	**Front Panel Key Path:**
Model #: (Ex. E4440A)	
Host ID: ____________________	**System**, **Show System**
Instrument Serial Number: ____________________	**System**, **Show System**

Introduction

2 Making Measurements

This chapter describes procedures used for making measurements of TD-SCDMA (3GPP) signals from either a base station (BTS) or a mobile station (MS). Instructions to set up and perform the measurements are provided, and examples of TD-SCDMA Modulation Analysis measurement results are shown.

TD-SCDMA Measurements

This chapter begins with instructions common to all measurements, and then details TD-SCDMA Modulation Analysis measurements available by pressing the **MEASURE** key.

For more information on front panel keys specific to this measurement personality, refer to “Key and SCPI Reference” on page 55, and for keys not described in this manual, refer to the PSA *User’s and Programmer’s Reference* manual.

For information specific to individual measurements refer to “Concepts” on page 165 or the sections at the page numbers below.

- “Code Domain Measurements” on page 29
- “Modulation Accuracy (Composite EVM) Measurements” on page 42

The measurements described in this chapter are referred to as **one-button measurements**. When you press the key to select a measurement, it becomes the active measurement, using settings and a display unique to that measurement. Data acquisition automatically begins when trigger requirements, if any, are met.

Setting up and Making a Measurement

Making the Initial Signal Connection

CAUTION Before connecting a signal to the instrument, make sure the instrument can safely accept the signal level provided. The signal level limits are marked next to the connectors on the front panel.

See the menu map, “Mode Setup Input Key Flow (1 of 2)” on page 205, and key descriptions, “Input” on page 60, for details on selecting input ports and setting internal attenuation to prevent overloading the instrument.

The “Input” on page 60 also provides details of **Int Preamp** operation.

Using Instrument Mode and Measurement Presets

If you want to set your current measurement personality to a known, factory default state, press **Preset**. This initializes the instrument by returning the mode setup and all of the measurement setups in the mode to the factory default parameters.

NOTE Pressing the **Preset** key may switch instrument modes if you have set the Power On/Preset function Preset Type to User or Factory.

To preset only the parameters that are specific to an active, selected measurement, press **Meas Setup**, then **Restore Meas Defaults**. Restore Meas Defaults will return all the measurement setup parameters to the factory defaults, but only for the currently selected measurement. This key may not appear on the first page of the Meas Setup menu. If it is not visible on the first page of the menu, press **More** until the key is available.

The 3 Steps to Set Up and Make Measurements

All measurements need to be set up in 3 steps: first at the Mode level, second at the Measurement level, then finally the result display may be adjusted.

1. Select and Set Up the Mode

   Press **MODE** - All licensed, installed Modes available are shown.
   Press **TD-SCDMA Modulation**, or to make measurements of signals with non-standard formats, select **Basic** mode.

   Press **Mode Setup** - Make any required adjustments to the mode settings. These settings apply to all measurement in the mode.

2. Select and Set Up the Measurement

   Press **MEASURE** - Select a specific measurement to be performed (e.g. **Mod**

Accuracy (Composite EVM), or **Code Domain**. The measurement begins as soon as any required trigger conditions are met. The resulting data is shown on the display or is available for export.

Press **Meas Setup -** Make any adjustments as required to the selected measurement settings. The settings only apply to this measurement.

3. Select and Set Up a View of the Results

   Press **Trace/View -** Select a display format for the current measurement data. Depending on the mode and measurement selected, other graphical and tabular data presentations may be available. **AMPLITUDE Y-Scale** adjustments may also be made now.

NOTE A setting may be reset at any time, and will be in effect on the next measurement cycle or View.

Step	Primary Key	Setup Keys	Related Keys
1. Select & set up a Mode	**MODE**	**Mode Setup**, **Input/Output**, **FREQUENCY Channel**	**System**
2. Select & set up a Measurement	**MEASURE**	**Meas Setup**	**Meas Control**, **Restart**
3. Select & set up a View of the Results	**Trace/View**	**AMPLITUDE Y Scale**, **Display**, **Next Window**, **Zoom**	**File**, **Save**, **Print**, **Print Setup**, **Marker**

Code Domain Measurements

This section explains how to make a code domain measurement on TD-SCDMA (3GPP) MS and BTS. This is the measurement of the spread code channels across composite RF channels. The code power may be measured relative to the total power within the 1.28 MHz channel bandwidth, or absolutely, in units of power.

Code Domain measurement examples using a TD-SCDMA (UL) signal and a HSDPA (DL) signal are shown in this section.

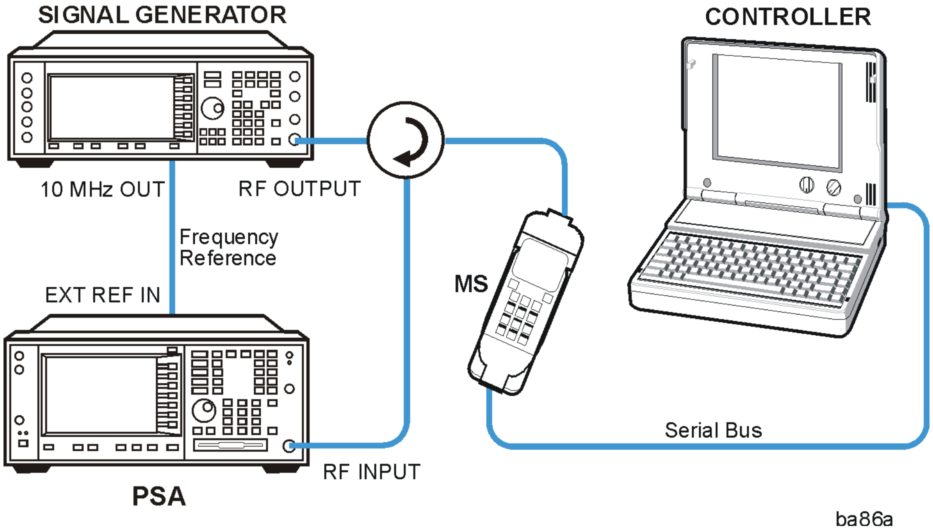
NOTE Before activating a measurement, make sure the mode setup and frequency channel parameters are set to the desired settings. Refer to the sections "Mode" on page 66 and "FREQUENCY/Channel key" on page 58.

One-Button MS Measurement Procedure

Step 1. Configure the Unit Under Test (UUT) as follows.

The mobile station (MS) under test has to be set to transmit the one RF carrier remotely through the system controller. This transmitting signal is connected to the instrument's RF input port. Connect the equipment as shown.

Figure 2-1 Code Domain Measurement System



a. Using the appropriate cables, adapters, and circulator, connect the output signal of the MS to the RF input of the instrument.

b. Connect the base transmission station simulator or signal generator to the MS through the circulator to initiate a link constructed with the sync and pilot channels, if required.

c. Connect a BNC cable between the 10 MHz OUT port of the signal generator and the EXT REF IN port of the instrument.

d. Connect the system controller to the MS through the serial bus cable to control the MS operation.

Step 2. From the base transmission station simulator and/or the system controller, perform all of the call acquisition functions required for the MS to transmit the RF signal as follows:

Frequency: 2,017.2 MHz (Channel Number: $5 \times 2{,}017.2 = 10{,}086$)

Switch Point: 1, Uplink

Scramble Code: 0

Spread Code Length: 8

Signal Amplitude: -20 dBm

Step 3. If you want to set the current measurement personality mode to a known, factory default state, ensure that the preset type is set to Mode and press **Preset**.

NOTE To preset only the parameter settings that are specific to the selected measurement, press **Meas Setup** and **Restore Meas Defaults**. (The Restore Meas Defaults key may not be on the first page of the menu. If not, press **More** until the key is available.)

Step 4. Press **MODE**, **TD-SCDMA Modulation** to enable the TD-SCDMA modulation analysis measurements.

NOTE If you have installed Option 213, you need to press **MODE**, **TD-SCDMA Modulation with HSDPA** to enable the TD-SCDMA modulation analysis with HSDPA/8PSK measurements.

The desired mode key may not be on the first page of the menu. If not, press **More** until the key is available.

Step 5. Press **Mode Setup**, **Radio**, **Device** to toggle the device to **MS**.

Step 6. Press **Mode Setup**, **Demod**, **Analysis TimeSlot** to select a timeslot to be measured.

Step 7. Press **Mode Setup**, **Demod**, **More, Timing Ref** to select a timing reference.

For downlink signals, select **DwPTS**;

For uplink signals, select **UwPTS**;

You can also select **Trigger** for either downlink or uplink signals. Make sure the trigger source has been correctly set up.

Step 8. Press **FREQUENCY Channel**, then use the numeric keypad to set the center frequency.

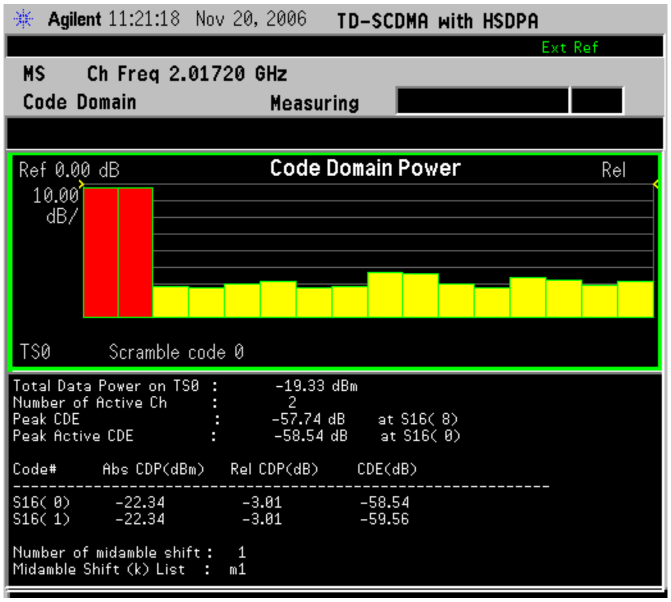
Step 9. Press **MEASURE**, **Code Domain** to initiate the code domain measurement.

Depending on the current settings of **Meas Control**, the instrument will begin making the selected measurements.

To make measurements repeatedly, press **Meas Control**, **Measure** to change the Meas Control from **Single** to **Cont**.

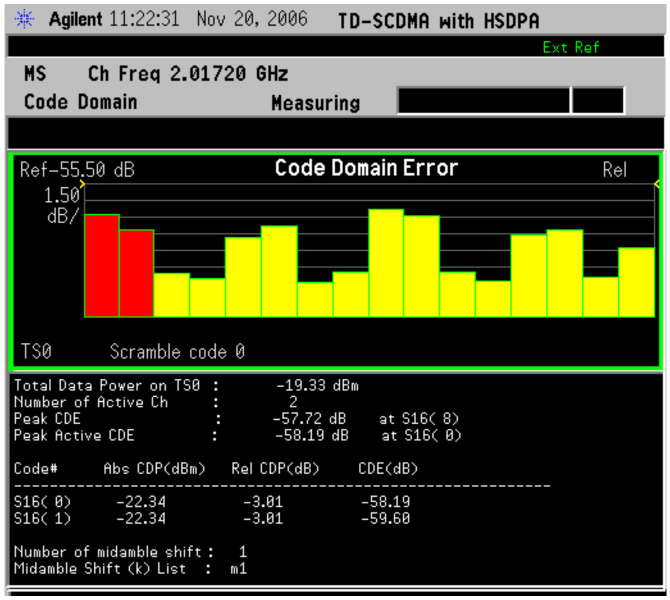
The Code Domain Power measurement result should look like Figure 2-2. The graphical window is displayed with a text window below it. The text window shows the total power level along with the relative power levels of the various channels.

Figure 2-2 Code Domain Measurement Result - CDP Graph & Metrics (Default) View



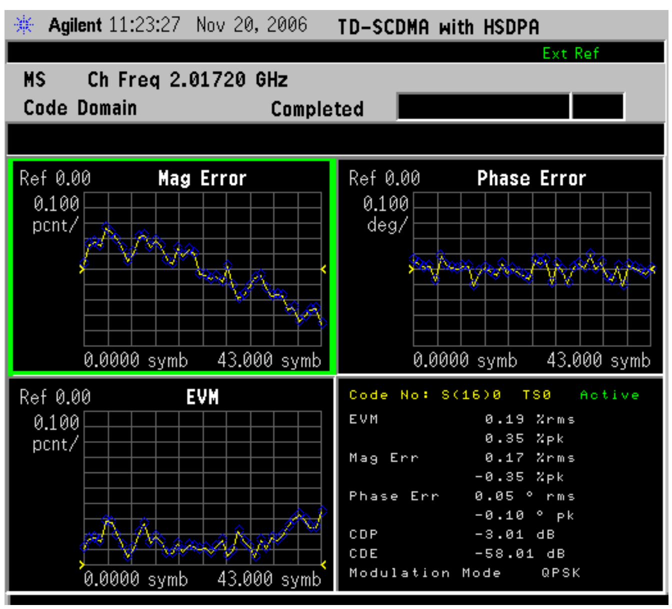
Step 10. Press **Trace/View**, **CDE Graph & Metrics** to display a combination view of the code domain error with a summary results window as shown below:

Figure 2-3 **Code Domain Measurement Result - CDE Graph & Metrics View**



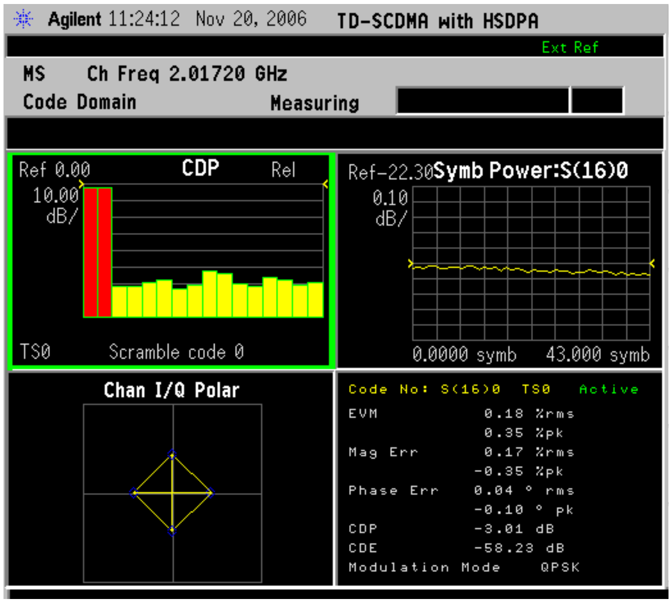
Step 11. Press **Trace/View**, **I/Q Error (Quad View)** to display a combination view of the magnitude error vs. time, phase error vs. time, and EVM vs. time, together with the modulation summary results window as shown below:

Figure 2-4 **Code Domain Measurement Result - I/Q Error Quad View**



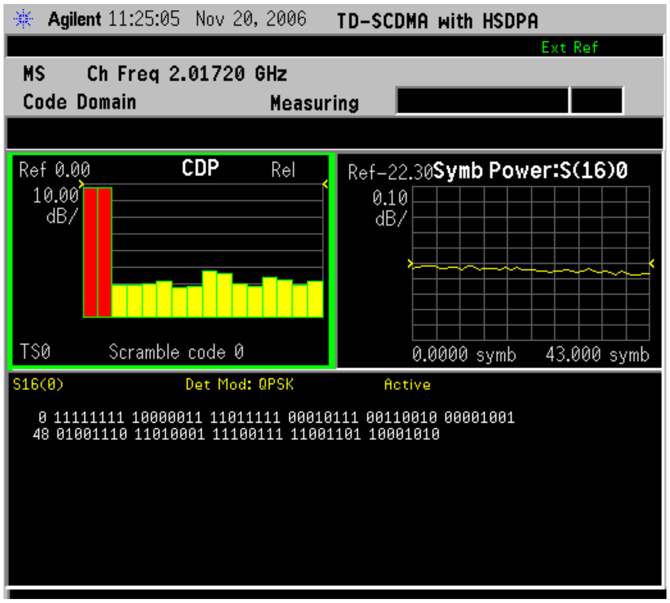
Step 12. Press **Trace/View**, **Code Domain** to display a combination view of the code domain power, symbol power, and I/Q polar vector, together with a summary results window as shown below:

Figure 2-5 Code Domain Measurement Result - Code Domain



Step 13. Press **Trace/View, Demod Bits** to display a combination view of the code domain power, symbol power, and the I/Q demodulated bit stream data for the symbol power slots selected by the measurement interval and measurement offset parameters.

Figure 2-6 Code Domain Measurement Result - Demod Bits View

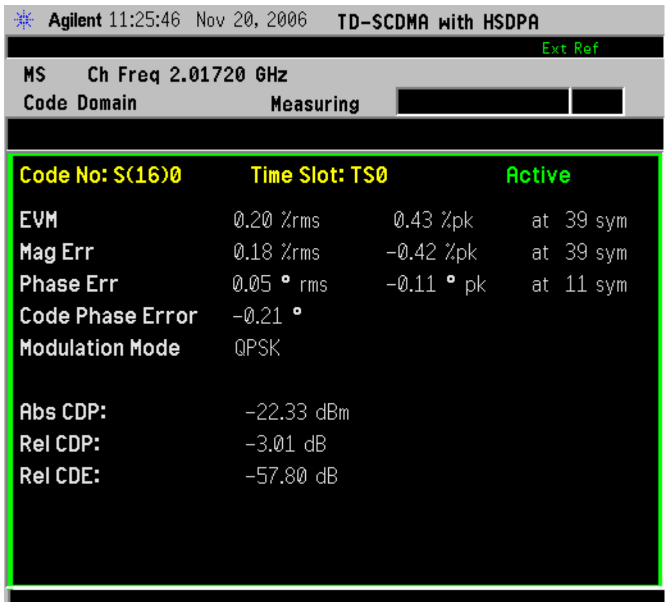


The Demod Bits View displays the same Code Domain Power and Symbol Power windows shown in Figure 2-5 on page 33

The demodulated bit stream displayed is the data contained in the Measurement Interval, slot number. For more details of these adjustments see “Code Domain Measurement” on page 101

Step 14. Press **Trace/View**, **Results Metrics** to display a numeric result metrics window.

Figure 2-7 Code Domain Measurement Result - Numeric Results



Step 15. You may need to change some of the display settings. These changes should not affect the measurement results, but will affect how you view the measurement results on the instrument display.

The **AMPLITUDE Y Scale** key accesses the menu to set the desired horizontal scale and associated settings: **Scale/Div**, **Ref Value**, **Ref Position** and **Scale Coupling**

The **X/Scale** key accesses the menu to set the desired vertical scale and associated settings: **Scale/Div**, **Ref Value** and **Ref Position**.

The **Display** key accesses the menu to set the desired settings. For more information, refer to “Code Domain Display Selection Key Flow” on page 208.

Step 16. If you want to change the measurement parameters from their default condition so that you can make a customized measurement, press **Meas Setup** to see the available keys. Then, for additional information on use of the available keys and customizing your measurement, refer to “Code Domain Measurement” on page 101. For additional information on the measurement concepts, refer to “Code Domain Measurement Concepts” on page 181.

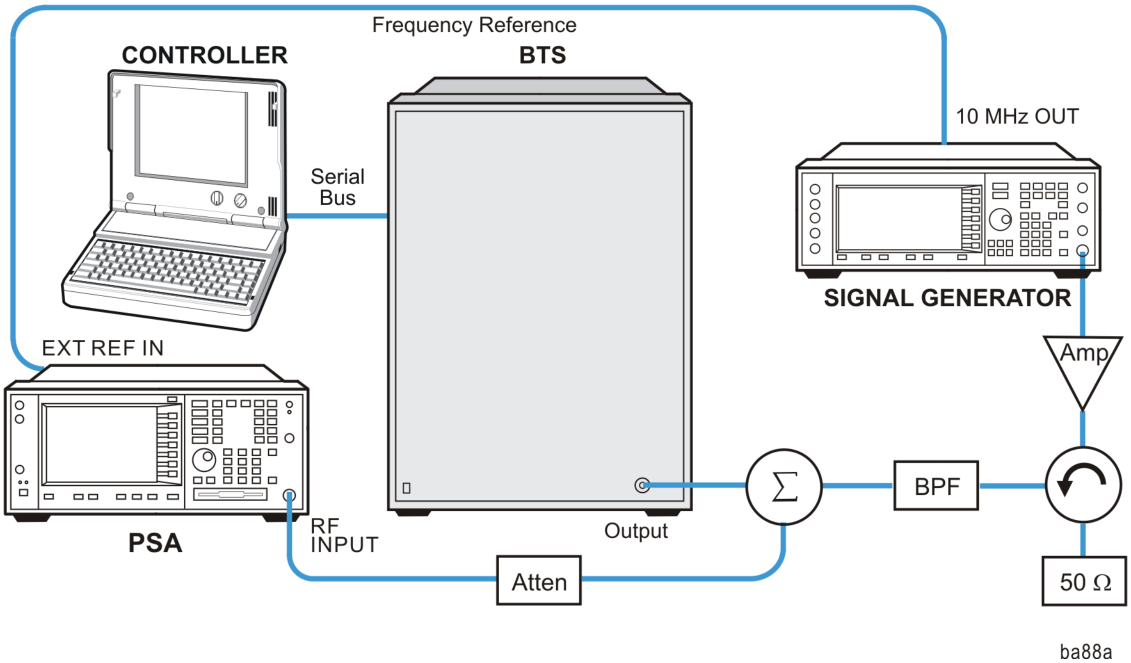
If you have a problem, and get an error message, see the “Instrument Messages and Functional Tests” manual.

One-Button BTS Measurement Procedure

Step 1. Configure the Unit Under Test (UUT) as follows.

The base transmission station (BTS) under test has to be set to transmit one RF carrier remotely through the system controller. This transmitting signal is connected to the instrument's RF input port. Connect the equipment as shown.

Figure 2-8 Code Domain Measurement System



a. Using the appropriate amplifier, circulator, bandpass filter, combiner, cables, and adapters, connect the unmodulated carrier signal from the signal generator to the output connector of the BTS.

b. Connect the circulator output signal to the RF input port of the instrument through the attenuator.

c. Connect a BNC cable between the 10 MHz OUT port of the signal generator and the EXT REF IN port of the instrument.

d. Connect the system controller to the BTS through the serial bus cable.

Step 2. From the base transmission station simulator and/or the system controller, perform all of the call acquisition functions required for the BTS to transmit the RF signal as follows:

Frequency: 2,017.2 MHz (Channel Number: $5 \times 2{,}017.2 = 10{,}086$)

Switch Point: 1, Downlink

Scramble Code: 0

Spread Code Length: 8

Signal Amplitude: -20 dBm

Step 3. Enable the TD-SCDMA measurement personality mode by pressing **MODE** and **TD-SCDMA Modulation**. The desired mode key may not be on the first page of the menu. If not, press **More** until the key is available.

NOTE If you have installed Option 213, you need to press **MODE**, **TD-SCDMA Modulation with HSDPA** keys to enable the TD-SCDMA modulation analysis with HSDPA/8PSK measurements.

Step 4. If you want to set the current measurement personality mode to a known, factory default state, ensure that the preset type is set to Mode, and press **Preset**.

NOTE To preset only the parameter settings that are specific to the selected measurement, press **Meas Setup** and **Restore Meas Defaults**. (The Restore Meas Defaults key may not be on the first page of the menu. If not, press **More** until the key is available.)

Step 5. Toggle the device to **BTS** by pressing **Mode Setup**, **Radio**, **Device**.

Step 6. Press the **Mode Setup**, **Demod**, **Analysis TimeSlot** to select a timeslot to be measured.

Step 7. Press the **Mode Setup**, **Demod**, **More, Timing Ref** to select a timing reference.

For downlink signals, select **DwPTS**;

For uplink signals, select **UwPTS**;

You can also select **Trigger** for either downlink or uplink signals. Make sure the trigger source has been correctly setup.

Step 8. Set the desired center frequency by pressing **FREQUENCY Channel** and **Center Freq**, then use the numeric keypad to enter the frequency of interest.

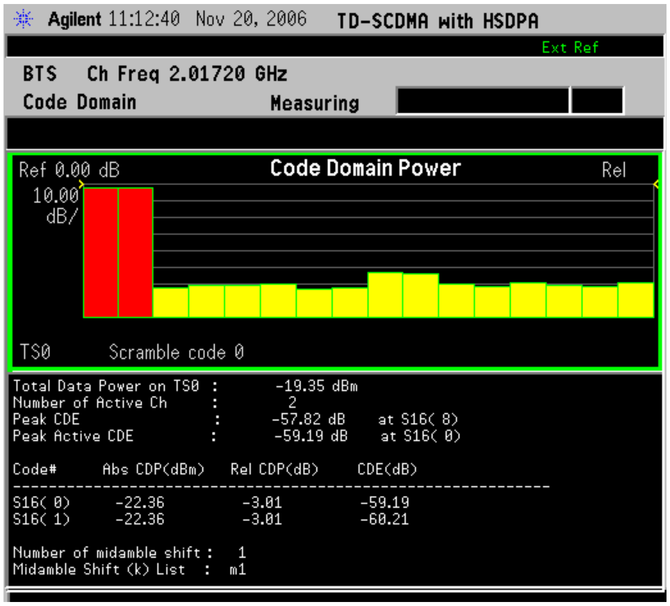
Step 9. Press **MEASURE**, **Code Domain** to initiate the code domain measurement.

Depending on the current settings of **Meas Control**, the instrument will begin making the selected measurements.

To make measurements repeatedly, press the **Meas Control**, **Measure** keys to change the Meas Control from **Single** to **Cont**.

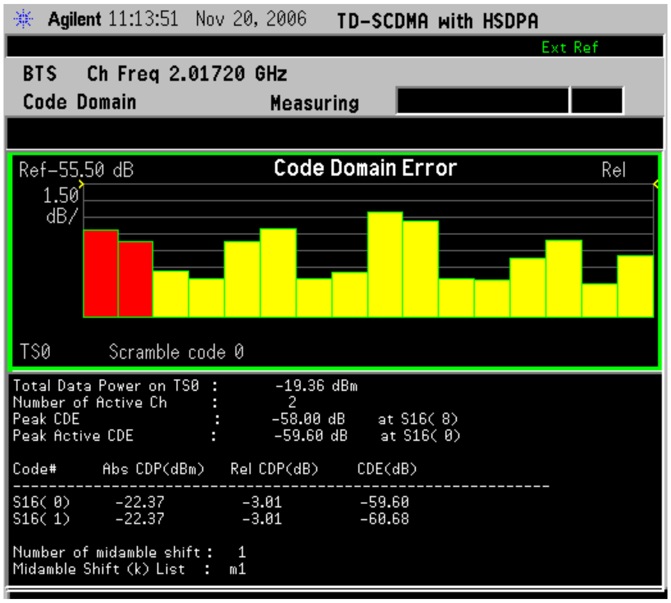
The Code Domain Power measurement result should look like Figure 2-9. The graphical window is displayed with a text window below it. The text window shows the total power level along with the relative power levels of the various channels.

Figure 2-9 Code Domain Measurement Result - CDP Graph & Metrics (Default) View



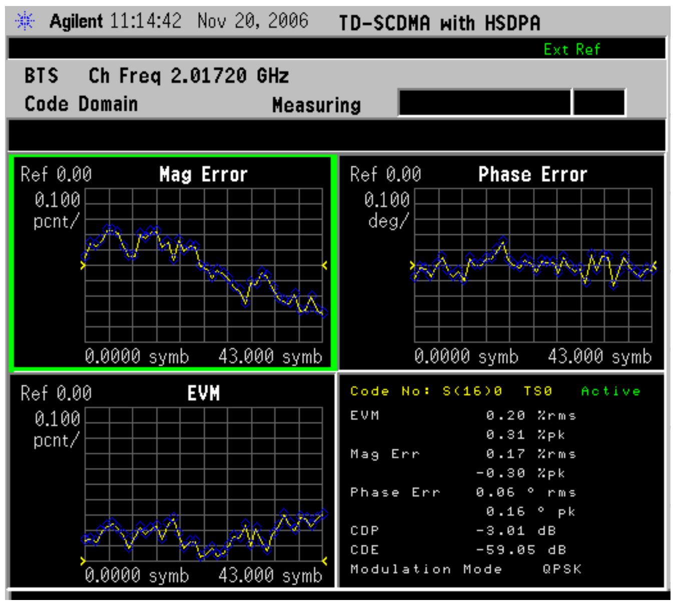
Step 10. Press the **Trace/View**, **CDE Graph & Metrics** key to display a combination view of the code domain error with a summary results window as shown below:

Figure 2-10 Code Domain Measurement Result - CDE Graph & Metrics View



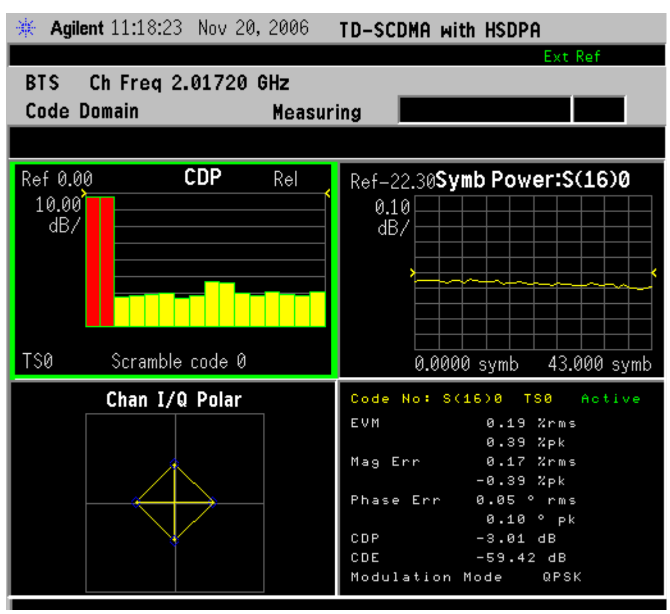
Step 11. Press the **Trace/View**, **I/Q Error (Quad View)** keys to display a combination view of the magnitude error vs. time, phase error vs. time, and EVM vs. time, together with the modulation summary results window as shown below:

Figure 2-11 Code Domain Measurement Result - I/Q Error Quad View



Step 12. Press **Trace/View**, **Code Domain** to display a combination view of the code domain power, symbol power, and I/Q polar vector, with a summary results window as shown below:

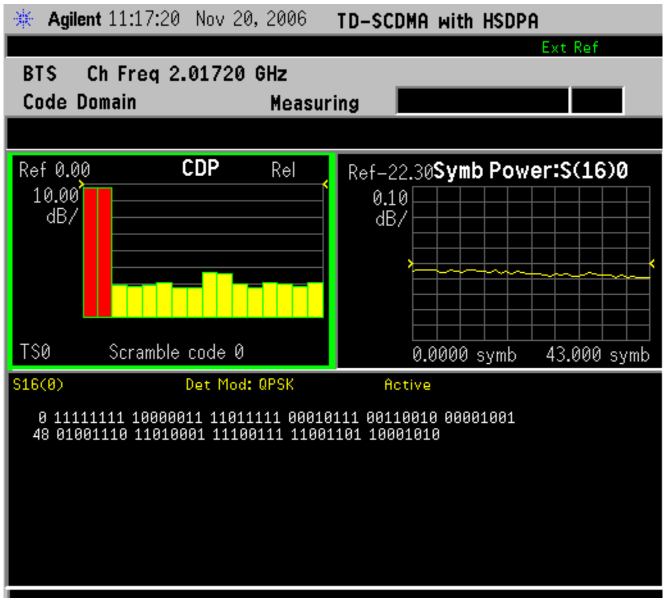
Figure 2-12 Code Domain Measurement Result - Code Domain



Step 13. Press **Trace/View, Demod Bits** to display a combination view of the code domain power, symbol power, and the I/Q demodulated bit stream data for the symbol

power slots selected by the measurement interval and measurement offset parameters.

Figure 2-13 Code Domain Measurement Result - Demod Bits View



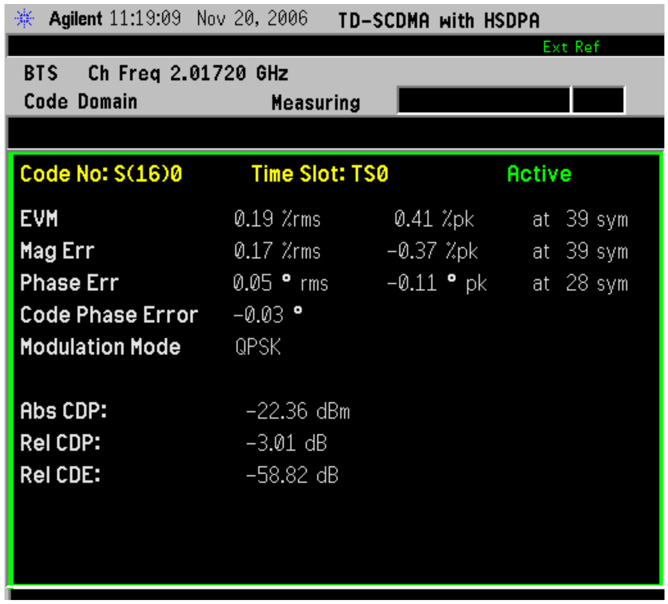
The Demod Bits View displays the same Code Domain Power and Symbol Power windows shown in Figure 2-12 on page 38

The demodulated bit stream displayed is the data contained in the Measurement Interval, slot number. For more details of these adjustments see "Code Domain Measurement" on page 101

Making Measurements

Step 14. Press **Trace/View**, **Results Metrics** to display a numeric result metrics window.

Figure 2-14 Code Domain Measurement Result - Numeric Results



Step 15. You may need to change some of the display settings. These changes should not affect the measurement results, but will affect how you view the measurement results on the instrument display.

The **AMPLITUDE Y Scale** key accesses the menu to set the desired vertical scale and associated settings: **Scale/Div**, **Ref Value**, **Ref Position** and **Scale Coupling**

The **X/Scale** key accesses the menu to set the desired vertical scale and associated settings: **Scale/Div**, **Ref Value** and **Ref Position**.

The **Display** key accesses the menu to set the desired settings. For more information, refer to "Code Domain Display Selection Key Flow" on page 208.

Step 16. If you want to change the measurement parameters from their default condition so that you can make a customized measurement, press **Meas Setup** to see the available keys. Then, for additional information on use of the available keys and customizing your measurement, refer to "Code Domain Measurement" on page 101. For additional information on the measurement concepts, refer to "Code Domain Measurement Concepts" on page 181.

If you have a problem and get an error message, refer to the "Instrument Messages and Functional Tests" manual.

Troubleshooting Hints

Uncorrelated interference may cause CW interference like local oscillator feedthrough or spurs. Another cause of uncorrelated noise can be I/Q modulation impairments.

Correlated impairments can be due to the phase noise on the local oscillator in the upconverter or I/Q modulator of the UUT. These will be analyzed by the code domain measurements along with the QPSK EVM measurements and others.

Poor phase error indicates a problem with one or more of the following: I/Q baseband generator, the filters, or the modulator in the transmitter circuitry of the UUT. The output amplifier in the transmitter can also create distortion that causes unacceptably high phase error. In a real system, poor phase error will reduce the ability of a receiver to correctly demodulate the received signal, especially in marginal signal conditions.

If the error code “`No Pilot burst found`” is shown, it means that your measurement has failed to find any active channels due to the lack of a pilot when you select **Sync Type** as **Pilot**. The input signal may need to be adjusted to enable a pilot.

If the error code “`No active channel found`” is shown, it means that no active channel is found on the analyzed timeslot, the possible reason is the power of code channels are below the Active Channel Threshold.

If the error code “`Not an active slot`” is shown, it means that the selected timeslot is inactive and the input signal may need to be adjusted to enable the timeslot under test.

If the error code “`No sync code is found in the selected`” is shown, it means that no midamble code is detected in the selected timeslot, so it fails to synchronize. Please check whether the settings are correct, especially the scramble code.

If the error code “`Frequency reference pilot burst not active`” is shown, it means that Pilot is selected to be used as the frequency and phase reference for a specified timeslot, but the appropriate pilot timeslot (UpPTS for an uplink timeslot) is not present and the recommendation is to use Midamble as Slot Freq Ref.

If the error code “`Input overload`” is shown, it means that the level of the input signal is too high, thus causing the ADC to overload. You can set the RF Input Range under the Input menu to AUTO, and then restart the measurement.

If the error code “`Sync with midamble fail due to not find uplink slot`” is shown, it means that no uplink timeslot is detected when you select Midamble as Sync Ref. Midamble synchronization searches for the first Uplink traffic burst, positioning it as timeslot TS1. Synchronization will fail if there are Pilot bursts present, if TS0 is present, if there are no traffic bursts present or if the incorrect Basic Midamble Code ID is set. The synchronization algorithm may at times have difficulty identifying which burst is TS1 when non-contiguous traffic bursts are present.

Modulation Accuracy (Composite EVM) Measurements

This section explains how to make the modulation accuracy (composite EVM) measurement on a TD-SCDMA (3GPP) mobile station.

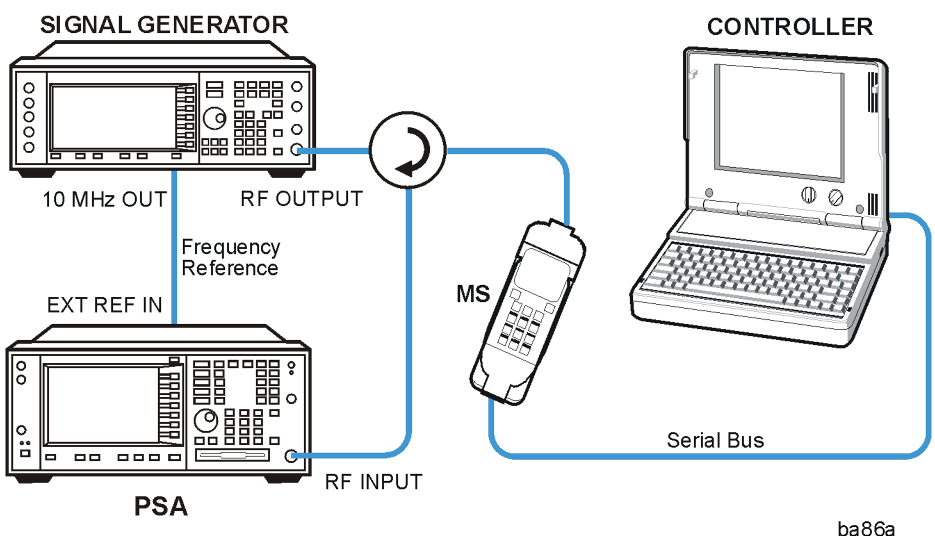
NOTE Before activating a measurement, make sure the mode setup and frequency channel parameters are set to the desired settings. Refer to the sections "Mode" on page 66 and "FREQUENCY/Channel key" on page 58.

One-Button MS Measurements Procedure

Step 1. Configure the Unit Under Test (UUT) as follows.

The mobile station (MS) under test has to be set to transmit one RF carrier remotely through the system controller. This transmitting signal is connected to the instrument's RF input port. Connect the equipment as shown.

Figure 2-15 Modulation Accuracy Measurement System



a. Using the appropriate cables, adapters, and circulator, connect the output signal of the MS to the RF input of the instrument.

b. Connect the base transmission station simulator or signal generator to the MS through the circulator to initiate a link constructed with the sync and pilot channels, if required.

c. Connect a BNC cable between the 10 MHz OUT port of the signal generator and the EXT REF IN port of the instrument.

d. Connect the system controller to the MS through the serial bus cable to control the MS operation.

Step 2. Setting the MS: On either the base transmission station simulator or the system controller, or on both, perform all of the call acquisition functions required for the MS to transmit the RF signal as follows:

Frequency: 2,017.2 MHz (Channel Number: 5 × 2,017.2 = 10,086)

Switch Point: 1, Uplink

Scramble Code: 0

Spread Code Length: 8

Signal Amplitude: -20 dBm

Step 3. If you want to set the current measurement personality mode to a known, factory default state, ensure that the preset type is set to Mode, and press **Preset**.

NOTE To preset only the parameter settings that are specific to the selected measurement, press **Meas Setup** and **Restore Meas Defaults**. (The Restore Meas Defaults key may not be on the first page of the menu. If not, press **More** until the key is available.)

Step 4. Press the **MODE**, **TD-SCDMA Modulation** keys to enable the TD-SCDMA modulation analysis measurements.

NOTE If you have installed Option 213, you need to press **MODE**, **TD-SCDMA Modulation with HSDPA** to enable the TD-SCDMA modulation analysis with HSDPA/8PSK measurements.

The desired mode key may not be on the first page of the menu. If not, press **More** until the key is available.

Step 5. Press **Mode Setup**, **Radio**, **Device** to toggle the device to **MS**.

Step 6. Press **Mode Setup**, **Demod**, **Analysis TimeSlot** to select a timeslot to be measured.

Step 7. Press **Mode Setup**, **Demod**, **More, Timing Ref** to select a timing reference.

For downlink signals, select **DwPTS**.

For uplink signals, select **UwPTS**.

You can also select **Trigger** for either downlink or uplink signals. Make sure the trigger source has been correctly set up.

Step 8. Press **FREQUENCY Channel**, then use the numeric keypad to set the center frequency.

Step 9. Press **MEASURE**, **Mod Accuracy (Composite EVM)** to initiate the modulation accuracy (composite EVM) measurement.

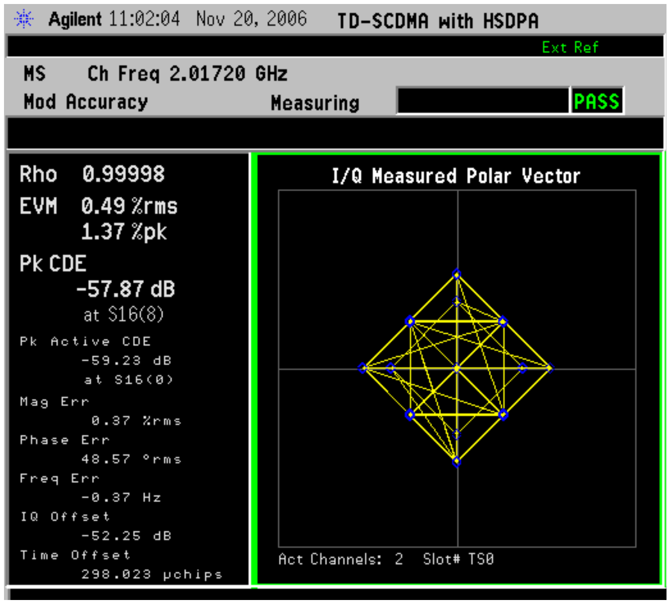
Depending on the current settings of **Meas Control**, the instrument will begin making the selected measurements.

To make measurements repeatedly, Press **Meas Control**, **Measure** to change the

Meas Control from **Single** to **Cont**.

The `Mod Accuracy: I/Q Measured Polar Vector` measurement result should look like Figure 2-16.

Figure 2-16 Modulation Accuracy Measurement Result - Polar Graph (Default) View

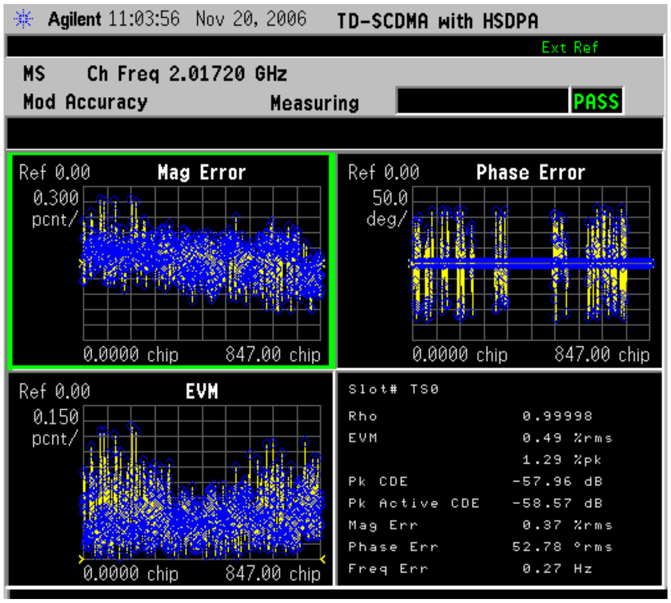


The modulation constellation is shown, along with summary data for Rho, EVM, Peak Code Domain Error, and phase and magnitude errors. For more information see “Modulation Accuracy (Composite EVM)” on page 185 in the Concepts section of this manual.

Making Measurements

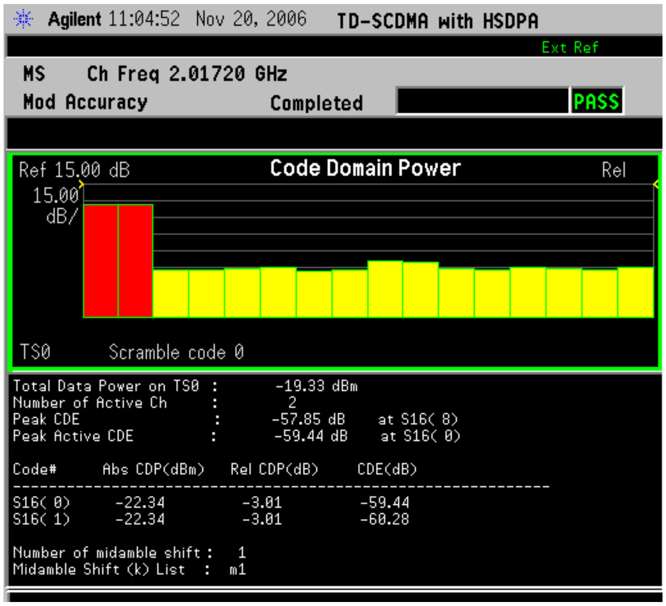
Step 10. Press **Trace/View**, **I/Q Error (Quad View)** to display a combination view of the magnitude error, phase error, and EVM, and the modulation results summary.

Figure 2-17 Modulation Accuracy Measurement Result - I/Q Error (Quad View)



Step 11. Press **Trace/View**, **Code Domain Power** to display a combination view of the code domain power graph and the metrics windows.

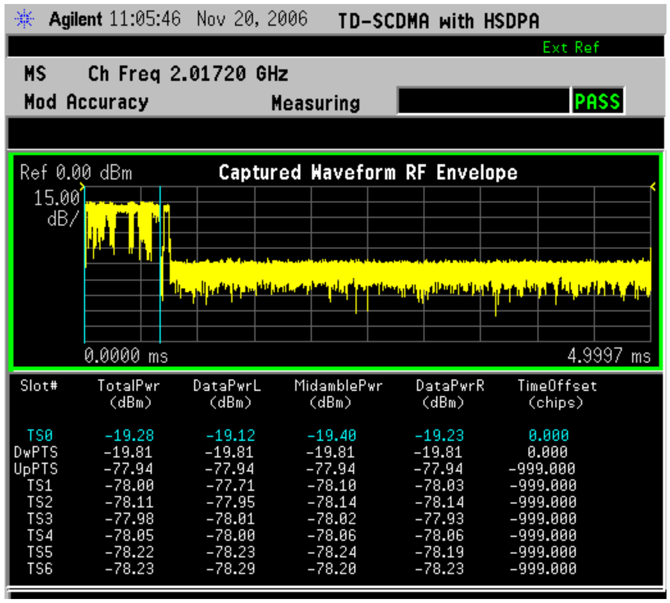
Figure 2-18 Modulation Accuracy Measurement Result - Code Domain Power



Making Measurements

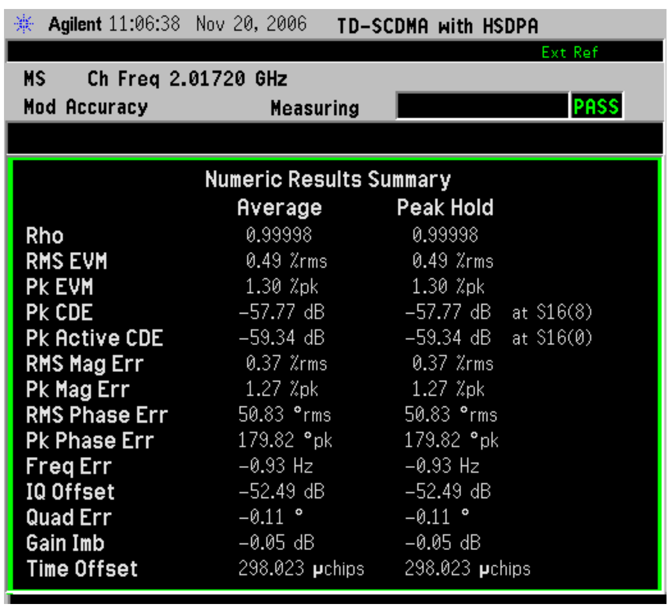
Step 12. Press **Trace/View**, **Capture Time Summary** to display a combination view of the captured data trace and metrics windows.

Figure 2-19 Modulation Accuracy Measurement Result - Capture Time Summary



Step 13. Press **Trace/View**, **Numeric Results** to display a numeric result metrics window.

Figure 2-20 Modulation Accuracy Measurement Result - Numeric Results



Step 14. You may need to change some of the display settings. These changes should not affect the measurement results, but will affect how you view the measurement results on the instrument display.

The **AMPLITUDE Y Scale** key accesses the menu to set the desired horizontal scale and associated settings: **Scale/Div**, **Ref Value**, **Ref Position** and **Scale Coupling**

The **X/Scale** key accesses the menu to set the desired vertical scale and associated settings: **Scale/Div**, **Ref Value** and **Ref Position**.

The **Display** key accesses the menu to set the desired settings. For more information, refer to "Modulation Accuracy Display Selection Key Flow" on page 213.

Step 15. If you want to change the measurement parameters from their default condition so that you can make a customized measurement, press **Meas Setup** to see the available keys. Then, for additional information on use of the available keys and customizing your measurement, refer to "Modulation Accuracy Measurement" on page 132. For additional information on the measurement concepts, refer to "Modulation Accuracy (Composite EVM)" on page 185.

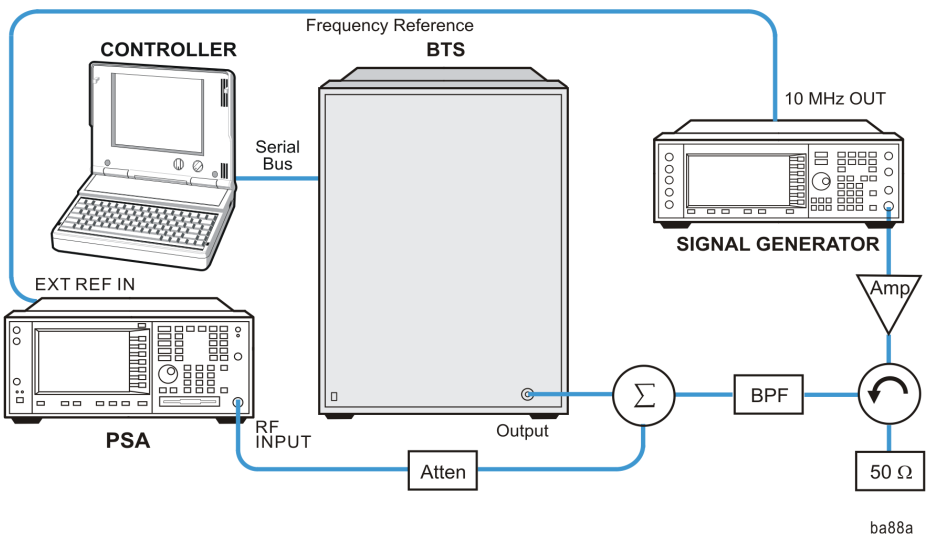
If you have a problem, and get an error message, see the "Instrument Messages and Functional Tests" manual.

One-Button BTS Measurement Procedure

Step 1. Configure the Unit Under Test (UUT) as follows.

The base transmission station (BTS) under test has to be set to transmit one RF carrier remotely through the system controller. This transmitting signal is connected to the instrument's RF input port. Connect the equipment as shown.

Figure 2-21 Modulation Accuracy Measurement System



a. Using the appropriate amplifier, circulator, bandpass filter, combiner, cables, and adapters, connect the unmodulated carrier signal from the signal generator to the output connector of the BTS.

b. Connect the circulator output signal to the RF input port of the instrument through the attenuator.

c. Connect a BNC cable between the 10 MHz OUT port of the signal generator and the EXT REF IN port of the instrument.

d. Connect the system controller to the BTS through the serial bus cable.

Step 2. From the base transmission station simulator and/or the system controller, perform all of the call acquisition functions required for the BTS to transmit the RF signal as follows:

Frequency: 2,017.2 MHz (Channel Number: $5 \times 2{,}017.2 = 10{,}086$)

Switch Point: 1, Downlink

Scramble Code: 0

Spread Code Length: 8

Signal Amplitude: -20 dBm

Step 3. If you want to set the current measurement personality mode to a known, factory default state, ensure that the preset type is set to Mode, and then press **Preset**.

NOTE To preset only the parameter settings that are specific to the selected measurement, press **Meas Setup** and **Restore Meas Defaults**. (The Restore Meas Defaults key may not be on the first page of the menu. If not, press **More** until the key is available.)

Step 4. Press **MODE**, **TD-SCDMA Modulation** to enable the TD-SCDMA modulation analysis measurements.

NOTE If you have installed Option 213, you need to press **MODE**, **TD-SCDMA Modulation with HSDPA** keys to enable the TD-SCDMA modulation analysis with HSDPA/8PSK measurements.

The desired mode key may not be on the first page of the menu. If not, press **More** until the key is available.

Step 5. Press **Mode Setup**, **Radio**, **Device** to toggle the device to **BTS**.

Step 6. Press **Mode Setup**, **Demod**, **Analysis TimeSlot** to select a timeslot to be measured.

Step 7. Press **Mode Setup**, **Demod**, **More, Timing Ref** to select a timing reference.

For downlink signals, select **DwPTS**;

For uplink signals, select **UwPTS**;

You can also select **Trigger** for either downlink or uplink signals. Make sure the trigger source has been correctly setup.

Step 8. Press **FREQUENCY Channel**, then use the numeric keypad to set the center frequency.

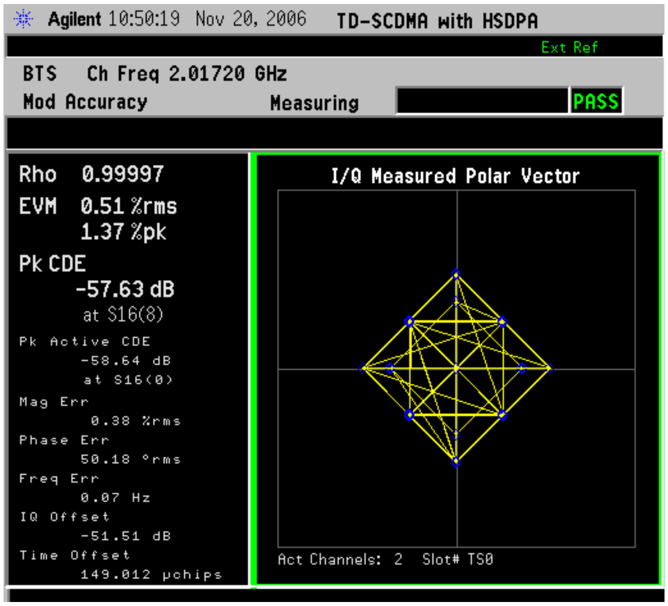
Step 9. Press **MEASURE**, **Mod Accuracy (Composite EVM)** to initiate the modulation accuracy (composite EVM) measurement.

Depending on the current settings of **Meas Control**, the instrument will begin making the selected measurements.

To make measurements repeatedly, Press **Meas Control**, **Measure** to change the Meas Control from **Single** to **Cont**.

The `Mod Accuracy: I/Q Measured Polar Vector` measurement result should look like Figure 2-22.

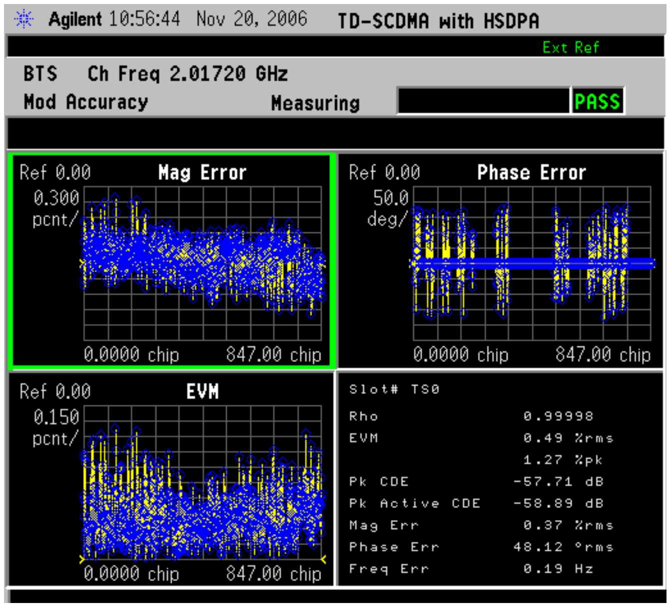
Figure 2-22 Modulation Accuracy Measurement Result - Polar Graph (Default) View



The modulation constellation is shown, along with summary data for Rho, EVM, Peak Code Domain Error, and phase and magnitude errors. For more information, see “Modulation Accuracy (Composite EVM)” on page 185 in the Concepts section of this manual.

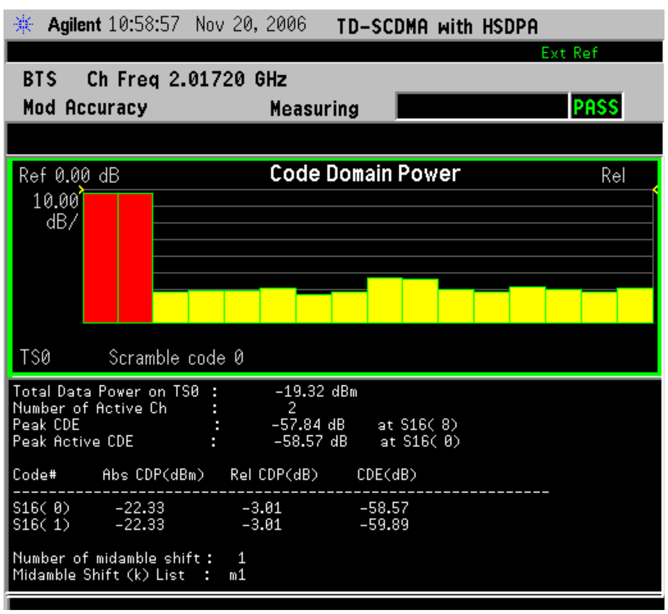
Step 10. Press **Trace/View**, **I/Q Error (Quad View)** to display a combination view of the magnitude error, phase error, and EVM, and the modulation results summary.

Figure 2-23 Modulation Accuracy Measurement Result - I/Q Error (Quad View)



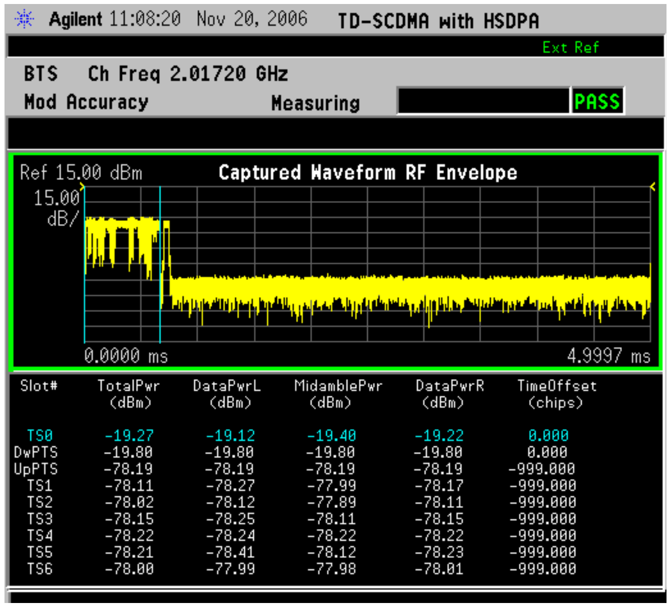
Step 11. Press **Trace/View**, **Code Domain Power** to display a combination view of the code domain power graph and the metrics windows.

Figure 2-24 Modulation Accuracy Measurement Result - Code Domain Power



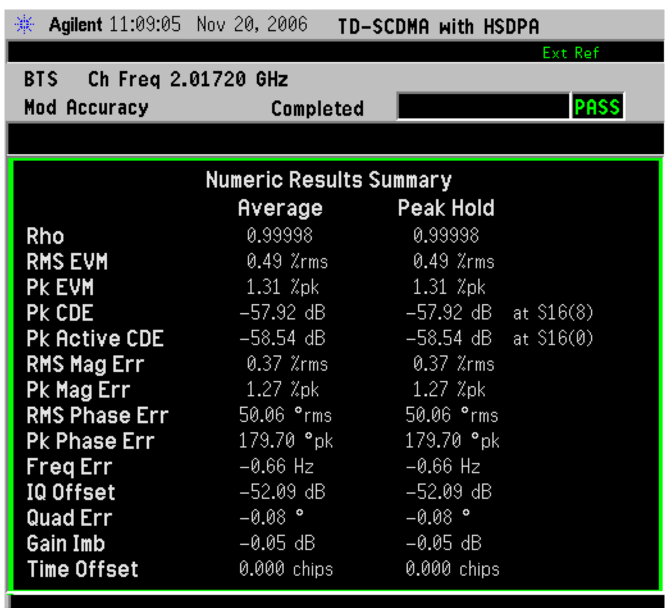
Step 12. Press **Trace/View**, **Capture Time Summary** to display a combination view of the captured data trace and metrics windows.

Figure 2-25 Modulation Accuracy Measurement Result - Capture Time Summary



Step 13. Press **Trace/View**, **Numeric Results** to display a numeric result metrics window.

Figure 2-26 Modulation Accuracy Measurement Result - Numeric Results



Step 14. You may need to change some of the display settings. These changes should not affect the measurement results, but will affect how you view the measurement results on the instrument display.

The **AMPLITUDE Y Scale** key accesses the menu to set the desired horizontal scale and associated settings: **Scale/Div**, **Ref Value**, **Ref Position** and **Scale Coupling**

The **X/Scale** key accesses the menu to set the desired vertical scale and associated settings: **Scale/Div**, **Ref Value** and **Ref Position**.

The **Display** key accesses the menu to set the desired settings. For more information, refer to "Modulation Accuracy Display Selection Key Flow" on page 213.

Step 15. If you want to change the measurement parameters from their default condition so that you can make a customized measurement, press **Meas Setup** to see the available keys. Then, for additional information on use of the available keys and customizing your measurement, refer to "Modulation Accuracy Measurement" on page 132. For additional information on the measurement concepts, refer to "Modulation Accuracy (Composite EVM)" on page 185.

If you have a problem, and get an error message, see the "Instrument Messages and Functional Tests" manual.

Troubleshooting Hints

A poor phase error often indicates a problem with one or more of the following: I/Q baseband generator, the filters, or modulator in the transmitter circuitry of the UUT. The output amplifier in the transmitter can also create distortion that causes unacceptably high phase error. In a real system, a poor phase error will reduce the ability of a receiver to correctly demodulate the received signal, especially in marginal signal conditions.

If the error code "`No Pilot burst found`" is shown, it means that your measurement has failed to find any active channels due to the lack of a pilot when you select **Sync Type** as **Pilot**. The input signal may need to be adjusted to enable a pilot.

If the error code "`No active channel found`" is shown, it means that no active channel is found on the analyzed timeslot, the possible reason is the power of code channels are below the Active Channel Threshold.

If the error code "`Not an active slot`" is shown, it means that the selected timeslot is inactive and the input signal may need to be adjusted to enable the timeslot under test.

If the error code "`No sync code is found in the selected`" is shown, it means that no midamble code is detected in the selected timeslot, so it fails to synchronize. Please check whether the settings are correct, especially the scramble code.

If the error code "`Frequency reference pilot burst not active`" is shown, it means that Pilot is selected to be used as the frequency and phase reference for a specified timeslot, but the appropriate pilot timeslot (UpPTS for an uplink timeslot) is not present and the recommendation is to use Midamble as Slot Freq Ref.

If the error code "`Input overload`" is shown, it means that the level of the input signal is too high, thus causing the ADC to overload. You can set the RF Input Range under the Input menu to AUTO, and then restart the measurement.

If the error code “`Sync with midamble fail due to not find uplink slot`” is shown, it means that no uplink timeslot is detected when you select Midamble as Sync Ref. Midamble synchronization searches for the first Uplink traffic burst, positioning it as timeslot TS1. Synchronization will fail if there are Pilot bursts present, if TS0 is present, if there are no traffic bursts present or if the incorrect Basic Midamble Code ID is set. The synchronization algorithm may at times have difficulty identifying which burst is TS1 when non-contiguous traffic bursts are present.

Using Basic Mode

Basic mode is part of Option B7J for the PSA Series Spectrum Analyzers. Basic mode is *not* related to a particular communications standard. That is, it does not default to measurement settings that are for any specific standard. You may want to use Basic Mode if you are making measurements on a signal that is not based on a specific digital communications standard.

Basic Mode in PSA Series Spectrum Analyzers

There are two generic measurements available under the **MEASURE** key in Basic mode:

- Spectrum measurement (frequency domain).
- Waveform measurement (time domain)

For additional information on these measurements in the Basic mode, refer to the PSA *Basic Mode Guide*. For remote commands and command information on the Spectrum and Waveform measurements, refer to "Spectrum (Freq Domain)" on page 99 or "WaveForm (Time Domain)" on page 99.

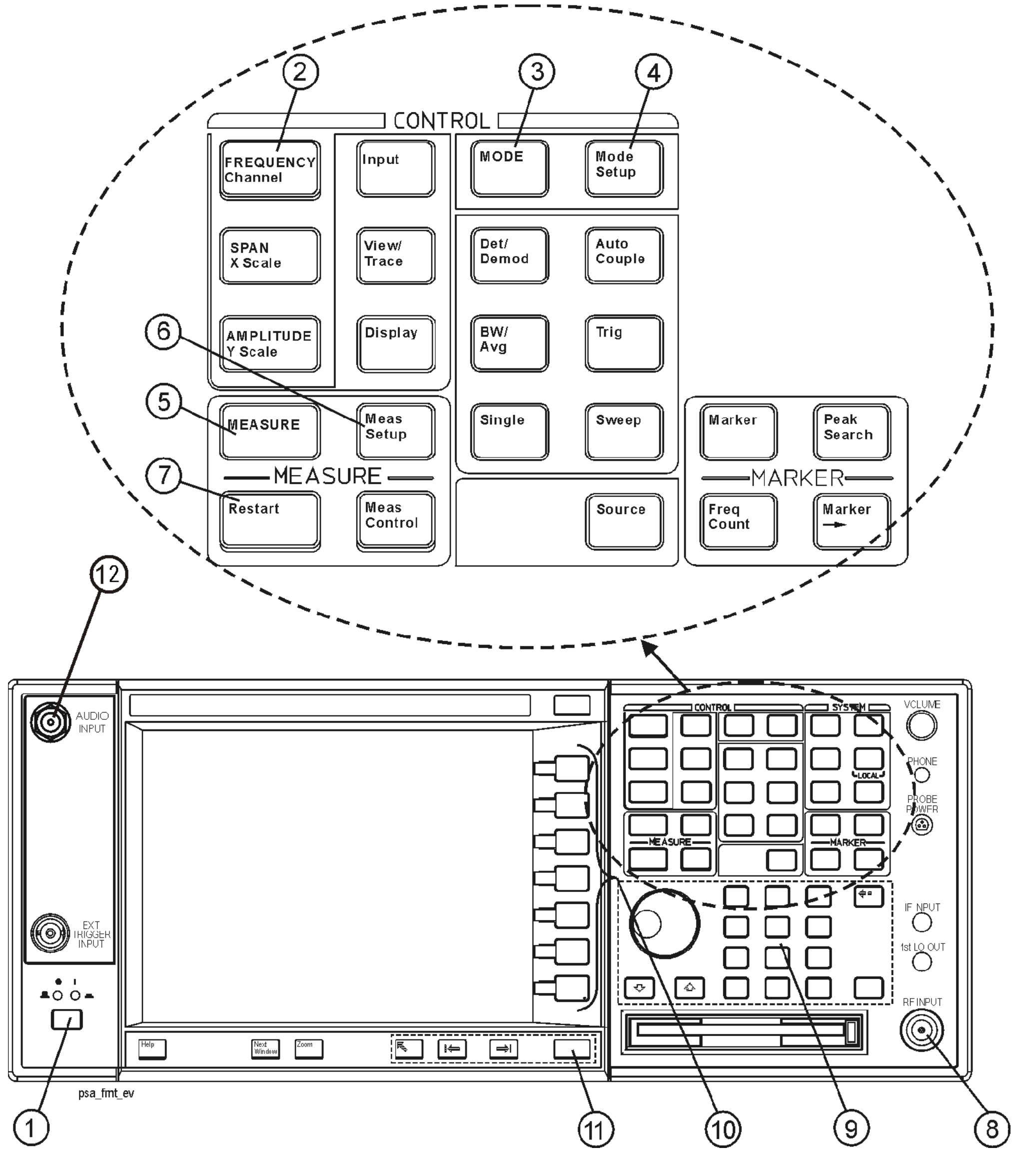
3 Key and SCPI Reference

NOTE Only front panel keys affected by selection of TD-SCDMA Modulation mode are described here. For a complete description of all front panel keys see the *PSA Series User's Guide*.

3.1 Instrument Front Panel Highlights

The most commonly used function keys on the PSA front panel are located as shown in the illustrations below. The operation of the keys is briefly explained on the following pages. Refer to your User's Guide for complete details on all keys.

Figure 3-1 Selected PSA Series Front Panel Feature Locations



3.1.1 Selected PSA Front-Panel Features

1. The **On/Off** switch toggles the AC Line power between On and Standby. A green LED will light when the

instrument is On. When energized in the standby mode, a yellow LED is lit above the switch.

2. **FREQUENCY Channel** accesses a key menu to set the analyzer center frequency in units of Hz, kHz, MHz, or GHz, or by channel number. These parameters apply to all measurements in the current mode.
3. **MODE** accesses a key menu to select one of the measurement personalities installed in the instrument. Each mode is independent from all other modes.
4. **Mode Setup** accesses a key menu that sets parameters specific to the current mode and can affect all measurements within that mode.
5. **MEASURE** accesses a display key menu to initiate one of the various measurements that are specific to the current mode.
6. **Meas Setup** accesses the menus of test parameters that are specific to the current measurement.
7. **Restart** causes a measurement to start again from the initial process according to the current measurement setup parameters.
8. **RF INPUT** port: Type N connector for the E4443A, E4445A, and E4440A. It is 2.4mm on the E4446A, E4447A, and E4448A. It is a 3.5mm connector on the E4440A with Opt BAB. The maximum input power level is shown next to the port.
9. The **Data Entry** keypad is used to enter numeric values. Keypad entries are displayed in the active function area of the screen and become valid for the current measurement upon pressing the **Enter** key or selecting a unit of measurement, depending on the parameter.
10. The **Display** Menu keys allow you either to activate a feature or to access a more detailed sub-menu. An arrow on the right side of a softkey label indicates that the key has a further selection menu. The active menu key is highlighted, however, grayed-out keys are currently unavailable for use or only show information. If a menu has multiple pages, successive pages are accessed by pressing the **More** key located at the bottom of the menu.
11. Pressing the **Return** key allows you to exit the current menu and display the previous menu. Often, pressing a menu key will invoke a multi-page sub-menu. Pressing the **Return** key will show the menu “above” it, not a previous page. When you activate another measurement, the return list is cleared. The **Return** key will not return you to a previously activated mode, nor will it alter any values you have entered in previous menus.

3.2 FREQUENCY/Channel key

3.2.1 Center Freq

Sets the center frequency to be measured for the selected band.

Key Path:	**FREQUENCY/Channel**
Remote Command:	`[:SENSe]:FREQuency[:CENTer] <freq>`
	`[:SENSe]:FREQuency[:CENTer]?`
Unit:	Hz | kHz | MHz | GHz
Preset:	1.0 GHz
State Saved:	Saved in instrument state.
Range:	HW DEPENDENT
Remote Command Notes:	You must be in the TD-SCDMA Modulation mode to use this command. Changing Center Frequency will affect all measurements in the selected mode.
Example:	:FREQ 1.0MHZ
	:FREQ?

3.2.2 CF Step

Sets the step value for the Center Frequency. When CF Step State is set to Manual, the Step value is determined by this setting. Once the value of the CF Step State is changed to Auto, the Step value will be changed to 1.6MHz automatically.

Key Path:	**FREQUENCY/Channel**
Remote Command:	`[:SENSe]:FREQuency[:CENTer]:STEP <freq>`
	`[:SENSe]:FREQuency[:CENTer]:STEP?`
	`[:SENSe]:FREQuency[:CENTer]:STEP:AUTO OFF|ON|0|1`
	`[:SENSe]:FREQuency[:CENTer]:STEP:AUTO?`
Unit:	Hz | kHz | MHz | GHz
Preset:	1.6 MHz, ON
State Saved:	Saved in instrument state.
Range:	1.0 Hz to 1.0 GHz

Remote Command Notes:	You must be in the TD-SCDMA Modulation mode to use this command. Changing this parameter will affect all measurements in the selected mode.
Example:	:FREQ:STEP 100KHZ
	:FREQ:STEP?
	:FREQ:STEP:AUTO OFF
	:FREQ:STEP:AUTO?

3.3 Input

This key provides the same behavior as that of Input hardkey of the base instrument.

3.3.1 Int Preamp

Sets the state of the Internal Preamplifier. If the current measurement is not either Evm or Code Domain, this key will be disabled.

Mode:	TDDEMOD
Key Path:	**Input**
Remote Command:	`[:SENSe]:POWer:RF:GAIN[:STATe] ON|OFF|0|1` `[:SENSe]:POWer:RF:GAIN[:STATe]?`
Preset:	OFF
State Saved:	Saved in instrument state.
Range:	On | Off
Remote Command Notes:	You must be in the TD-SCDMA Modulation mode to use this command. Changing this parameter will affect all measurements in the selected mode.
Example:	:POW:RF:GAIN ON :POW:RF:GAIN?

3.3.2 RF Input Ranging

Sets the power input range of the PSA.

Mode:	TDDEMOD
Key Path:	**Input**
Remote Command:	`[:SENSe]:POWer:RF:RANGe:AUTO OFF|ON|0|1` `[:SENSe]:POWer:RF:RANGe:AUTO?`
Preset:	ON
State Saved:	Saved in instrument state.
Remote Command Notes:	You must be in the TD-SCDMA Modulation mode to use this command. Changing this parameter will affect all measurements in the selected mode.
Example:	:POW:RF:RANG:AUTO ON :POW:RF:RANG:AUTO?

3.3.3 Max Total Power

Sets the value of the Max total power. The default unit for this parameter is dBm.

Mode:	TDDEMOD
Key Path:	**Input**
Remote Command:	`[:SENSe]:POWer[:RF]:RANGe[:UPPer] <power>`
	`[:SENSe]:POWer[:RF]:RANGe[:UPPer]?`
Preset:	–15.0
State Saved:	Saved in instrument state.
Min:	–200
Max:	50
Dependencies/Couplings:	Coupled with Input Attenuation.
Remote Command Notes:	You must be in the TD-SCDMA Modulation mode to use this command. Changing this parameter will affect all measurements in the selected mode.
Example:	:POW:RANG 10
	:POW:RANG?

3.3.4 Input Attenuation

Sets the value of the Input Attenuation.

Mode:	TDDEMOD
Key Path:	**Input**
Remote Command:	`[:SENSe]:POWer:RF:ATTenuation <integer>`
	`[:SENSe]:POWer:RF:ATTenuation?`
Preset:	0 dB
State Saved:	Saved in instrument state.
Min:	0 dB
Max:	Elec: 40 dB, Mech: 70 dB
Dependencies/Couplings:	Coupled with Max Total Power when Int Preamp is set to OFF. When Int Preamp is set to ON, only even numbers are allowed.
Remote Command Notes:	You must be in the TD-SCDMA Modulation mode to use this command. Changing this parameter will affect all measurements in the selected mode.

Example:	:POW:RF:ATT 30
	:POW:RF:ATT?

3.3.5 MS Ext RF Attenuation

Sets the value of the external RF input attenuation for the MS.

Mode:	TDDEMOD
Key Path:	**Input, Ext RF Atten**
Remote Command:	`[:SENSe]:CORRection:MS[:RF]:LOSS <real>`
	`[:SENSe]:CORRection:MS[:RF]:LOSS?`
Unit:	dB
Preset:	0
State Saved:	Saved in instrument state.
Min:	–100 dB
Max:	100 dB
Remote Command Notes:	You must be in the TD-SCDMA Modulation mode to use this command. Changing this parameter will affect all measurements in the selected mode.
Example:	:CORR:MS:LOSS 10
	:CORR:MS:LOSS?

3.3.6 BTS Ext RF Attenuation

Sets the value of the external RF input attenuation for the BTS.

Mode:	TDDEMOD
Key Path:	**Input, Ext RF Atten**
Remote Command:	`[:SENSe]:CORRection:BTS[:RF]:LOSS < real>`
	`[:SENSe]:CORRection:BTS[:RF]:LOSS?`
Unit:	dB
Preset:	0
State Saved:	Saved in instrument state.
Min:	–100 dB

Max:	100 dB
Remote Command Notes:	You must be in the TD-SCDMA Modulation mode to use this command. Changing this parameter will affect all measurements in the selected mode.
Example:	:CORR:BTS:LOSS 10 :CORR:BTS:LOSS?

3.4 Meas Control

These functions allow you to pause and resume the currently selected measurement and to select between continuous or single measurements.

3.4.1 Measure

Press this key to toggle the measurement state between **Single** and **Cont** (continuous).

NOTE This key has a different function from the **MEASURE** front panel key. When set to **Single**, the measurement will continue until it has reached the specified number of averages set by the average counter. When set to **Cont**, the measurement will run continuously and execute averaging according to the current average mode, either repeat or exponential.

Key Path	**Meas Control**
Factory Preset	Cont
State Saved	Saved in instrument state.
Remote Command	`:INITiate:CONTinuous OFF|ON`
Remote Command Notes	When ON, at the completion of each trigger cycle, the trigger system immediately initiates another trigger cycle. When OFF, the trigger system remains in an “idle” state until CONTinuous is set to ON or an :INITiate[:IMMediate] command is received. On receiving the :INITiate[:IMMediate] command, it will go through a single trigger cycle, and then return to the “idle” state. The query INIT:CONT? returns 1 or 0. A “1” is returned when the instrument is continuous triggering. “0” is returned when it is single triggering.
Example	:INIT:CONT OFF

3.4.2 Pause/Resume

Press this key to pause the current measurement Once toggled, the label of the **Pause** key changes to read **Resume**. The **Resume** key, once pressed, continues the active measurement from the point at which it was paused.

Key Path:	**Meas Control**
Remote Command:	`:INITiate:PAUSe` `:INITiate:RESume`
Example:	:INIT:PAUS

3.4.3 Restart

Press this key to repeat the current measurement from the beginning, while retaining the current measurement settings. This is equivalent to the **Restart** front panel key.

Key Path:	**Meas Control**
Remote Command:	`:INITiate:RESTart`
Remote Command Notes:	This command is equivalent to sending an :ABORt command followed by an :INITiate[:IMMediate] command.
Example:	:INIT:REST

3.5 Mode

Accesses any installed personality modes. The minimum set of available modes will be Spectrum Analysis, and TD-SCDMA Modulation. This menu will have additional entries if other personalities have been installed, for example, WLAN.

3.5.1 Spectrum Analysis

For information related to the operation of the Spectrum Analysis mode, refer to the PSA User's/Programmer's Guide.

3.5.2 TD-SCDMA Modulation

The TD-SCDMA Modulation mode provides you with the ability to set up your own measurement environment to perform modulation analysis on signals complying with TD-SCDMA standards.

3.5.3 Instrument Selection by Name

This remote command allows you to use SCPI commands to change from the current mode to TD-SCDMA Modulation mode. This has the same effect as pressing the TD-SCDMA Modulation key.

Key Path:	**Mode**
Remote Command:	`:INSTrument[:SELect] SA|TDDEMOD`
	`:INSTrument[:SELect]?`
Example:	:INST TDDEMOD
	:INST?

3.5.4 Instrument Selection by Number (Remote command only)

This remote command allows you to use SCPI commands to change from the current mode to TD-SCDMA Modulation mode (Option 212). This has the same effect as pressing the TD-SCDMA Modulation key.

Key Path:	**Mode**
Remote Command:	`:INSTrument:NSELect 212`
	`:INSTrument:NSELect?`
Example:	:INST:NSEL 212
	:INST:NSEL?

3.6 Mode Setup

3.6.1 Radio Device

Sets the type of radio device.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Radio**
Remote Command:	`[:SENSe]:RADio:DEVice BTS|MS`
	`[:SENSe]:RADio:DEVice?`
Preset:	BTS
State Saved:	Saved in instrument state.
Range:	BTS | MS
Example:	:RAD:DEV BTS
	:RAD:DEV?

3.6.2 Demod

3.6.2.1 Scramble Code

Sets the scramble code.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod**
Remote Command:	`[:SENSe]:TDEMod:SCODe <integer>`
	`[:SENSe]:TDEMod:SCODe?`
Preset:	0
State Saved:	Saved in instrument state.
Min:	0
Max:	127
Example:	:TDEM:SCOD 0
	:TDEM:SCOD?

3.6.2.2 Uplink Pilot

Lets you specify the Uplink Pilot synchronization ID sequence (SYNC-UL).

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod**
Remote Command:	`[:SENSe]:TDEMod:UPTS <integer>` `[:SENSe]:TDEMod:UPTS?`
Preset:	0
State Saved:	Saved in instrument state.
Min:	0
Max:	255
Dependencies/Couplings:	Value Range: (dint(Scramble Code/4))*8) to (dint(Scramble Code/4)+1)*8) – 1 dint(x) returns the largest integer which is no greater than x
Example:	:TDEM:UPTS 0 :TDEM:UPTS?

3.6.2.3 Analysis Timeslot

Sets the analysis timeslot. Analysis Timeslot specifies which sub-frames timeslot, within the selected Analysis Sub-frame, is used for analysis and trace data measurement results. The available selections include timeslots 0 through 6, the DwPTS and UpPTS timeslots.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod**
Remote Command:	`[:SENSe]:TDEMod:SLOT TS0|TS1|TS2|TS3|TS4|TS5|TS6|UPTS|DPTS` `[:SENSe]:TDEMod:SLOT?`
Preset:	TS0
State Saved:	Saved in instrument state.
Range:	TS0 | TS1 | TS2 | TS3 | TS4 | TS5 | TS6 | DwPTS | UpPTS
Example:	:TDEM:SLOT TS0 :TDEM:SLOT?

3.6.2.4 Sync Type

Sets the Sync Type to Pilot or Midamble. Pilot synchronization searches for either the Uplink Pilot or Downlink Pilot burst and then uses the location of that burst to position all of the rest of the time slots. Synchronization will fail if neither pilot burst is found, or if the incorrect Uplink or Downlink Pilot Code ID is set for the Pilot burst present. Midamble synchronization searches for the first Uplink traffic burst, positioning it as timeslot TS1. Synchronization will fail if there are Pilot bursts present, if TS0 is present, if there are no traffic bursts present, or if the incorrect Basic Midamble Code ID is set.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod**
Remote Command:	`[:SENSe]:TDEMod:SYNC PILot|MIDamble`
	`[:SENSe]:TDEMod:SYNC?`
Preset:	PILot
State Saved:	Saved in instrument state.
Range:	Pilot | Midamble
Example:	:TDEM:SYNC PIL
	:TDEM:SYNC?

3.6.2.5 Uplink Switch Point

Sets the Uplink Switch Point. Uplink Switch Point is the timeslot number of the last uplink traffic timeslot. Timeslots from the following (next higher numbered) traffic timeslot through the end of the sub-frame are treated as downlink timeslots.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod**
Remote Command:	`[:SENSe]:TDEMod:ULSPoint <integer>`
	`[:SENSe]:TDEMod:ULSPoint?`
Preset:	1
State Saved:	Saved in instrument state.
Min:	0
Max:	6
Example:	:TDEM:ULSP 0
	:TDEM:ULSP?

3.6.2.6 Max User(K) for Traffic Timeslots

Sets the max user value for TS0 to TS6. Lets you specify the number of Maximum Users (K) that will be associated with the timeslots specified by the Traffic Timeslots parameter.

3.6.2.6.1 TS0

Sets the maximum user value for TS0. Lets you specify the number of Maximum Users (K) that will be associated with Timeslot 0.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, Max User(K) for Traffic Timeslots**
Remote Command:	`[:SENSe]:TDEMod:MXUSer:TS0 <integer>` `[:SENSe]:TDEMod:MXUSer:TS0?`
Preset:	16
State Saved:	Saved in instrument state.
Min:	2
Max:	16
Example:	:TDEM:MXUS:TS0 2 :TDEM:MXUS:TS0?

3.6.2.6.2 TS1

Sets the maximum user value for TS1. Lets you specify the number of Maximum Users (K) that will be associated with Timeslot 1.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, Max User(K) for Traffic Timeslots**
Remote Command:	`[:SENSe]:TDEMod:MXUSer:TS1 <integer>` `[:SENSe]:TDEMod:MXUSer:TS1?`
Preset:	16
State Saved:	Saved in instrument state.
Min:	2
Max:	16
Example:	:TDEM:MXUS:TS1 2 :TDEM:MXUS:TS1?

3.6.2.6.3 TS2

Sets the maximum user value for TS2. Lets you specify the number of Maximum Users (K) that will be associated with Timeslot 2.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, Max User(K) for Traffic Timeslots**
Remote Command:	`[:SENSe]:TDEMod:MXUSer:TS2 <integer>`
	`[:SENSe]:TDEMod:MXUSer:TS2?`
Preset:	16
State Saved:	Saved in instrument state.
Min:	2
Max:	16
Example:	:TDEM:MXUS:TS2 2
	:TDEM:MXUS:TS2?

3.6.2.6.4 TS3

Sets the maximum user value for TS3. Lets you specify the number of Maximum Users (K) that will be associated with Timeslot 3.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, Max User(K) for Traffic Timeslots**
Remote Command:	`[:SENSe]:TDEMod:MXUSer:TS3 <integer>`
	`[:SENSe]:TDEMod:MXUSer:TS3?`
Preset:	16
State Saved:	Saved in instrument state.
Min:	2
Max:	16
Example:	:TDEM:MXUS:TS3 2
	:TDEM:MXUS:TS3?

3.6.2.6.5 TS4

Sets the maximum user value for TS4. Lets you specify the number of Maximum Users (K) that will be associated with Timeslot 4.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, More, Max User(K) for Traffic Timeslots**
Remote Command:	`[:SENSe]:TDEMod:MXUSer:TS4 <integer>`
	`[:SENSe]:TDEMod:MXUSer:TS4?`
Preset:	16
State Saved:	Saved in instrument state.
Min:	2
Max:	16
Example:	:TDEM:MXUS:TS4 2
	:TDEM:MXUS:TS4?

3.6.2.6.6 TS5

Sets the maximum user value for TS5. Lets you specify the number of Maximum Users (K) that will be associated with Timeslot 5.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, Max User(K) for Traffic Timeslots**
Remote Command:	`[:SENSe]:TDEMod:MXUSer:TS5 <integer>`
	`[:SENSe]:TDEMod:MXUSer:TS5?`
Preset:	16
State Saved:	Saved in instrument state.
Min:	2
Max:	16
Example:	:TDEM:MXUS:TS5 2
	:TDEM:MXUS:TS5?

3.6.2.6.7 TS6

Sets the maximum user value for TS6. Lets you specify the number of Maximum Users (K) that will be associated with Timeslot 6.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, Max User(K) for Traffic Timeslots**
Remote Command:	`[:SENSe]:TDEMod:MXUSer:TS6 <integer>`
	`[:SENSe]:TDEMod:MXUSer:TS6?`
Preset:	16
State Saved:	Saved in instrument state.
Min:	2
Max:	16
Example:	:TDEM:MXUS:TS6 2
	:TDEM:MXUS:TS6?

3.6.2.7 Mod Scheme

Sets the modulation scheme.

NOTE The **Mod Scheme** key is only available when Option 213 is installed and **Enable HSDPA/8PSK** is set to ON. Otherwise, this key is grayed out the value will be set to AUTO.

If Mod Scheme is MAN, you can specify the modulation format for each channel. If the Mod Scheme is set to AUTO, the measurement will automatically detect the channel's modulation format.The Auto mode is only applied to QPSK and 16QAM. For 8PSK, only MAN mode is supported.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, More**
Remote Command:	`[:SENSe]:TDEMod:MODScheme:AUTO 1|0|ON|OFF`
	`[:SENSe]:TDEMod:MODScheme:AUTO?`
Preset:	ON
State Saved:	Saved in instrument state.
Dependencies/Couplings:	The modulation formats of QPSK and 16QAM support AUTO and MAN mode. 8PSK only supports MAN mode.
Range:	Auto | Man

Example:	:TDEM:MODS:AUTO ON
	:TDEM:MODS:AUTO?

3.6.2.8 Modulation Scheme Setup

If Mod Scheme is Auto, or the HSDPA/8PSK Option (Option 213) is not installed, or HSDPA/8PSK is set to OFF, this menu will be grayed out.

3.6.2.8.1 Spread Code Length

Sets the spread code length.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, More, Mod Scheme Setup**
Remote Command:	`[:SENSe]:TDEMod:SCLength <integer>`
	`[:SENSe]:TDEMod:SCLength?`
Preset:	16
State Saved:	Saved in instrument state.
Min:	1
Max:	16
Dependencies/Couplings:	Only 1, 2, 4, 8, and 16 are valid Spread Code Lengths. Any other number will be clipped to the nearest valid number.
Example:	:TDEM:SCL 1
	:TDEM:SCL?

3.6.2.8.2 Code Channel

Sets the Code Channel. The maximum value for the Code Channel should be (Spread Code length – 1). The Code Channel is used, along with the Spread Code Length, to specify the active code channel and layer used for the channel trace data measurement results. If the Code Channel Selection State Value is All, by modifying the modulation format, you can change the values of all code channels which correspond to the current spread code length.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, More, Mod Scheme Setup**

Remote Command:	[:SENSe]:TDEMod:CDCHannel <integer>
	[:SENSe]:TDEMod:CDCHannel?
	[:SENSe]:TDEMod:CDCHannel:SELect SINGle|ALL
	[:SENSe]:TDEMod:CDCHannel:SELect?
Preset:	0, SINGle
State Saved:	Saved in instrument state.
Min:	0
Max:	Equals (Spread Code length – 1)
Example:	:TDEM:CDCH 0
	:TDEM:CDCH?
Example:	:TDEM:CDCH:SEL ALL
	:TDEM:CDCH:SEL?

3.6.2.8.3 Modulation Format

Sets the modulation format. If Auto is assigned to a code channel with a specified spread code length, the modulation format on this code channel will be determined by the measurement.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, More, Mod Scheme Setup**
Remote Command:	[:SENSe]:TDEMod:MODFormat <integer>,<integer>,AUTO|QPSK|PSK8|QAM16
	[:SENSe]:TDEMod:MODFormat? <integer>,<integer>
Preset:	AUTO
State Saved:	Saved in instrument state.
Range:	Auto | QPSK | 8PSK | 16QAM
Restriction and Notes:	If Spread Code Length is 2, 4 or 8, the only valid value is QPSK or AUTO
Example:	:TDEM:MODF 1,0,AUTO
	:TDEM:MODF? 1,0

3.6.2.8.4 Show Mod Scheme Setup

Shows all values of the modulation format. If any other menu is displayed, this window will exit.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, More, Mod Scheme Setup**

3.6.2.9 Slot Frequency Reference

Sets the slot frequency reference. Lets you specify whether the appropriate pilot timeslot or the midamble section of the timeslot will be used as the frequency and phase reference for an individual traffic timeslot.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, More**
Remote Command:	`[:SENSe]:TDEMod:SREFerence PILot|MIDamble`
	`[:SENSe]:TDEMod:SREFerence?`
Preset:	MIDamble
State Saved:	Saved in instrument state.
Range:	Pilot | Midamble
Example:	:TDEM:SREF PIL
	:TDEM:SREF?

3.6.2.10 Timing Reference

Sets the timing reference.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, More**
Remote Command:	`[:SENSe]:TDEMod:TREFerence DPTS|UPTS|TRIG`
	`[:SENSe]:TDEMod:TREFerence?`
Preset:	DPTS
State Saved:	Saved in instrument state.
Range:	DwPTS | UpPTS | Trigger
Example:	:TDEM:TREF DWPTS
	:TDEM:TREF?

3.6.2.11 Advanced

3.6.2.11.1 Filter Alpha

Sets the measurement filter (Root-raised Cosine) alpha value.

Key Path:	**Mode Setup, Demod, More, Advanced**
Remote Command:	`[:SENSe]:TDEMod:ALPHa <real>` `[:SENSe]:TDEMod:ALPHa?`
Preset:	0.22
State Saved:	Saved in instrument state.
Range:	0.05 to 1.0
Remote Command Notes:	You must be in the TD-SCDMA Modulation mode to use this command. Changing this parameter will affect all measurements in the selected mode.
Example:	:TDEM:ALPH 0.22 :TDEM:ALPH?

3.6.2.11.2 Active Slot Threshold

Sets the Active Slot Detection Threshold. The Active Slot Detection Threshold is specified in dB below the slot with the highest measured power.

Key Path:	**Mode Setup, Demod, More, Advanced**
Remote Command:	`[:SENSe]:TDEMod:THReshold:SLOT <float>` `[:SENSe]:TDEMod:THReshold:SLOT?`
Preset:	–30
Front-Panel Unit:	dBc
Unit:	DBC
State Saved:	Saved in instrument state.
Range:	–120 dBc to 0 dBc
Remote Command Notes:	You must be in the TD-SCDMA Modulation mode to use this command. Changing this parameter will affect all measurements in the selected mode.
Example:	:TDEM:THR:SLOT –30 :TDEM:THR:SLOT?

3.6.2.11.3 Active Channel Threshold

Sets the Active Channel Threshold. Active Channel Threshold lets you set the threshold above which a channel is deemed to be active, and is included in the Composite Reference waveform. The units are dBc (dB below the total power within the Analysis Timeslot).

Key Path:	**Mode Setup, Demod, More, Advanced**
Remote Command:	`[:SENSe]:TDEMod:THReshold:CHANnel <float>`
	`[:SENSe]:TDEMod:THReshold:CHANnel?`
	`[:SENSe]:TDEMod:THReshold:CHANnel:AUTO ON|OFF|0|1`
	`[:SENSe]:TDEMod:THReshold:CHANnel:AUTO?`
Preset:	–30, ON
Front-Panel Unit:	dBc
Unit:	DBC
State Saved:	Saved in instrument state.
Range:	–120 dBc to 0 dBc
Remote Command Notes:	You must be in the TD-SCDMA Modulation mode to use this command. Changing this parameter will affect all measurements in the selected mode.
Example:	:TDEM:THR:CHAN –30
	:TDEM:THR:CHAN?
	:TDEM:THR:CHAN:AUTO OFF
	:TDEM:THR:CHAN:AUTO?

3.6.2.11.4 EVM Result IQ Offset

Sets the EVM result IQ offset.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, More, Advanced**
Remote Command:	`[:SENSe]:TDEMod:EVMResult:IQOFfset STANard|EXClude`
	`[:SENSe]:TDEMod:EVMResult:IQOFfset?`
Preset:	STAN
State Saved:	Saved in instrument state.
Range:	Std | Exclude

Example:	:TDEM:EVMR:IQOF STAN
	:TDEM:EVMR:IQOF?

3.6.2.11.5 Spectrum

Sets the Mirror Frequency Spectrum value. Lets you correctly demodulate frequency spectrums that are mirrored (flipped) about the center frequency.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, More, Advanced**
Remote Command:	`[:SENSe]:TDEMod:SPECtrum:MIRRor NORMal|INVert`
	`[:SENSe]:TDEMod:SPECtrum:MIRRor?`
Preset:	NORMal
State Saved:	Saved in instrument state.
Range:	Normal | Invert
Example:	:TDEM:SPEC:MIRR NORM
	:TDEM:SPEC:MIRR?

3.6.2.11.6 Normalize

Sets Normalize On or Off. When Normalize is set to ON, the analyzer applies trace data normalization to the trace data results.

Mode:	TDDEMOD
Key Path:	**Mode Setup, Demod, More, Advanced**
Remote Command:	`[:SENSe]:TDEMod:NORMalize 1|0|ON|OFF`
	`[:SENSe]:TDEMod:NORMalize?`
Preset:	ON
State Saved:	Saved in instrument state.
Range:	On | Off
Example:	:TDEM:NORM ON
	:TDEM:NORM?

3.6.3 Multi-Carrier Demod

Allows you to disable or enable the Multi-Carrier functionality. When this key is set to ON, a low pass filter is applied to the baseband signal to reject the interference from the adjacent carriers, thus giving more accurate results.

Key Path:	**Mode Setup**
Remote Command:	`[:SENSe]:TDEMod:MCARier OFF|ON|0|1`
	`[:SENSe]:TDEMod:MCARier?`
Preset:	OFF
State Saved:	Saved in instrument state.
Range:	Off | On| 0 | 1
Dependencies/Couplings:	No Coupling.
Example:	:TDEM:MCAR OFF
	:TDEM:MCAR?

3.6.4 HSDPA/8PSK Enable

Allows you to disable or enable the HSDPA/8PSK (Option 213) functionality manually.

When this key is set to OFF, the Modulation Scheme is switched to AUTO and both the Modulation Scheme key and the Modulation Scheme Setup softkey are disabled.

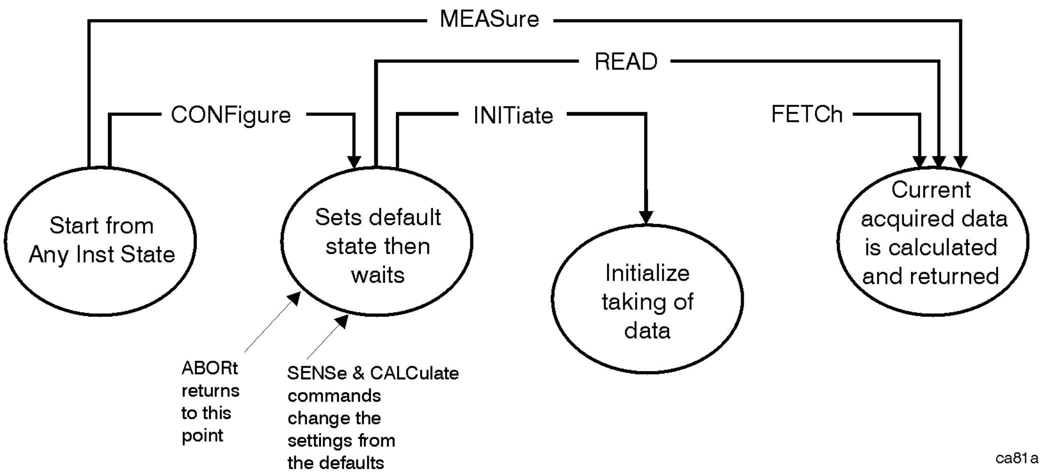
Key Path:	**Mode Setup**
Remote Command:	`[:SENSe]:RADio:CONFigure:HSDPa[:STATe] OFF|ON|0|1`
	`[:SENSe]:RADio:CONFigure:HSDPa[:STATe]?`
Preset:	OFF
State Saved:	Saved in instrument state.
Range:	Off | On
Dependencies/Couplings:	No Coupling.
Restriction and Notes:	This softkey is active when Option 213 (TD-SCDMA HSDPA/8PSK option) license is installed. This softkey will be disabled if Option 213 license is not installed.
Example:	:RAD:CONF:HSDP:STAT OFF
	:RAD:CONF:HSDP:STAT?

3.7 Measure

Accesses the Measure menus.

3.7.1 Command Interactions: MEASure, CONFigure, FETCh, INITiate and READ

Figure 3-2 Measurement Group of Commands



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 Mode Setup settings (e.g. radio standard) that you have currently selected.

- Stops the current measurement (if any) 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. The type of data returned may be defined by an [n] value that is sent with the command.

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

  ASCII is the default format for the data output. (Older versions of Spectrum Analysis and Phase Noise mode measurements only use ASCII.) The binary data formats should be used for handling large blocks of data since they are smaller and faster than the ASCII format. Refer to the FORMat:DATA command for more information.

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 to initiate the measurement and query the results. See Figure 3-2.

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 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>?.

Configure Commands:

:CONFigure:<measurement>

This command stops the current measurement (if any) and sets up the instrument for the specified measurement using the factory default instrument settings. It sets the instrument to single measurement mode but should not initiate the taking of measurement data unless INIT:CONTinuous is ON. After you change any measurement settings, the READ command can be used to initiate a measurement without changing the settings back to their defaults.

The CONFigure? query returns the current measurement name.

Fetch Commands:

`:FETCh:<measurement>[n]?`

This command puts selected data from the most recent measurement into the output buffer. Use FETCh if you have already made a good measurement and you want to return several types of data (different [n] values, e.g. both scalars and trace data) from a single measurement. FETCh saves you the time of re-making the measurement. You can only FETCh results from the measurement that is currently active, it will not change to a different measurement.

If you need to get new measurement data, use the READ command, which is equivalent to an INITiate followed by a FETCh.

The scalar measurement results will be returned if the optional [n] value is not included, or is set to 1. 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 transfer faster then the ASCII format. (FORMat:DATA)

FETCh may be used to return results other than those specified with the original READ or MEASure command that you sent.

INITiate Commands:

`:INITiate:<measurement>`

This command is not available for measurements in all the instrument modes:

- Initiates a trigger cycle for the specified measurement, but does not output any data. You must then use the FETCh<meas> command to return data. If a measurement other than the current one is specified, the instrument will switch to that measurement and then initiate it.

  For example, suppose you have previously initiated the ACP measurement, but now you are running the channel power measurement. If you send INIT:ACP? it will change from channel power to ACP and will initiate an ACP measurement.

- Does not change any of the measurement settings. For example, if you have previously started the ACP measurement and you send INIT:ACP? it will initiate a new ACP measurement using the same instrument settings as the last time ACP was run.

- If your selected measurement is currently active (in the idle state) it triggers the measurement, assuming the trigger conditions are met. Then it completes one trigger cycle. Depending upon the measurement and the number of averages, there may be multiple data acquisitions, with multiple trigger events, for one full trigger cycle. It also holds off additional commands on GPIB until the acquisition is complete.

READ Commands:

`:READ:<measurement>[n]?`

- Does not preset the measurement to the factory default settings. For example, if you have previously initiated the ACP measurement and you send READ:ACP? it will initiate a new measurement using the same instrument settings.
- 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.

  For example, suppose you have previously initiated the ACP measurement, but now you are running the channel power measurement. Then you send READ:ACP? It will change from channel power back to ACP and, using the previous ACP settings, will initiate the measurement and return 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. (FORMat:DATA)

3.7.2 Mod Accuracy (Composite EVM)

This measures the Modulation Accuracy of a TD-SCDMA signal. You must be in the TD-SCDMA Modulation mode to use these commands.

Key Path:	**Measure**
Remote Command:	`:CONFigure:EVM`
Restriction and Notes:	This key invokes Mod Accuracy Measurement
Example:	:CONF:EVM

3.7.2.1 SCPI Remote Commands

NOTE If the result is unavailable, the value returned will be –999.

```
:CONFigure:EVM
:INITiate:EVM
:FETCh:EVM[n]?
:READ:EVM[n]?
:MEASure:EVM[n]?
```

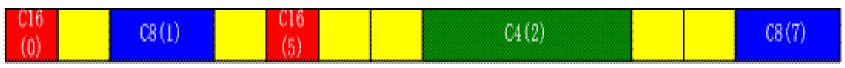
Index: n <Mnemonic>	Results Returned
0	#. Result name (type of number) [unit] <size> I/Q Capture Data Trace (float) [volt] <2 * captured data length in chips> Returns unprocessed I/Q trace data of Capture Interval, as a series of trace point values, in volts. The I values are listed first in each pair, using the 0 through even-indexed values. The Q values are the odd-indexed values. The sample rate is 3.75 MHz in this measurement.

1 (or not specified)	Returns the following 34 comma-separated scalar results, in the following order: #. Result name (type of number) [unit] <size> 1. Rho (Average) (float) [NA] Averaged composite Rho (in average cycle) in the selected timeslot and sub-frame. 2. Rho (Peak Hold) (float) [NA] Peak/Maximum composite Rho (in average cycle) in the selected timeslot and sub-frame. 3. RMS EVM (Average) (float) [% rms] Averaged composite RMS EVM (in average cycle) in the selected timeslot and sub-frame. 4. RMS EVM (Peak Hold) (float) [% rms] Peak/Maximum composite RMS EVM (in average cycle) in the selected timeslot and sub-frame. 5. Peak EVM (Average) (float) [% pk] Averaged composite peak EVM (in average cycle) in the selected timeslot and sub-frame. 6. Peak EVM (Peak Hold) (float) [% pk] Peak/Maximum composite peak EVM (in average cycle) in the selected timeslot and sub-frame. 7. RMS Magnitude Error (Average) (float) [% rms] Averaged composite RMS magnitude error (in average cycle) in the selected timeslot and sub-frame. 8. RMS Magnitude Error (Peak Hold) (float) [% rms] Peak/Maximum composite RMS magnitude error (in average cycle) in the selected timeslot and sub-frame. 9. Peak Magnitude Error (Average) (float) [% pk] Averaged composite peak magnitude error in the selected timeslot and sub-frame. 10. Peak Magnitude Error (Peak Hold) (float) [% pk] Peak/Maximum composite peak magnitude error in the selected timeslot and sub-frame. 11. RMS Phase Error (Average) (float) [° rms] Averaged composite RMS phase error (in average cycle) in the selected timeslot and sub-frame. 12. RMS Phase Error (Peak Hold) (float) [° rms] Peak/Maximum composite RMS phase error (in average cycle) in the selected timeslot and sub-frame. 13. Peak Phase Error (Average) (float) [° pk]
	Averaged composite peak phase error (in average cycle) in the selected timeslot and sub-frame.

1 (or not specified)	(continued) #. Result name (type of number) [unit] <size> 14. Peak Phase Error (Peak Hold) (float) [° pk] Peak/Maximum composite peak phase error (in average cycle) in the selected timeslot and sub-frame. 15. Peak CDE (Average) (float) [dB] Averaged Peak code domain error of all code channels (in average cycle), including active code channels and inactive code channels. When DwPTS or UpPTS is selected, –999 will be returned. 16. Peak CDE (Peak Hold) (float) [dB] Peak/Maximum Peak code domain error of all code channels (in average cycle), including active code channels and inactive code channels. When DwPTS or UpPTS is selected, –999 will be returned. 17. Peak Active CDE (Average) (float) [dB] Averaged Peak Code Domain Error of active code channels (in average cycle). If no active channel is detected, –999 will be returned. When DwPTS or UpPTS is selected, –999 will be returned. 18. Peak Active CDE (Peak Hold) (float) [dB] Peak/Maximum Peak Code Domain Error of active code channels (in average cycle). If no active channel is detected, –999 will be returned. When DwPTS or UpPTS is selected, –999 will be returned. 19. Frequency Error (Average) (float) [Hz] Averaged composite frequency error (in average cycle) in the selected timeslot and sub-frame. 20. Frequency Error (Peak Hold) (float) [Hz] Peak/Maximum composite frequency error (in average cycle) in the selected timeslot and sub-frame. 21. IQ Offset (Average) (float) [dB] Averaged composite IQ offset (in average cycle) in the selected timeslot and sub-frame. 22. IQ Offset (Peak Hold) (float) [dB] Peak/Maximum composite IQ offset (in average cycle) in the selected timeslot and sub-frame. 23. Quad Error (Average) (float) [deg] Averaged composite Quad Error (in average cycle) in the selected timeslot and sub-frame.

1 (or not specified)	(continued) #. Result name (type of number) [unit] <size> 24. Quad Error (Peak Hold) (float) [deg] Peak/Maximum composite Quad Error (in average cycle) in the selected timeslot and sub-frame. 25. Gain Imbalance (Average) (float) [dB] Averaged composite gain imbalance (in average cycle) in the selected timeslot and sub-frame. 26. Gain Imbalance (Peak Hold) (float) [dB] Peak/Maximum composite gain imbalance (in average cycle) in the selected timeslot and sub-frame. 27. Time Offset (Average) (float) [chips] Averaged composite timing error (in average cycle) in chips, relative to the timing reference (DwPTS/UpPTS/Trig) 28. Time Offset (Peak Hold) (float) [chips] Peak/Maximum composite timing error (in average cycle) in chips, relative to the timing reference (DwPTS/UpPTS/Trig) 29. Position of Peak CDE - Code Level (Peak Hold) (int) [NA] Code channel number of Peak/Maximum Peak CDE (in average cycle) is CX(Y). X is the OVSF code length (1,2, 4, 8, or 16), Y is the OVSF code index (0, … X – 1). OVSF code length X is returned. When DwPTS or UpPTS is selected, –999 will be returned. 30. Position of Peak CDE - Code Index (Peak Hold) (int) [NA] Code channel number of Peak/Maximum Peak CDE (in average cycle) is CX(Y). X is the OVSF code length (1, 2, 4, 8, or 16), Y is the OVSF code index (0, … X – 1). OVSF Code index Y is returned. When DwPTS or UpPTS is selected, –999 will be returned. 31. Position of Peak Active CDE - Code Level (Peak Hold) (int) [NA] Code channel number of Peak/Maximum Peak Active CDE (in average cycle) is SX(Y). X is the OVSF length (1, 2, 4, 8, or 16), Y is the OVSF code index (0, …, X – 1). OVSF code length X is returned. If no active channel is detected, –999 will be returned. When DwPTS or UpPTS is selected, –999 will be returned. 32. Position of Peak Active CDE - Code Index (Peak Hold) (int) [NA] Code channel number of Peak/Maximum Peak Active CDE (in average cycle) is SX(Y). X is the OVSF code length (1, 2, 4, 8, or 16), Y is the OVSF code index (0, …, X – 1). OVSF code index Y is returned. If no active channel is detected, –999 will be returned. When DwPTS or UpPTS is selected, –999 will be returned.

1 (or not specified)	(continued) #. Result name (type of number) [unit] <size> 33. Number of Active Channels (int) [NA] Number of active channels in the selected timeslot and sub-frame. 34. Total Data Power (float) [dBm] The total data part power of the selected timeslot and sub-frame.
2	Filtered Analysis Subframe Data Trace (float) [Volt] <2*4*6432> Return I/Q trace data of RRC filtered selected timeslot and sub-frame, as a series of trace point values, in volts. There are 4 I/Q pair samples per chip. The I values are listed first in each pair, using the 0 through even-indexed values. The Q values are the odd-indexed values. There are 6400 chips in a sub-frame. There are extra 16 chips at the head of the sub-frame and extra 16 chips at the end of the sub-frame.
3	Unnormalized I/Q Measured Polar Data Trace (float) [Volt] <2*848> Return unprocessed I/Q trace data of selected timeslot and sub-frame, as a series of trace point values, 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. When the analyzed time slot is inactive, a series of –999 will be returned.
4	Normalized I/Q Measured Polar Data Trace (float) [dB] <2*848> Return unprocessed I/Q trace data of selected timeslot and sub-frame, as a series of trace point values, in dB. The I values are listed first in each pair, using the 0 through even-indexed values. The Q values are the odd-indexed values. When the analyzed time slot is inactive, a series of –999 will be returned.
5	Magnitude Error vs. Chip Trace (float) [dB] <848> Return composite magnitude error vs. chip data, as a series of comma-separated trace points. The result is a series of floating point numbers. When the analyzed time slot is inactive, a series of –999 will be returned.
6	Phase Error vs. Chip Trace (float) [dB] <848> Return composite phase error vs. chip data, as a series of comma-separated trace points. The result is a series of floating point numbers. When the analyzed time slot is inactive, a series of –999 will be returned.
7	EVM vs. Chip Trace (float) [dB] <848> Return composite EVM error vs. chip data, as a series of comma-separated trace points. The result is a series of floating point numbers. When the analyzed time slot is inactive, a series of –999 will be returned.

8	Code Length Vector (int) [NA] <16> Return the vector containing information of the spreading code length of each code channel, active or inactive, in the specified timeslot. There are 16 numbers in this vector. For the active channel, if its code length is less than the max spreading code length 16, the filled length value is duplicated (16/spreading code length) times. For the inactive channel, it is set to 16. The purpose of this vector is providing the code length information for each value in Active Flag Vector, Unnormalized Code Domain Power Vector, Normalized Code Domain Power Vector, Unnormalized Code Domain Error Vector, and Normalized Code Domain Error Vector. Its data is aligned according to the increasing code index, for example: There are five active code channels in one timeslot, C16(0), C8(1), C16(5), C4(2) and C8(7), as follows, and the blank block denotes inactive channel.  So the values in this vector should be {16, 16, 8, 8, 16, 16, 16, 16, 4, 4, 4, 4, 16, 16, 8, 8}. Note: When the measurement fails to get synchronization or the slot under test is DwPTS/UpPTS or inactive, and so on, all the lengths in this vector are -999.
9	Active Flag Vector (int) [NA] <16> Returns the vector containing information on whether or not the specified channel is active, as a series of comma-separated points. “1” denotes active, and “0” denotes inactive. There are 16 numbers in this vector. If the active channel’s code length (specified by the value on the same position within the Code Length Vector) is less than the max spreading code length 16, the flag is duplicated (16/spreading code length) times. Its data is aligned according to the increasing code index. Take Configuration 1 for example, the values in this vector should be {1, 0, 1, 1, 0, 1, 0, 0, 1, 1, 1, 1, 0, 0, 1, 1}. Note: When the measurement fails to get synchronization or the slot under test is DwPTS/UpPTS or inactive, and so on, all the flags in this vector are -999.
10	Unnormalized Code Domain Power Trace (float) [dBm] <16> Return the vector containing unnormalized CDP information for the specified code channel, as a series of comma-separated points. There are 16 numbers in this vector. If the active channel’s code length (specified by the value on the same position within the Code Length Vector) is less than the max spreading code length 16, the power is duplicated (16/spreading code length) times. Its data is aligned according to the increasing code index. Take Configuration 1 for example, the values in this vector should be {P1, Px, P2, P2, Px, P3, Px, Px, P4, P4, P4, P4, Px, Px, P5, P5}. Px is the power on code channel C16(x). Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, this vector will be unavailable and return –999.

11	Normalized Code Domain Power Trace (float) [dB] <16> Return the vector containing normalized CDP information for the specified code channel, as a series of comma-separated points. There are 16 numbers in this vector. If the active channel's code length (specified by the value on the same position within the Code Length Vector) is less than the max spreading code length 16, the power is duplicated (16/spreading code length) times. Its data is aligned according to the increasing code index. Take Configuration 1 for example, the values in this vector should be {P1, Px, P2, P2, Px, P3, Px, Px, P4, P4, P4, P4, Px, Px, P5, P5}. Px is the power on code channel C16(x). … … Note: When the measurement fails to get the result, for example, when failing to synchronize or the slot under test is DwPTS/UpPTS or inactive, all values in this vector will be –999.
12	Normalized Code Domain Error Trace (float) [dB] < 16 > Return the vector containing normalized CDE information for the specified code channel, as a series of comma-separated points. There are 16 numbers in this vector. If the active channel's code length (specified by the value on the same position within the Code Length Vector) is less than the max spreading code length 16, the error is duplicated (16/spreading code length) times. Its data is aligned according to the increasing code index. Take Configuration 1 for example, the values in this vector should be {E1, Ex, E2, E2, Ex, E3, Ex, Ex, E4, E4, E4, E4, Ex, Ex, E5, E5}. Ex is the power on code channel C16(x). Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, all values in this vector will be –999.
13	Total Power vs. Timeslots Trace (float) [dBm] <9> Return absolute power measurement of composite signals for each timeslot within the analyzed subframe. The sequence of timeslot is TS0, DwPTS, UpPTS, TS1, TS2, TS3, TS4, TS5, and TS6 Note: When the measurement fails, such as: failing to synchronize, all values in this vector will be –999.
14	Midamble Power vs. Timeslots Trace (float) [dBm] <9> Return absolute power measurement of composite midamble signals for each timeslot within the analyzed subframe. The sequence of timeslot is TS0, DwPTS, UpPTS, TS1, TS2, TS3, TS4, TS5, and TS6. The midamble power of DwPTS/UpPTS returned is same as the total power of DwPTS/UpPTS. Note: When the measurement fails, such as: failing to synchronize, all values in this vector will be –999.

15	Data Power 1 vs. Timeslots Trace (float) [dBm] <9> Return absolute power measurement of composite data signals before midamble for each timeslot within the analyzed subframe. The sequence of timeslot is TS0, DwPTS, UpPTS, TS1, TS2, TS3, TS4, TS5, and TS6. The data power of DwPTS/UpPTS returned is same as the total power of DwPTS/UpPTS. Note: When the measurement fails, such as: failing to synchronize, all values in this vector will be –999.
16	Data Power 2 vs. Timeslots Trace (float) [dBm] <9> Return absolute power measurement of composite data signals after midamble for each timeslot within the analyzed subframe. The sequence of timeslot is TS0, DwPTS, UpPTS, TS1, TS2, TS3, TS4, TS5, and TS6. The data power of DwPTS/UpPTS returned is same as the total power of DwPTS/UpPTS. Note: When the measurement fails, such as: failing to synchronize, all values in this vector will be –999.
17	Time Offset vs. Timeslots Trace (float) [chips] <9> Return the difference in time (in chips) between the measured and ideal start times for each timeslot within the analyzed sub-frame relative to the specified time reference. The sequence of the timeslots is TS0, DwPTS, UpPTS, TS1, TS2, TS3, TS4, TS5, and TS6, totally 9 timeslots. Either the DwPTS, UpPTS, or Trigger Point as the time reference can be set as Timing Ref in Demod parameters Note: When the measurement fails, such as: failing to synchronize, all values in this vector will be –999.
18	Limit PASS/FAIL Trace (int) [NA] <5> Return the PASS/FAIL (0/1) message of the current selected device (BTS or MS) in the sequence of: 1st, Composite RMS EVM 2nd, Composite Peak EVM 3rd, Composite Rho 4th, Peak CDE 5th, Composite Frequency Error Coupled with device. When the current device is set BTS, the trace indicates the limit Pass/Fail of BTS; When the device is set MS, the trace indicates the limit Pass/Fail of MS. Note: When the measurement fails, such as: failing to synchronize, all values in this vector will be –999.
19	Time Slot Active Flag Trace (int) [NA] <9> Return the Active/Inactive (1/0) of the 9 time slots within the selected analysis sub-frame. The sequence of the timeslots is TS0, DwPTS, UpPTS, TS1, TS2, TS3, TS4, TS5 and TS6. Note: When the measurement fails to get synchronization, all the values in this vector will be -999.

3.7.3 Code Domain

Key Path:	**Measure**
Remote Command:	`:CONFigure:CDPower`
Restriction and Notes:	This key invokes Code Domain Measurement
Example:	:CONF:CDP

3.7.3.1 Remote SCPI Results

`:CONFigure:CDPower`

`:INITiate:CDPower`

`:FETCh:CDPower[n]?`

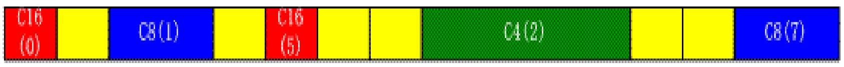
`:MEASure:CDPower[n]?`

`:READ:CDPower[n]?`

Index: n <Mnemonic>	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 24 comma-separated scalar results: #. Result Name: (type of number) [unit] <explanation> Note: When the measurement fails to get results, such as: failing to synchronize or the slot under test is DwPTS/UpPTS or inactive, all the following scalar results will be unavailable and return –999. 1. RMS EVM: (double) [percent] The RMS-averaged EVM of despreaded symbols in the specified code (spreading code length and code channel), timeslot and sub-frame. 2. Peak EVM: (double) [percent] The peak symbol EVM in the specified code (spreading code length and code channel), timeslot and sub-frame. 3. Peak position of peak EVM: (int) [symbol] The index of symbol which has the maximum EVM in the specified code channel, timeslot and sub-frame. 4. Rms Mag Error: (double) [percent] The RMS-averaged magnitude error of despreaded symbols in the specified code (spreading code length and code channel), timeslot and sub-frame. 5. Peak Mag Error: (double) [percent] The peak symbol Mag Error in the specified code (spreading code length and code channel), timeslot and sub-frame. 6. Peak position of peak Mag Error: (int) [symbol] The index of symbol which has the maximum mag error in the specified code channel, timeslot and sub-frame. 7. Rms Phase Error: (double) [deg] The RMS-averaged phase error of despreaded symbols in the specified code (spreading code length and code channel), timeslot and sub-frame. 8. Peak Phase Error: (double) [deg] The peak symbol Phase Error in the specified code (spreading code length and code channel), timeslot and sub-frame. 9. Peak position of peak phase Error: (int) [symbol] The index of symbol which has the with maximum phase error in the specified code channel, timeslot and sub-frame. 10. Code Phase Error: (double) [deg] The phase offset of the code channel relative to the DwPTS pilot time slot. 11. Number of Active Channels: (int) [NA] The number of active channels in the specified timeslot and sub-frame. 12. Total Data Power: (double) [dBm] The total data power of the selected timeslot and sub-frame. It is the power to be used to normalize CDP and CDE.

not specified or n = 1	(continued) #. Result Name: (type of number) [unit] <explanation> 13. Code Domain Power (dBm): (double) [dBm] The absolute signal power of specified code channel. 14. Code Domain Power (dB): (double) [dB] The signal power of specified code channel normalized to the total signal power. 15. Code Domain Error (dBm): (double) [dB] The code domain error of the specified code channel. 16. Code Domain Error (dB): (double) [dB] The code domain error of the specified code channel. 17. Peak Active CDE (double) [dB] The peak CDE in dB among the active channel in the specified timeslot. 18. Spreading Code Length of Peak Active CDE: (int) [NA] The spreading code length of peak active CDE in the specified timeslot and sub-frame. 19. Code Channel No. of Peak Active CDE: (int) [NA] The code channel No. of peak active CDE in the specified timeslot and sub-frame. 20. Peak CDE (double) [dB] The peak CDE in dB among all the channel in the specified timeslot. 21. Spreading Code Length of Peak CDE: (int) [NA] The spreading code length of peak CDE in the specified timeslot and sub-frame. 22. Code Channel No. of Peak CDE: (int) [NA] The code channel No. of peak CDE in the specified timeslot and sub-frame. 23. Number of Midamble Shifts: (int) [NA] The number of midamble shifts detected in the specified timeslot. 24. Mod Detection: (int) [NA] The modulation mod has been detected. 0 stands for QPSK, 1 stands for 8PSK and 2 stands for 16QAM.

2	Code Length Vector (int) [NA] Return the vector containing information of the spreading code length of each code channel, active or inactive, in the specified timeslot. There are 16 numbers in this vector. For the active channel, if its code length is less than the max spreading code length 16, the filled length value is duplicated (16/spreading code length) times. For the inactive channel, it is set to 16. The purpose of this vector is providing the code length information for each value in Active Flag Vector, Unnormalized Code Domain Power Vector, Normalized Code Domain Power Vector, Unnormalized Code Domain Error Vector, and Normalized Code Domain Error Vector. Its data is aligned lined according to the increasing code index, for example: There are five active code channels in one timeslot, C16(0), C8(1), C16(5), C4(2) and C8(7), as follows, and the blank block denotes inactive channel.  So the values in this vector should be {16, 16, 8, 8, 16, 16, 16, 16, 4, 4, 4, 4, 16, 16, 8, 8}. Note: When the measurement fails to get synchronization or the slot under test is DwPTS/UpPTS or inactive, and so on, all the length in this vector will be unavailable.
3	Active Flag Vector (int) [NA] Return the vector containing information whether or not the specified channel is active, as a series of comma-separated points. "1" denotes active, and "0" denotes inactive. There are 16 numbers in this vector. If the active channel's code length (specified by the value on the same position within the Code Length Vector) is less than the max spreading code length 16, the flag is duplicated (16/spreading code length) times. Its data is aligned according to the increasing code index. Take Configuration 1 for example, the values in this vector should be {1, 0, 1, 1, 0, 1, 0, 0, 1, 1, 1, 1, 0, 0, 1, 1}. Note: When the measurement fails to get synchronization or the slot under test is DwPTS/UpPTS or inactive, and so on, all flags in this vector will be -999.
4	Unnormalized Code Domain Power Vector (float) [dBm] Return the vector containing unnormalized CDP information for the specified code channel, as a series of comma-separated points. There are 16 numbers in this vector. If the active channel's code length (specified by the value on the same position within the Code Length Vector) is less than the max spreading code length 16, the power is duplicated (16/spreading code length) times. Its data is aligned according to the increasing code index. Take Configuration 1 for example, the values in this vector should be {P1, Px, P2, P2, Px, P3, Px, Px, P4, P4, P4, P4, Px, Px, P5, P5}. Px is the power on code channel C16(x). Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, all the values in this vector will be -999.

5	Normalized Code Domain Power Vector (float) [dB] Return the vector containing normalized CDP information for the specified code channel, as a series of comma-separated points. There are 16 numbers in this vector. If the active channel's code length (specified by the value on the same position within the Code Length Vector) is less than the max spreading code length 16, the power is duplicated (16/spreading code length) times. Its data is aligned according to the increasing code index. Take Configuration 1 for example, the values in this vector should be {P1, Px, P2, P2, Px, P3, Px, Px, P4, P4, P4, P4, Px, Px, P5, P5}. Px is the power on code channel C16(x). … … Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, all the values in this vector will be -999.
6	Unnormalized Code Domain Error Vector (float) [dBm] Return the vector containing unnormalized CDE information for the specified code channel, as a series of comma-separated points. There are 16 numbers in this vector. If the active channel's code length (specified by the value on the same position within the Code Length Vector) is less than the max spreading code length 16, the error is duplicated (16/spreading code length) times. Its data is aligned according to the increasing code index. Take Configuration 1 for example, the values in this vector should be {E1, Ex, E2, E2, Ex, E3, Ex, Ex, E4, E4, E4, E4, Ex, Ex, E5, E5}. Ex is the power on code channel C16(x). Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, all the values in this vector will be -999.
7	Normalized Code Domain Error Vector (float) [dB] Return the vector containing normalized CDE information for the specified code channel, as a series of comma-separated points. There are 16 numbers in this vector. If the active channel's code length (specified by the value on the same position within the Code Length Vector) is less than the max spreading code length 16, the error is duplicated (16/spreading code length) times. Its data is aligned according to the increasing code index. Take Configuration 1 for example, the values in this vector should be {E1, Ex, E2, E2, Ex, E3, Ex, Ex, E4, E4, E4, E4, Ex, Ex, E5, E5}. Ex is the power on code channel C16(x). Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, all the values in this vector will be -999.

8	Symbol Magnitude Error Vector (float) [percent] Return symbol magnitude error vector for the specified code channel and spread code length, as a series of comma-separated points. The length of the vector depends on the number of symbols in the code channel. Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, this vector will return a series of -999 with length 44.
9	Symbol Phase Error Vector (float) [deg] Return symbol phase error vector for the specified code channel and spread code length, as a series of comma-separated points. The length of the vector depends on the number of symbols in the code channel. Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, this vector will return a series of -999 with length 44.
10	Symbol EVM Vector (float) [percent] Return symbol EVM vector for the specified code channel and spread code length, as a series of comma-separated points. The length of the vector depends on the number of symbols in the code channel. Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, this vector will return a series of -999 with length 44.
11	Unnormalized I/Q Symbol Polar Vector (float) [volts] Return unnormalized I/Q data of demod symbols in the specified code channel (Code Length) and code layer (Spread Code Length), as a series of comma-separated points. The I values are listed first in each pair, using the 0 through even-indexed values. The Q values are the odd-indexed values. The length of the vector depends on the number of symbols in the code channel. Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, this vector will return a series of -999 with length 88.
12	Normalized I/Q Symbol Polar Vector (float) [NA] Return normalized I/Q data of demod symbols in the specified code channel (Code Length) and code layer (Spread Code Length), as a series of comma-separated points. The I values are listed first in each pair, using the 0 through even-indexed values. The Q values are the odd-indexed values. The length of the vector depends on the number of symbols in the code channel. Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, this vector will return a series of -999 with length 88.

13	Symbol Power Vector (float) [dBm] Return symbol power vector for the specified code channel and spread code length, as a series of comma-separated points. The length of the vector depends on the number of symbols in the code channel. Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, this vector will return a series of -999 with length 44.
14	Demod Bits Vector (int) [NA] Return the vector containing the demod binary bits for each symbol in the specified code channel, as a series of comma-separated trace points. The length depends on the number of bits in the specified code channel. Note: When the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, this vector will be unavailable.
15	Midamble Shift Vector (int) [NA] Return the vector containing the midamble shift detected in the specified timeslot, as a series of comma-separated trace points. The length depends on the number of detected midamble shifts in the specified timeslot, it can be gotten by querying the scalar result [24], Number of User. Note: When there is no midamble shift existing in the analyzed timeslot, or when the measurement fails to get the result, for example, when failing to synchronize, or if the slot under test is DwPTS/UpPTS or inactive, this vector will be unavailable.

3.7.4 Spectrum (Freq Domain)

Allows you to switch to the Spectrum (Freq Domain) measurements of TD-SCDMA signals. Refer to *PSA Basic Mode Guide* for more information.

Key Path:	**Measure**
Remote Command:	`:CONFigure:SPECtrum`
Restriction and Notes:	This key invokes the Spectrum (Freq Domain) Measurement.
Example:	:CONF:SPEC

3.7.5 WaveForm (Time Domain)

Allows you to switch to the WaveForm (Time Domain) measurements of TD-SCDMA signals. Refer to *PSA Basic Mode Guide* for more information.

Key Path:	**Measure**
Remote Command:	`:CONFigure:WAVeform`

Restriction and Notes:	This key invokes the Waveform (Time Domain) Measurement.
Example:	:CONF:WAV

3.8 Code Domain Measurement

3.8.1 Front Panel Display

The Code Domain measurement consists of 6 views.

The following table shows the layout of each view.

NO.	View	Number of Windows	Window No.	Window
1	CDP Graph & Metrics	Dual (Upper/Lower)	1	Code Domain Power (Upper)
			2	Code Domain Power Summary (Lower)
2	CDE Graph & Metrics	Dual (Upper/Lower)	1	Code Domain Error (Upper)
			2	Code Domain Error Summary (Lower)
3	I/Q Error (Quad View)	Quad	1	Code Domain Magnitude Error (Upper Left)
			2	Code Domain Phase Error (Upper Right)
			3	Code Domain EVM (Lower Left)
			4	Code Domain Result metrics (Lower Right)
4	Code Domain	Quad	1	Code Domain Power (Upper Left)
			2	Code Domain Symbol Power (Upper Right)
			3	I/Q Symbol Polar Vector (Constellation) (Lower Left)
			4	Code Domain Result metrics (Lower Right)
5	Demod Bits	Triplex	1	Code Domain Power (Upper Left)
			2	Code Domain Symbol Power (Upper Right)
			3	Demod Bits (Lower)
6	Numeric Results Summary	One	1	Code Domain Numeric Results Summary

3.8.1.1 CDP Graph & Metrics View

There are two windows in this view:

- Code Domain Power (upper)
- Code Domain Power Summary (lower)

3.8.1.1.1 Code Domain Power Window

Marker Trace	Yes

Corresponding Trace	Code Domain Power vs. Code Channel (n=3)

3.8.1.1.2 Code Domain Power Summary Window

Name	Corresponding Results	Format
Total Data Power (dBm)	n=1, 12th Total data part power of the timeslot (not including Midamble part)	-xx.xx dBm
Number of Active Channels	n=1, 11th The number of total active channel	xx
Peak Active CDE	n=1, 17th The peak CDE among all the active channel	-xx.xx dB
Spreading Code Length of Peak Active CDE	n=1, 18th The spreading code length of the active channel with peak CDE	xx
Code Channel No. of Peak Active CDE	n=1, 19th The code channel index of the peak active CDE	xx
Peak CDE	n=1, 20th The peak CDE among all the channel	-xx.xxdB
Spreading Code Length of Peak CDE	n=1, 21st The spreading code length of the channel with peak CDE	xx
Code Channel No. of Peak CDE	n=1, 22nd The code channel index of the peak CDE	xx
Number of User	n=1, 23rd The number of midamble shift detected in a timeslot.	xx

Marker Trace	No
	Unnormalized Code Domain Power vs. Code Channel (dBm) (n=3)
	Normalized Code Domain Power vs. Code Channel (dB) (n=4)
	Normalized Code Domain Error vs. Code Channel (dB) (n=6)
	Midamble Shift Vector (chip) (n=15)

3.8.1.2 CDE Graph & Metrics View

There are two windows in this view:

- Code Domain Error (upper)
- Code Domain Power Summary (lower)

3.8.1.2.1 Code Domain Error Window

Marker Trace	Yes
Corresponding Trace	If Normalize is Off, the trace is unnormalized Code Domain Error vs. Code Channel (dBm) (n=5), otherwise the trace is normalized Code Domain Error vs. Code Channel (dB) (n=6)

3.8.1.2.2 Code Domain Power Summary Window

Shows code domain power summary as the same as those of "Code Domain Power Summary Window" on page 102.

3.8.1.3 I/Q Error View

There are four windows in this view:

- Code Domain Mag Error Window
- Code Domain Phase Error Window
- Code Domain EVM Error Window
- Code Domain Result Metrics Window

3.8.1.3.1 Code Domain Mag Error Window

Provides mag errors vs. symbols results.

Marker Trace	Yes
Corresponding Trace	Mag Error vs. Symbols trace (n=7)

3.8.1.3.2 Code Domain Phase Error Window

Provides phase errors vs. symbols results.

Marker Trace	Yes
Corresponding Trace	Phase Error vs. Symbols trace (n=8)

3.8.1.3.3 Code Domain EVM Window

Provides EVM vs. symbols results.

Marker Trace	Yes
Corresponding Trace	EVM vs. Symbols trace (n=9)

3.8.1.3.4 Code Domain Result Metrics Window

Name	Corresponding Results	Format
Code No:	NA	SX(Y) TSM X: spreading code length (1, 2, 4, 8, or 16) Y: code channel number (0 .. X – 1) M: Time Slot
Rms EVM	n=1 1st The rms symbol EVM	xx.xx % rms
Peak EVM	n=1 2nd The peak symbol EVM	xx.xx % pk
Rms Mag Error	n=1 4th The rms symbol mag error	xx.xx % rms
Peak Mag Error	n=1 5th The peak symbol mag error	xx.xx % pk
Rms Phase Error	n=1 7th The rms symbol phase error	xx.xx ° rms
Peak Phase Error	n=1 8th The peak symbol phase error	xx.xx ° pk
Code Domain Power (dB)	n=1 14th The power of the code channel in dB	xx.xx dB
Code Domain Error (dB)	n=1 16th The error of the code channel in dB	xx.xx dB
Mod Detection	n=1 24th The modulation mode has been detected.	xxxx

3.8.1.4 Code Domain View

There are four windows in this view:

- Code Domain Power Window
- Code Domain Symbol Power Window
- I/Q Symbol Polar Vector (Constellation) Window
- Result metrics Window

3.8.1.4.1 Code Domain Power Window

Shows code domain power graph the same as that "Code Domain Power Window" on page 101.

Provide symbol power vs. time results.

Marker Trace	Yes
Corresponding Trace	Symbol Power (n=12)

3.8.1.4.2 I/Q Symbol Polar Vector (Constellation) Window

Marker Trace	Yes
Corresponding Trace	If Normalize is Off, the trace is unnormalized I/Q Symbol Polar Vector (n=10), otherwise it is normalized I/Q Symbol Polar Vector (n=11)

3.8.1.4.3 Code Domain Result metrics Window

Shows code domain result metrics window the same as those of "Code Domain Result Metrics Window" on page 104.

3.8.1.5 Demod bits View

There are three windows in this view:

- Code Domain Power Window
- I/Q Symbol Polar Vector (Constellation) Window
- Demod Bits Window

3.8.1.5.1 Code Domain Power Window

Shows code domain power graph the same as that of "Code Domain Power Window" on page 101.

3.8.1.5.2 I/Q Symbol Polar Vector (Constellation) Window

Shows code domain power graph the same as that of "I/Q Symbol Polar Vector (Constellation) Window" on page 105.

3.8.1.5.3 Demod Bits Window

Marker Trace	No
Corresponding Trace	Demod bits (n=13)

3.8.1.6 Results metrics View

There is only one window in this view:

- Code Domain Numeric Results Window

Name	Corresponding Results	Format
Code No:	NA	SX(Y) TSM X: spreading code length (1, 2, 4, 8, or 16) Y: code channel number (0 .. X – 1) M: Time Slot
Rms EVM	n=1 1st The rms symbol EVM	xx.xx % rms
Peak EVM	n=1 2nd The peak symbol EVM	xx.xx % pk
Peak position of peak EVM	n=1 3rd The symbol number with the peak symbol EVM	xxx
Rms Mag Error	n=1 4th The rms symbol mag error	xx.xx % rms
Peak Mag Error	n=1 5th The peak symbol mag error	xx.xx % pk
Peak position of peak Mag Error	n=1 6th The symbol number with the peak mag error	xxx
Rms Phase Error	n=1 7th The rms symbol phase error	xx.xx ° rms
Peak Phase Error	n=1 8th The peak symbol phase error	xx.xx ° pk
Peak position of peak phase Error	n=1 9th The symbol number with the peak phase error	xxx

Code Phase Error	n=1 10th The phase error of the code channel	xx.xx °
Code Domain Power (dBm)	n=1 13th The power of the code channel in dBm	xx.xx dBm
Code Domain Power (dB)	n=1 14th The power of the code channel in dB	xx.xx dB
Code Domain Error (dBm)	n=1 15th The error of the code channel	xx.xx dBm
Code Domain Error (dB)	n=1 16th The error of the code channel	xx.xx dB
Mod Detection	n=1 24th The modulation mode has been detected.	xxxx

3.8.2 Display

3.8.2.1 Display Menu under I/Q Symbol Polar Vector Windows

3.8.2.1.1 I/Q Polar

Selects the polar display type:

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:CDPower:IQPType VCONStln|VECTor|CONStln` `:DISPlay:CDPower:IQPType?`
Preset:	VCONstln
State Saved:	Saved in instrument state.
Range:	Vec & Constln | Vec | Constln
Restriction and Notes:	• Vec & Constln: Sets the view to display both the vector and constellation diagrams • Vector: Sets the view to display an I/Q polar vector diagram • Constellation: Sets the view to display the constellation diagram

Example:	:DISP:CDP:IQPT VCON
	:DISP:CDP:IQPT?

3.8.2.1.2 I/Q Points

Specifies the total number of I/Q points displayed during each measurement interval in the I/Q Symbol Polar Vector Graph.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:CDPower:IQPoints <integer>`
	`:DISPlay:CDPower:IQPoint?`
Preset:	44
State Saved:	Saved in instrument state.
Min:	1
Max:	1000
Dependencies/Couplings:	See Restriction and Notes.
Restriction and Notes:	The max I/Q points should be the symbol number in the specified code channel (equal to 704/spread code length). If the number of I/Q Points is larger than the symbol in the code channel, the I/Q Points will be clipped to the maximum possible number.
Example:	:DISP:CDP:IQP 80
	:DISP:CDP:IQP?

3.8.2.1.3 I/Q Points Offset

Specifies an offset from the first I/Q point in the I/Q Polar diagrams. If you choose to display only a subset of the I/Q points, this subset of displayed points is offset from the first I/Q point.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:CDPower:IQPoints:OFFSet <integer>`
	`:DISPlay:CDPower:IQPoints:OFFSet?`
Preset:	0

State Saved:	Saved in instrument state.
Min:	0
Max:	1000
Dependencies/Couplings:	See Restriction and Notes.
Restriction and Notes:	The max I/Q points Offset should be less than the symbol number in the code channel (equal to 704/spread code length). If the I/Q Points Offset is larger than or equal to the symbols in the code channel, the I/Q Points Offset will be clipped to its max possible number.
Example:	:DISP:CDP:IQP:OFFS 14 :DISP:CDP:IQP:OFFS?

3.8.2.1.4 I/Q Rotation

Specifies whether or not 45 degree rotation is applied to the I/Q constellation.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:CDPower:ROTation OFF|ON|0|1` `:DISPlay:CDPower:ROTation?`
Preset:	OFF
State Saved:	Saved in instrument state.
Range:	On | Off
Example:	:DISP:CDP:ROT ON :DISP:CDP:ROT?

3.8.2.1.5 Interpolation

Specifies whether the input I/Q data should be interpolated.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:CDPower:INTerpolate OFF|ON|0|1` `:DISPlay:CDPower:INTerpolate?`
Preset:	Off

State Saved:	Saved in instrument state.
Range:	On | Off
Example:	:DISP:CDP:INT ON
	:DISP:CDP:INT?

3.8.2.1.6 Full Vector (background)

When the I/Q Points value is less than total symbols number, the non-selected portion of the I/Q vector is not displayed. When Full Vector is on, the trace will show all the I/Q vector within the code channel. The hidden portion (the points before the I/Q offset) is displayed in gray.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:CDPower:FVECtor[:STATe] OFF|ON|0|1`
	`:DISPlay:CDPower:FVECtor[:STATe]?`
Preset:	OFF
State Saved:	Saved in instrument state.
Range:	On | Off
Example:	:DISP:CDP:FVEC ON
	:DISP:CDP:FVEC?

3.8.2.2 Display Menu under Demod Bits View

3.8.2.2.1 Demod Bit Format

Allows you to select the show format of the demod bits.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:CDPower:DBITs:FORMat BINary|HEX`
	`:DISPlay:CDPower:DBITs:FORMat?`
Preset:	BINary
State Saved:	Saved in instrument state.
Range:	Binary | Hex

Example:	:DISP:CDP:DBIT:FORM HEX
	:DISP:CDP:DBIT:FORM?

3.8.2.3 Display Menu under CDP Window and CDE Window

3.8.2.3.1 Composite

Specifies whether the composite CDP/CDE is displayed. If composite is On, it displays CDP/CDE of the active channel on its own spread code length. Otherwise, it displays CDP/CDE of all the channels on spread code length specified by the second key under this menu.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:CDPower:COMPosite OFF|ON|0|1`
	`:DISPLay:CDPower:COMPosite?`
Dependencies/Couplings:	If composite is On, the spread code length key followed it will be greyed out
Preset:	On
State Saved:	Saved in instrument state.
Range:	On | Off
Example:	:DISP:CDP:COMP ON
	:DISP:CDP:COMP?

3.8.2.3.2 Spread Code Length

Selects the active Spread Code Length for the CDP/CDE trace data. This parameter has no effect other than the display of the CDP and CDE trace when Composite is Off. If Composite is On, the spread code length key will be greyed out.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:CDPower:SCLength <integer>`
	`:DISPlay:CDPower:SCLength?`
Preset:	16
State Saved:	Saved in instrument state.
Min:	1
Max:	16

Dependencies/Couplings:	Only 1, 2, 4, 8, and 16 are valid. Any other number will be clipped to the nearest valid number.
Example:	:DISP:CDP:SCL 1 :DISP:CDP:SCL?

3.8.3 SPAN/X Scale

The SPAN/X Scale key accesses the menu to set the desired horizontal scale and associated settings of waveform.

EVM, Mag Error, Phase Error and Symbol Power window have the same SPAN/X Scale menu. CDP and CDE window share a different menu.

3.8.3.1 Scale/Div

This key is for X Scale/Div control. This key is only available in EVM, Mag Error, Phase Error, Symbol Power, Code Domain Error and Code Domain Power windows.

Mode:	TDDEMOD
Key Path:	**Span X Scale**
Remote Command:	`:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:X[:SCALe]:PDIVision` `:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:X[:SCALe]:PDIVision?`
Unit:	See Table 3-1 on page 113
Preset:	See Table 3-1 on page 113
State Saved:	Saved in instrument state.
Min:	See Table 3-1 on page 113
Max:	See Table 3-1 on page 113
Dependencies/Couplings:	See Table 3-1 on page 113

SCPI Remarks: CDP[1]: CDP Graph & Metrics View

Window[1]: Code Domain Power Window

Window2: Code Domain Power Summary Window

CDP2: CDE Graph & Metrics View

Window[1]: Code Domain Error Window

Window2: Code Domain Power Summary Window

CDP3: I/Q Error View

Window[1]: Code Domain Mag Error Window

Window2: Code Domain Phase Error Window

Window3: Code Domain EVM Window

Window4: Code Domain Result Metrics Window

CDP4: Code Domain View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: I/Q Symbol Polar Vector Window

Window4: Code Domain Result Metrics Window

CDP5: Demod Bits View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: Demod Bits Window

CDP6: Result Metrics View

Window[1]: Code Domain Numeric Results Window

Note: [ ] denotes the content within the square brackets can be omitted.

Example: :DISP:CDP1:WIND1:TRAC:X:PDIV 100

:DISP:CDP1:WIND2:TRAC:X:PDIV?

Table 3-1 X Scale/Div Settings

	EVM Window **Mag Error Window** **Phase Error Window** **Symbol Power Window**	**CDP Window** **CDE Window**
Unit	none	none
Preset	4.4 symbols	16
Min	0.2 symbol	1

Table 3-1 X Scale/Div Settings

	EVM Window Mag Error Window Phase Error Window Symbol Power Window	CDP Window CDE Window
Max	1000 symbols	100
Resolution	0.1	1
Coupling	If the Scale Coupling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Scale Coupling automatically changes to Off.	NA

3.8.3.2 Ref Value

Allows you to set the display Reference Value. This key is only available in EVM, Mag Error, Phase Error, Symbol Power, Code Domain Error and Code Domain Power windows.

Mode:	TDDEMOD
Key Path:	**Span X Scale**
Remote Command:	`:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:X[:SCALe]:RLEVel <real>` `:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:X[:SCALe]:RLEVel?`
Unit:	See Table 3-2 on page 115
Preset:	See Table 3-2 on page 115
State Saved:	Saved in instrument state.
Min:	See Table 3-2 on page 115
Max:	See Table 3-2 on page 115
Dependencies/Couplings:	See Table 3-2 on page 115

SCPI Remarks: CDP[1]: CDP Graph & Metrics View

Window[1]: Code Domain Power Window

Window2: Code Domain Power Summary Window

CDP2: CDE Graph & Metrics View

Window[1]: Code Domain Error Window

Window2: Code Domain Power Summary Window

CDP3: I/Q Error View

Window[1]: Code Domain Mag Error Window

Window2: Code Domain Phase Error Window

Window3: Code Domain EVM Window

Window4: Code Domain Result Metrics Window

CDP4: Code Domain View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: I/Q Symbol Polar Vector Window

Window4: Code Domain Result Metrics Window

CDP5: Demod Bits View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: Demod Bits Window

CDP6: Result Metrics View

Window[1]: Code Domain Numeric Results Window

Note: [ ] denotes the content within the square brackets can be omitted.

Example: :DISP:CDP:WIND:TRAC:X:RLEV 0

:DISP:CDP:WIND:TRAC:X:RLEV?

Table 3-2 X Ref Value Settings

	EVM Window Mag Error Window Phase Error Window Symbol Power Window	CDP Window CDE Window
Unit	none	none
Preset	0 symbol	0

Table 3-2 X Ref Value Settings

Min	0.1symbol	0.1
Max	1000 symbols	100
Resolution	0.1	0.1
Coupling	If the Scale Coupling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Scale Coupling automatically changes to Off.	NA

3.8.3.3 Ref Position

Allows you to set the display reference position to Left, Ctr (center), or Right. This key is only available in EVM, Mag Error, Phase Error, Symbol Power, Code Domain Error and Code Domain Power windows.

Mode: TDDEMOD

Key Path: **Span X Scale**

Remote Command:

```
:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:X[:SCALe]:RPOSition LEFT|CENTer|RIGHt
:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:X[:SCALe]:RPOSition?
```

Preset: LEFT

State Saved: Saved in instrument state.

Range: Left | Ctr | Right

SCPI Remarks:	CDP[1]: CDP Graph & Metrics View
	Window[1]: Code Domain Power Window
	Window2: Code Domain Power Summary Window
	CDP2: CDE Graph & Metrics View
	Window[1]: Code Domain Error Window
	Window2: Code Domain Power Summary Window
	CDP3: I/Q Error View
	Window[1]: Code Domain Mag Error Window
	Window2: Code Domain Phase Error Window
	Window3: Code Domain EVM Window
	Window4: Code Domain Result Metrics Window
	CDP4: Code Domain View
	Window[1]: Code Domain Power Window
	Window2: Code Domain Symbol Power Window
	Window3: I/Q Symbol Polar Vector Window
	Window4: Code Domain Result Metrics Window
	CDP5: Demod Bits View
	Window[1]: Code Domain Power Window
	Window2: Code Domain Symbol Power Window
	Window3: Demod Bits Window
	CDP6: Result Metrics View
	Window[1]: Code Domain Numeric Results Window
	Note: [ ] denotes the content within the square brackets can be omitted.
Example:	:DISP:CDP:WIND:TRAC:X:RPOS CENT
	:DISP:CDP:WIND:TRAC:X:RPOS?

3.8.3.4 Scale Coupling

Allows you to toggle the scale coupling function between On and Off. This key is only available in EVM, Mag Error, Phase Error and Symbol Power windows.

Mode:	TDDEMOD
Key Path:	**Span X Scale**

Remote Command:	`:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:X[:SCALe]:COUPle 0|1|OFF|ON`
	`:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:X[:SCALe]:COUPle?`
Preset:	ON
State Saved:	Saved in instrument state.
Range:	Off | On
Dependencies/ Couplings:	See Restriction and Notes
Restriction and Notes:	Upon pressing the Restart front-panel key or Restart softkey under the Meas Control menu, the scale coupling function automatically determines the scale per division and reference values based on the measurement results if this parameter is set to On. When you set a value to either Scale/Div or Ref Value manually, Scale Coupling automatically changes to Off.

SCPI Remarks: CDP[1]: CDP Graph & Metrics View

Window[1]: Code Domain Power Window

Window2: Code Domain Power Summary Window

CDP2: CDE Graph & Metrics View

Window[1]: Code Domain Error Window

Window2: Code Domain Power Summary Window

CDP3: I/Q Error View

Window[1]: Code Domain Mag Error Window

Window2: Code Domain Phase Error Window

Window3: Code Domain EVM Window

Window4: Code Domain Result Metrics Window

CDP4: Code Domain View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: I/Q Symbol Polar Vector Window

Window4: Code Domain Result Metrics Window

CDP5: Demod Bits View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: Demod Bits Window

CDP6: Result Metrics View

Window[1]: Code Domain Numeric Results Window

Note: [ ] denotes the content within the square brackets can be omitted.

Example: :DISP:CDP:WIND:TRAC:X:COUP OFF

:DISP:CDP:WIND:TRAC:X:COUP?

3.8.4 AMPLITUDE/Y Scale

The AMPLITUDE/Y Scale key accesses the menu to set the desired vertical scale and associated settings.

Default values are independent for each window.

3.8.4.1 Scale/Div

Allows you to enter a numeric value to change the vertical display sensitivity. This key is only available in EVM, Mag Error, Phase Error, Code Domain Power and Symbol Power windows.

Mode:	TDDEMOD
Key Path:	**Amplitude Y Scale**
Remote Command:	`:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:PDIVision <real>` `:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:PDIVision?`
Unit:	See Table 3-3 on page 121
Preset:	See Table 3-3 on page 121
State Saved:	Saved in instrument state.
Min:	See Table 3-3 on page 121
Max:	See Table 3-3 on page 121
Dependencies/Couplings:	If the Scale Coupling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Scale Coupling automatically changes to Off.
Restriction and Notes:	See Table 3-3 on page 121

SCPI Remarks: CDP[1]: CDP Graph & Metrics View

Window[1]: Code Domain Power Window

Window2: Code Domain Power Summary Window

CDP2: CDE Graph & Metrics View

Window[1]: Code Domain Error Window

Window2: Code Domain Power Summary Window

CDP3: I/Q Error View

Window[1]: Code Domain Mag Error Window

Window2: Code Domain Phase Error Window

Window3: Code Domain EVM Window

Window4: Code Domain Result Metrics Window

CDP4: Code Domain View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: I/Q Symbol Polar Vector Window

Window4: Code Domain Result Metrics Window

CDP5: Demod Bits View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: Demod Bits Window

CDP6: Result Metrics View

Window[1]: Code Domain Numeric Results Window

Note: [ ] denotes the content within the square brackets can be omitted.

Example: :DISP:CDP:WIND:TRAC:Y:PDIV 20

:DISP:CDP:WIND:TRAC:Y:PDIV?

Table 3-3 Y Scale/Div

	EVM Window	Mag Error Window	Phase Error Window	CDP Window CDE Window	Symbol Power Window
Unit	PCT	PCT	DEG	DB	DBM
Preset	0.1%	0.1%	0.1 deg	10 dB	10 dB
Min	0.1%	0. 1%	0.1 deg	0.1 dB	0. 1 dB
Max	50%	50%	1000 deg	20 dB	20 dB

3.8.4.2 Ref Value

Allows you to set the absolute power reference. This key is only available in EVM, Mag Error, Phase Error, Code Domain Power and Symbol Power windows.

Mode:	TDDEMOD
Key Path:	**Amplitude Y Scale**
Remote Command:	`:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:RLEVel <real>` `:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:RLEVel?`
Unit:	See Table 3-4 on page 123
Preset:	See Table 3-4 on page 123
State Saved:	Saved in instrument state.
Min:	See Table 3-4 on page 123
Max:	See Table 3-4 on page 123
Dependencies/ Couplings:	If the Scale Coupling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Scale Coupling automatically changes to Off.

SCPI Remarks: CDP[1]: CDP Graph & Metrics View

Window[1]: Code Domain Power Window

Window2: Code Domain Power Summary Window

CDP2: CDE Graph & Metrics View

Window[1]: Code Domain Error Window

Window2: Code Domain Power Summary Window

CDP3: I/Q Error View

Window[1]: Code Domain Mag Error Window

Window2: Code Domain Phase Error Window

Window3: Code Domain EVM Window

Window4: Code Domain Result Metrics Window

CDP4: Code Domain View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: I/Q Symbol Polar Vector Window

Window4: Code Domain Result Metrics Window

CDP5: Demod Bits View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: Demod Bits Window

CDP6: Result Metrics View

Window[1]: Code Domain Numeric Results Window

Note: [ ] denotes the content within the square brackets can be omitted.

Example: :DISP:CDP:WIND:TRAC:Y:RLEV 0

:DISP:CDP:WIND:TRAC:Y:RLEV?

Table 3-4 Y Ref Value

	EVM Window	Mag Error Window	Phase Error Window	CDP Window CDE Window	Symbol Power Window
Unit	Percent	Percent	Deg	Refer to notes	dBm
Preset	0%	0%	0 deg	0	0 dBm
Min	0%	0%	0 deg	–250	–250 dBm
Max	500%	500%	10000 deg	250	250 dBm

3.8.4.3 Ref Position

Allows you to set the display Reference Position to either Top, Ctr (center), or Bot (bottom). This key is only available in EVM, Mag Error, Phase Error and Symbol Power windows.

Mode:	TDDEMOD
Key Path:	**Amplitude Y Scale**
Remote Command:	`:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:RPOSition TOP|CENTer|BOTTom` `:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:RPOSition?`
Preset:	See Table 3-5 on page 125
State Saved:	Saved in instrument state.
Range:	Top | Ctr | Bottom

SCPI Remarks: CDP[1]: CDP Graph & Metrics View

Window[1]: Code Domain Power Window

Window2: Code Domain Power Summary Window

CDP2: CDE Graph & Metrics View

Window[1]: Code Domain Error Window

Window2: Code Domain Power Summary Window

CDP3: I/Q Error View

Window[1]: Code Domain Mag Error Window

Window2: Code Domain Phase Error Window

Window3: Code Domain EVM Window

Window4: Code Domain Result Metrics Window

CDP4: Code Domain View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: I/Q Symbol Polar Vector Window

Window4: Code Domain Result Metrics Window

CDP5: Demod Bits View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: Demod Bits Window

CDP6: Result Metrics View

Window[1]: Code Domain Numeric Results Window

Note: [ ] denotes the content within the square brackets can be omitted.

Example: :DISP:CDP:WIND:TRAC:Y:RPOS TOP

:DISP:CDP:WIND:TRAC:Y:RPOS?

Table 3-5 Y Ref Position Settings

	EVM Window	Mag Error Window	Phase Error Window	CDP Window CDE Window	Symbol Power Window
Preset	Bottom	Ctr	Ctr	Top	Ctr

3.8.4.4 Scale Coupling

Allows you to toggle the scale coupling function between On and Off. This key is only available in EVM, Mag Error, Phase Error and Symbol Power windows.

Mode:	TDDEMOD
Key Path:	**Amplitude Y Scale**
Remote Command:	`:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:COUPle 0|1|OFF|ON` `:DISPlay:CDPower[1]|2|3|4|5|6:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:COUPle?`
Preset:	ON
State Saved:	Saved in instrument state.
Range:	On | Off
Dependencies/Couplings:	See Restriction and Notes
Restriction and Notes:	Upon pressing the Restart front-panel key or Restart softkey under the Meas Control menu, the scale coupling function automatically determines the scale per division and reference values based on the measurement results if this parameter is set to On. When you set a value to either Scale/Div or Ref Value manually, Scale Coupling automatically changes to Off.

SCPI Remarks: CDP[1]: CDP Graph & Metrics View

Window[1]: Code Domain Power Window

Window2: Code Domain Power Summary Window

CDP2: CDE Graph & Metrics View

Window[1]: Code Domain Error Window

Window2: Code Domain Power Summary Window

CDP3: I/Q Error View

Window[1]: Code Domain Mag Error Window

Window2: Code Domain Phase Error Window

Window3: Code Domain EVM Window

Window4: Code Domain Result Metrics Window

CDP4: Code Domain View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: I/Q Symbol Polar Vector Window

Window4: Code Domain Result Metrics Window

CDP5: Demod Bits View

Window[1]: Code Domain Power Window

Window2: Code Domain Symbol Power Window

Window3: Demod Bits Window

CDP6: Result Metrics View

Window[1]: Code Domain Numeric Results Window

Note: [ ] denotes the content within the square brackets can be omitted.

Example: :DISP:CDP:WIND:TRAC:Y:COUP OFF

:DISP:CDP:WIND:TRAC:Y:COUP?

3.8.5 Trace / View

Allows you to select the desired measurement view from the following selections:

- CDP Graph & Metrics
- CDE Graph & Metrics
- I/Q Error
- Code Domain

- Demod Bits
- Result Metrics

Mode:	TDDEMOD
Key Path:	**View/Display**
Remote Command:	`:DISPlay:CDPower:VIEW[:SELect] CDPGraph|CDEGraph|IQERror|CDOMain|DBITs|RESMetrics` `:DISPlay:CDPower:VIEW?`
Preset:	CDPGraph
State Saved:	Saved in instrument state.
Range:	CDP Graph & Metrics | CDE Graph & Metrics | I/Q Error | Code Domain | Demod Bits| RESMetrics
Example:	:DISP:CDP:VIEW CDPG :DISP:CDP:VIEW?

3.8.6 Meas setup

Displays the measurement setup menu for the Code Domain Measurement when Code Domain **Measurement** has been selected in the **Measure** menu.

3.8.6.1 Capture Interval

Determines the signal capture length in terms of sub-frames. This is the data used by the analyzer for demodulation and signal analysis. Make sure that the result length is long enough to capture all the desired data. For example, when it is necessary to estimate the S1/S2 phase on DwPTS, Capture Interval should be set to a number no lower than 4.

Mode:	TDDEMOD
Key Path:	**Meas Setup**
Remote Command:	`[:SENSe]:CDPower:CINTerval <integer>` `[:SENSe]:CDPower:CINTerval?`
Preset:	1
State Saved:	Saved in instrument state.
Min:	1
Max:	12
Example:	:CDPower:CINTerval 1 :CDPower:CINTerval?

3.8.6.2 Analysis Subframe

Specifies which sub-frame, within the acquired Result Length, is used for analysis and trace data measurement results. The available selections include the acquired sub-frames.

Mode:	TDDEMOD
Key Path:	**Meas Setup**
Remote Command:	`[:SENSe]:CDPower:ANALysis:SUBFrame <integer>`
	`[:SENSe]:CDPower:ANALysis:SUBFrame?`
Preset:	0
State Saved:	Saved in instrument state.
Min:	0
Max:	Equals (Capture Interval – 1)
Example:	:CDP:ANAL:SUBF 1
	:CDP:ANAL:SUBF?

3.8.6.3 Spread Code Length

Lets you set the Spread Code Length. The Spread Code Length is used along with the Code Channel to specify the active code layer and channel used for the measurement results (including IQ Meas Time, Mag Error, Phase Error and Syms/Errs trace data results).

Mode:	TDDEMOD
Key Path:	**Meas Setup**
Remote Command:	`[:SENSe]:CDPower:SCLength <integer>`
	`[:SENSe]:CDPower:SCLength?`
Preset:	16
State Saved:	Saved in instrument state.
Min:	1
Max:	16
Dependencies/Couplings:	Only 1, 2, 4, 8, and 16 are valid. Any other number will be clipped to the nearest valid number.

Example:	:CDP:SCL 1
	:CDP:SCL?

3.8.6.4 Code Channel

Lets you set the Code Channel to be analyzed. The Code Channel is used along with the Spread Code Length to specify the active code channel and layer used for the measurement results (including IQ Meas Time, Mag Error, Phase Error and Syms/Errs trace data results).

Mode:	TDDEMOD
Key Path:	**Meas Setup**
Remote Command:	`[:SENSe]:CDPower:CDCHannel <integer>`
	`[:SENSe]:CDPower:CDCHannel?`
Preset:	0
State Saved:	Saved in instrument state.
Min:	0
Max:	Equals (Spread Code length – 1)
Dependencies/Couplings:	This value only can be set from 1 to Spread Code Length – 1.
Example:	:CDP: CDCH 1
	:CDP: CDCH?

3.8.6.5 Trig Source

Displays menu keys that enable you to select the trigger mode of a measurement. When in a trigger mode other than Free Run, the analyzer will begin the measurement only with the proper trigger condition. The available trigger modes are as the follows:

KEY: Free Run (Immediate) SCPI: IMMediate	The next measurement is taken immediately, capturing the signal asynchronously (also called ‘immediate’).
KEY: Video (IF Envlp) SCPI: IF	An internal IF envelope trigger that occurs at the absolute threshold level of the IF signal level.
KEY: RF Burst (IF Wideband) SCPI: RFBurst	An internal wideband RF burst trigger that has an automatic level control for burst signals. It triggers on a level that is relative to the peak of the signal passed by the RF, or at an absolute level.

KEY: Ext Front SCPI: EXTernal[1]	Sets the trigger directly to an external signal connected to the front-panel EXT TRIGGER INPUT connector. No measurement will be made unless a signal is connected to the EXT TRIGGER INPUT connector on the front-panel.
KEY: Ext Rear SCPI: EXTernal2	Sets the trigger directly to an external signal connected to the rear-panel TRIGGER IN connector. No measurement will be made unless a signal is connected to the TRIGGER IN connector on the rear panel.

Mode:	TDDEMOD
Key Path:	**Meas Setup**
Remote Command:	`[:SENSe]:CDPower:TRIGger:SOURce IMMediate|IF|EXTernal[1]|EXTernal2|RFBurst` `[:SENSe]:CDPower:TRIGger:SOURce?`
Preset:	IMMediate
State Saved:	Saved in instrument state.
Range:	Free Run (Immediate) | Video (IF Envlp) | RF Burst |Ext Front | Ext Rear
Example:	CDP:TRIG:SOUR IF CDP:TRIG:SOUR?

3.8.6.6 Restore Meas Defaults

Restores all the measurement settings to their defaults. This function is only available from the front panel. There is no associated SCPI command.

Mode:	TDDEMOD
Key Path:	**Meas Setup**

3.9 Modulation Accuracy Measurement

3.9.1 Front Panel Display

There are five views available for the Modulation Accuracy measurement.

The following table shows the layout of each view.

No.	View	Number of Windows	Window No.	Window
1	I/Q Measured Polar Graph	Dual (Left/Right)	1	Result Metrics (Left)
			2	I/Q Measured Polar Vector (Right)
2	I/Q Error (Quad View)	Quad	1	Magnitude Error (Upper Left)
			2	Phase Error (Upper Right)
			3	EVM (Lower Left)
			4	Result metrics (Lower Right)
3	Code Domain Power and Metrics	Dual (Upper/Lower)	1	Code Domain Power (Upper)
			2	Code Domain Power Summary (Lower)
4	Capture Time Summary	Dual (Upper/Lower)	1	Captured Data Trace (Upper)
			2	Capture Time Summary (Lower)
5	Numeric Results Summary	One	1	Numeric Results Summary

The default view is I/Q Measured Polar Graph.

3.9.1.1 View - I/Q Measured Polar Graph

There are two windows, Result Metrics (left) and I/Q Measured Polar Vector (right).

3.9.1.1.1 Result Metrics Window (Left)

Modulation Accuracy Result Metrics are listed in the following table.

Name	Corresponding Results	Format
Rho	n=1, 1st Averaged composite Rho (in average cycle) of the selected timeslot	x.xxxxx

RMS EVM	n=1 3rd Averaged composite RMS EVM (in average cycle) of the selected timeslot	xx.xx % rms
Pk EVM	n=1 6th Peak hold composite Peak EVM (in average cycle) of the selected timeslot	xx.xx % pk
RMS Mag Err	n=1 7th Averaged composite RMS Magnitude Error (in average cycle) of the selected timeslot	xx.xx % rms
RMS Phase Err	n=1 11th Averaged composite RMS Phase Error (in average cycle) of the selected timeslot	xx.xx ° rms
Pk CDE	n=1 16th Peak hold Peak Code Domain Error (of all the code channels, including active and inactive, in average cycle) of the selected timeslot	xx.xx dB
Pk CDE Position	n=1 29th Code length of peak hold Peak CDE (in average cycle) of the selected timeslot, X of SX(Y); n=1 30th Code index of peak hold Peak CDE (in average cycle) of the selected timeslot, Y of SX(Y)	SX(Y) X: OVSF code length (1, 2, 4, 8, or 16) Y: OVSF code index (0, … X – 1)
Pk Active CDE	n=1 18th Peak hold Peak Active CDE (of active code channels, in average cycle) of the selected timeslot	xx.xx dB
Pk Active CDE Position	n=1 31st Code length of peak hold Peak Active CDE (in average cycle) of the selected timeslot, X of SX(Y); n=1 32nd Code index of peak hold Peak Active CDE (in average cycle) of the selected timeslot, Y of SX(Y)	SX(Y) X: OVSF code length (1, 2, 4, 8, or 16) Y: OVSF code index (0, … X – 1)
Freq Err	n=1 19th Averaged composite Frequency Error (in average cycle) of the selected timeslot	xx.xx Hz
IQ Offset	n=1 21st Averaged composite IQ Offset (in average cycle) of the selected timeslot	xx.xx dB

Time Offset	n=1 27th Averaged composite timing error (in average cycle) of the selected timeslot, relative to the timing reference (DwPTS/UpPTS/Trig)	xx.xx chips

3.9.1.1.2 I/Q Measured Polar Vector Window (Right)

Provides composite IQ Polar Vector.

Name	Corresponding Results	Format
Composite Constellation	The I/Q polar trace of measured input data within the selected timeslot. Coupled with normalize: If normalize is set Off, unnormalized input I/Q data will be displayed (n=2). If normalize is set On, normalized input I/Q data will be displayed (n=3). The length displayed is defined by I/Q Points.	Vector/Constellation Vector Constellation
Active Channels	n=1 33rd Number of active code channels of the selected timeslot	xx
Slot	Number of current timeslot which is under measurement	TSi, (i=0, 1, …, 6) DwPTS UpPTS

NOTE No marker operation for this window.

3.9.1.2 View - I/Q Error

There are four windows in this view:

- Magnitude Error Window (upper left)
- Phase Error Window (upper right)
- EVM Window (lower left)
- Result Metrics Window (lower right)

3.9.1.2.1 Magnitude Error Window (Upper Left)

Provides magnitude errors vs. chips results for the selected timeslot.

Marker Trace	Yes
Corresponding Trace	Magnitude Error vs. Chips trace for the selected timeslot (n=5)

3.9.1.2.2 Phase Error Window (Upper Right)

Provides phase errors vs. chips results for the selected timeslot.

Marker Trace	Yes
Corresponding Trace	Phase Error vs. Chips trace for the selected timeslot (n=6)

3.9.1.2.3 EVM Window (Lower Left)

Provides EVM results vs. chips results for the selected timeslot.

Marker Trace	Yes
Corresponding Trace	EVM vs. Chips trace for the selected timeslot (n=7)

3.9.1.2.4 Result Metrics Window (Lower Right)

Provides modulation accuracy result metrics.

Name	Corresponding Results	Format
Slot	The slot under measurement within the analyzed sub-frame TS0, DwPTS, UwPTS, TS1, TS2, TS3, TS4, TS5, TS6	TSi (i=0, 1, …, 6) DwPTS UpPTS
Rho	n=1 1st Averaged composite Rho (in average cycle) of the selected timeslot	x.xxxxx
RMS EVM	n=1 3rd Averaged composite RMS EVM (in average cycle) of the selected timeslot	xx.xx % rms
Pk EVM	n=1 6th Peak hold composite Peak EVM (in average cycle) of the selected timeslot	xx.xx % pk
RMS Mag Err	n=1 7th Averaged composite RMS Magnitude Error (in average cycle) of the selected timeslot	xx.xx % rms

RMS Phase Err	n=1 11th Averaged composite RMS Phase Error (in average cycle) of the selected timeslot	xx.xx ° rms
Pk CDE	n=1 16th Peak hold Peak Code Domain Error (all the code channels, including active and inactive, in average cycle) of the selected timeslot	xx.xx dB
Pk Act CDE	n=1 18th Peak hold Peak Active CDE (active code channels, in average cycle) of the selected timeslot	xx.xx dB

3.9.1.3 View - Code Domain Power

There are two windows in this view:

- Code Domain Power Window (Upper)
- Code Domain Power Summary Window (Lower)

3.9.1.3.1 Code Domain Power Window (Upper)

Shows a list of all channel codes within the code set, and their individual powers.

Marker Trace	Yes
Corresponding Trace	Code Domain Power vs. Codes trace of the selected timeslot. Coupled with normalize: If normalize is set Off, unnormalized power vs. codes trace in dB will be displayed (n=10). If normalize is set On, normalized power vs. codes trace in dBm will be displayed (n=11)

3.9.1.3.2 Code Domain Power Summary Window

Shows the total power, the number of active channels, and a table of active channel codes with their powers (in dB and dBm) and Code Domain Errors separately.

Name	Corresponding Results	Format
Total Power	n=1, 34th Total data part of the selected time slot	-xx.xx dBm

Active Channels	n=1, 33rd Number of active channels in the selected time slot	xx
Slot	The slot under measurement within the analyzed sub-frame	TSi, (i=0, 1, …, 6) DwPTS UpPTS
Code	Spread code number list of active channels	SX(Y), X: OVSF code length (1, 2, 4, 8, or 16) Y: OVSF code index (0, … X – 1)
Power (dBm)	Absolute Power list of active code channels in dBm	xx.xx
Power (dB)	Normalized Power list of active code channels in dB	xx.xx
CDE (dB)	Normalized Code domain error list of active code channels	xx.xx

3.9.1.4 View - Capture Time Summary

There are two windows in this view:

- Captured Data Trace Window (Upper)
- Capture Time Summary Window (Lower)

The Time trace shows the pre-demodulation time record data. The Capture Interval parameter determines the amount of time data that is displayed. The selected timeslot is marked out by lines.

The summary window at the bottom lists total power, midamble power, data power, and timing error of each time slot within the analysis sub-frame (TS0, DwPTS, UpPTS, TS1, TS2, …, TS6).

3.9.1.4.1 Captured Data Trace Window (Upper)

Shows raw time domain data within the captured interval. The selected timeslot is marked out by two lines.

Marker Trace	Yes
Corresponding Trace	RF envelope of Captured data vs. time trace. The selected timeslot is marked out by two lines at the time boundary

3.9.1.4.2 Capture Time Summary Window (Lower)

Provide a table of total power, midamble power and data power for each timeslot within the analyzed sub-frame.

Name	Corresponding Results	Format
Slot	The slot under measurement within the analyzed sub-frame. TS0, DwPTS, UpPTS, TS1, TS2, …, TS6	TSi, (i=0, 1, …, 6) DwPTS UpPTS
Total Pwr	Total power of each slot within the analyzed sub-frame (n=13)	xx.xx
Midamble Pwr	Midamble power of each slot within the analyzed sub-frame (n=14)	xx.xx
Data PwrL	Power of data before midamble (left hand data) of each slot within the analyzed sub-frame (n=15)	xx.xx
Data PwrR	Power of data after midamble (right hand data) of each slot within the analyzed sub-frame (n=16)	xx.xx
Time Offset	Timing error of each slot within the analyzed sub-frame (n=17)	xx.xx

3.9.1.5 View - Numeric Results Summary

There is one window, which shows a summary of the modulation accuracy results.

3.9.1.5.1 Numeric Results Summary Window

Shows the results summary window.

Name	Corresponding Results	Format
Rho	n=1, 1st Averaged composite Rho (in average cycle) in the selected timeslot and sub-frame n=1, 2nd Peak hold composite Rho (in average cycle) in the selected timeslot and sub-frame	x.xxxxx
RMS EVM	n=1, 3rd Averaged composite RMS EVM (in average cycle) in the selected timeslot and sub-frame n=1, 4th Peak hold composite RMS EVM (in average cycle) in the selected timeslot and sub-frame	xx.xx % rms

Pk EVM	n=1, 5th Averaged composite Peak EVM (in average cycle) in the selected timeslot and sub-frame n=1, 6th Peak hold composite Peak EVM (in average cycle) in the selected timeslot and sub-frame	xx.xx % pk
RMS Mag Err	n=1, 7th Averaged composite RMS Magnitude Error (in average cycle) in the selected timeslot and sub-frame n=1, 8th Peak hold composite RMS Magnitude Error (in average cycle) in the selected timeslot and sub-frame	xx.xx % rms
Pk Mag Err	n=1, 9th Averaged composite Peak Magnitude Error (in average cycle) in the selected timeslot and sub-frame n=1, 10th Peak hold composite Peak Magnitude Error (in average cycle) in the selected timeslot and sub-frame	xx.xx % pk
RMS Phase Err	n=1, 11th Averaged composite RMS Phase Error (in average cycle) in the selected timeslot and sub-frame n=1, 12th Peak hold composite RMS Phase Error (in average cycle) in the selected timeslot and sub-frame	xx.xx ° rms
Pk Phase Err	n=1, 13th Averaged composite Peak Phase Error (in average cycle) in the selected timeslot and sub-frame n=1, 14th Peak hold composite Peak Phase Error (in average cycle) in the selected timeslot and sub-frame	xx.xx ° pk
Pk CDE	n=1, 15th Averaged Peak Code Domain Error (of all the code channels, including active and inactive, in average cycle) in the selected timeslot and sub-frame n=1, 16th Peak hold Peak Code Domain Error (of all the code channels, including active and inactive, in average cycle) in the selected timeslot and sub-frame	xx.xx dB

Pk CDE Position	n=1, 29th Code length of peak hold Peak CDE (in average cycle) of the selected timeslot, X of SX(Y) n=1, 30th Code index of peak hold Peak CDE (in average cycle) of the selected timeslot, Y of SX(Y)	SX(Y) X: OVSF code length (1, 2, 4, 8, or 16) Y: OVSF code index (0, … X – 1)
Pk Active CDE	n=1, 17th Averaged Peak Active Code Domain Error (of all the code channels, including active and inactive, in average cycle) in the selected timeslot and sub-frame n=1, 18th Peak hold Peak Active Code Domain Error (of all the code channels, including active and inactive, in average cycle) in the selected timeslot and sub-frame	xx.xx dB
Pk Active CDE Position	n=1, 31st Code length of peak hold Peak Active CDE (in average cycle) of the selected timeslot, X of SX(Y); n=1, 32nd Code index of peak hold Peak Active CDE (in average cycle) of the selected timeslot, Y of SX(Y)	SX(Y) X: OVSF code length (1, 2, 4, 8, or 16) Y: OVSF code index (0, … X – 1)
Freq Err	n=1, 19th Averaged composite Frequency Error (in average cycle) in the selected timeslot and sub-frame n=1, 20th Peak hold composite Frequency Error (in average cycle) in the selected timeslot and sub-frame	xx.xx Hz
IQ Offset	n=1, 21st Averaged composite IQ Offset (in average cycle) in the selected timeslot and sub-frame n=1, 22nd Peak hold composite IQ Offset (in average cycle) in the selected timeslot and sub-frame	xx.xx dB
Quad Err	n=1, 23rd Averaged composite Quad Error (in average cycle) in the selected timeslot and sub-frame n=1, 24th Peak hold composite Quad Error (in average cycle) in the selected timeslot and sub-frame	xx.xx °

IQ Imb	n=1, 25th Averaged composite IQ Imbalance (in average cycle) in the selected timeslot and sub-frame n=1, 26th Peak hold composite IQ Imbalance (in average cycle) in the selected timeslot and sub-frame	xx.xx dB
Time Offset	n=1, 27th Averaged composite Time Offset (in average cycle) in the selected timeslot and sub-frame, relative to the timing reference (DwPTS/UpPTS/Trig) n=1, 28th Peak hold composite Time Offset (in average cycle) in the selected timeslot and sub-frame, relative to the timing reference (DwPTS/UpPTS/Trig)	xx.xx chips

3.9.2 Display

Allows you to access Display menus.

3.9.2.1 I/Q Polar

Selects from one of the three polar display types.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:EVM:IQPType VCONstln|VECTor|CONStln` `:DISPlay:EVM:IQPType?`
Preset:	VCONstln
State Saved:	Saved in instrument state.
Range:	Vec & Constln | Vec | Constln
Restriction and Notes:	• Three polar display types: • Vec & Constln: Sets the view to display both the vector and constellation diagrams • Vector: Sets the view to display an I/Q polar vector diagram • Constellation: Sets the view to display the constellation diagram
Example:	:DISP:EVM:IQPT VCON :DISP:EVM:IQPT?

3.9.2.2 I/Q Points

Specifies the total number of I/Q points displayed during each measurement interval in the I/Q measured Polar Vector Graph.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:EVM:IQPoints <integer>`
	`:DISPlay:EVM:IQPoint?`
Preset:	848 chips
State Saved:	Saved in instrument state.
Min:	1 chip
Max:	848 chips
Dependencies/Couplings:	See Restriction and Notes.
Restriction and Notes:	I/Q Points + I/Q Points Offset <= 848.
	If the I/Q Points defined is higher than the 848, the I/Q Points will be set 848.
	If Capture Interval is changed, I/Q Point Offset is set to the default value.
Example:	:DISP:EVM:IQP 80
	:DISP:EVM:IQP?

3.9.2.3 I/Q Points Offset

Specifies an offset from the first I/Q point in the I/Q Polar diagrams. If you choose to display only a subset of the I/Q points, this subset of displayed points is offset from the first I/Q point.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:EVM:IQPoints:OFFSet <integer>`
	`:DISPlay:EVM:IQPoints:OFFSet?`
Preset:	0 chip
State Saved:	Saved in instrument state.
Min:	0 chip

Max:	847 chips
Dependencies/Couplings:	See Restriction and Notes.
Restriction and Notes:	I/Q Points + I/Q Points Offset <= 848.
	If I/Q Points Offset > (848 – I/Q Points), I/Q Points Offset is set (848 – I/Q Points);
	If Capture Interval is changed, I/Q Point Offset is set to the default value.
Example:	:DISP:EVM:IQP:OFFS 14
	:DISP:EVM:IQP:OFFS?

3.9.2.4 I/Q Rotation

Specifies whether or not the 45 degree rotation is applied to the I/Q constellation.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:EVM:ROTation OFF|ON|0|1`
	`:DISPlay:EVM:ROTation?`
Preset:	OFF
State Saved:	Saved in instrument state.
Range:	On | Off
Example:	:DISP:EVM:ROT ON
	:DISP:EVM:ROT?

3.9.2.5 Interpolation

Specifies whether the input I/Q data should be interpolated.

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:EVM:INTerpolate OFF|ON|0|1`
	`:DISPlay:EVM:INTerpolate?`
Preset:	Off
State Saved:	Saved in instrument state.

Range:	On | Off
Example:	:DISP:EVM:INT ON
	:DISP:EVM:INT?

3.9.2.6 Full Vector (background)

When Full Vector is Off, the I/Q data is displayed from (I/Q Offset + 1), with length I/Q Points, in the selected timeslot and sub-frame. The points before (I/Q Offset + 1) will not be displayed.

When Full Vector is On, the trace will show all the I/Q vector in the selected timeslot and sub-frame, the hidden portion (the points before the I/Q offset) is displayed in gray.

NOTE For filter settling reasons, 4 chips at the start and end of the timeslot are ignored, resulting in data results that are 8 chips shorter than the full traffic timeslot length (not including the Guard Period).

Mode:	TDDEMOD
Key Path:	**Display**
Remote Command:	`:DISPlay:EVM:FVECtor[:STATe] OFF|ON|0|1`
	`:DISPlay:EVM:FVECtor[:STATe]?`
Preset:	OFF
State Saved:	Saved in instrument state.
Range:	On | Off
Example:	:DISP:EVM:FVEC ON
	:DISP:EVM:FVEC?

3.9.3 SPAN X Scale

The AMPLITUDE/X Scale key accesses the menu to set the desired horizontal scale and associated settings of the display. It specifies SPAN X Scale setting when the EVM, Magnitude Error, Phase Error, Code Domain Power, or Captured Data Trace window is active.

3.9.3.1 X Scale/Div

Sets the X scale per graticule division on the display. The key is active in EVM, Magnitude Error, Phase Error, Code Domain Power, and Captured Data Trace windows.

Mode:	TDDEMOD
Key Path:	**Span X Scale**
Remote Command:	`:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:X[:SCALe]:PDIVision <real>` `:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:X[:SCALe]:PDIVision?`
Unit:	See Table 3-6 on page 146
Preset:	See Table 3-6 on page 146
State Saved:	Saved in instrument state.
Min:	See Table 3-6 on page 146
Max:	See Table 3-6 on page 146
Dependencies/Couplings:	See Table 3-6 on page 146
Restriction and Notes:	See Table 3-6 on page 146
Remote Command Notes:	EVM1: I/Q Measured Polar Graph View WIND1: Result Metrics WIND2: I/Q Measured Polar Graph EVM2: I/Q Error View WIND1: Magnitude Error WIND2: Phase Error WIND3: EVM WIND4: Result Metrics EVM3: Code Domain Power and Metrics View WIND1: Code Domain Power WIND2: Code Domain Power Summary EVM4: Capture Time Summary View WIND1: Captured Data Trace WIND2: Capture Time Summary EVM5: Numeric Results Summary View WIND1: Numeric Results Summary
Example:	:DISP:EVM2:WIND1:TRAC:X:PDIV 3.0 :DISP:EVM2:WIND1:TRAC:X:PDIV?

The difference between each window is listed in the following table.

Table 3-6 X Scale/Div Settings of Different Windows

	Magnitude Error Window Phase Error Window EVM Window	Code Domain Power Window	Captured Data Trace Window
Unit	None	None	ms
Preset	84.8 chips	16	6 ms
Min	0.1 chips	1	0.1 ms
Max	1000 chips	100	10 ms
Resolution	0.2 chips	1	0.1 ms
Coupling	See Restriction and Notes	None	See Restriction and Notes
Restriction and Notes	If the Scale Coupling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Scale Coupling automatically changes to Off.	None	If the Scale Coupling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Scale Coupling automatically changes to Off.

3.9.3.2 X Ref Value

Allows you to set the display X reference value. The key is active in EVM, Magnitude Error, Phase Error, Code Domain Power, and Captured Data Trace windows.

Mode:	TDDEMOD
Key Path:	**Span X Scale**
Remote Command:	`:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:X[:SCALe]:RLEVel <real>` `:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:X[:SCALe]:RLEVel?`
Unit:	See Table 3-7 on page 147
Preset:	See Table 3-7 on page 147
State Saved:	Saved in instrument state.
Min:	See Table 3-7 on page 147
Max:	See Table 3-7 on page 147
Dependencies/Couplings:	See Table 3-7 on page 147
Restriction and Notes:	See Table 3-7 on page 147

Remote Command Notes:	EVM1: I/Q Measured Polar Graph View WIND1: Result Metrics WIND2: I/Q Measured Polar Graph EVM2: I/Q Error View WIND1: Magnitude Error WIND2: Phase Error WIND3: EVM WIND4: Result Metrics EVM3: Code Domain Power and Metrics View WIND1: Code Domain Power WIND2: Code Domain Power Summary EVM4: Capture Time Summary View WIND1: Captured Data Trace WIND2: Capture Time Summary EVM5: Numeric Results Summary View WIND1: Numeric Results Summary
Example:	:DISP:EVM2:WIND1:TRAC:X:RLEV 0.0 :DISP:EVM2:WIND1:TRAC:X:RLEV?

Table 3-7 X Ref Value Settings of Different Windows

	Magnitude Error Window Phase Error Window EVM Window	Code Domain Power Window	Captured Data Trace Window
Unit	None	None	ms
Preset	0 chip	0	0 ms
Min	0 chip	0.1	0 ms
Max	1000 chips	100	60 ms
Resolution	0.1 chips	0.1	0.1 ms
Coupling	See Restriction and Notes	None	See Restriction and Notes
Restriction and Notes	If the Scale Coupling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Scale Coupling automatically changes to Off.	None	If the Scale Coupling is set to On, this value is automatically determined by the measurement result. When you set this value manually, Scale Coupling automatically changes to Off.

3.9.3.3 X Ref Position

Allows you to set the display reference position to either Left, Ctr (center), or Right. The key is active in EVM, Mag Error, Phase Error, Code Domain Power, and Captured Data Trace windows.

Mode:	TDDEMOD
Key Path:	**Span X Scale**
Remote Command:	`:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:X[:SCALe]:RPOSition LEFT|CENTer|RIGHt` `:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:X[:SCALe]:RPOSition?`
Preset:	LEFT
State Saved:	Saved in instrument state.
Range:	Left | Ctr | Right
Remote Command Notes:	EVM1: I/Q Measured Polar Graph View WIND1: Result Metrics WIND2: I/Q Measured Polar Graph EVM2: I/Q Error View WIND1: Magnitude Error WIND2: Phase Error WIND3: EVM WIND4: Result Metrics EVM3: Code Domain Power and Metrics View WIND1: Code Domain Power WIND2: Code Domain Power Summary EVM4: Capture Time Summary View WIND1: Captured Data Trace WIND2: Capture Time Summary EVM5: Numeric Results Summary View WIND1: Numeric Results Summary
Example:	:DISP:EVM2:WIND1:TRAC:X:RPOS LEFT :DISP:EVM2:WIND1:TRAC:X:RPOS?

3.9.3.4 X Scale Coupling

Allows you to toggle the Scale Coupling function between On and Off. The key is active in Mag Error, Phase Error, EVM, and Captured Data Trace windows.

Mode:	TDDEMOD
Key Path:	**Span X Scale**
Remote Command:	`:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:X[:SCALe]:COUPle 0|1|OFF|ON` `:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:X[:SCALe]:COUPle?`
Preset:	ON
State Saved:	Saved in instrument state.
Range:	Off | On
Dependencies/Couplings:	See Restriction and Notes
Restriction and Notes:	Upon pressing the Restart front-panel key or Restart softkey under the Meas Control menu, the Scale Coupling function automatically determines the scale per division and reference values based on the measurement results if this parameter is set to On. When you set a value to either Scale/Div or Ref Value manually, Scale Coupling automatically changes to Off.
Remote Command Notes:	EVM1: I/Q Measured Polar Graph View WIND1: Result Metrics WIND2: I/Q Measured Polar Graph EVM2: I/Q Error View WIND1: Magnitude Error WIND2: Phase Error WIND3: EVM WIND4: Result Metrics EVM3: Code Domain Power and Metrics View WIND1: Code Domain Power WIND2: Code Domain Power Summary EVM4: Capture Time Summary View WIND1: Captured Data Trace WIND2: Capture Time Summary EVM5: Numeric Results Summary View WIND1: Numeric Results Summary
Example:	:DISP:EVM2:WIND1:TRAC:X:COUP OFF :DISP:EVM2:WIND1:TRAC:X:COUP?

3.9.4 AMPLITUDE Y Scale

The AMPLITUDE Y Scale key accesses the menu to set the desired vertical scale and associated settings. Default values are independent for each window.

3.9.4.1 Y Scale/Div

Allows you to set Y Scale/Div. This key is active in EVM, Mag Error, Phase Error, Code Domain Power, and Captured Data Trace windows.

Mode:	TDDEMOD
Key Path:	**Amplitude Y Scale**
Remote Command:	`:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:PDIVision <real>` `:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:PDIVision ?`
Unit:	See Table 3-8 on page 151
Preset:	See Table 3-8 on page 151
State Saved:	Saved in instrument state.
Min:	See Table 3-8 on page 151
Max:	See Table 3-8 on page 151
Dependencies/Couplings:	If the Scale Coupling is set to ON, this value is automatically determined by the measurement result. When you set this value to MAN, Scale Coupling automatically changes to OFF.

Remote Command Notes:

EVM1: I/Q Measured Polar Graph View

WIND1: Result Metrics

WIND2: I/Q Measured Polar Graph

EVM2: I/Q Error View

WIND1: Magnitude Error

WIND2: Phase Error

WIND3: EVM

WIND4: Result Metrics

EVM3: Code Domain Power and Metrics View

WIND1: Code Domain Power

WIND2: Code Domain Power Summary

EVM4: Capture Time Summary View

WIND1: Captured Data Trace

WIND2: Capture Time Summary

EVM5: Numeric Results Summary View

WIND1: Numeric Results Summary

Example: :DISP:EVM2:WIND1:TRAC:Y:PDIV 0.100

:DISP:EVM2:WIND1:TRAC:Y:PDIV?

Table 3-8 Y Scale/Div Settings of Different Windows

	Magnitude Error Window	Phase Error Window	EVM Window	Code Domain Power Window	Captured Time Data Trace Window
Unit	PCT	DEG	PCT	dB	dB
Preset	0.100 pcnt	0.100 deg	0.100 pcnt	10.00 dB	10.00 dB
Min	0.01 pcnt	0.01 deg	0.01 pcnt	0.1 dB	0.1 dB
Max	100.0 pcnt	1000 deg	100.0 pcnt	50.0 dB	50.0 dB

3.9.4.2 Y Ref Value

Allows you to set the display Y reference value. The key is active in EVM, Magnitude Error, Phase Error, Code Domain Power, and Captured Data Trace windows.

Mode: TDDEMOD

Key Path: **Amplitude Y Scale**

Remote Command:	`:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:RLEVel <real>` `:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:RLEVel?`
Unit:	See Table 3-9 on page 152
Preset:	See Table 3-9 on page 152
State Saved:	Saved in instrument state.
Min:	See Table 3-9 on page 152
Max:	See Table 3-9 on page 152
Dependencies/ Couplings:	If the Scale Coupling is set to ON, this value is automatically determined by the measurement result. When you set this value to MAN, Scale Coupling automatically changes to OFF
Remote Command Notes:	EVM1: I/Q Measured Polar Graph View WIND1: Result Metrics WIND2: I/Q Measured Polar Graph EVM2: I/Q Error View WIND1: Magnitude Error WIND2: Phase Error WIND3: EVM WIND4: Result Metrics EVM3: Code Domain Power and Metrics View WIND1: Code Domain Power WIND2: Code Domain Power Summary EVM4: Capture Time Summary View WIND1: Captured Data Trace WIND2: Capture Time Summary EVM5: Numeric Results Summary View WIND1: Numeric Results Summary
Example:	:DISP:EVM2:WIND1:TRAC:Y:RLEV 0.00 :DISP:EVM2:WIND1:TRAC:Y:RLEV?

Table 3-9 Y Ref Value Settings of Different Windows

	Magnitude Error Window	**Phase Error Window**	**EVM Window**	**Code Domain Power Window**	**Captured Time Data Trace Window**
Unit	PCT	DEG	PCT	None	dBm

Table 3-9 Y Ref Value Settings of Different Windows

	Magnitude Error Window	Phase Error Window	EVM Window	Code Domain Power Window	Captured Time Data Trace Window
Preset	0.00 pcnt	0.00 deg	0.00 pcnt	0.00 dB	0.00
Min	0.00 pcnt	0.00 deg	0.00 pcnt	-1000.0	-1000.0
Max	1000.0 pcnt	1000.0 deg	1000.0 pcnt	1000.0	1000.0

3.9.4.3 Y Ref Position

Allows you to set the display reference position to either Top, Ctr (center), or Bot (Bottom). The key is active in EVM, Mag Error, and Phase Error windows.

Mode: TDDEMOD

Key Path: **Amplitude Y Scale**

Remote Command:

```
:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:RPOSition
TOP|CENTer|BOTTom
```

```
:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:RPOSition
?
```

Preset: See Table 3-10 on page 154

State Saved: Saved in instrument state.

Range: Top | Ctr | Bottom

Remote Command Notes:	EVM1: I/Q Measured Polar Graph View
	WIND1: Result Metrics
	WIND2: I/Q Measured Polar Graph
	EVM2: I/Q Error View
	WIND1: Magnitude Error
	WIND2: Phase Error
	WIND3: EVM
	WIND4: Result Metrics
	EVM3: Code Domain Power and Metrics View
	WIND1: Code Domain Power
	WIND2: Code Domain Power Summary
	EVM4: Capture Time Summary View
	WIND1: Captured Data Trace
	WIND2: Capture Time Summary
	EVM5: Numeric Results Summary View
	WIND1: Numeric Results Summary
Example:	:DISP:EVM2:WIND3:TRAC:Y:RPOS TOP
	:DISP:EVM2:WIND3:TRAC:Y:RPOS?

Table 3-10 Y Ref Position Settings of Different Windows

	Magnitude Error Window	**Phase Error Window**	**EVM Window**	**Code Domain Power Window**	**Captured Time Data Trace Window**
Preset	CNETer	CENTer	BOTTom	TOP	TOP

3.9.4.4 Y Scale Coupling

Allows you to toggle the scale coupling function between On and Off. The key is active in EVM, Mag Error, Phase Error, and Captured Data Trace windows.

Mode:	TDDEMOD
Key Path:	**Amplitude Y Scale**
Remote Command:	`:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:COUPle 0|1|OFF|ON`
	`:DISPlay:EVM[1]|2|3|4|5:WINDow[1]|2|3|4:TRACe:Y[:SCALe]:COUPle?`
Preset:	ON

State Saved:	Saved in instrument state.
Range:	On | Off
Dependencies/ Couplings:	See Restriction and Notes
Restriction and Notes:	Upon pressing the Restart front-panel key or Restart softkey under the Meas Control menu, the scale coupling function automatically determines the scale per division and reference values based on the measurement results if this parameter is set to On. When you set a value to either Scale/Div or Ref Value manually, Scale Coupling automatically changes to Off.
Remote Command Notes:	EVM1: I/Q Measured Polar Graph View WIND1: Result Metrics WIND2: I/Q Measured Polar Graph EVM2: I/Q Error View WIND1: Magnitude Error WIND2: Phase Error WIND3: EVM WIND4: Result Metrics EVM3: Code Domain Power and Metrics View WIND1: Code Domain Power WIND2: Code Domain Power Summary EVM4: Capture Time Summary View WIND1: Captured Data Trace WIND2: Capture Time Summary EVM5: Numeric Results Summary View WIND1: Numeric Results Summary
Example:	:DISP:EVM2:WIND1:TRAC:Y:COUP OFF :DISP:EVM2:WIND1:TRAC:Y:COUP?

3.9.5 Trace/View

Gives you to access Trace/View menus, allowing you to select the desired measurement view from the following selections:

- I/Q Measured Polar Graph
- I/Q Error (quad view). Provides a combination view of a Magnitude Error, Phase Error and EVM graphs, and the summarized error data.
- Code Domain Power

- Capture Time Summary
- Numeric Results. Provides a table of the Modulation Accuracy summary data such as Peak and RMS EVM, Magnitude Error, Phase Error, Frequency Error, Code Domain Power, and so forth in a text window. Results are shown in terms of averaged and detected peak/maximum values in the average cycle.

Mode:	TDDEMOD
Key Path:	**Trace/View**
Remote Command:	`:DISPlay:EVM:VIEW[:SELect] POLar|ERRor|PGRaph|SUMMary|NRESults` `:DISPlay:EVM:VIEW[:SELect]?`
Preset:	I/Q Measured Polar Graph
State Saved:	Saved in instrument state.
Range:	POLar | ERRor | PGRaph | SUMMary | NRESults
Example:	:DISP:EVM:VIEW: ERR :DISP:EVM:VIEW?

3.9.6 Meas Setup

Displays the measurement setup menu for the Modulation Accuracy Measurement when the Modulation Accuracy Measurement is selected in the Measure menu.

3.9.6.1 Average Number

Sets the number that will be averaged. After the specified number (average counts) have been averaged, the averaging mode (termination control) setting determines the averaging action.

Mode:	TDDEMOD
Key Path:	**Meas Setup**

Remote Command:	`[:SENSe]:EVM:AVERage:COUNt <integer>`
	`[:SENSe]:EVM:AVERage:COUNt?`
	`[:SENSe]:EVM:AVERage[:STATe] OFF|ON|0|1`
	`[:SENSe]:EVM:AVERage[:STATe]?`

Preset:	25, OFF
State Saved:	Saved in instrument state.
Min:	1
Max:	8192

Example:	:EVM:AVER:COUN 25
	:EVM:AVER:COUN?
	:EVM:AVER:STAT OFF
	:EVM:AVER:STAT?

3.9.6.2 Average Mode

Selects the type of termination control used for averaging.

Exponential - After the average count has been reached, each successive data acquisition is exponentially weighted and combined with the existing average.

Repeat - After the average count has been reached, the averaging is reset and a new average is started.

Mode:	TDDEMOD
Key Path:	**Meas Setup**
Remote Command:	`[:SENSe]:EVM:AVERage:TCONtrol REP|EXP`
	`[:SENSe]:EVM:AVERage:TCONtrol?`
Preset:	REP
State Saved:	Saved in instrument state.
Range:	Exp | Repeat
Example:	:EVM:AVER:TCON EXP
	:EVM:AVER:TCON?

3.9.6.3 Capture Interval

Sets the signal capture length in terms of sub-frames. This is the data used by the analyzer for demodulation and signal analysis. Make sure that the result length is long enough to capture all the desired data.

Mode:	TDDEMOD
Key Path:	**Meas Setup**
Remote Command:	`[:SENSe]:EVM:CINTerval <integer>`
	`[:SENSe]:EVM:CINTerval?`
Preset:	1
State Saved:	Saved in instrument state.

Min:	1
Max:	12
Dependencies/Couplings:	Coupling with the Analysis Subframe. The Analysis Subframe should be less than the Capture Interval here. If the Analysis Subframe is larger than Capture Interval, it is clipped to Capture Interval.
Restriction and Notes:	If the input value is less than 1, it is clipped to 1. If the input value is larger than 12, it is clipped to 12
Example:	:EVM:CINT 1 :EVM:CINT?

3.9.6.4 Analysis Subframe

Specifies which sub-frame, within the acquired Capture Interval, is used for analysis and trace data measurement results. The available selections should include the acquired sub-frames. If the specified sub-frame is larger than the number of sub-frames within the Capture Interval, the Analysis Subframe will be the last sub-frame within the Capture Interval.

Mode:	TDDEMOD
Key Path:	**Meas Setup**
Remote Command:	`[:SENSe]:EVM:ANALysis:SUBFrame <integer>` `[:SENSe]:EVM:ANALysis:SUBFrame?`
Preset:	0
State Saved:	Saved in instrument state.
Min:	0
Max:	See Coupling
Dependencies/Couplings:	Coupling with the Capture Interval. The Analysis Subframe should be less than or equal to (Capture Interval – 1). If the Analysis Subframe is larger than Capture Interval, it is clipped to (Capture Interval – 1).
Example:	:EVM:ANAL:SUBF 0 :EVM:ANAL:SUBF?

3.9.6.5 Limits

It allows you to set the limit lines which determine the Pass/Fail status of the specified results.

3.9.6.5.1 RMS EVM (Composite)

Allows you to set the limit of composite RMS EVM measurement result. The default RMS EVM limit for BTS is 12.5%, which is defined in 3GPP TS 25.142, 6.8.1. The default RMS EVM limit for MS is 17.5%, which is defined in 3GPP TS34.122, 5.7.1. When the average RMS EVM result exceeds the limit, a red FAIL indicator appears in the PASS/FAIL window. When the average RMS EVM result is less than the limit, a green PASS indicator appears in the PASS/FAIL window.

Mode:	TDDEMOD
Key Path:	**Meas Setup, Limits**
Remote Command:	`:CALCulate:EVM:LIMit[1]|2:RMS<real>`
	`:CALCulate:EVM:LIMit[1]|2:RMS?`
Unit:	PCT
Preset:	12.5 | 17.5%
State Saved:	Saved in instrument state.
Min:	0.0%
Max:	100.0%
Dependencies/Couplings:	Coupling with Mode Setup, Radio, Device:
	If BTS is selected, the default value is 12.5%.
	If MS is selected, the default value is 17.5%.
SCIP Remarks:	RMS1: BTS RMS EVM
	RMS2: MS RMS EVM
Example:	:CALC:EVM:LIM1:RMS: 1.0
	:CALC:EVM:LIM1:RMS?

3.9.6.5.2 Peak EVM (Composite)

Allows you to set the limit for a Composite Peak EVM measurement result.

Mode:	TDDEMOD
Key Path:	**Meas Setup, Limits**
Remote Command:	`:CALCulate:EVM:LIMit[1]|2:PEAK <real>`
	`:CALCulate:EVM:LIMit[1]|2:PEAK?`
Unit:	PCT
Preset:	200.0 | 200.0%
State Saved:	Saved in instrument state.

Min:	0.0%
Max:	200.0%
Dependencies/Couplings:	Coupling with Mode Setup, Radio, Device: If BTS is selected, the default value is 200.0%. If MS is selected, the default value is 200.0%.
Remote Command Notes:	PEAK1: BTS Peak EVM PEAK2: MS Peak EVM
Example:	:CALC:EVM:LIM1:PEAK 100.0 :CALC:EVM:LIM1:PEAK?

3.9.6.5.3 Rho (Composite)

Allows you to set the limit for a Composite Rho measurement result.

Mode:	TDDEMOD
Key Path:	**Meas Setup, Limits**
Remote Command:	`:CALCulate:EVM:LIMit[1]|2:RHO <real>` `:CALCulate:EVM:LIMit[1]|2:RHO?`
Preset:	0.50000 | 0.50000
State Saved:	Saved in instrument state.
Min:	0.0
Max:	1.0
Dependencies/Couplings:	Coupling with Mode Setup, Radio, Device: If BTS is selected, the default value is 0.50000. If MS is selected, the default value is 0.50000.
Remote Command Notes:	RHO1: BTS Rho RHO2: MS Rho
Example:	:CALC:EVM:LIM1:RHO 0.9 :CALC:EVM:LIM1:RHO?

3.9.6.5.4 Peak Code Domain Error

Allows you to set the Peak Code Domain Error limit in dB. The default value for BTS is –28 dB, which is defined in 3GPP TS25.142, 6.8.2. The default value for MS is –21.0 dB, which is defined in 3GPP TS34.122, 5.7.2.

Mode:	TDDEMOD
Key Path:	**Meas Setup, Limits**
Remote Command:	`:CALCulate:EVM:LIMit[1]|2:PCDE <rel_ampl>`
	`:CALCulate:EVM:LIMit[1]|2:PCDE?`
Unit:	dB
Preset:	–28.0 dB | –21.0 dB
State Saved:	Saved in instrument state.
Min:	–100.0 dB
Max:	0.0 dB
Dependencies/Couplings:	Coupling with Mode Setup, Radio, Device:
	If BTS is selected, the default value is –28.0 dB.
	If MS is selected, the default value is –21.0 dB
Remote Command Notes:	PCDE1: BTS Peak CDE
	PCDE2: MS Peak CDE
Example:	:CALC:EVM:LIM1:PCDE –10.0 dB
	:CALC:EVM:LIM1:PCDE?

3.9.6.5.5 Frequency Error

Sets a Frequency Error limit to warn you if the measured average frequency error value exceeds your limit. The default value for BTS is 0.05 ppm (relative to carrier frequency) defined in 3GPP TS25.142, 6.3.2. The default value for MS is 0.1 ppm (relative to carrier frequency) defined in 3GPP TS34.122, 5.3.2.

Mode:	TDDEMOD
Key Path:	**Meas Setup, Limits**
Remote Command:	`:CALCulate:EVM:LIMit[1]|2:FERRor <real>`
	`:CALCulate:EVM:LIMit[1]|2:FERRor?`
Preset:	0.05 | 0.1
State Saved:	Saved in instrument state.

Min:	0.000
Max:	2.000
Dependencies/Couplings:	Coupling with Mode Setup, Radio, Device: If BTS is selected, the default value is 0.05; If MS is selected, the default value is 0.1.
Remote Command Notes:	FERR1: BTS Frequency Error FERR2: MS Frequency Error
Example:	:CALC:EVM:LIM1:FERR 0.05 :CALC:EVM:LIM1:FERR?

3.9.6.6 Trig Source

Displays menu keys that enable you to select the trigger mode of a measurement. When in a trigger mode other than Free Run, the analyzer will begin the measurement only when the specified trigger condition is met. The available trigger modes are as follows:

- **Free Run**: The next measurement is taken immediately, capturing the signal asynchronously (also called "immediate").
- **Video**: An internal IF envelope trigger that occurs at the absolute threshold level of the IF signal level.
- **Ext Front**: Sets the trigger directly to an external signal connected to the front-panel EXT TRIGGER INPUT connector. No measurement will be made unless a signal is connected to the EXT TRIGGER INPUT connector on the front-panel.
- **Ext Rear**: Sets the trigger directly to an external signal connected to the rear-panel TRIGGER IN connector. No measurement will be made unless a signal is connected to the TRIGGER IN connector on the rear panel.
- **RF Burst** (IF Wideband): An internal wideband RF burst trigger that has an automatic level control for burst signals. It triggers on a level that is relative to the peak of the signal passed by the RF, or at an absolute level.

Mode:	TDDEMOD
Key Path:	**Meas Setup**
Remote Command:	`[:SENSe]:EVM:TRIGger:SOURce IMMediate|IF|EXTernal[1]|EXTernal2|RFBurst` `[:SENSe]:EVM:TRIGger:SOURce?`
Preset:	IMMediate
State Saved:	Saved in instrument state.
Range:	Free Run (Immediate) | Video (IF Envlp) | Ext Front | Ext Rear | RF Burst

Example:	:EVM:TRIG:SOUR IMM :EVM:TRIG:SOUR?

3.9.6.7 Restore Meas Defaults

Allows you to restore all the measurement settings to their defaults. This function is only available from the front panel. There is no associated SCPI command.

This will set the measurement setup parameters to the factory defaults for the currently selected measurement only.

Mode:	TDDEMOD
Key Path:	**Meas Setup**
Dependencies/Couplings:	Selecting measurement preset will restore all measurement parameters to their default values for the current measurement.

4 Concepts

This chapter provides overall information on the TD-SCDMA communications system, including HSDPA/8PSK signals, and describes TD-SCDMA measurements made by the analyzer. Suggestions for optimizing and troubleshooting your setup are provided, along with a list of associated documents that are referenced for further information.

What Is the TD-SCDMA Communications System?

TD-SCDMA (Time Division-Synchronous Code Division Multiple Access) is a mobile radio format developed by the China Academy of Telecommunication and Technology (CATT). TD-SCDMA is a multiple access technology, which is a combination of time division multiple access (TDMA) and code division multiple access (CDMA) to provide an efficient use of resources and dynamically adapt to both symmetric and asymmetric traffic loads.

TD-SCDMA benefits from several key technological features that enable its efficiency in handling symmetric and asymmetric traffic loads and optimize system performance and capacity. These include the following:

Smart antennas permit cell sectorization through the use of multiple, dynamic, focused base station antenna beam patterns. These multiple-element antenna arrays receive and transmit signals to specific areas within a cell, in order to target specific mobile users individually and simultaneously. They also enable the base station to track the user as it moves within a cell. Additionally, smart antennas help minimize multiple access interference, and increase the capacity of the TD-SCDMA network.

Joint detection is used to combat multiple access interference and increase system capacity. Efficient implementation of joint detection is made possible through the limited use of CDMA codes per timeslot (a maximum of 16), thus avoiding the high computational complexity of joint detection as implemented in other systems. The capacity improvement through the use of joint detection is enhanced by the synchronization of nodes in the network.

Synchronization also reduces the search time for handover searching and reduces the time for position location calculations. It enables the use of hard handoffs instead of soft handoffs, thus reducing system overhead.

Optimal utilization of the spectrum is achieved through the use of unpaired frequency bands. Assigning separate frequency bands for uplink and downlink signals is inefficient for use with applications that have asymmetric traffic loads. Applications that have a heavy downlink requirement do not efficiently use frequency bands allocated to uplink signals. TD-SCDMA uses the same frequency band for both uplink and downlink, and can dynamically allocate resources for either uplink or downlink as needed.

TD-SCDMA Slots, Frames, and Power Control

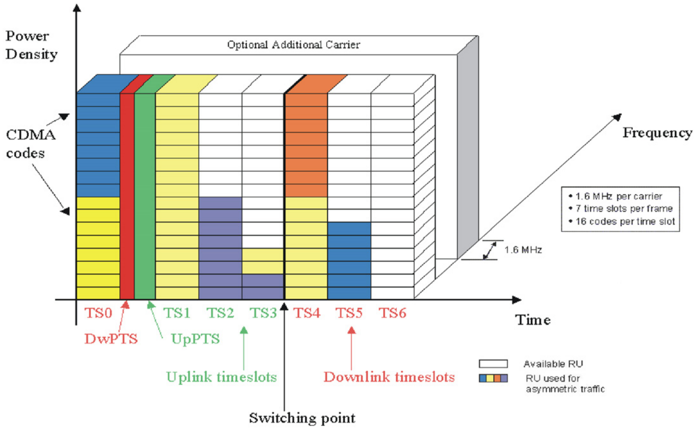
TD-SCDMA combines a TDMA component with a CDMA component to provide an efficient use of resources and dynamically adapt to both symmetric and asymmetric traffic loads.

TDD (Time Division Duplexing) is used in TD-SCDMA to separate the uplink and downlink. The frame length (or the TDD interval) of TD-SCDMA is 5 ms and the whole frame is divided into downlink and uplink by the two switching points. Both the uplink and downlink periods are divided into timeslots. The total number of timeslots is 7, numbered 0 through 6. The ratio for uplink/downlink can be reconfigured to provide symmetric or asymmetric data services.

Within each time slot, the CDMA is implemented with the maximum spreading factor of 16. In other word, there are up to 16 code channels that are available to allocate to a single user or to distribute among multiple users.

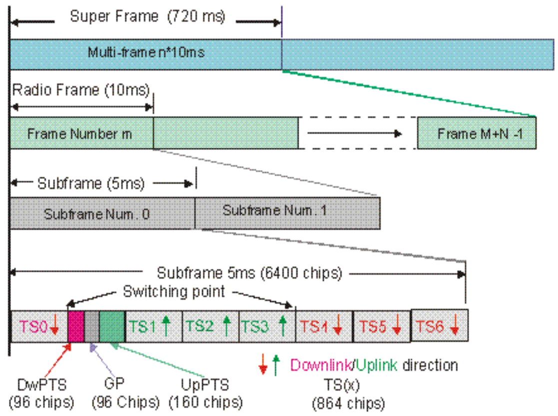
Therefore, a Resource Unit (RU) is defined by a frequency, time slot, and code channel with spreading factor. The basic resource unit uses a spreading factor of 16. Halving the Spreading Factor doubles the number of RU’s.

Figure 4-1 TD-SCDMA Resource Unit Structure



In TD-SCDMA, the CDMA chip rate is 1.28 Mcps and each carrier signal occupies 1.6 MHz bandwidth. All physical channels utilize a three-layer structure: Super frame, Radio frame, and Sub-frame. A physical channel is defined by frequency, timeslot, channelization code, burst type, and radio frame allocation. The physical channels can either be of infinite duration or finite duration, defined for the given allocation.

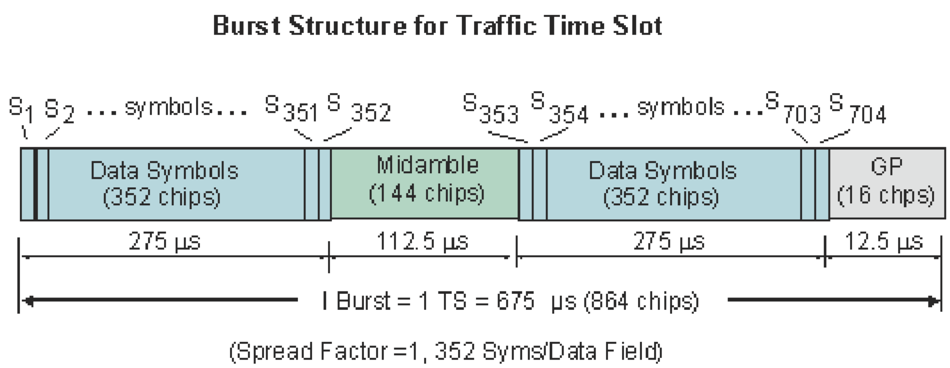
Figure 4-2 Frame Structure



The first time slot in a frame, time slot 0, is always allocated to downlink traffic. Also included in each 5 ms frame are two additional time slots, the downlink pilot timeslot (DwPTS) and the uplink pilot timeslot (UpPTS), which are separated by a 75 µs guard period. The DwPTS and UpPTS are separated from the traffic time-slot 0 by a switching point. The next time slots, beginning with time slot 1, are allocated to uplink traffic, until the second switching point in the frame occurs, at which point traffic time slots switch from uplink to downlink traffic slots. TD-SCDMA adapts to symmetric and asymmetric traffic loads by adjusting the number of downlink and uplink time slots per frame.

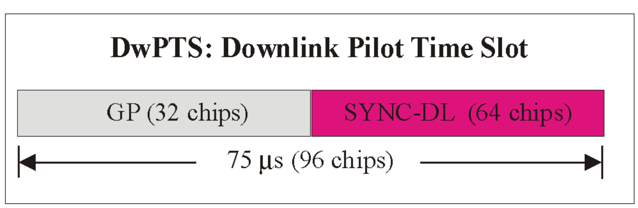
In TD-SCDMA, a traffic time slot burst consists of two data symbol fields, a midamble field, and a guard period. Each traffic burst is 675 µs in length, including the 12.5 µs long guard period at the end of the burst, which is used to avoid time slot multi-path interference. The midamble is used as a training sequence for channel estimation, power measurements, and synchronization.

Figure 4-3 Burst Structure for Traffic Time Slot



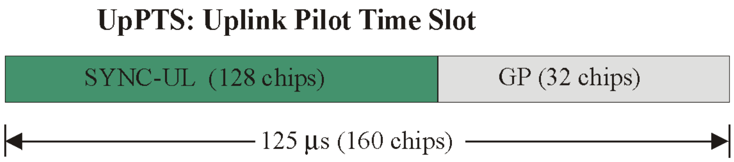
The downlink pilot time slot is used for downlink synchronization and cell initial search. There are 32 different downlink synchronization codes used to distinguish base stations. The DwPTS is 75 µs long.

Figure 4-4 Downlink Pilot Time Slot



The uplink pilot timeslot is used for initial synchronization, random access, and adjacent cell handoff measurements. There are 256 synchronization codes, which can be divided into 32 groups of 8 codes. The base station receives initial beam forming parameters from this signal. This time slot is 125 µs long.

Figure 4-5 Uplink Pilot Time Slot



Downlink Pilot

Scramble Code

Basic Midamble

Modulation of the SYNC-DL

HSDPA Concepts

What is HSDPA?

High Speed Downlink Packet Access (HSDPA) is a digital packet communications format that supports high speed data transmission. HSDPA operates inside a TD-SCDMA downlink with data transmission up to 8-10 Mbps (and 20 Mbps for MIMO systems) over a 1.6 MHz bandwidth. Appropriate uses for HSDPA are DL data bit streams like those employed for Internet browsing, video, or GPS mapping data.

HSDPA physical layer code channels are defined in 3GPP TS 25.211-214 v.5. HSDPA implementations as defined by 3GPP include Adaptive Modulation and Coding (AMC), Hybrid Automatic reQuest (HARQ), and fast cell search.

3GPP specifications include three new code channels: HS-DSCH, HS-SCCH, HS-SICH.

Modulation Scheme Detection

The DL HS-PDSCH may be modulated using either QPSK or 16QAM. MS (UE) gets the modulation scheme in advance of the actual modulated signal from information encoded into the HS-SCCH. The modulation scheme can change dynamically as often as every subframe, or every 3 slots.

For Code Domain and Modulation Accuracy (Composite EVM) measurements the user can select the method by which the modulation scheme is detected, or the modulation scheme can be predetermined. For details see "Code Domain Measurement Concepts" on page 181, or "Modulation Accuracy (Composite EVM)" on page 185.

Why Test HSPDPA User Equipment?

Although HSDPA is primarily a baseband or signaling extension to TD-SCDMA, many aspects of the new service require specialized testing.

The main aspects of HSDPA technology that have implications for physical layer testing of the UE are the following:

- The new uplink high speed dedicated physical control channel (HS-SICH) increases the peak-to-average power ratio (PAR).
- The uplink HS-SICH is not usually transmitted continuously and can be offset in time from the dedicated physical control channel (DSCH).
- The new 16QAM format in the downlink high speed physical data shared channel (HS-DSCH) has less margin for UE receiver impairments than does QPSK.
- Decoding the downlink high speed data shared channel (HS-DSCH) involves

complex new functionality.

- Accurate channel quality reporting is crucial to overall system performance.
- Without correct detection of the high speed shared control channel (HS-SCCH) downlink control information, HSDPA communication is not possible.

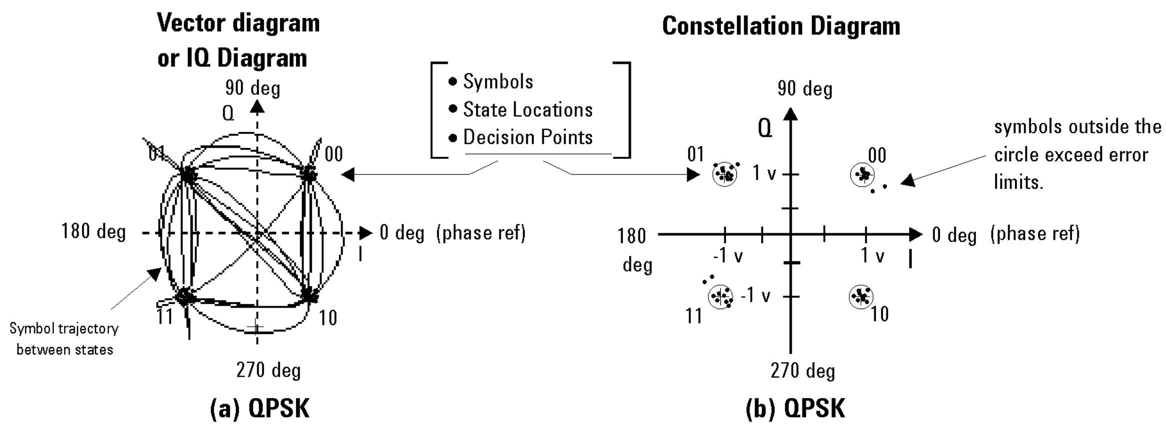
Each of these areas of change and the implications for testing are next discussed briefly.

Digital Modulation Format Standards

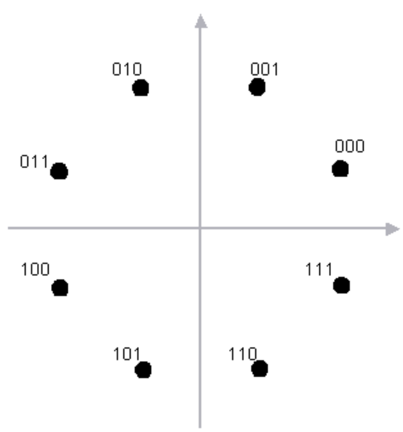
Quadrature Phase Shift Keying (QPSK) Concepts

A common type of phase modulation is Quadrature Phase Shift Keying (QPSK). It is used extensively in applications including CDMA (Code Division Multiple Access) cellular service, wireless local loop, and DVB-S (Digital Video Broadcasting — Satellite). Quadrature means that the signal shifts between phase states which are separated by 90 degrees. The signal shifts in increments of 90 degrees from 45 to 135, –45, or –135 degrees. These points are chosen as they can be easily implemented using an I/Q modulator. Only two I values and two Q values are needed and this gives two bits per symbol. There are four states because $2^2 = 4$. It is therefore a more bandwidth-efficient type of modulation than BPSK, potentially twice as efficient.

Figure 4-6 **Phase Shift Keying (QPSK and 8PSK)**



(a) The Vector or IQ diagram shows the detected symbols and the transitions between them. I shows the instantaneous power levels during state transitions. (b) The Constellation diagram shows the detected symbols versus ideal states, giving you a visual indication of the quality of the measured signal.



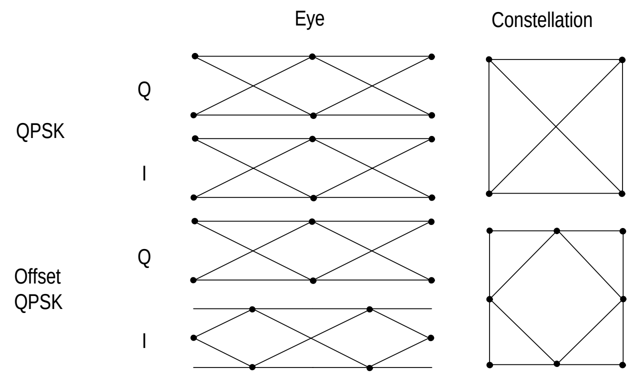
Offset QPSK Modulation Concepts

Offset QPSK (OQPSK) is used in the cellular CDMA (code division multiple access) system for the reverse (mobile to base) link.

In QPSK, the I and Q bit streams are switched at the same time. The symbol clocks, or the I and Q digital signal clocks, are synchronized. In offset QPSK (OQPSK), the I and Q bit streams are offset in their relative alignment by one half of a symbol period. This is shown in the diagram. Since the transitions of I and Q are offset, at any given time only one of the two bit streams can change values. This creates a dramatically different constellation, even though there are still just two I/Q values. This has power efficiency advantages. In OQPSK the signal trajectories are modified by the symbol clock offset so that the carrier amplitude does not go through or near zero (the center of the constellation). The spectral efficiency is the same with two I states and two Q states. The reduced amplitude variations (perhaps 3 dB for OQPSK, versus 30 to 40 dB for QPSK) allow a more power-efficient, less linear RF power amplifier to be used.

Figure 4-7 shows a comparison of the Eye diagrams of QPSK and Offset QPSK.

Figure 4-7 **I/Q "Offset" Modulation**



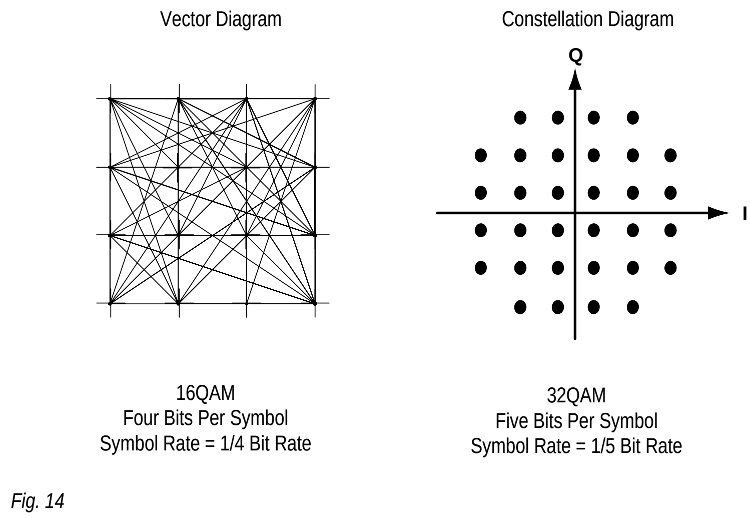
Quadrature Amplitude Modulation (QAM) Concepts

Quadrature amplitude modulation (QAM) is used in applications including microwave digital radio, DVB-C (Digital Video Broadcasting—Cable), and modems.

16 QAM

In 16-state quadrature amplitude modulation (16QAM), there are four I values and four Q values. This results in a total of 16 possible states for the signal. It can transition from any state to any other state at every symbol time. Since $16 = 2^4$ four bits per symbol can be sent. This consists of two bits for I, and two bits for Q. The symbol rate is one fourth of the bit rate. So this modulation format produces a more spectrally efficient transmission. It is more efficient than BPSK, QPSK, or 8PSK.

Figure 4-8 Quadrature Amplitude Modulation



In any digital modulation system, if the input signal is distorted or severely attenuated the receiver will eventually lose symbol lock completely. If the receiver can no longer recover the symbol clock, it cannot demodulate the signal or recover any information. With less degradation, the symbol clock can be recovered, but it is noisy, and the symbol locations themselves are noisy. In some cases, a symbol will fall far enough away from its intended position that it will cross over to an adjacent position. The I and Q level detectors used in the demodulator would misinterpret such a symbol as being in the wrong location, causing bit errors. QPSK is not as efficient, but the states are much farther apart for a given power and the system can tolerate a lot more noise before suffering symbol errors. QPSK has no intermediate states between the four corner-symbol locations, so there is less opportunity for the demodulator to misinterpret symbols. QPSK requires less transmitter power than QAM to achieve the same bit error rate.

Modulation Bit State Diagrams

This section shows bit state diagrams for various digital modulation formats that may be demodulated by the measurements, including QPSK, 8PSK, and 16QAM.

Figure 4-9 **QPSK Bit State Diagram**

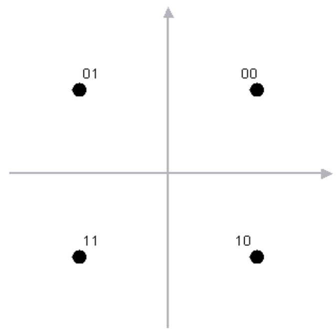


Figure 4-10 **8PSK Bit State Diagram**

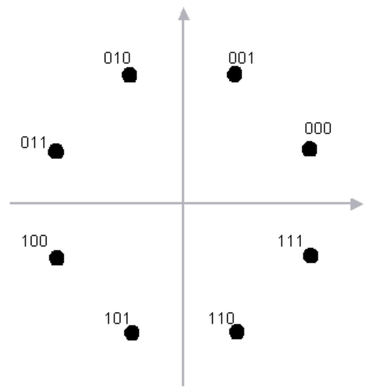
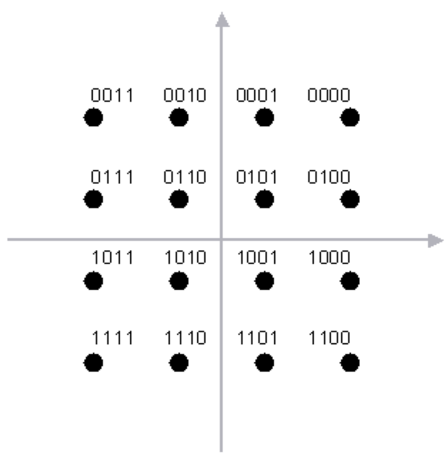


Figure 4-11 **16 QAM Bit State Diagram**



Modulation Quality Measurements

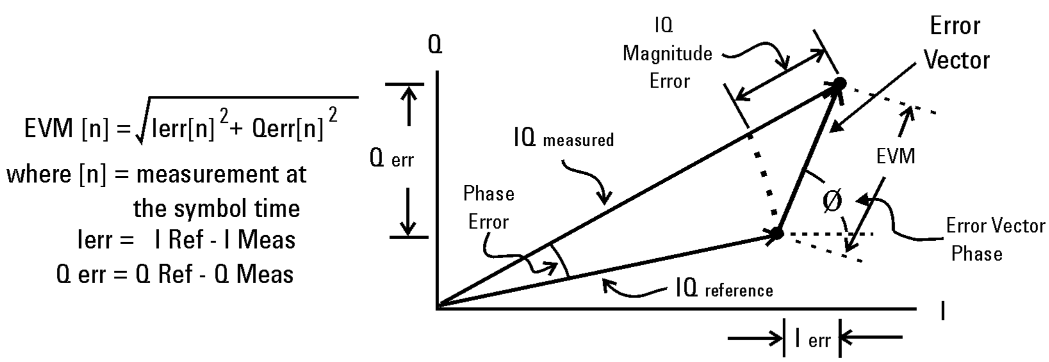
There are a number of different ways to measure the quality of a digitally modulated signal. These usually involve precision demodulation of the transmitted signal and comparison of this transmitted signal with a mathematically generated ideal or reference signal, as we saw earlier. The definition of the actual measurement depends mainly on the modulation scheme and the standard followed.

Error Vector Magnitude (EVM)

The most widely used modulation quality metric in digital communications systems is error vector magnitude (EVM). The error vector is the vector difference at a given time between the ideal reference signal and the measured signal (Figure 4-12). The error vector is a complex quantity that contains a magnitude and phase component. It is important not to confuse the magnitude of the error vector with the magnitude error, or the phase of the error vector with the phase error.

Expressed another way, the EVM is the residual noise and distortion remaining after an ideal version of the signal has been stripped away.

Figure 4-12



Error Vector Magnitude (EVM) is the difference between the actual measured signal and an ideal reference signal.

EVM is defined as the root mean square (RMS) of the error vector over time at the instants of the symbol clock transitions. By convention, EVM is usually normalized to either the amplitude of the outermost symbol or the square root of the average symbol power. The EVM measurement and the various related data results are sensitive to any signal impairment that affects the magnitude and phase trajectory of a signal for any digital modulation format. This makes it an ideal measurement tool for troubleshooting communications system problems at baseband, IF, or RF sections of the radio transmitter.

Phase and Frequency Errors

For constant-amplitude modulation formats, such as GMSK used in GSM systems, the I/Q phase and frequency errors are more representative measures of the quality of the signal than EVM. As with EVM, the analyzer samples the transmitter output in order to capture the actual phase trajectory. This is then demodulated, and the ideal (or reference) phase trajectory is mathematically derived. Comparing the actual and reference signals determines the phase error. The mean gradient of the phase error signal is the frequency error.

Significant phase errors can indicate problems in the baseband section of the transmitter. The output amplifier in the transmitter can also create distortion that causes unacceptably high phase error for multi carrier signals. Significant phase error at the beginning of a burst can indicate that a synthesizer is failing to settle quickly enough. In a real system, poor phase error reduces the ability of a receiver to correctly demodulate, especially with marginal signal conditions. This ultimately degrades sensitivity.

Frequency error is the difference between the specified carrier frequency and the actual carrier frequency. A stable frequency error simply indicates that a slightly wrong carrier frequency is being used. Unstable frequency errors can indicate short-term instability in the LO, improper filtering, AM-PM conversion in the amplifier, or wrong modulation index if the transmitter is implemented using an analog frequency modulator.

Rho

Rho is the normalized correlation coefficient between the measured and ideal reference signals. Rho is computed by comparing the normalized correlated power between the measured signal and the reference signal and is designated as the waveform quality factor. The maximum value of Rho is 1.0 (which means the measured signal and reference signal are 100% identical).

A Rho value of 1.0 indicates that all of the transmitted power correlates with the ideal signal as determined by the detected sequence.

Rho is the correlated power for all active code channels (as seen in the composite CDP trace data display).

Impairments

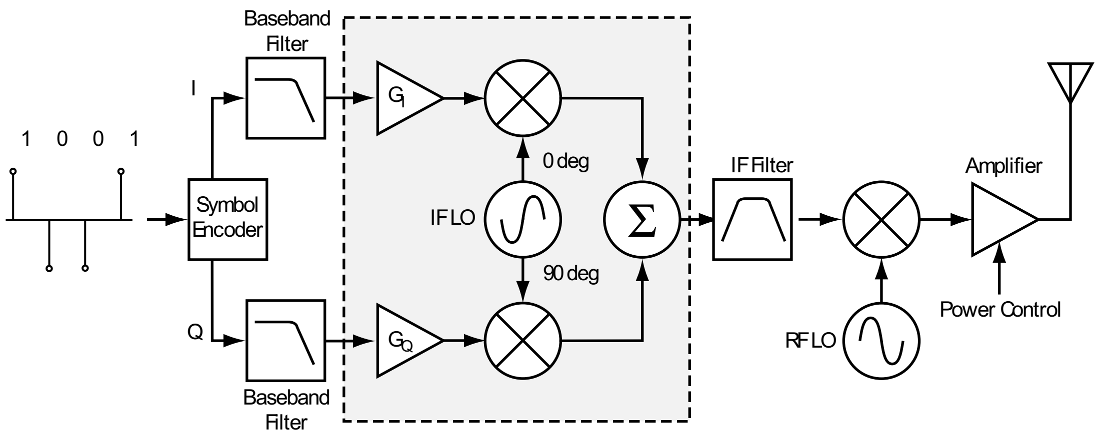
How can you verify the different I/Q impairments? The best way to verify most I/Q impairments is to look at the constellation and EVM metrics.

Matching problems due to component differences between the I side and Q side of a network can cause I/Q impairments. The I/Q modulator in the transmitter is a significant source of I/Q impairments. A diagram of it is shown in Figure 4-13.

For any of these errors, magnifying the scale of the constellation can help detect subtle imbalances visually. Since the constellation is affected, these errors deteriorate EVM.

The most common I/Q impairments are listed below:

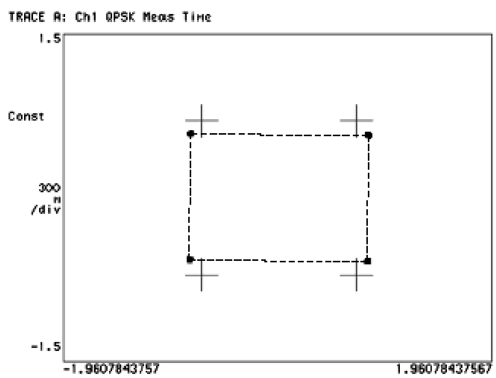
Figure 4-13 **I/Q Modulator a source of Impairments**



I/Q Gain Imbalance

Since I and Q are two separate signals, each one is created and amplified independently. Inequality of this gain between the I and Q paths results in incorrect positioning of each symbol in the constellation, causing errors in recovering the data. I/Q gain imbalance results in an asymmetric constellation, as seen in Figure 4-14. This problem is rare in systems where the IF is implemented digitally.

Figure 4-14 **I/Q Gain Imbalance**

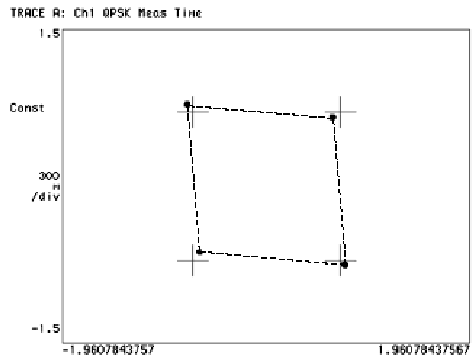


Quadrature errors

Quadrature errors. If the phase shift between the IF (or RF) LO signals that mix with the I and Q baseband signal at the modulator is not 90 degrees, a quadrature error occurs. The constellation of the signal is distorted (see Figure 4-15 on page 180), which may cause error in the interpretation of the recovered symbols.

Quadrature errors result in a “tipped” or skewed constellation, as seen in Figure 4-15

Figure 4-15 **I/Q Quadrature Errors**

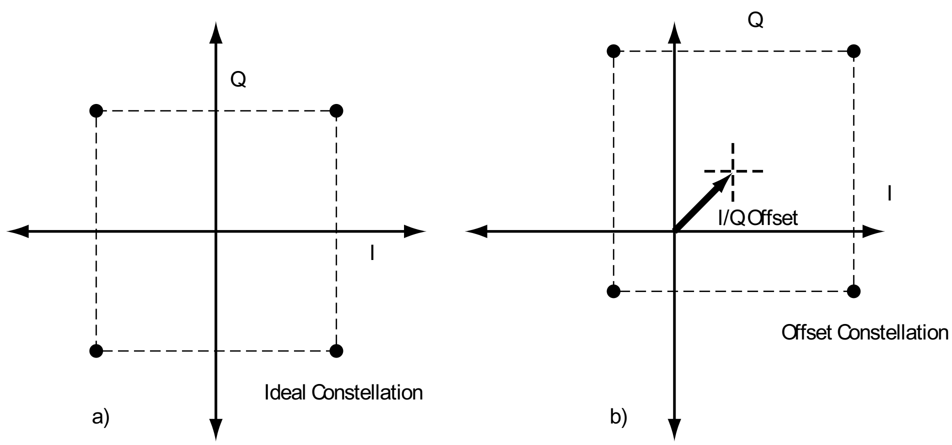


I/Q Offsets

DC offsets may be introduced in the I and Q paths. They may be added in by the amplifiers in the I and Q paths, see Figure 4-16.

For digital IF implementations, offsets may also occur from rounding errors in the DSP. I/Q offsets result in carrier feed through. Some instruments compensate for this error before displaying the constellation or polar diagram and measuring EVM. In that case, I/Q offset is given as a separate error metric.

Figure 4-16 **Ideal Versus I/Q Offset Constellation**



Code Domain Measurement Concepts

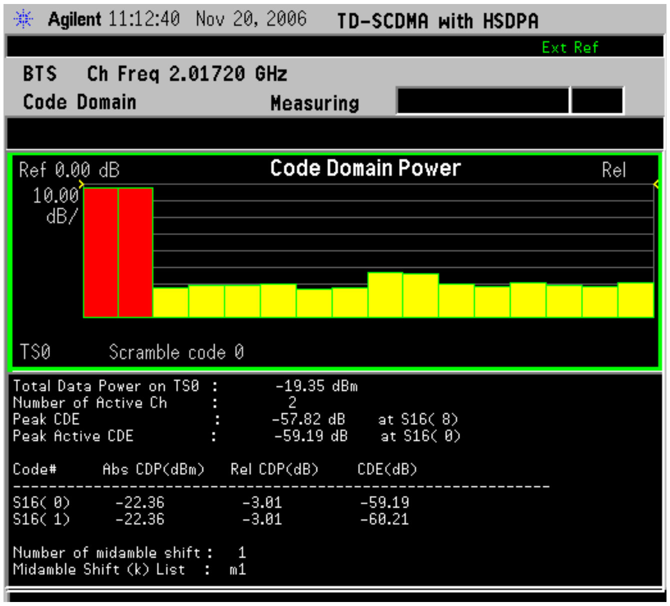
What is the Code Domain power?

Code domain power is an analysis of the distribution of signal power across the set of code channels, normalized to the total signal power. To analyze the composite waveform, each channel is decoded using a code-correlation algorithm. This algorithm determines the correlation coefficient factor for each code. Once the channels are decoded, the power in each code channel is determined.

The code domain power composite view provides information about the in-channel characteristics of the TD-SCDMA (3GPP) signal. It directly informs the user of the active channels with their individual channel powers. The composite view also shows which code lengths are active and the corresponding amount of code space used.

When the level of the code domain noise floor is too high, relative to a reference or an expected level, one of the possible causes might be due to CW interference, like local oscillator feedthrough or spurs. I/Q modulation impairments can be another source of this uncorrelated noise. The I/Q demodulation measurements can reveal errors such as I/Q gain imbalance or I/Q quadrature error.

Figure 4-17 Code Domain Power



Purpose

The code domain power measurement helps you not only verify that each channel is operating at its proper amplitude, but also identify problems throughout the transmitter design from the coding to the RF section. In particular, the levels of the inactive channels can provide useful information about specific impairments.

Ideally, the levels for the inactive channels would be zero. In reality, signal and system imperfections compromise the code orthogonality and result in a certain amount of signal power projecting onto inactive codes. A real signal will also have a certain noise level, which being random, will project more or less evenly onto all codes.

The projection of the error is interesting because it enables you to see how the error power is distributed in the code domain. You want the error power to be evenly distributed throughout the code domain, rather than concentrated in a few codes, to avoid code-dependent channel quality variations.

One possible cause of uneven distribution of error power is LO instability. In essence, energy is lost from the active channels and appears in those channels with codes that are closely related to the active channel codes. In the case of OVSF codes, this results in higher code domain noise for channels with code assignments consecutive to the active channel code, whether they are at the same or at a different I/Q path.

Peak Code Domain Error

To address the possibility of uneven error power distribution, the composite EVM measurement has been supplemented by another test called peak code domain error that specifies a limit for the error power in any one code.

The result of the measurement coincides with the peak active code domain error, which calculates the error only in the active code channels.

Symbol EVM

Apart from looking at the code domain power and peak code domain error, it is useful to analyze a specific code channel. The following sections describe some analysis tools and how they can be applied.

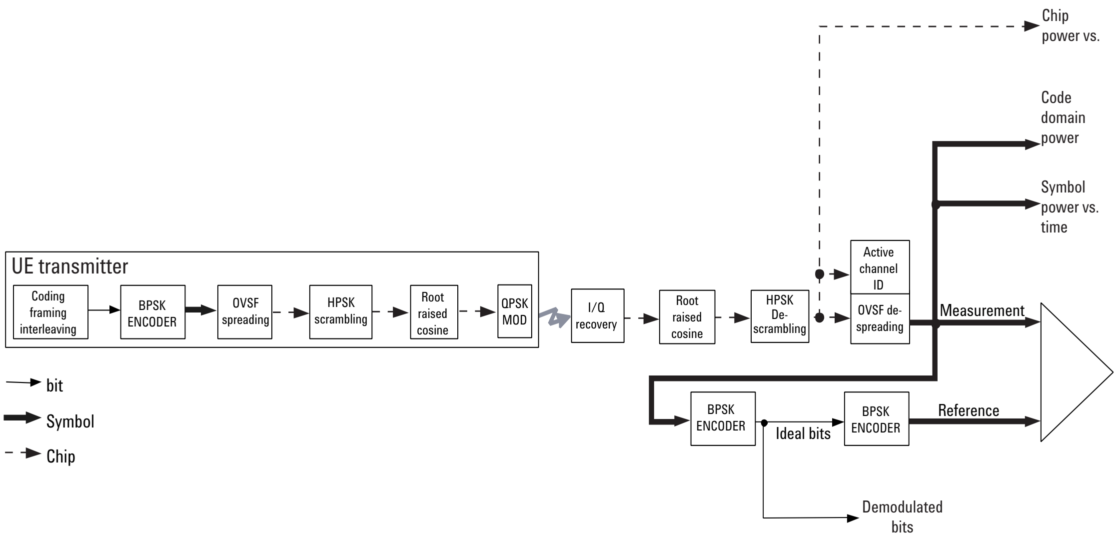
By descrambling and despreading the signal you can analyze the constellation and EVM for a specific code channel at the symbol level, even in the presence of multiple codes.

An impairment that affects symbol EVM will also affect the composite EVM. For example, an amplifier compression problem will appear both in the composite EVM and in the symbol EVM measurement. However, because of the spreading gain symbol EVM will mute the impairment. So why use symbol EVM?

Symbol EVM provides the bridge between RF and demodulated bits. Since it includes the spreading gain, it provides a measure of modulation quality closer to real-life performance. In this sense, you can think of symbol EVM as the actual quality the user in that channel will experience (similar to the reciprocal of the bit error rate).

The relationship between symbol EVM and chip EVM depends on the SF. At low SFs (high data rates) chip modulation errors have a significant effect on symbol EVM. But at high SFs, chip modulation errors have little effect on symbol EVM. In this sense, it is particularly useful to baseband digital signal processing (DSP) engineers to evaluate symbol quality and analyze how specific impairments affect the quality of channels at different data rates.

Figure 4-18 **Process to Calculate Code Domain Power, Symbol EVM, Symbol Power vs. Time, Chip Power vs. Time, and Demodulated Bits US (UL) above, BS (DL) below**



Symbol Power versus Time (PvT)

Analyzing the symbol power for a specific code channel versus time can be particularly useful to monitor the power and response of the UE power control system for different code channels.

Chip power represents the total power of the signal at the chip rate. Analyzing the symbol power for a channel in combination with the total chip power versus time is particularly useful for system integrators to analyze the power amplifier response (ripple) to a power control command.

To view this combination display, you must select **Display**, **Composite Chip Power**, **ON**.

Demodulated Bits

By obtaining the demodulated bits after descrambling and despreading for each code channel, the correct bit patterns can be verified. You can verify if the bits for the different fields (Pilot, TPC, etc.) are correct by using the demodulated bits measurement.

Analyzing demodulated bits enables baseband engineers to identify coding and interleaving errors. In many cases, it can help you clarify situations where the BTS and UE are having problems communicating with each other. Analyzing the demodulated bits may verify whether the error is coming from the UE coding and interleaving, or the BTS de-interleaving and decoding process.

Modulation Scheme Selection

Modulation scheme selections are available to allow you to determine how the instrument demodulates detected TD-SCDMA active channels. There are three choices available under the **Meas Setup**, **Mod Scheme** menu:

NOTE **Mod Scheme** key is only available if the Option 212 is installed and **Mode Setup**, **HSDPA/8PSK Enable** is set to **On**.

Mod Scheme Setup selections are only available if the Option 212 is installed, **Mode Setup**, **HSDPA/8PSK Enable** is set to **On** and **Mod Scheme** is set to **Man**.

- **Auto -** Use this setting to specify detected active channels will be automatically examined to determine modulation scheme based on the assumption the modulation scheme for ALL channels remains constant throughout the entire **Capture Intvl** (Interval) setting. When this criterion is met, this setting offers the most stable detection results.
- **QPSK -** The code channels specified by the **Symbol Rate** and **Code Number** settings are known to be QPSK modulated.
- **8QPSK -** The code channels specified by the **Symbol Rate** and **Code Number** settings are known to be 8QPSK modulated.
- **16QAM -** The code channels specified by the **Symbol Rate** and **Code Number** settings are known to be 16QAM modulated.

You should use the **Auto** setting when measuring HSDPA signals that employ Adaptive Modulation and Coding (AMC). With AMC, the modulation scheme changes dynamically between QPSK and 16QAM, so the **AUTO** detection algorithm cannot correctly calculate the difference, or EVM, between the reference and vector symbols. With **Auto** you can select the symbol boundary that defines which slots may be detected as containing active channels. Use the **Symbol Rate** and **Code Number** settings to define these channels so only one modulation scheme is present in a measurement interval.

Measurement Method

This procedure measures the power levels of the spread channels in composite RF channels. For BTS tests, the symbol based sync type is available for defining any channel code to synchronize with. If **Device** is set to **MS**, the demodulated I and Q signals are individually shown in the code domain power graph window. Unlike most of the other measurements, the default setting for **Measure** in the **Meas Control** menu is **Single** for this measurement.

The code domain measurement displays the power for each of the spread channels. This power is relative to the total power within the 1.60 MHz channel bandwidth and centered around the center frequency. Each spread channel level is displayed as an individual vertical bar with a different width determined by a spread rate. Because this is a relative measurement, the default unit of measure is dBc.

Modulation Accuracy (Composite EVM)

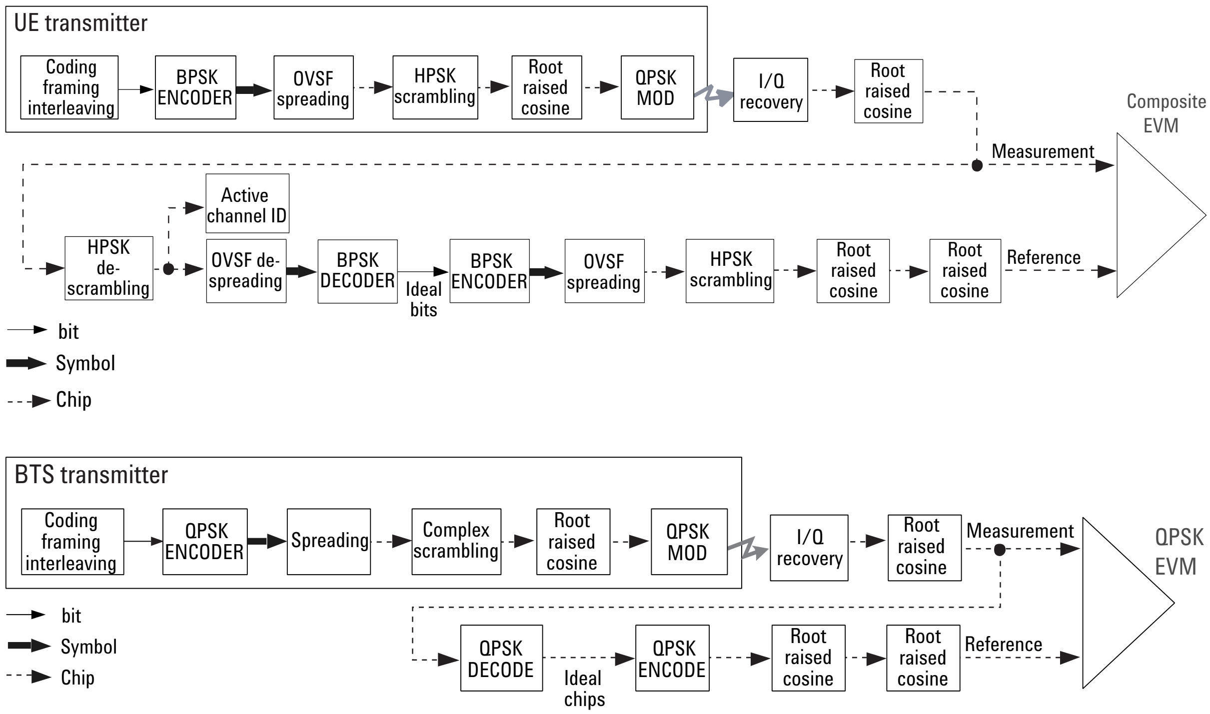
Purpose

The Modulation Accuracy (Composite EVM) measurement is made to qualify a transmitter. The Symbol EVM is for measuring a single coded channel. The composite EVM measurement is the modulation accuracy against the multi coded reference chip power through the spreading and scrambling circuits. For more basic information on Error Vector Magnitude measurements see "Error Vector Magnitude (EVM)" on page 177.

Rho is one of the key modulation quality metrics, along with EVM and code domain power. Rho is the ratio of the correlated power in a multi coded channel to the total signal power. This measurement takes into account all possible error mechanisms in the entire transmission chain including: baseband filtering, I/Q modulation anomalies, filter amplitude and phase non-linearities, and power amplifier distortions. This provides an overall indication of the performance level of the transmitter of the unit under test (UUT). It corresponds to the modulation accuracy conformance test specified in the 3GPP specifications [9].

To evaluate the modulation accuracy of a TD-SCDMA multi-channel signal, we again need to synthesize a reference signal. The signal under test is downconverted (the baseband I and Q signals are recovered) and passed through a root raised cosine receiver filter. Active channels are descrambled, despread, and QPSK decoded to bits for UL signals and DL signals (see Figure 4-19 on page 186).

Figure 4-19 Process to Calculate Composite EVM for TD-SCDMA Signal



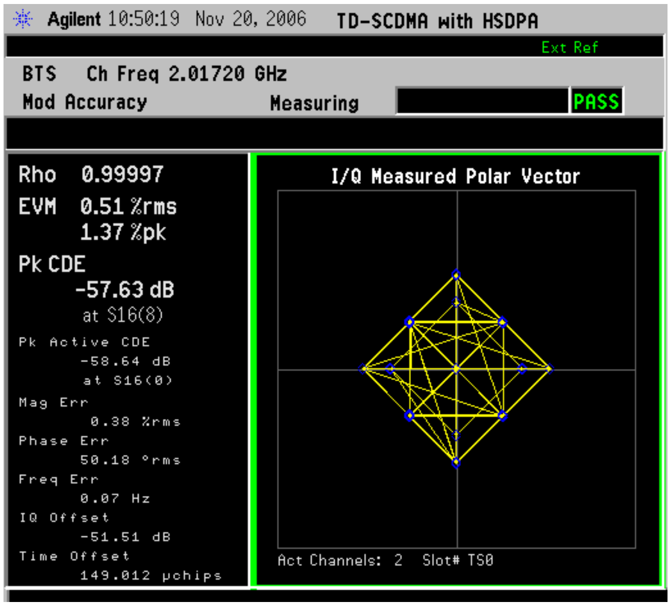
The despread bits are "perfectly" remodulated to produce the required reference signal at the chip level. The reference signal is then subtracted from the measured signal to produce a time record of error phasors. The square root of the ratio of the mean power of the error signal to the mean power of the reference signal is computed and expressed as a percentage EVM.

The composite EVM measurement accounts for all spreading and scrambling problems in the active channels and for all baseband, IF, and RF impairments in the transmitter chain.

There are several situations were you will want to use the Composite EVM measurement (and its related vector diagram, phase error and magnitude error metrics, etc.):

1. To evaluate the quality of the transmitter for a multi-channel signal. This is particularly important for RF designers, who need to test the RF section (or components) of the transmitter using realistic signals with correct statistics. In general, the peak-to-average power ratio of the signal increases as the number of channels increases. By measuring modulation quality on a multichannel signal you can analyze the performance of the RF design for TD-SCDMA UL signals with different levels of stress (different CCDFs). Evaluating the modulation quality of multi-channel signals is also important for the baseband designers to analyze the performance of multi-board baseband designs. For example, a small timing error in the clock synchronization between channels on different boards can be detected as a decrease in modulation quality. Figure 4-20 shows the composite EVM diagram.

Figure 4-20 Composite EVM



2. Use the composite EVM measurement to detect spreading or scrambling errors. Depending on the degree of the error, the analyzer may show an intermittent unlock condition or may not be able to lock at all when trying to perform a composite EVM measurement. This is mainly useful to system integrators to determine errors in the spreading and scrambling. If this problem occurs, you can use the symbol EVM measurement to confirm that the rest of the transmitter is working as expected. If the scrambling or spreading error does not cause an unlock measurement condition, you can use the error vector versus time display to find the problematic chip.

3. Use the composite EVM measurement to detect certain problems between the baseband and RF sections. This is mainly useful for system integrators. For example, LO instability caused by interference from digital signals can be detected with symbol EVM. However, the symbol EVM measurement will not detect problems that require the measurement to synchronize with a bit sequence. For example, I/Q swapped (reversed I and Q) errors will look perfectly normal if a symbol EVM measurement is used. On the other hand, it will cause an unlock condition when performing a composite EVM measurement.

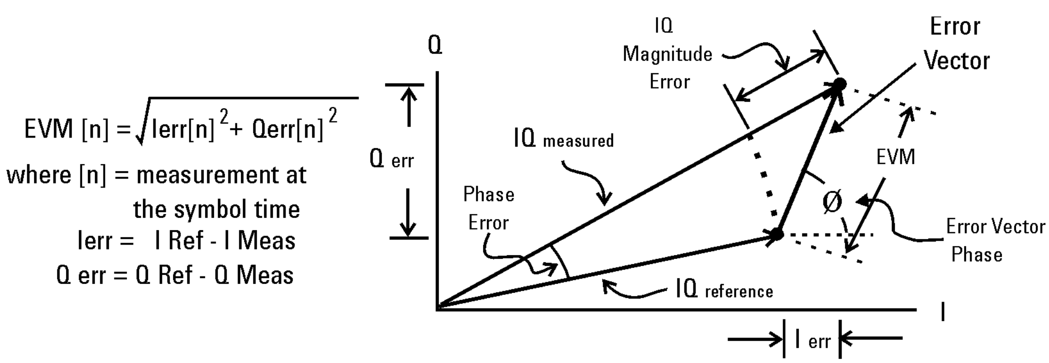
Measurement Method

The modulation accuracy measurement is made to get results for a composite error vector magnitude, rho, and code domain error from this difference. The code domain error is computed by projecting the error vector power onto the code domain at the maximum spreading factor. The error vector for each power code is defined as the ratio to the mean power of the reference waveform expressed in dB. Rho values are in the range of 0 to 1. A value of 1 indicates perfect correlation to the reference (high modulation quality).

When a modulation accuracy measurement is performed, the following data is provided (See Figure 4-21 on page 188):

- Rho - modulation quality representing the ratio of the correlated power in a multi coded channel to the total signal power
- EVM - peak and rms error vector magnitude
- Peak CDE - peak code domain error at the code number, with respect to the ideal total power
- Peak Active CDE - peak active code domain error with a code number
- Magnitude Error - peak and rms magnitude error
- Phase Error - peak and rms phase error
- Freq Error - the frequency difference between the transmitter’s actual center frequency and the frequency (or channel) that you entered
- I/Q Offset - the origin offset for I/Q signals,
- Time Offset - the time offset between the measured and ideal start times for the indicated timeslot relative to the specified time reference.
- IQ Imbalance - the gain imbalance in the selected timeslot and sub-frame, defined as I_{gain}/Q_{gain}
- Quad Error- the orthogonal error between the I and Q signals. Ideally, I and Q should be orthogonal, 90 degrees apart. A quadrature skew error of 3 degrees means I and Q are 93 degrees apart. A quadrature skew error of -3 degrees means I and Q are 87 degrees apart.

Figure 4-21 Error Vector Magnitude and Related Parameters



Error Vector Magnitude (EVM) is the difference between the actual measured signal and an ideal reference signal.

To perform the Modulation Accuracy measurements, you can also get following trace results, either on the screen display or via SCPI commands:

- Capture Time Data Trace
- Filtered Analysis Subframe Data Trace
- I/Q Measured Polar Data Trace (Unnormalized and Normalized)

- Magnitude Error vs. Chips Trace
- Phase Error vs. Chip Trace
- EVM vs. Chip Trace
- Code Length Trace
- Active Flag of Code Channels Trace
- Code Domain Power vs. Code Channels Trace (Unnormalized and Normalized)
- Code Domain Error vs. Code Channels Trace (Normalized)
- Power vs. Timeslots Trace
  - Total power vs. timeslots trace
  - Midamble power vs. timeslots trace
  - Before Midamble power vs. timeslots trace
  - After Midamble power vs. timeslots trace
- Time Offset vs. Timeslot Trace
- Limit PASS/FAIL Trace
- Active Flag of Timeslot Trace

Concepts

Spectrum (Frequency Domain) Measurement Concepts

Purpose

The spectrum measurement provides spectrum analysis capability for the instrument. The control of the measurement was designed to be familiar to those who are accustomed to using swept spectrum analyzers.

This measurement is FFT (Fast Fourier Transform) based. The FFT-specific parameters are located in the **Meas Setup, Advanced** menu. Also available under basic mode spectrum measurements is an I/Q waveform window, which shows the I and Q signal waveforms in parameters of voltage versus time. The advantage of having an I/Q view available while in the spectrum measurement is that it allows you to view complex components of the same signal without changing settings or measurements.

Measurement Method

The measurement uses digital signal processing to sample the input signal and convert it to the frequency domain. With the instrument tuned to a fixed center frequency, samples are digitized at a high rate, converted to I and Q components with DSP hardware, and then converted to the frequency domain with FFT software.

Troubleshooting Hints

Changes made by the user to advanced spectrum settings, particularly to ADC range settings, can inadvertently result in spectrum measurements that are invalid and cause error messages to appear. Care needs to be taken when using advanced features.

Waveform (Time Domain) Measurement Concepts

Purpose

The waveform measurement is a generic measurement for viewing the input signal waveforms in the time domain. This measurement is how the instrument performs the zero span functionality found in traditional spectrum analyzers.

Basic mode waveform measurement data may be displayed using either an RF Envelope window, or an I/Q Waveform window which shows the I and Q signal waveforms in parameters of voltage versus time. The advantage of having an I/Q view available while making a waveform measurement is that it allows you to view complex components of the same signal without changing settings or measurements.

The waveform measurement can be used to perform general purpose power measurements in the time domain with excellent accuracy.

Measurement Method

The instrument makes repeated power measurements at a set frequency, similar to the way a swept-tuned spectrum analyzer makes zero span measurements. The input analog signal is converted to a digital signal, which then is processed into a representation of a waveform measurement. The measurement relies on a high rate of sampling to create an accurate representation of a time domain signal.

Concepts

Other Sources of Measurement Information

Additional measurement application information is available through your local Agilent Technologies sales and service office. The following application notes treat digital communications measurements in much greater detail than discussed in this measurement guide.

- Application Note 1298

  Digital Modulation in Communications Systems - An Introduction
  Agilent part number 5965-7160E

- Application Note 1311

  Understanding CDMA Measurements for Base Stations and Their Components
  Agilent part number 5968-0953E

- Application Note

  HSDPA RF Measurements for User Equipment
  Agilent part number 5989-4099EN

Instrument Updates at www.agilent.com

These web locations can be used to access the latest information about the instrument, including the latest firmware version.

http://www.agilent.com/find/psa

References

1. 3rd Generation Partnership Project. Technical Specification Group User Equipment (UE) Radio Transmission and Reception (TDD). 3GPP TS 25.102 (V5.0.0).
2. 3rd Generation Partnership Project. Technical Specification Group Base Station (BS) Radio Transmission and Reception (TDD). 3GPP TS 25.105 (V5.0.0).
3. 3rd Generation Partnership Project. Technical Specification Group Base Station (BS) Conformance Testing (TDD). 3GPP TS 25.142 (V5.0.0).
4. 3rd Generation Partnership Project. Technical Specification Group Physical Channels and Mapping of Transport Channels onto Physical Channels. 3GPP TS 25.221 (V5.0.0).
5. 3rd Generation Partnership Project. Technical Specification Group Multiplexing and Channel Coding. 3GPP TS 25.222 (V5.0.0).
6. 3rd Generation Partnership Project. Technical Specification Group Spreading and Modulation. 3GPP TS 25.222 (V5.0.0).
7. 3rd Generation Partnership Project. Technical Specification Group Physical Layer Procedures. 3GPP TS 25.222 (V5.0.0).
8. 3rd Generation Partnership Project. Technical Specification Group Physical Layer Measurements. 3GPP TS 25.225 (V5.0.0).
9. 3rd Generation Partnership Project. Technical Specification Group Terminal; Terminal Conformance Specification. Radio Transmission and Reception (TDD). 3GPP TS 34.122 (V5.0.0).

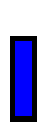
5 Menu Maps

Directions for Use

Refer to the following notes to utilize the key-flow diagrams:

- Start from the upper left corner of each measurement diagram. Go to the right, and go from the top to the bottom.
- When changing a key from auto (with underline) to manual, just press that key one time.
- When entering a numeric value for **`frequency`**, a value with units, use the numeric keypad and terminate the entry with the appropriate unit selection from the softkeys displayed.
- When entering a numeric value for a unitless value, like **`Avg Number`**, use the numeric keypad and terminate the entry with the **Enter** front-panel key.
- Instead of using the numeric keypad to enter a value, it may be easier to use the front-panel knob or **Up/Down** arrow keys.

Table 5-1 Menu Map Legend

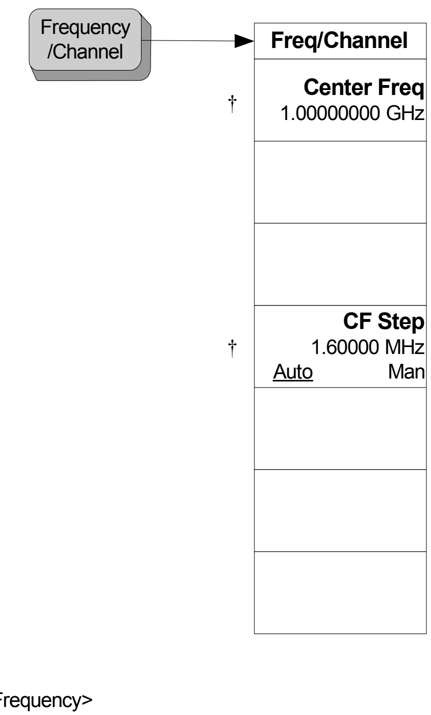
Icon	Description
	This represents the analyzer front-panel key.
	An oval represents additional levels of menus.
	This box shows how the menu key default condition is displayed. Default parameters or values are underlined wherever possible.
†	A dagger to the left of a menu key indicates that when the key is pressed this is an active function.
‡	A double-dagger to the left of the menu key indicates a function that is not always available. It is dependent on other instrument settings.
	A bar on the left of two or more menu keys indicates that the keys are a mutually exclusive choice.

Menu Maps

These menu maps are functionally ordered.

The key flow diagrams, shown in a hierarchical manner on the following pages, will help grasp the overall functional relationships for the front-panel keys and the menu keys displayed at the extreme right side of the screen. The diagrams are:

Figure 5-1 Frequency Channel Key Flow



Menu Maps

Menu Maps

Figure 5-2 Measurement Selection Key Flow

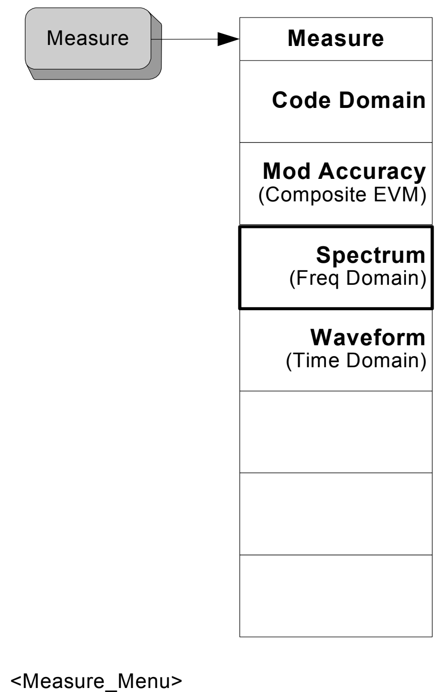


Figure 5-3 Mode Selection Key flow

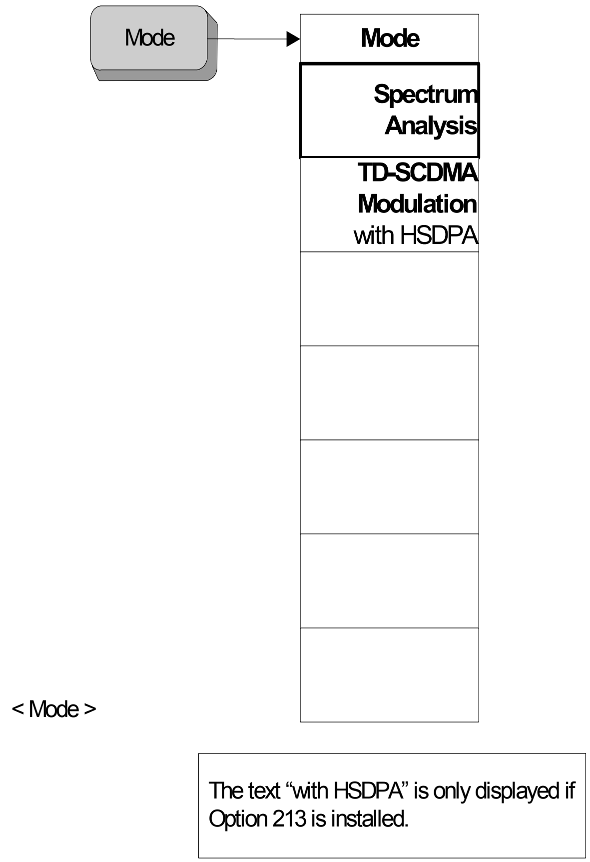


Figure 5-4 Mode Setup Selection Key Flow

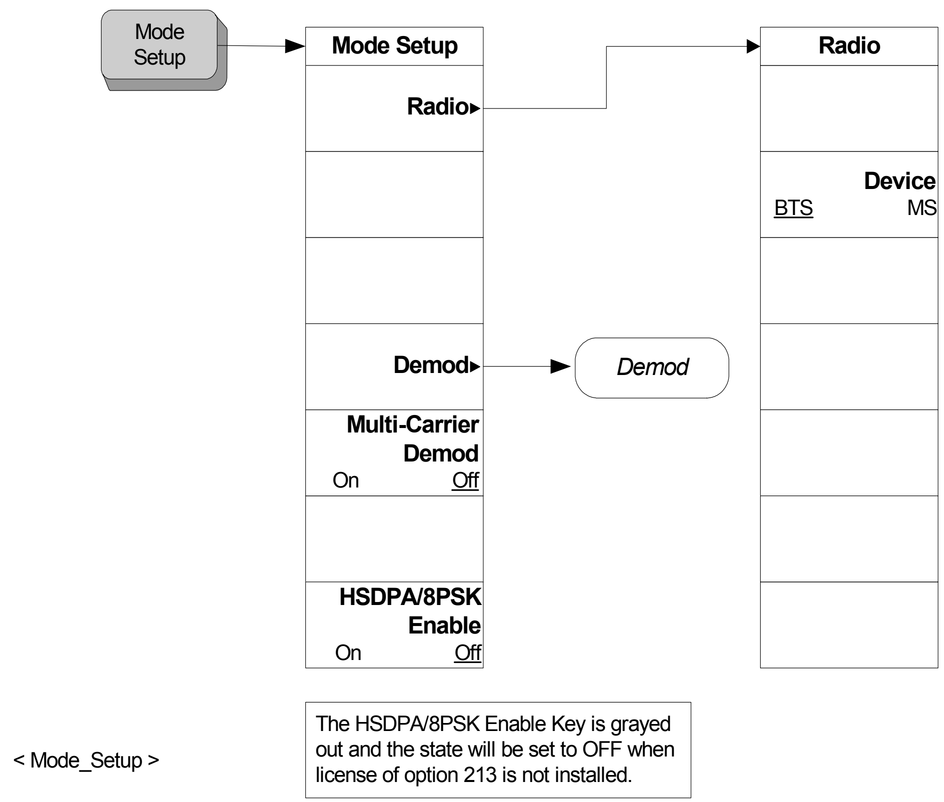
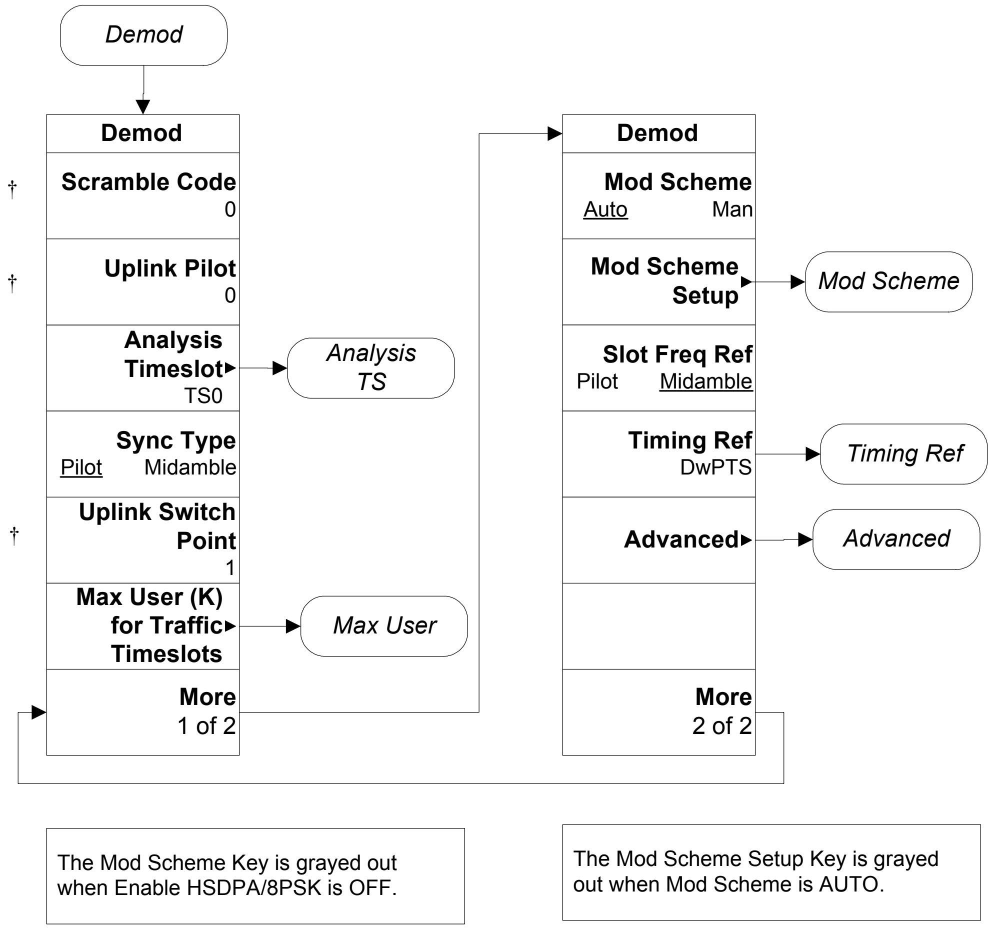


Figure 5-5 Mode Setup Demod Key Flow (1 of 3)



< Mode_Setup_Demod_1>

Figure 5-6 Mode Setup Demod Key Flow (2 of 3)

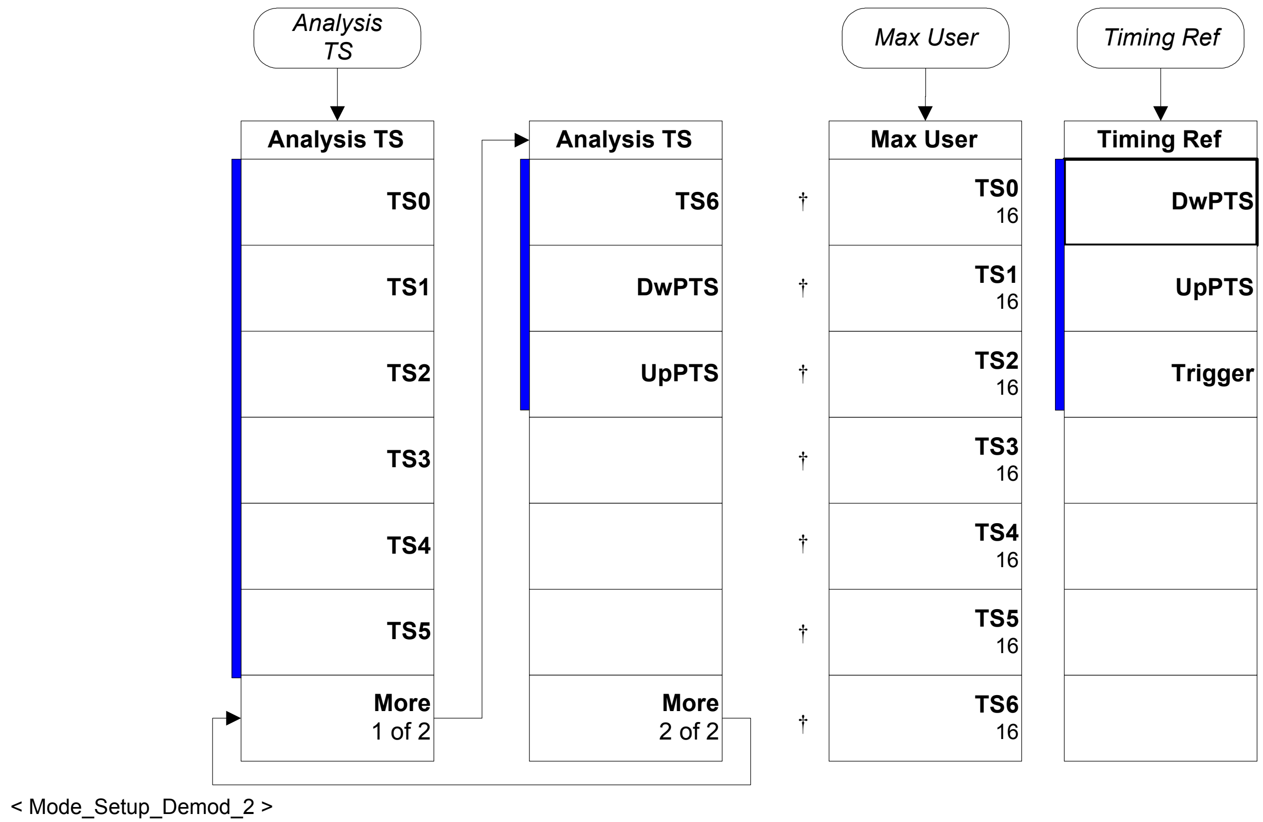
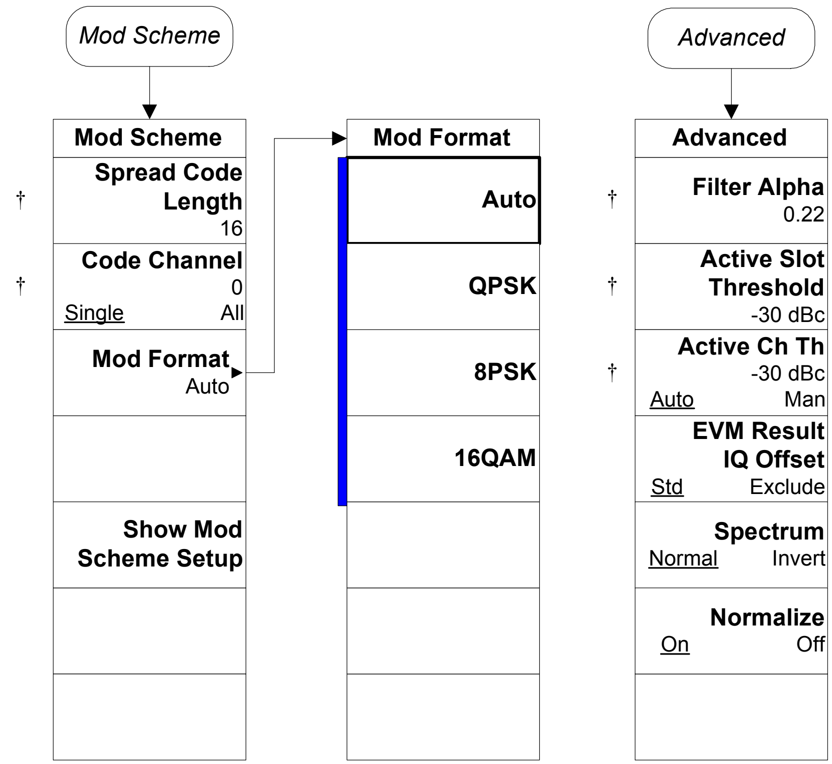
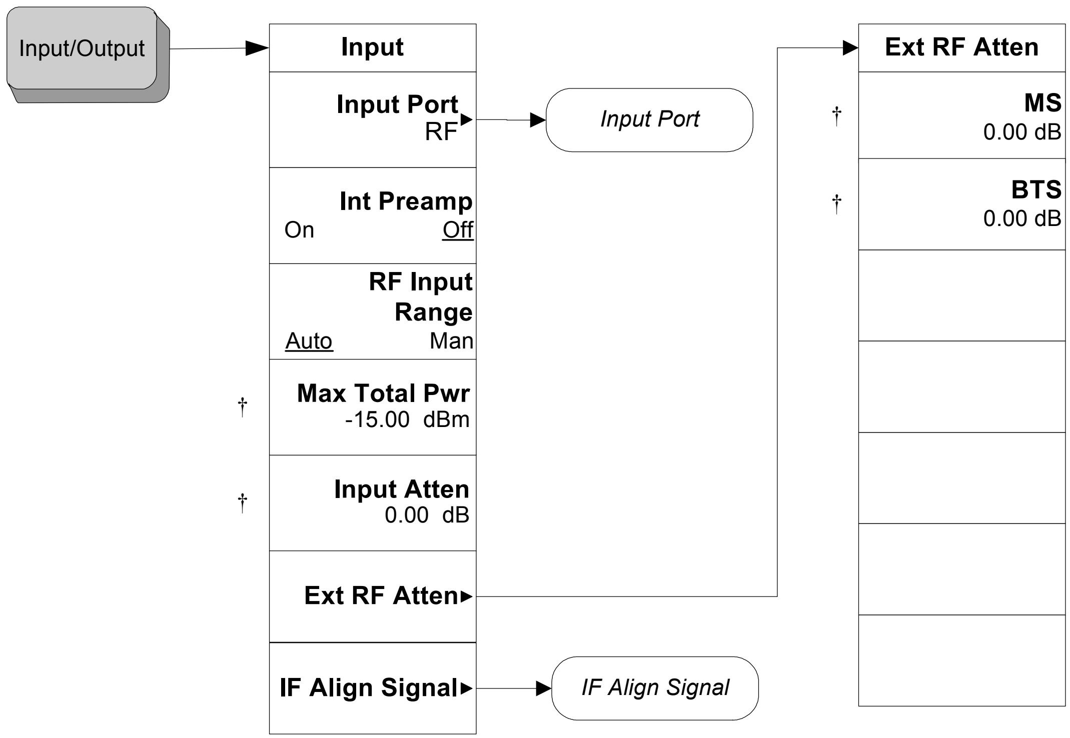


Figure 5-7 Mode Setup Demod Key Flow (3 of 3)



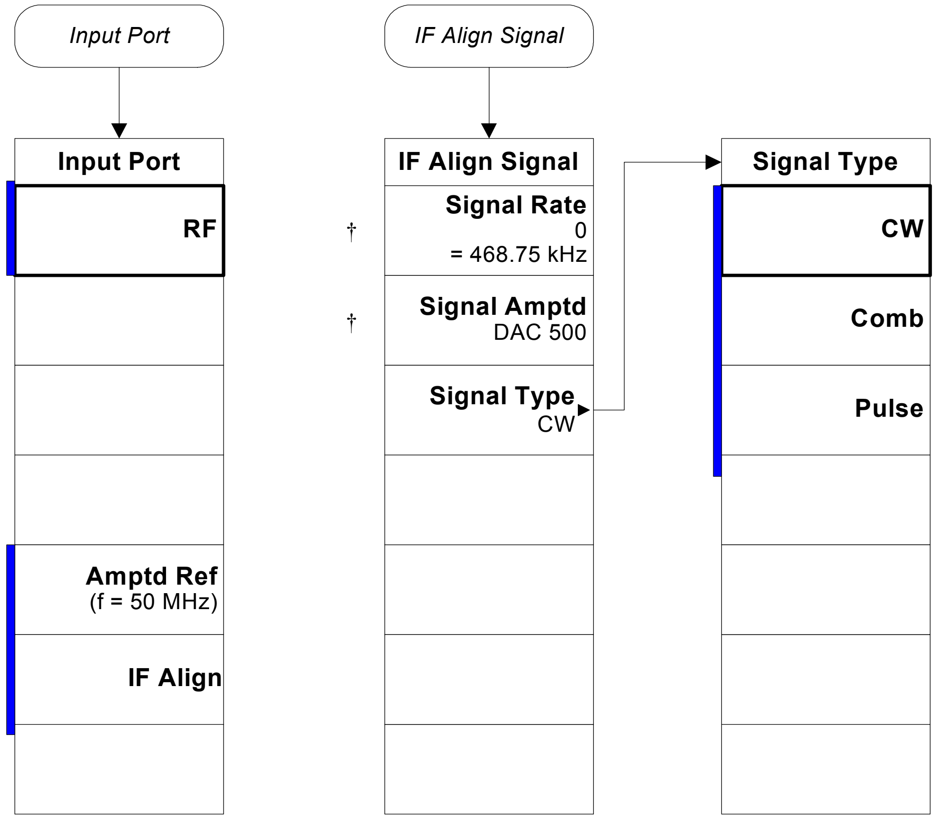
< Mode_Setup_Demod_3 >

Figure 5-8 **Mode Setup Input Key Flow (1 of 2)**



< Input_1 >

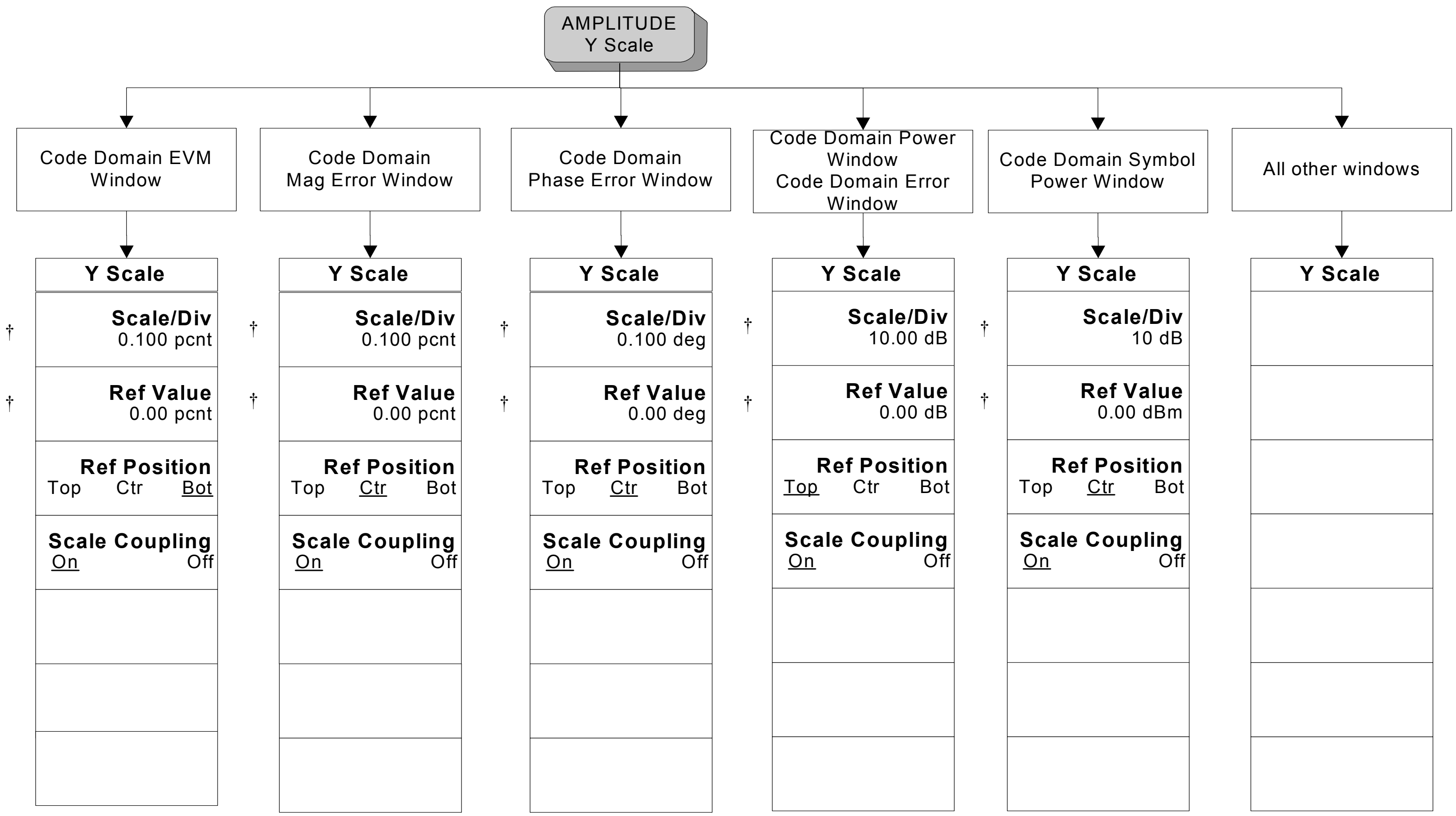
Figure 5-9 Mode Setup Input Key Flow (2 of 2)



< Input_2 >

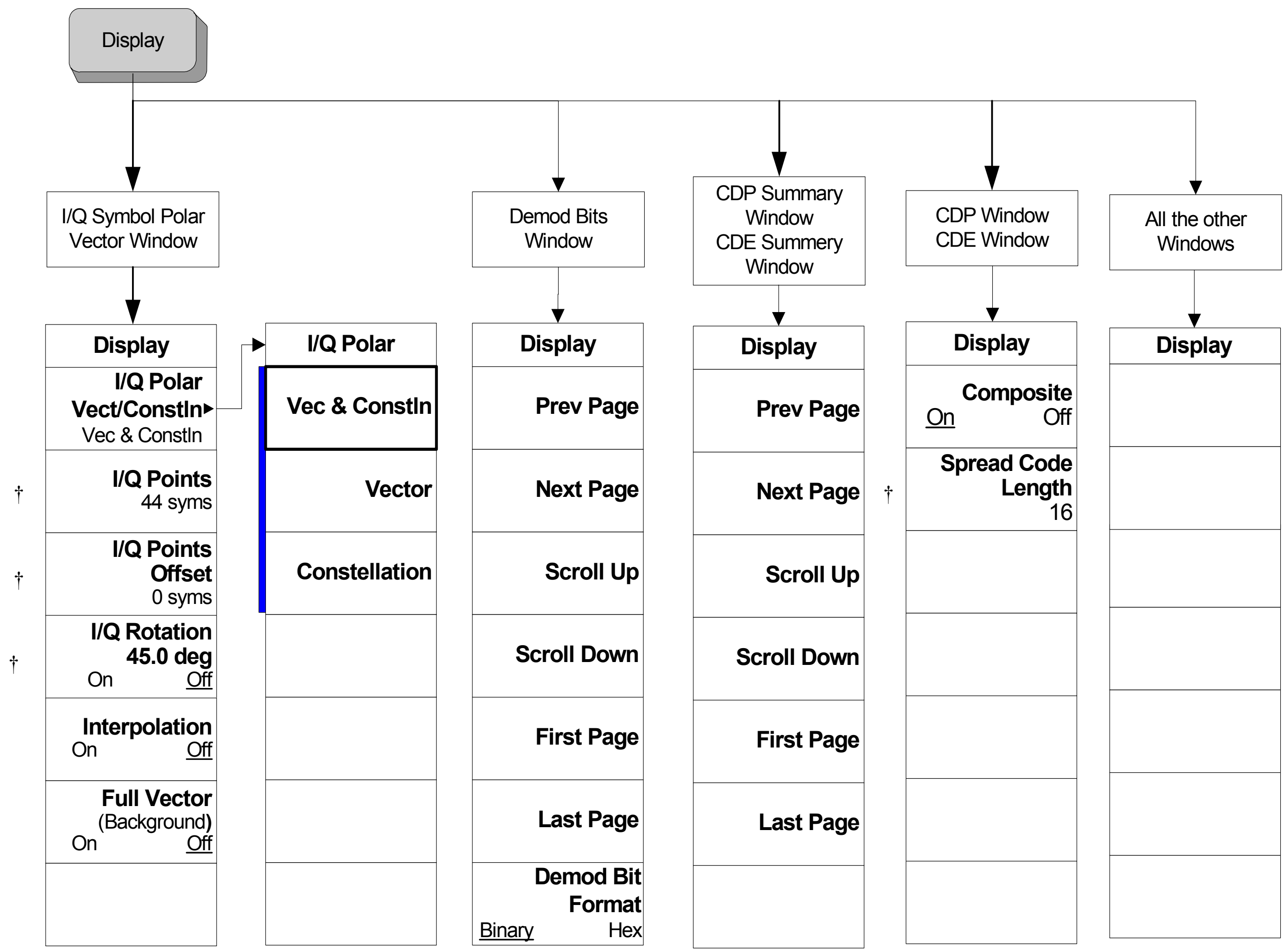
Menu Maps

Figure 5-10 Code Domain Amplitude Selection Key Flow



< Amplitude_CodeDomain >

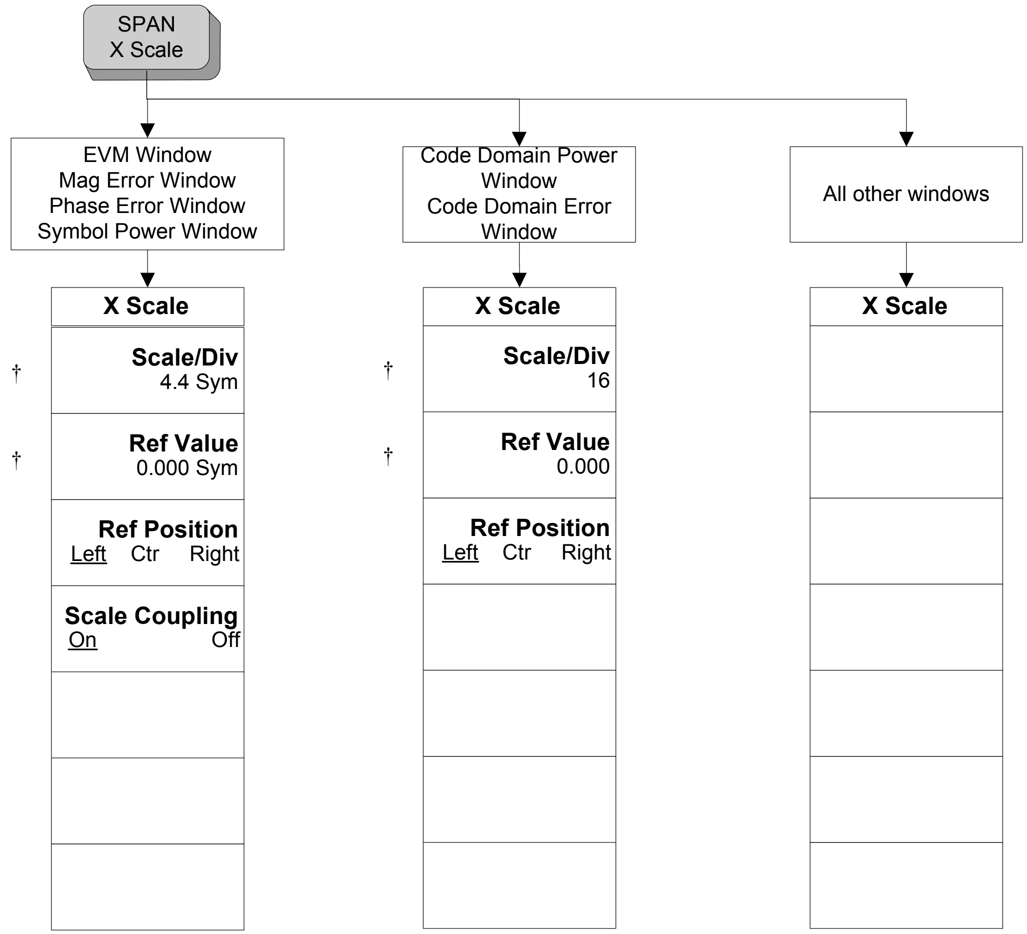
Figure 5-11 Code Domain Display Selection Key Flow



< Display_CodeDomain >

Menu Maps
Menu Maps

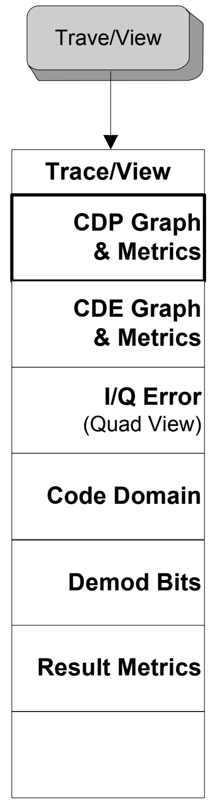
Figure 5-12 Code Domain Span Selection Key Flow



< Span_CodeDomain >

Menu Maps
Menu Maps

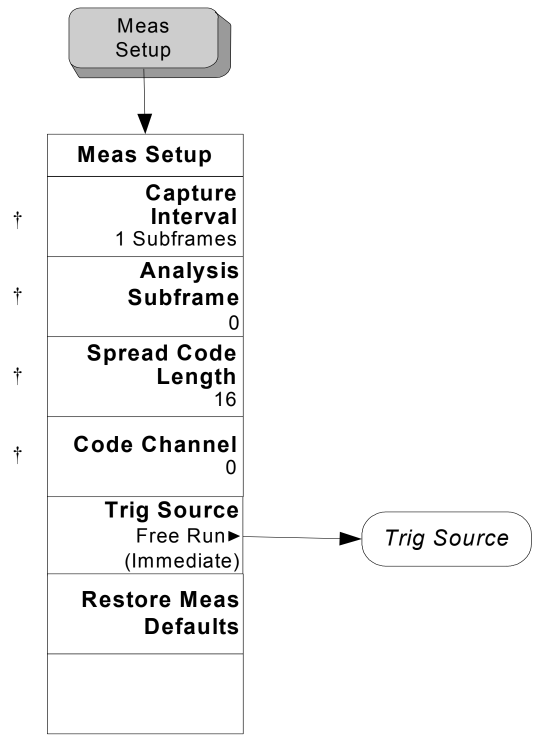
Figure 5-13 **Code Domain Trace/View Selection Key Flow**



< TraceView_CodeDomain >

Menu Maps

Figure 5-14 Code Domain Measurement Setup Key Flow



< Meas_Setup_CodeDomain >

Menu Maps

Figure 5-15 Modulation Accuracy Amplitude Selection Key Flow

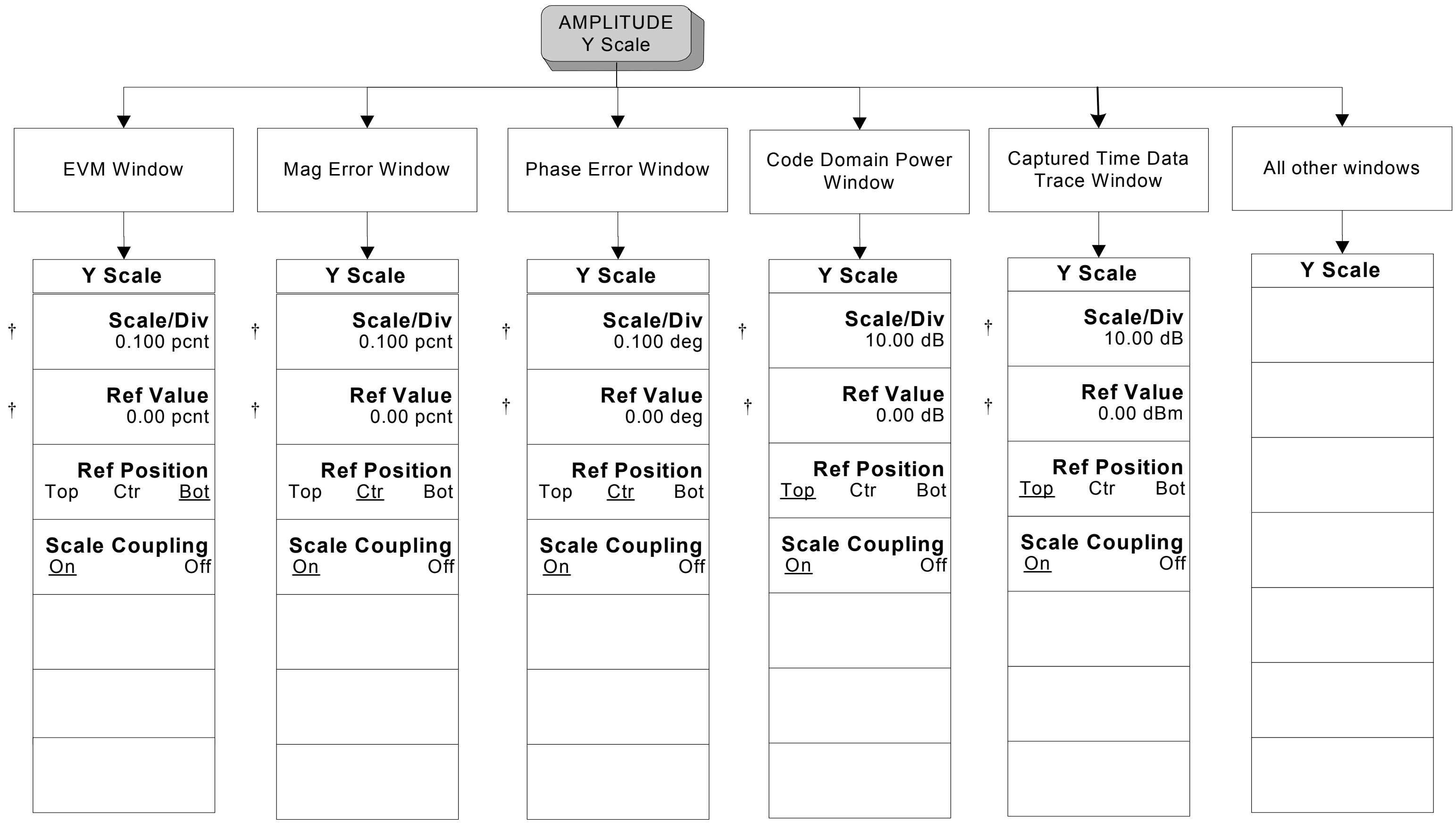
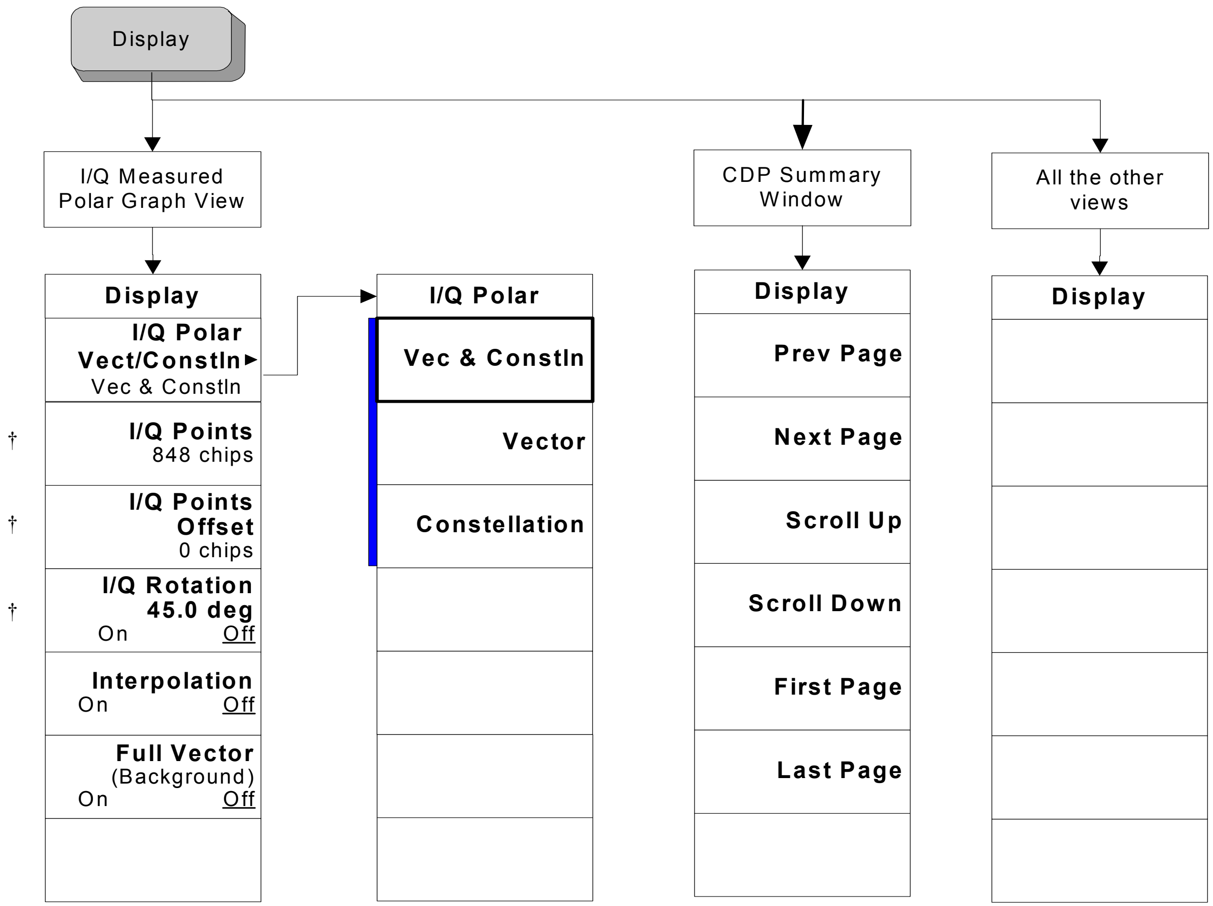
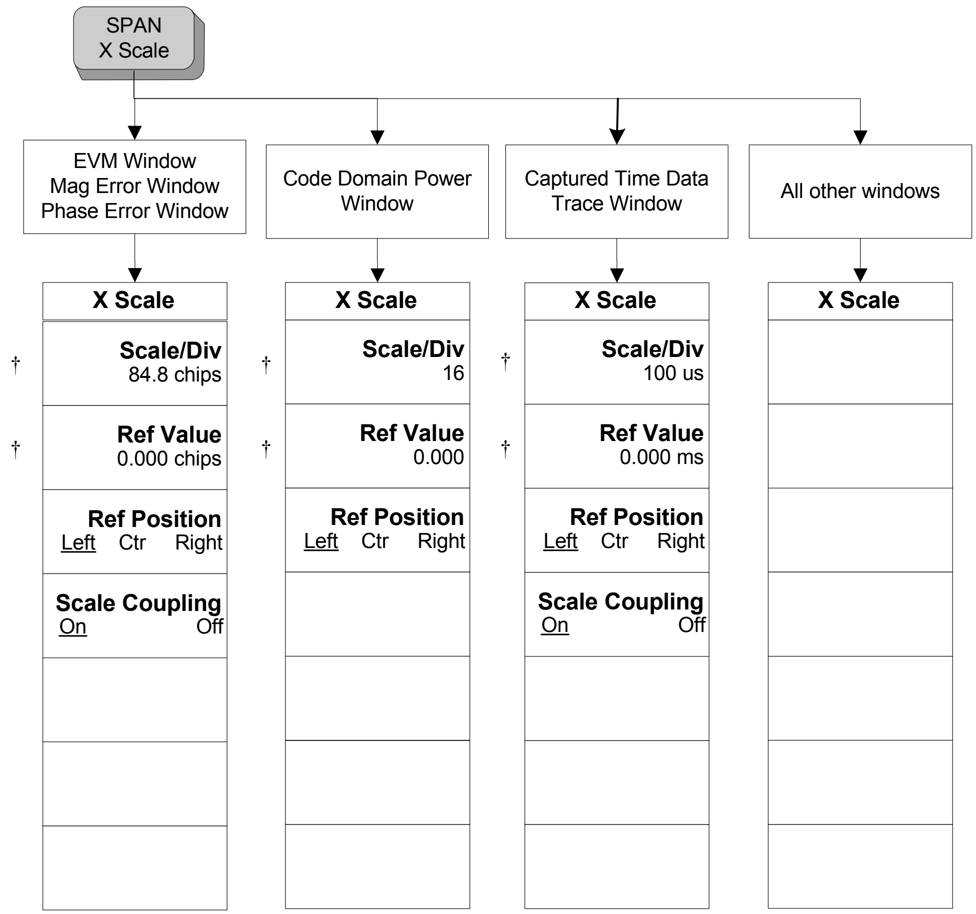


Figure 5-16 Modulation Accuracy Display Selection Key Flow



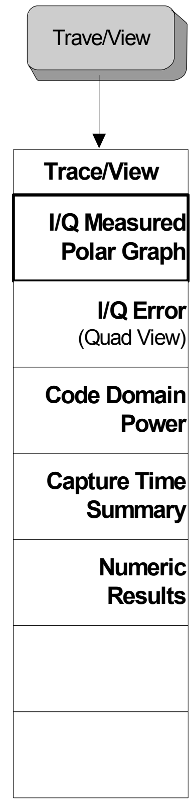
< Display_EVM >

Figure 5-17 Modulation Accuracy Span Selection Key Flow



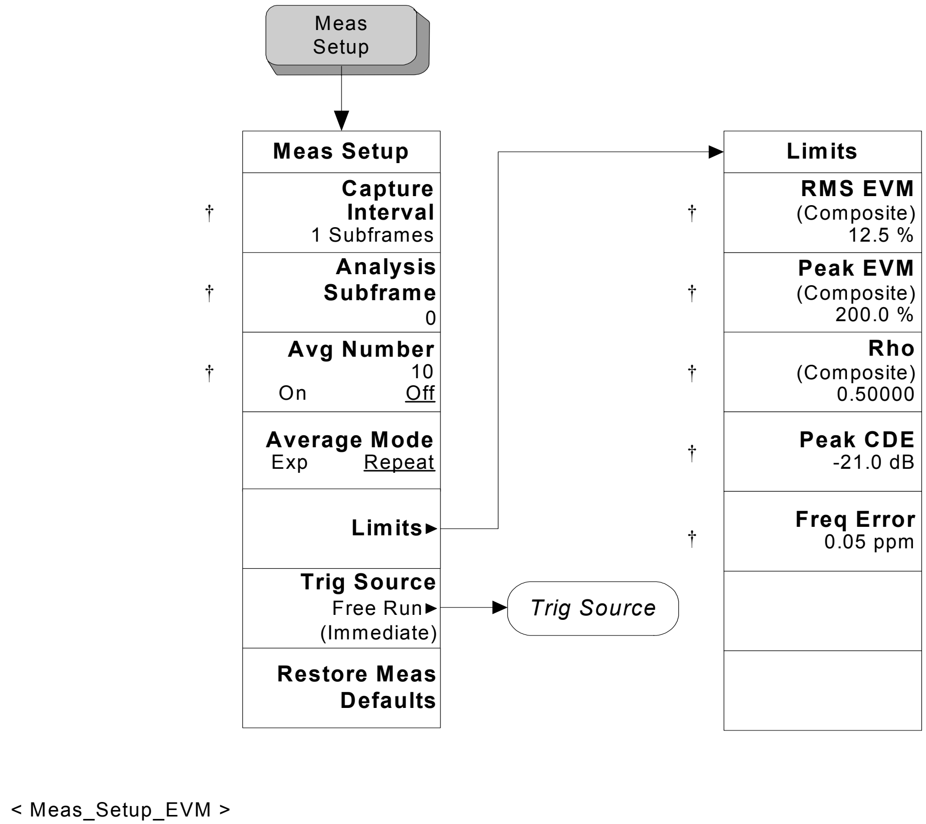
< Span_EVM >

Figure 5-18 Modulation Accuracy Trace/View Selection Key Flow



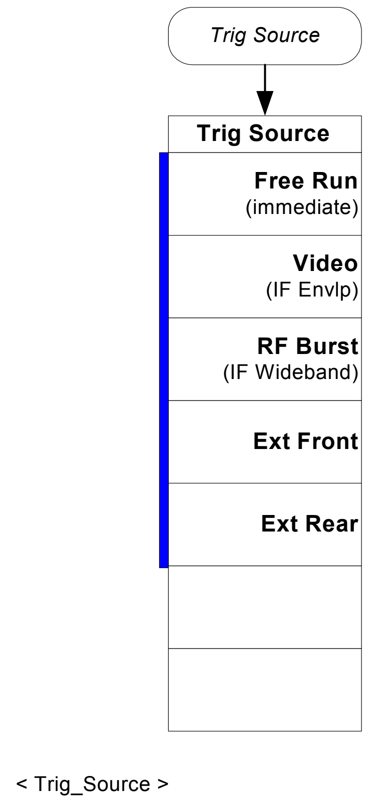
< TraceView_EVM >

Figure 5-19 Modulation Accuracy Measurement Setup Key Flow (1 of 2)



Menu Maps

Figure 5-20 Modulation Accuracy Measurement Setup Key Flow (2 of 2)



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