Agilent
PSA Series Spectrum Analyzers
TD-SCDMA Measurement Personalities

Technical Overview with Self-Guided Demonstration
Option 211
Option 212
Option 213

Agilent's PSA Series spectrum analyzers offer the most comprehensive and easy-to-use solution for performingTD-SCDMA measurements in a single analyzer. The TD-SCDMA measurement personalities provide one-button standards-based power and modulation measurements for complex TD-SCDMA signals, including HSDPA/8PSK.

Agilent Technologies

Use the TD-SCDMA Personalities to Evaluate Your Designs Quickly and Thoroughly For Fast Development Completion.

TD-SCDMA (time division synchronous code division multiple access) is a wireless multiple access technology, originally based on the China Wireless Telecommunication Standard Group (CWTS) TSM V3.1.0/NTDD standard, which combines aspects of code division multiple access (CDMA) and time division multiple access (TDMA). It has also been adopted by 3GPP as N-TDD 1.28 Mcps. The PSA Series TD-SCDMA measurement personalities provide a one-analyzer solution to perform essential power measurements on complex TD-SCDMA signals. These measurement personalities enables the user to:

- Facilitate the design, development, and deployment of TD-SCDMA systems
- Expand design possibilities with powerful measurement capability and flexibility
- Expedite troubleshooting and design verification with numerous features and an intuitive user interface
- Simplify test systems with RF power measurements, modulaiton analysis measurements, spur searches, and general high-performance spectrum analysis in one analyzer

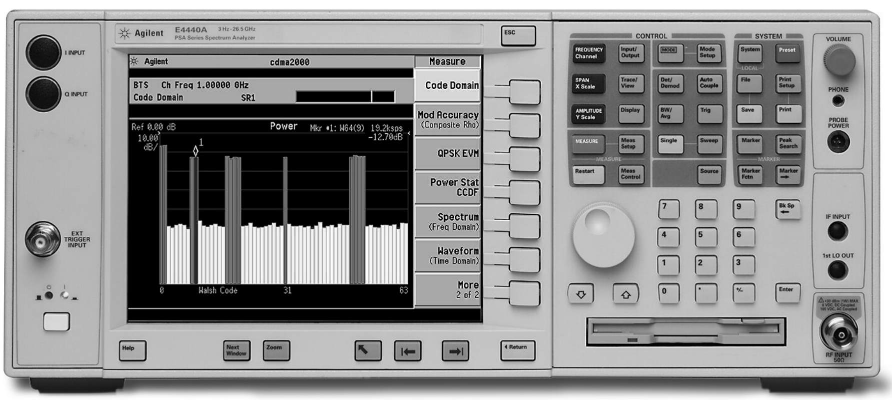
The Agilent PSA Series offers high performance spectrum analysis up to 50 GHz with powerful one-button measurements, a versatile feature set, and a leading-edge combination of flexibility, speed, accuracy, and dynamic range. Expand the PSA Series high-performance spectrum analyzer to include TD-SCDMA power measurements (Option 211), TD-SCDMA modulation analysis (Option 212), and HSDPA/8PSK for TD-SCDMA modulation analysis (Option 213). Measurements may be performed on both uplink and downlink signals.

TD-SCDMA technical background information page 3

Demonstration preparation page 5

Transmit power page 7

Power versus time page 8



PSA Series high-performance spectrum analyzer

Adjacent channel power page 9

Multi-carrier power page 10

Spurious emissions page 11

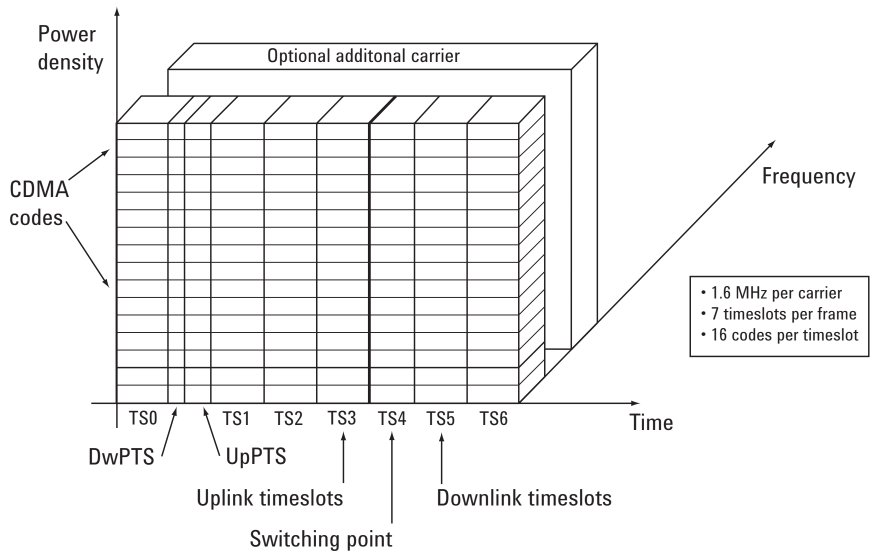
Spectrum emission mask page 12

TD-SCDMA technical background information

TD-SCDMA is a mobile radio format developed by the China Academy of Telecommunication and Technology (CATT). TD-SCDMA combines a TDMA and CDMA component to provide more efficient use of resources by dynamically adapting to both symmetric and asymmetric traffic loads. There are seven time slots (numbered 0 through 6) in a single five ms long frame, and within each time slot there are up to 16 code channels that are available to allocate to a single user or to distribute among multiple users. Time division duplexing is used to separate uplink and downlink periods in a given time frame. 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. In TD-SCDMA, the chip rate is 1.28 Mcps and each carrier signal occupies 1.6 MHz
bandwidth.

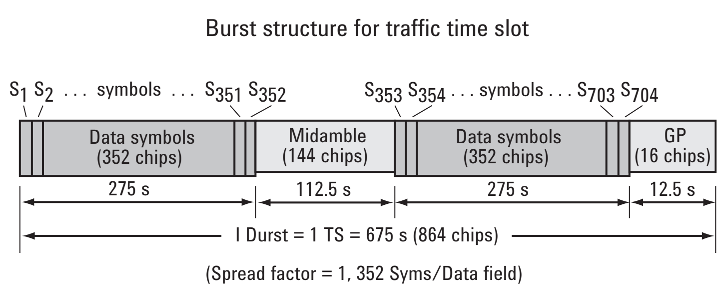
The first time slot in a frame, time slot 0, is always allocated to downlink traffic. Also included in each five ms frame are two additional time slots, the downlink pilot timeslot (DwPTS) and the uplink pilot timeslot (UpPTS), which are separated by a 75 µs guard period. The DwPTS and UpPTS are separated 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. Figure 1 illustrates the time, frequency, and power characteristics of a TD-SCDMA signal, highlighting the sequence of traffic and pilot timeslots in a given frame.

Figure 1.
TD-SCDMA resource unit structure



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 multipath interference. The midamble is used as a training sequence for channel estimation, power measurements, and synchronization. Figure 2 illustrates the burst structure for a traffic time slot.

Figure 2.
Burst structure for traffic time slot



TD-SCDMA technical background information – continued

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. The downlink pilot time slot is shown in Figure 3.

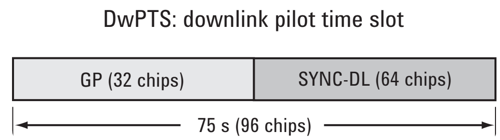


Figure 3.
Downlink pilot time slot

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 eight codes. The base station receives initial beam forming parameters from this signal. This time slot is 125 μs long. Figure 4 shows the structure of the uplink pilot time slot.

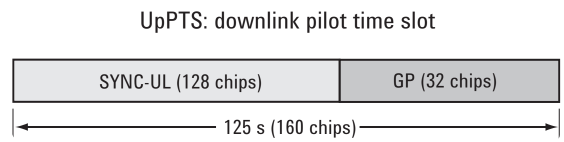


Figure 4.
Uplink pilot time slot

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 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.

Since the adoption of TD-SCDMA by the 3GPP body, the standard has continued to evolve. Newer features such as HSDPA (High Speed Downlink Packet Access) and H-ARQ (Hybrid Automatic Repeat reQuest) enable high data rate applications to be used in the downlink. HSDPA is enabled through the use of higher-order modulation techniques, such as 8PSK and 16QAM.

Demonstration preparation

All demonstrations use the PSA Series & E4438C ESG vector signal generator; keystrokes surrounded by [ ] indicate front-panel hard keys; keystrokes surrounded by { } indicate soft keys on display. An Agilent MXG N5182A vector signal generator may also be used.

Connect the PC, PSA and ESG

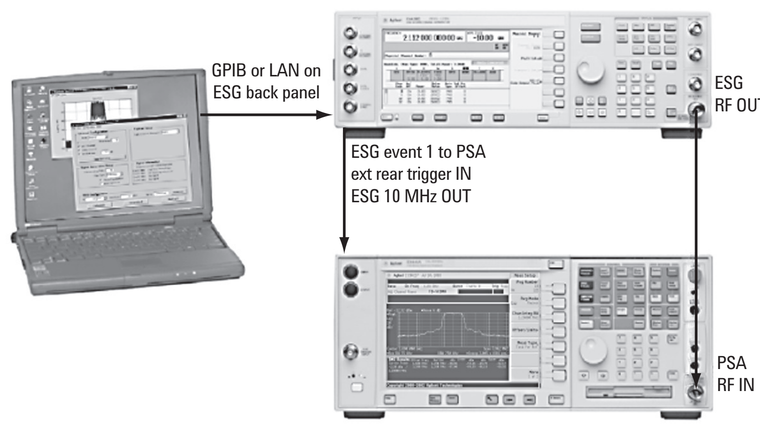
Connect a PC (loaded with N7612B Agilent Signal Studio for 3GPP TD-SCDMA software and Agilent I/O libraries) to the E4438C ESG via GPIB or LAN. The setup procedure used in this guide assumes the LAN interface is used. To use LAN interface from Signal Studio, set up LAN Client with I/O Configuration of Agilent I/O Library. Perform the following steps to interconnect the PSA and ESG (see Figure 5 for a graphical overview):

- Connect the ESG RF Output port to the PSA RF Input port
- Connect the ESG 10 MHz Out to the PSA Ext Ref In port
- Connect the ESG Event Trigger 1 port to the PSA Ext Trigger Input (front panel)

See figure for diagram of this setup.

Product type	Model number	Required options
ESG vector signal generator	E4438C firmware revision C0.2.51 or later	N7612B-3FP and either N7612B-EFP or N7612B-QFP
OR		
MXG vector signal generator	N5182A	N7612B-1FP and either N7612B-EFP or N7612B-QFP
PSA Series spectrum analyzer	E4440A/E4443A/ E4445A/ E4446A/E4447A/E4448A	B7J - Digital demodulation hardware 211 - TD-SCDMA measurement personality 212 - TD-SCDMA modulation analysis measurement personality 213 - HSDPA/8PSK for TD-SCDMA modulation analysis

Figure 5. Demonstration setup



Demonstration preparation – continued

E4438C ESG setup

Agilent Signal Studio for 3GPP TD-SCDMA is a Windows®-based utility that simplifies the creation of standards-based or customized TD-SCDMA waveforms. The Signal Studio software is used to configure the TD-SCDMA signal and then the parameters are downloaded into the ESG signal generator, which creates the desired waveform.

Instructions on the ESG:

Configure the desired signal parameters using the Signal Studio software on a PC. Detailed instructions on how to use the software, including examples illustrating the configuration of test signals, are provided with the Signal Studio software.

Instructions	Keystrokes
On the ESG:	
Preset the ESG.	[Preset]
Check the IP address.	[Utility] {GPIB/RS-232/LAN} {LAN Setup} e.g., {IP address 192.168.100.1}
On the Signal Studio software	
Run the Agilent Signal Studio for 3GPP TD-SCDMA.	Double-click on the TD-SCDMA shortcut on the desktop or access the program via the Windows® start menu.
Verify that the software is communicating with the instrument via the LAN TCP/IP link.	To establish a new connection, click on the {System} pull-down menu at the top of the Signal Studio program window. Next, select {Run System Configuration Wizard}.
On the Signal Studio software	
Set the amplitude to -10 dBm.	In the ESG Configuration block: Enter the value numerically or use the up/down arrows to change the default value to –10.00 dBm
Disable the uplink pilot timeslot (UpPTS).	Under Waveform Setup, Carrier 0, click on UpPTS. Make sure the state is set to OFF.
Send the TD-SCDMA configuration parameters to the ESG.	Click Apply
Enable a signal with one timeslot enabled, as an example.	Settings for the Resource Units (RU) can be changed by clicking on each timeslot on the left-side of the window.

Transmit power

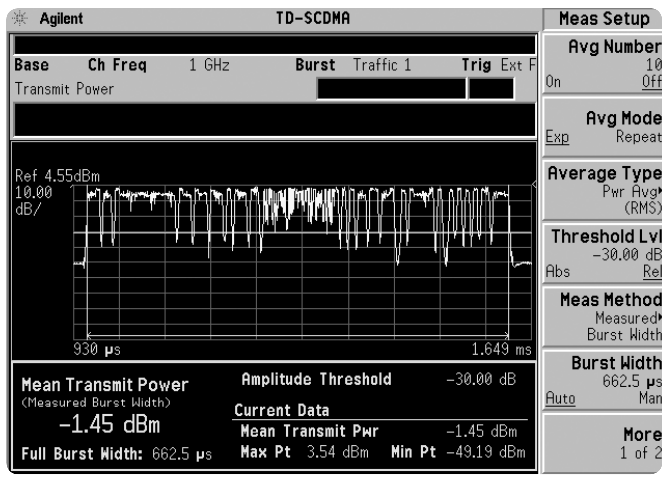
The transmit power measurement is a highly accurate measure of the average power in a specified RF burst. Power control is essential to optimize a link budget and minimize intra-cell and inter-cell interference, thus maximizing capacity.

- Measure traffic slots, UpPTS, and DwPTS slots
- View a single burst or a complete ten ms frame
- Display results as minimum, maximum, and mean values
- Trigger from RF burst or an external trigger source
- Enable RMS or log averaging

Quickly and accurately determine the power control parameter using the transmit power measurement. Figure 6 illustrates a single traffic burst Transmit Power measurement.

Instructions	Keystrokes
On the PSA:	
Perform the factory preset.	[System] {Power On/Preset} {Preset Type} {Factory} [Preset]
Enter the TD-SCDMA mode in the analyzer.	[MODE] {More} (if necessary) {TD-SCDMA}
Activate transmit power measurement (This is the default measurement selected upon entering TD-SCDMA mode after instrument presetting).	{Transmit Pwr}
Change the burst type to downlink pilot.	[FREQUENCY] {Burst Type} {Downlink Pilot}
Examine settings (figure 6) Use this step to make setup changes in any measurement.	[Meas Setup]

Figure 6.
Single traffic timeslot transmit power measurement



Power versus time

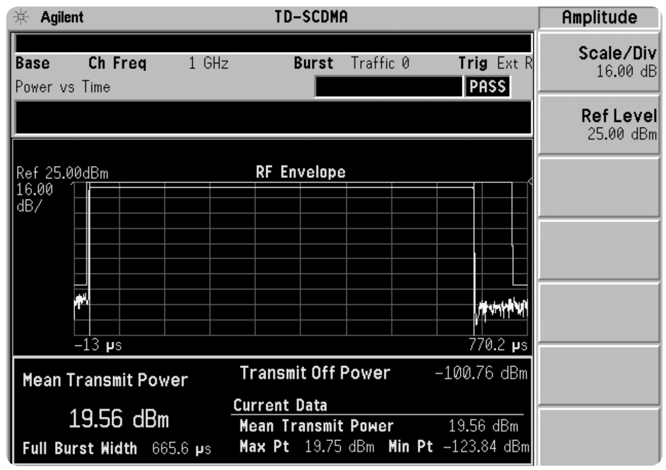
Timing is critical in a multi-slot, bursted transmission format such as TD-SCDMA. A bursted signal in a given time slot must fit within a tight mask so as not to interfere with adjacent time slots. The TD-SCDMA standard has a stringent dynamic range requirement of 112 dB, not possible with a conventional swept measurement. This measurement personality combines two sweeps, one optimized to measure noise and the other optimized to measure the signal, in order to achieve the dynamic range requirement. The measurement provides a visual display of power versus time, exhibiting the power variations throughout the burst. It also provides a pass/fail function to quickly indicate if the signal is entirely within the on-screen mask and conformant to the standard. See Figure 6 for an instrument screen capture of this measurement.

- Use a standard-compliant, consecutive timeslot power versus time mask
- Measure traffic slots, UpPTS, and DwPTS slots
- View a single burst or a complete ten ms frame
- Trigger from an external trigger source
- User-adjustable mask delay

Perform essential power versus time measurements with this feature, focusing on a single burst or an entire frame.

Instructions	Keystrokes
On the PSA:	
Activate power versus time measurement.	[MEASURE] {Pwr vs Time}
Use this step to make setup changes in any measurement.	[Meas Setup]

Figure 7.
Power versus time measurement for one timeslot



Adjacent channel power

Adjacent channel power (ACP) is a measurement of the power in channels adjacent to the transmit channel. Power leakage from one channel causes interference to other channels and reduces base station efficiency. This measurement displays both the relative and absolute power levels in up to six adjacent channel pairs, in a graphical and tabular format.

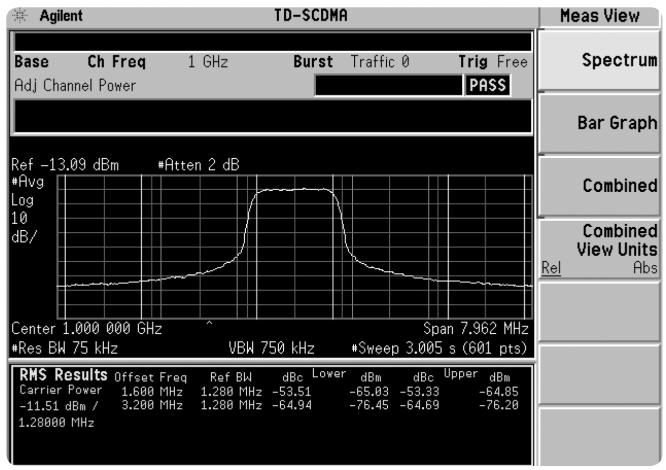
The ACP measurement provides:

- Default standard-compliant limit lines
- Limit line customization of up to six offsets (relative and absolute)
- Absolute, relative, absolute or relative, or absolute and relative fail masks
- The ability to examine traffic timecslots or pilot time slots (UpPTS or DwPTS)

Monitor adjacent channel emissions using this measurement.

Instructions	Keystrokes
On the PSA:	
Activate adjacent channel power measurement.	[MEASURE] {ACP}
Expand spectrum view.	[Next Window] (until spectrum display is highlighted in green), [Zoom] (press again to return)
Enable combined spectrum and bar graph view.	[View/Trace] {Combined}
Examine setting (figure 8) Use this step to make setup changes in any measurement.	[Meas Setup]

Figure 8.
Adjacent channel power measurement



Multi-carrier power

Multi-carrier power (MCP) is similar to adjacent channel power, but measures the power in two or more transmit channels and the power that leaks into their adjacent channels. It is used to monitor power amplifiers that transmit two or more carriers simultaneously.

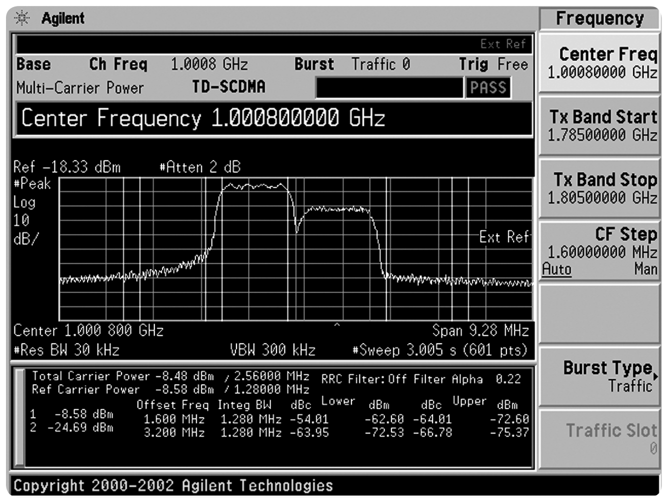
The MCP measurement:

- Defaults to standard-compliant limit lines
- Supports up to 12 carriers
- Allows limit line customization of up to three offsets (relative and absolute)

Eliminate tedious and time-consuming calculations using the multi-carrier power measurement.

Instructions	Keystrokes
On the PSA:	
Activate multi carrier power measurement.	[MEASURE] {Multi Carrier Power}
View results in bar graph format.	[Trace/View] {Combined}

Figure 9.
Multi-carrier power measurement



Spurious emissions

This spurious emissions measurement simplifies the location and identification of spurs in certain frequency bands. The range of frequencies to search for spurs within is user-adjustable, and up to 200 spurs can be reported.

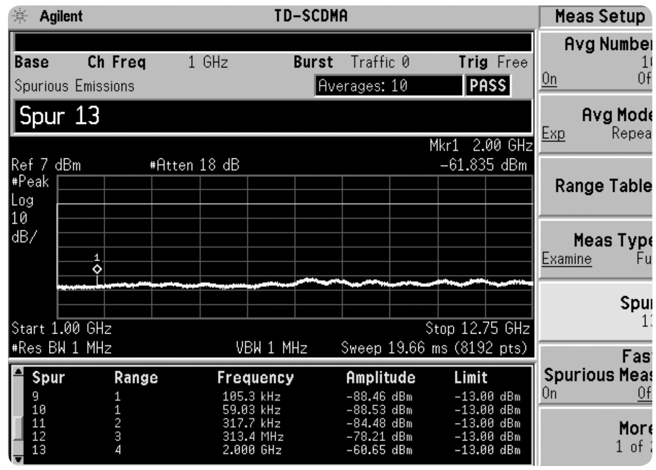
The spurious emissions measurement:

- Has standard-compliant user-defined Txband parameters
- Performs measurements conformant to TSM MS General & Additional Spurious Emissions Requirements
- Performs measurements conformant to TSM BTS Mandatory Spurious Emissions Limit Category A
- Allows for post-measurement spur examination
- Has a fast spur measure feature

Perform fast spur searches using this one-button measurement.

Instructions	Keystrokes
On the PSA:	
Activate spurious emissions measurement.	[MEASURE] {Spurious Emissions}
Conduct fast spurious emissions measurement.	[Meas Setup] {More} {Fast Spurious Meas}

Figure 10.
Spurious emissions measurement



Spectrum emission mask

The spectrum emission mask (SEM) measurement measures spurious emissions in specified frequency ranges and displays the power of the spurious emissions in those bands. The spectrum emission mask measurement required by the TD-SCDMA standard specifies different power limits in different frequency bands. This measurement simplifies the verification of compliance to the standard and provides visual indication of pass/fail status, eliminating the need for tedious and time-consuming hand calculations.

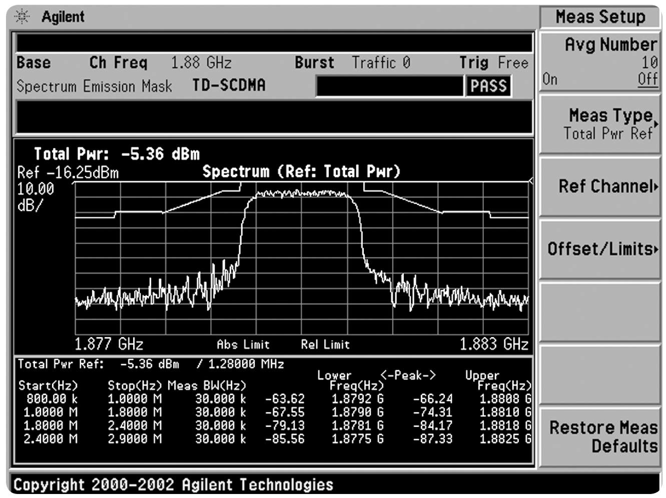
With the spectrum emission mask measurement:

- View spectrum and tabular results simultaneously on a single screen
- Select average (and number of averages) or peak detector
- Adjustable offset frequency, reference bandwidth, and limit values (relative and absolute)
- Use a standard-compliant SEM for BTS and MS

Verify standard compliance using a pass/fail indicator with this measurement.

Instructions	Keystrokes
On the PSA:	
Activate spectrum emission mask measurement.	[MEASURE] {Spectrum Emission Mask}

Figure 11.
Spurious emissions mask measurement

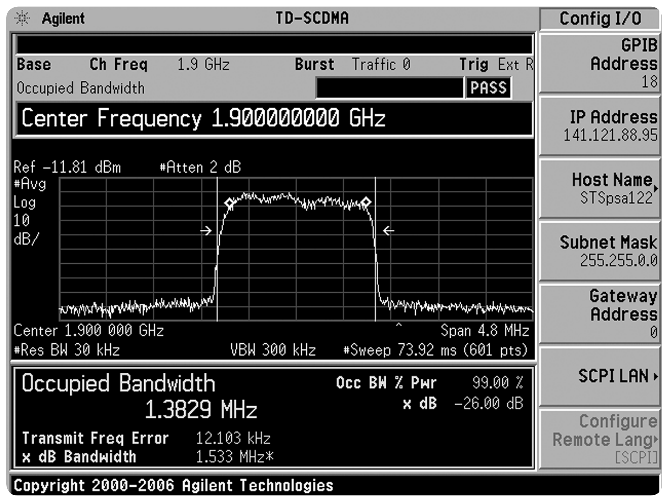


Occupied Bandwidth

The occupied bandwidth (OBW) measurement allows the user to quickly verify that a signal is within the standard-defined channel bandwidth and does not interfere intoadjacent channels due to its own modulated spectrum. The OBW measurement provides pass/fail indicators and gives a large, clear readout of the occupied bandwidth. The percentage of total signal power reported can be adjusted by the user. An adjustable x-dB down bandwidth readout is also displayed.

Instructions	Keystrokes
Activate spectrum emission mask measurement	[Meas] {Occupied BW}
User-adjustable parameters are conveniently accessed using the measurement setup key	{Meas Setup}

Figure 12.
Occupied bandwidth measurement



Modulation Accuracy/Composite EVM Measurement

Measurements of signal modulation accuracy and quality are necessary to meet standard-defined tests, ensure proper operation of devices such as base stations and userequipment, and maximize system capacity. PSA Option 211, TD-SCDMA modulation analysis, provides measurements such as composite EVM, QPSK EVM, code domain power, code domain error, and more.

Instructions	Keystrokes
Enter the TD-SCDMA modulation analysis mode in the PSA spectrum analyzer	[Mode] {More} (if necessary) {TD-SCDMA Modulation } or {TD-SCDMA Modulation with HSDPA} if Option 213 is installed
Activate the composite EVM measurement	[Meas] {Modulation Accuracy (Composite EVM)}
Analyze the desired timeslot	[Mode Setup] {Demod} {Analysis Timeslot}, then select the desired timeslot
The default view is of the I/Q measured polar vector and a results summary. Switch to the IQ error view	[Trace/View] {IQ Error (Quad View)}
Switch to the numeric results view	[Trace/View] {Numeric Results}
Switch to the capture time summary view	[Trace/View] {Capture Time Summary}

Figure 13.
I/Q measured polar view showing composite constellation

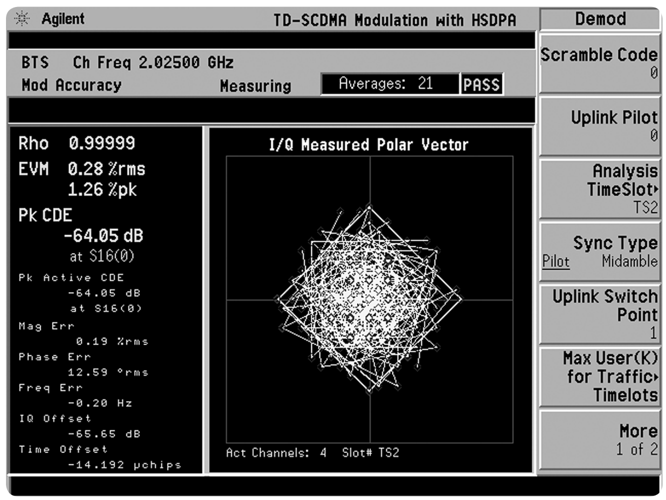


Figure 14.
Numeric results view shows details of signal quality parameters

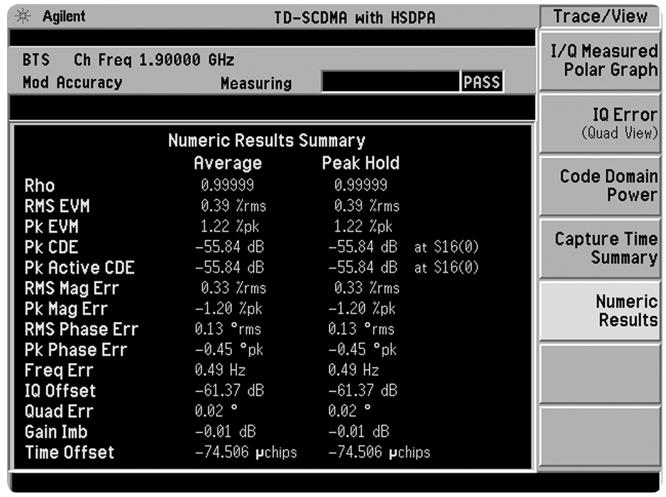
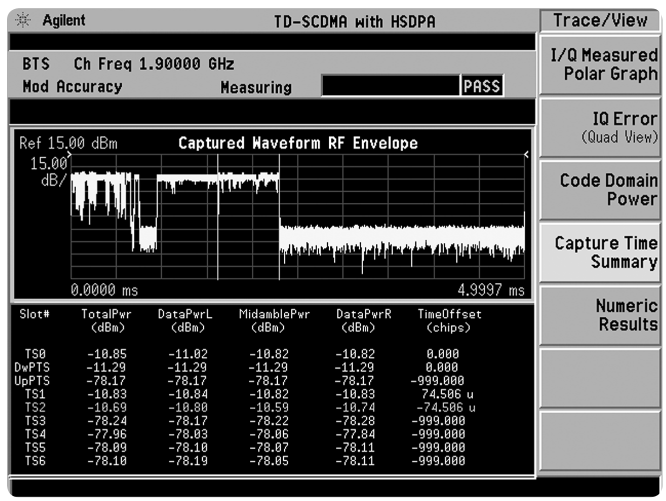


Figure 15.
Capture time summary view shows timeslot analyzed and parameters for the entire frame



Code Domain Measurements

The code domain measurement provides results such as absolute and relative code domain power, code domain error, number of active channels, channel constellation anderror views, symbol power, demod bits, and more. If Option 213 is installed, then analysis of HSDPA/8PSK signals is possible.

Instructions	Keystrokes
Activate the code domain measurement	[Meas] {Code Domain}
Ensure the desired timeslot is selected	[Mode Setup] {Demod} {Analysis Timeslot}, then select the desired timeslot
The default view is of the CDP graph and metrics windows. Switch to the IQ error view	[Trace/View] {IQ Error (Quad View)}
Switch to the code domain view. The modulaiton type is automatically detected	[Trace/View] {Code Domain}
Switch to the result metrics view	[Trace/View] {Result Metrics}

Figure 16.
Code domain power view shows active and inactive channels, and power metrics of active channels

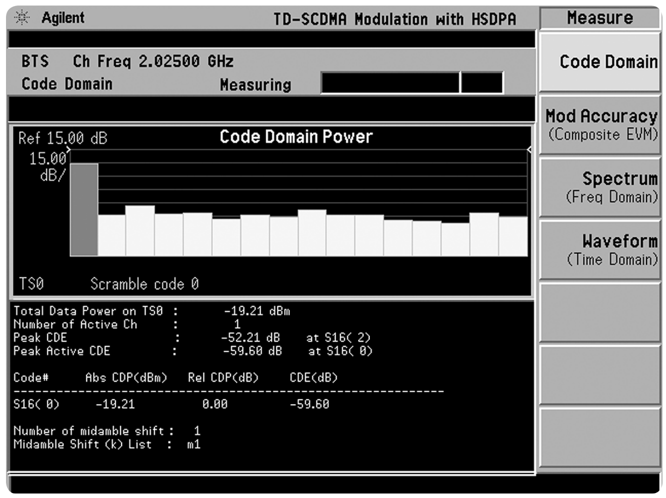


Figure 17.
I/Q error view shows channel magnitude error, phase error, and EVM

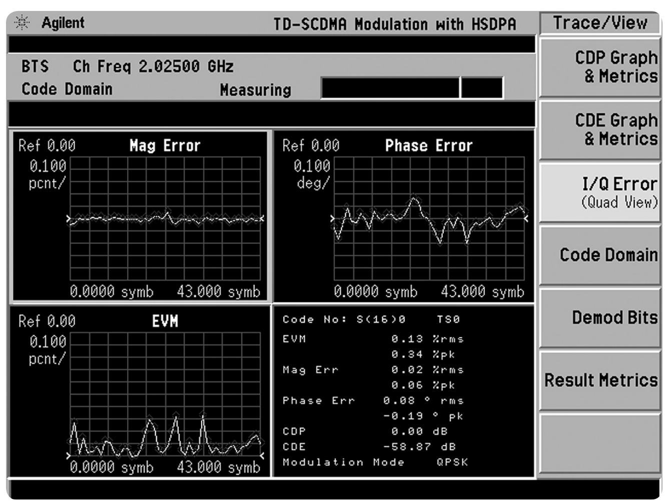


Figure 18.
Code domain view showing HSDPA channel with 16QAM modulation

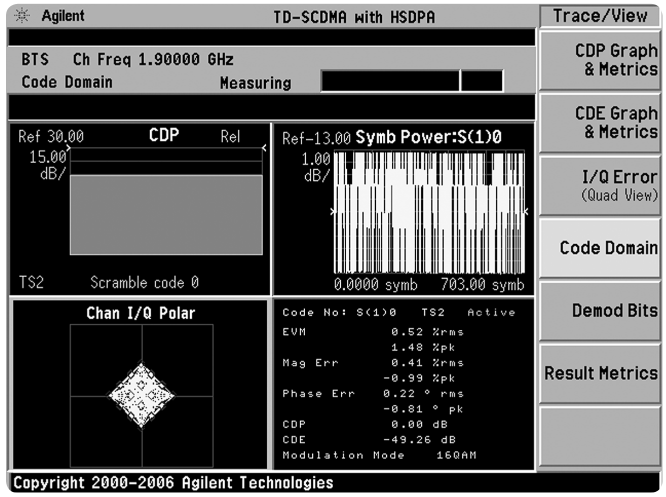
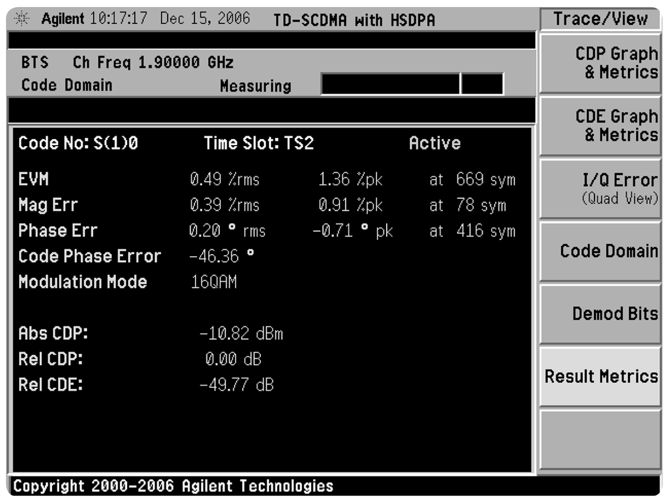


Figure 19.
Result metrics view shows channel parameters including modulation quality, modulation type, and power metrics



Specifications

General

Standards compliant 1.28 Mcps 3GPP N-TDD
Device types: MS, BTS
Automatic Input & ref level setting
User defined Tx band start/stop

Option 211 specifications summary

Power versus time
Mask supports consecutive timeslots (standards compliant)
Burst types: traffic, UpPTS, DwPTS
Support full radio frame mask (10 ms)
Tx Off power result
Result type: min, max, mean
Standards compliant dynamic range[1] (–82 dBm off power)
Trigger: External (front or rear)
Mask user definable[2]
Average type
Average mode
Markers: normal, delta

NOTE: RRC filter not supported

Transmit power
Burst types: traffic, UpPTS, DwPTS
Support full radio frame mask (10 ms)
Methods: above threshold, burst width
Result type: min, max, mean
Trigger: xxternal (front or rear), RF burst
Average type
Average mode
Markers: normal, delta

NOTE: Root raised cosine (RRC) filter not supported

Adjacent channel power (ACP)
Standards compliant default limits
RRC filter support
Average type
Limits customizable up to six offsets (relative and absolute)
Result representation: total power ref, PSD ref
Meets "minimum ACLR requirement (limit values)"

Multi channel power (MCP)
Standards compliant default limits
Support of up to 12 carriers
RRC filter support
Average type
Limits customizable up to three offsets (relative and absolute)
Meets "minimum ACLR requirement (limit values)"

Spurious emissions
Standard-compliant based on user defined Tx band parameters
"MS general & additional spurious emissions requirements"
"BS mandatory spurious emissions limits category A"
User definable range table
Support trace averaging
Post measurement spur examination

Spectrum emission mask
Standard-compliant based on user defined Tx band parameters
Standard-compliant SEM for MS and BTS
(Note: BTS max output power < 31 dBm)
Limits customizable (relative and absolute)
Markers: normal, delta

Occupied bandwidth
User-adjustable occupied bandwidth power percentage
Supports trace averaging
Adjustable x dB bandwidth readout

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1. Option 1DS required
2. Mask is definable using remote commands only

Specifications
– continued

Options 212 and 213 specifications summary

Code domain
Relative power accuracy < 0.1 dB (nominal)

Modulation accuracy
Composite EVM accuracy (1 DPCH per timeslot) ±1.0 % (nominal)
Composite EVM accuracy (4 HS-PDSCH per timeslot) ±1.0 % (nominal)

PSA Series Ordering Information

PSA Series spectrum analyzer

E4443A 3 Hz to 6.7 GHz
E4445A 3 Hz to 13.2 GHz
E4440A 3 Hz to 26.5 GHz
E4447A 3 Hz to 42.98 GHz
E4446A 3 Hz to 44 GHz
E4448A 3 Hz to 50 GHz

Options

To add options to a product,
use the following ordering scheme:
Model E444xA (x = 0, 3, 5, 6, 7 or 8)
Example options E4440A-B7J, E4448A-1DS

Warranty & Service

Standard warranty is three years.

R-51B-001-3C	Warranty Assurance Plan, Return to Agilent, 5 years

Calibration [1]

R-50C-011-3	Calibration Assurance Plan, Return to Agilent, 3 years
R-50C-011-5	Calibration Assurance Plan, Return to Agilent, 5 years
R-50C-016-3	Agilent Calibration + Uncertainties + Guardbanding, 3 years
R-50C-016-5	Agilent Calibration + Uncertainties + Guardbanding, 5 years
AMG	Agilent Calibration + Uncertainties + Guardbanding (accredited calibration)
A6J	ANSI Z540-1-1994 Calibration
R-50C-021-3	ANSI Z540-1-1994 Calibration, 3 years
R-50C-021-5	ANSI Z540-1-1994 Calibration, 5 years
UK6	Commercial calibration certificate with data To be ordered with PSA
E444xA-0BW	Service manual
R-52A	Calibration software and licensing (ordered with PSA)
N7810A	PSA Series calibration application software (stand-alone order)

Measurement Personalities

E444xA-226	Phase noise	
E444xA-219	Noise figure	Requires Option IDS or 110 to meet specifications
E444xA-241	Flexible digital modulation analysis	
E444xA-BAF	W-CDMA	Requires Option B7J
E444xA-210	HSDPA/HSUPA	Requires Options B7J and BAF
E444xA-202	GSM w/ EDGE	Requires Option B7J
E444xA-B78	cdma2000®	Requires Option B7J
E444xA-214	1xEV-DV	Requires Options B7J and B78
E444xA-204	1xEV-DO	Requires Option B7J
E444xA-BAC	cdmaOne	Requires Option B7J
E444xA-BAE	NADC, PCD	Requires Option B7J
E444xA-217	WLAN	Requires Option 122 or 140
E444xA-211	TD-SCDMA power measurements	
E444xA-212	TD-SCDMA modulation analysis	Requires Option B7J
E444xA-213	HSDPA/8PSK for TD-SCDMA	Requires Options B7J and 212
E444xA-215	External source control	
E444xA-266	Programming code compatibility suite	
E444xA-233	Built-in measuring receiver personality	
E444xA-23A	AM/FM/PM triggering	Requires Option 233
E444xA-23B	CCITT filter	Requires Options 233 and 107

Hardware

E444xA-1DS	RF internal preamplifier (100 kHz to 3 GHz)	Excludes Option 110
E444xA-110	RF/μW internal preamplifier (10 MHz to upper frequency limit of the PSA)	Excludes Option 1DS
E444xA-B7J	Digital demodulation hardware	
E444xA-122	80 MHz bandwidth digitizer	E4440A/43A/45A only, excludes Options 140, 107, and H70
E444xA-140	40 MHz bandwidth digitizer	E4440A/43A/45A only, excludes Options 122, 107, and H70
E444xA-123	Switchable MW preselector bypass	Excludes Option AYZ
E444xA-124	Y-axis video output	
E444xA-AYZ	External mixing	E4440A/47A/46A/48A only, excludes Option 123
E444xA-107	Audio input 100 kΩ	Requires Option 233 to operate; excludes Options 122 and 140
E444xA-111	USB device side I/O interface	
E444xA-115	512 MB user memory	Excludes Option 117; shipped standard in all PSA instruments with serial number prefix ≥ MY4615 unless Option 117 is installed
E4440A-BAB	Replaces type-N input connector with APC 3.5 connector	E4440A
E444xA-H70	70 MHz IF output	Excludes Options 122 and 140; not available for E4447A

PC Software

E444xA-230	BenchLink Web Remote Control Software	
E444xA-235	Wide BW digitizer external calibration wizard	Requires Option 122 E4443A/45A/40A only

Accessories

E444xA-1CM	Rack mount kit
E444xA-1CN	Front handle kit
E444xA-1CP	Rack mount with handles
E444xA-1CR	Rack slide kit
E444xA-015	6 GHz return loss measurement accessory kit
E444xA-045	Millimeter wave accessory kit
E444xA-0B1	Extra manual set including CD ROM

1. Options not available in all countries

Related Literature

Publication Title	Publication Type	Publication Number
PSA in general		
Selecting the Right Signal Analyzer for Your Needs	Selection Guide	5968-3413E
PSA Series	Brochure	5980-1283E
PSA Series	Data Sheet	5980-1284E
PSA Series	Configuration Guide	5989-2773EN
Self-Guided Demonstration for Spectrum Analysis	Product Note	5988-0735EN
Wide bandwidth and vector signal analysis		
40/80 MHz Bandwidth Digitizer	Technical Overview	5989-1115EN
Using Extended Calibration Software for Wide Bandwidth Measurements, PSA Option 122 & 89600 VSA	Application Note 1443	5988-7814EN
PSA Series Spectrum Analyzer Performance Guide Using 89601A Vector Signal Analysis Software	Product Note	5988-5015EN
89650S Wideband VSA System with High Performance Spectrum Analysis	Technical Overview	5989-0871EN
Measurement personalities and applications		
Phase Noise Measurement Personality	Technical Overview	5988-3698EN
Noise Figure Measurement Personality	Technical Overview	5988-7884EN
External Source Measurement Personality	Technical Overview	5989-2240EN
Flexible Modulation Analysis Measurement Personality	Technical Overview	5989-1119EN
W-CDMA and HSDPA/HSUPA Measurement Personalities	Technical Overview	5988-2388EN
GSM with EDGE Measurement Personality	Technical Overview	5988-2389EN
cdma2000® and 1xEV-DV Measurement Personalities	Technical Overview	5988-3694EN
1xEV-DO Measurement Personality	Technical Overview	5988-4828EN
cdmaOne Measurement Personality	Technical Overview	5988-3695EN
WLAN Measurement Personality	Technical Overview	5989-2781EN
NADC/PDC Measurement Personality	Technical Overview	5988-3697EN
TD-SCDMA Measurement Personality	Technical Overview	5989-0056EN
Built-in Measuring Receiver Personality / Agilent N5531S Measuring Receiver	Technical Overview	5989-4795EN
BenchLink Web Remote Control Software	Product Overview	5988-2610EN
IntuiLink Software	Data Sheet	5980-3115EN
Programming Code Compatibility Suite	Technical Overview	5989-1111EN
Hardware options		
PSA Series Spectrum Analyzers Video Output (Option 124)	Technical Overview	5989-1118EN
PSA Series Spectrum Analyzers, Option H70,70 MHz IF Output	Product Overview	5988-5261EN
Spectrum analyzer fundamentals		
Optimizing Dynamic Range for Distortion Measurements	Product Note	5980-3079EN
PSA Series Amplitude Accuracy	Product Note	5980-3080EN
PSA Series Swept and FFT Analysis	Product Note	5980-3081EN
PSA Series Measurement Innovations and Benefits	Product Note	5980-3082EN
Spectrum Analysis Basics	Application Note 150	5952-0292
Vector Signal Analysis Basics	Application Note 150-15	5989-1121EN
8 Hints for Millimeter Wave Spectrum Measurements	Application Note	5988-5680EN
External Waveguide Mixing and Millimeter Wave Measurement with PSA Spectrum Analyzers	Application Note 1485	5988-9414EN
EMI	Application Note 150-10	5968-3661E

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