

# CellAdvisor

JD745B/JD785B Base Station Analyzers

VIAVI

VIAVI Solutions

# Introduction

A CellAdvisor JD745B/JD785B Base Station Analyzer is the optimal test tool for installing and maintaining cell sites. It contains all the features and capabilities required for field testing cell sites for all 2G to 4G wireless technologies.

Equipped with one-button standards-based measurements for wireless signals, the analyzer offers a full scope of BTS conformance tests. Its combined functionality includes spectrum analysis, cable and antenna analysis, an RF/optical power meter, interference analysis, a channel scanner, RFoFiber<sup>™</sup>, and signal analysis.

Standard features include:

- Spectrum analyzer
- Cable and antenna analyzer
- RF power meter

Advanced features include:

- Interference analysis
- Channel scanner
- 2-port transmission
- CW signal generator
- RFoFiber (RFoCPRI/RFoOBSAI)
- GPS receiver
- Built-in bias tee
- Optical power meter
- Fiber inspection with pass/fail (requires P5000i microscope)\*
- Cloud Enabled via StrataSync™\*
- Signal analysis of cdmaOne/cdma2000, EV-DO, GSM/ GPRS/EDGE, WCDMA/HSPA+, TD-SCDMA, Mobile WiMAX, LTE/LTE-Advanced—FDD and LTE/LTE-Advanced—TDD

Highlights and capabilities include:

- Full LTE test capabilities
- LTE MBMS (multimedia broadcast multicast service)
- Passive intermodulation (PIM) detection
- Dual spectrum
- Spectrum replay
- Dual spectrogram
- Remote control
- Coverage mapping
- Remote wireless connectivity via Bluetooth®
- Radar chart
- BBU emulation



JD745B Base Station Analyzer

Spectrum analyzer
Cable and antenna analyzer
RF power meter

100 kHz to 4 GHz 5 MHz to 4 GHz 10 MHz to 4 GHz



JD785B Base Station Analyzer

Spectrum analyzer	9 kHz to 8 GHz
Cable and antenna analyzer	5 MHz to 6 GHz
RF power meter	10 MHz to 8 GHz

\*CellAdvisor JD785 only

# Features

# **Easy User Interface**

The analyzer provides a consistent, intuitive interface throughout its various functions, giving users a common, easy-to-use menu structure.

The analyzer's built-in help system guides users through each measurement task. They can save a screenshot of any function as a graphic file for report generation and save traces for post-analysis to the instrument's internal memory or to an external USB memory device. Stored data can be easily transferred to a PC using the USB or Ethernet port.



The outdoor display mode enables easier reading in direct sunlight

Users can edit file names using the instrument's rotary knob that also conveniently functions as an enter button when selecting alphanumeric characters.

# **Automatic Measurements**

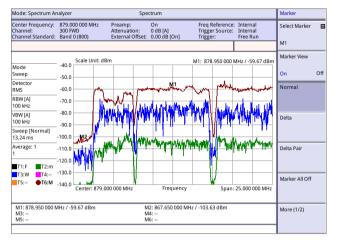
The analyzer's Auto Measure function affords complete signal profiling covering RF characterization and modulation quality parameters for up to 10 different carriers.

Auto Measure can be easily executed so the instrument automatically configures and tests every aspect for all carriers regardless of their frequency or modulation type. The analyzer's configurable channel scanner can track on one measurement screen the power levels for each of 20 carriers operating at different frequencies or modulation types.

# **Designed for Field Use**

The compact, lightweight analyzer is especially convenient for users who perform field measurements.

Its bright, multimode, 8-inch color display enables clear visibility indoors and outdoors.



Outdoor display mode

The operating temperature ranges from –10 to 55°C; and, its rugged bumper protects the instrument from external impacts exceeding the MIL-PRF-28800F class 2 specification.

# RFoFiber (RFoCPRI/RFoOBSAI)

Modern cell sites have a distributed architecture that replaces

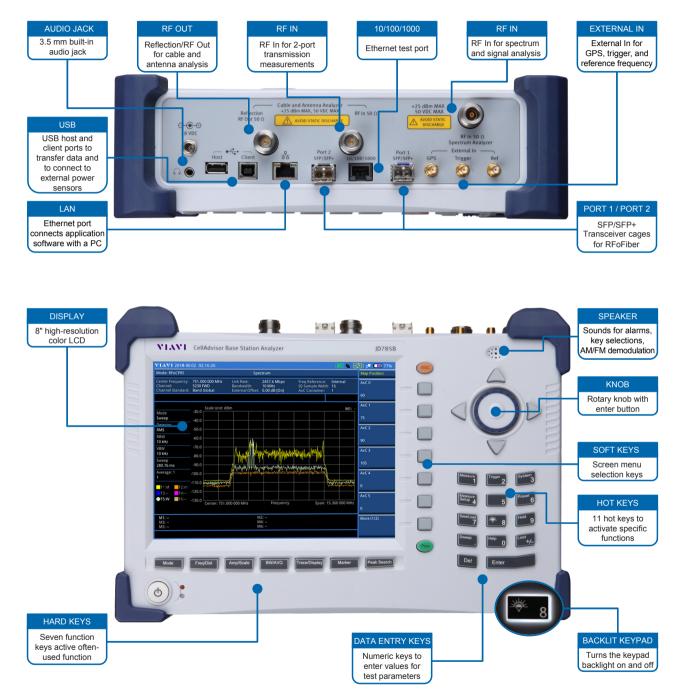
coax-based feeders with fiber-based feeders and, therefore, significantly reduces signal loss and reflection problems. However, since all RF interfaces reside on the RRH, any RF maintenance or troubleshooting requires reaching the tower top to gain access to the RRH, which increases safety concerns and operational expenses.



The VIAVI Solutions™RFoFiber reduces risky cell tower climbs letting technicians test safely from the ground

RFoFiber technology enables cell technicians to verify the control signals and extracts the RF (IQ) data transmitted between the BBU and RRH at the ground without the need to climb the tower. Key benefit of RFoFiber is that it enables monitoring and analyses of mobile terminal (uplink), PIM detection, as well as the radio's signal (downlink) interference over a fiber link.

# **Integrated Functionality**



<b>Spectrum Analyzer</b> 100 kHz to 4 GHz (JD745B)	Locates and identifies various signals.
9 kHz to 8 GHz (JD785B)	Detects signals as low as –160 dBm/
Built-in pre-amplifier	–165 dBm with better than 1 dB
	measurement accuracy.
Zero span with gate sweep	Triggers pulse or burst signals such as WiMAX, GSM, and TD-SCDMA.
Cable and Antenna	Provides cable and antenna
Analyzer	characterization for proper power transfer
5 MHz to 4 GHz (JD745B)	from the radio to the antenna.
5 MHz to 6 GHz (JD785B)	Locates failure points for effective
	troubleshooting. Verifies conformance to cable specifications.
RF Power Meter	Integrated RF power meter eliminates the
10 MHz to 4 GHz (JD745B)	need for a separate instrument and mea-
10 MHz to 8 GHz (JD785B)	sures power with or without a power sensor.
2-Port Transmission	Verifies passive and active devices such as
Measurements (option 001)	filters and amplifiers.
Bias Tee (option 002)	Supplies up to 32 VDC built-in bias to
	active devices such as amplifiers.
RFoFiber/CW Signal	Supports continuous wave (CW)
Generator	generation and generates LTE FDD and
(options 003, 081, 082, 086)	TDD signals.
RFoFiber/Interference Analyzer	Enables RF measurements over fiber without the need to climb the tower to
(options 008, 060–073)	access the remote radio head.
Bluetooth Connectivity	Provides remote control and monitoring
(option 006)	capability with JDRemote via Bluetooth
	interface.
GPS Receiver and Antenna	Provides geographical location and
(option 010)	highly-accurate frequency, and time for precise measurements.
Interference Analyzer	Provides the required spectrogram and
(option 011)	multisignal RSSI parameters to properly
	monitor, identify, and locate interference
	signals. In addition, it can generate a vari- able audible tone based on signal strength.
Channel Scanner	An intuitive graphical representation of
(option 012)	the signal's power for each of the 20
	user-definable carriers (frequencies or
	channels) enables quick identification of improper power levels.
Optical Power Meter	Measures optical power for all single-mode
optical i offici Metel	and multimode connectors via an optical
	power sensor (MP-60A or MP-80A).
Signal Analyzer	Provides 3GPP/3GPP2/IEEE802.16
Signal Analyzer (options 020-029)	Provides 3GPP/3GPP2/IEEE802.16 conformance testing for RF characteristics
	Provides 3GPP/3GPP2/IEEE802.16 conformance testing for RF characteristics as well as modulation analysis of 2G to 4G
(options 020-029)	Provides 3GPP/3GPP2/IEEE802.16 conformance testing for RF characteristics as well as modulation analysis of 2G to 4G wireless technologies.
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(options 020-029) RFoFiber Signal Analyzer (options 091, 092, 096)	Provides 3GPP/3GPP2/IEEE802.16 conformance testing for RF characteristics as well as modulation analysis of 2G to 4G wireless technologies. TheRFoFiber Signal Analyzer supports analysis for LTE-FDD/TDD signals such as modulation accuracy test.
(options 020-029) <b>RFoFiber Signal Analyzer</b> (options 091, 092, 096) <b>Over-the-Air Analyzer</b>	Provides 3GPP/3GPP2/IEEE802.16 conformance testing for RF characteristics as well as modulation analysis of 2G to 4G wireless technologies. TheRFoFiber Signal Analyzer supports analysis for LTE-FDD/TDD signals such as modulation accuracy test. Characterizes transmission quality at any
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(options 020-029) <b>RFoFiber Signal Analyzer</b> (options 091, 092, 096) <b>Over-the-Air Analyzer</b> (options 040 to 049)	Provides 3GPP/3GPP2/IEEE802.16 conformance testing for RF characteristics as well as modulation analysis of 2G to 4G wireless technologies. TheRFoFiber Signal Analyzer supports analysis for LTE-FDD/TDD signals such as modulation accuracy test. Characterizes transmission quality at any location providing reflective measurements and identifying signals transmitted from various sites.

# Spectrum Analyzer

The analyzer is the most flexible general purpose spectrum analysis test tool for monitoring and analyzing the RF spectrum. The Spectrum Analysis function performs these one-button standards-based wirelesssignal power measurements:

- Channel power
- Occupied bandwidth
- Spectrum emission mask
- Adjacent channel power
- Spurious emissions
- Field strength
- AM/FM audio demodulation
- Route map
- PIM detection
- Dual spectrum

# Capabilities

- Built-in preamplifier
- Zero span with gated sweep
- AM/FM audio demodulation
- Multiple detectors: normal, RMS, sample, negative, peak
- Advanced marker: frequency counter, noise marker
- Limit line
- Up to six markers and six traces

# Measurements

**Channel Power** measures the power level, spectral density, and peak-to-average ratio (PAR) of the signal in a specified channel bandwidth, showing pass/fail for the defined power



**Occupied BW** measures the frequency bandwidth that contains the specified percentage of the power, the total integrated power, and the occupied power with pass/fail results for the defined bandwidth.



RF test — Occupied Bandwidth

**Spectrum Emission Mask (SEM)** compares the total power level within the defined carrier bandwidth and the given offset frequencies to defined mask limits with pass/fail results.



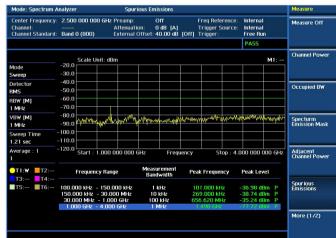


Adjacent Channel Power (ACP) measures the amount of RF power leakage in adjacent channels and its ratios, with pass/fail results for the defined test condition.



RF test — Spectrum Emission Mask

**Spurious Emissions** measurements identify and determine the power level of spurious emissions in certain frequency bands, showing pass/fail results based on the defined mask limits.



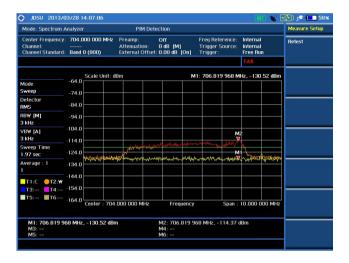
RF Test — Spurious Emissions

**Field Strength** quickly and conveniently measures and analyzes field strength to user-definable multisegment lines. Measuring field strength is easy once the user specifies the antenna factors in the analyzer.

**AM/FM Audio Demodulation** identifies interfering signals. The AM/FM signal can be demodulated into the instrument's built-in speaker or through a headset.

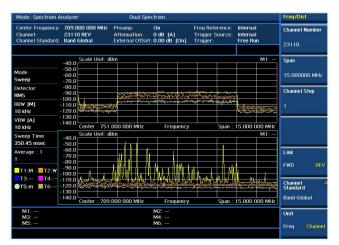
The spectrum analyzer can simultaneously operate with the CW signal generator. It easily fulfills the >100 dB guideline required for measuring repeater and antenna isolation.

**PIM Detection** identifies passive intermodulation in the uplink band caused when signals are combined and transmitted on a single nonlinear feed line.



RF test — PIM Detection

**Dual Spectrum** lets users view the spectrum activity for two different uplink and downlink spectrum bands on one screen simultaneously rather than switching between screens.



# **Cable and Antenna Analyzer**

The analyzer performs cable and antenna measurements to verify the base station's infrastructure, including feed lines, connectors, antennas, cables, jumpers, amplifiers, and filters.

# Capabilities

- Reflection
  - Voltage standing-wave ratio (VSWR)
  - Return loss
- DTF
  - vsWR
  - Return loss
- Cable loss (1-port)
- Port phase
- Smith chart
- 2-port transmission measurements (option 001)
  - Scalar measurements
  - Vector measurements

# Measurements

**Reflection – Return Loss** measures complete cellsite transmission line impedance performance across a specific frequency range in VSWR or return loss.



Cable and antenna test — Reflection

**DTF – Return Loss** measures fault locations in the cellsite transmission system indicating signal discontinuities in VSWR or return loss. This distance-to-fault measurement precisely pinpoints the location of such things as damaged or degraded antennas, connectors, amplifiers, filters, and duplexers.



Cable and antenna test — Distance to Fault

**Cable Loss (1 port)** measures the signal loss through a cable or other devices over a defined frequency range by connecting one end of the cable to the instrument measurement port and terminating the other end of the cable with a short, or leaving it open altogether.



 ${\sf Cable} \, {\sf and} \, {\sf antenna} \, {\sf test} - {\sf Cable} \, {\sf Loss}$ 

**Smith Chart** measures impedance and phase to properly tune RF devices.Smith Chart also displays impedance-matching characteristics in cable and antenna systems or filter and duplexer devices.



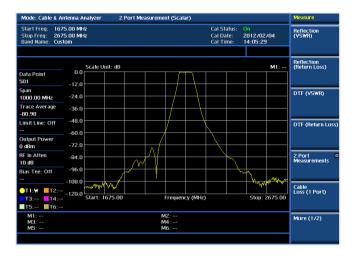
Cable and antenna test — Smith Chart

**1-Port Phase** measures  $S_{11}$  phase to tune antennas and to phase-match cables.



Cable and antenna test — 1-Port Phase

**2-Port Measurement (Scalar)** (option 001) have vector and scalar measurements. Scalar measurement provides greater dynamic range (>100 dB); vector measurement provides greater accuracy and faster test time.



Cable and antenna test — 2-port Measurement

**Insertion Gain/Loss** measures the characteristics of passive and active devices such as filters, jumpers, splitters, and amplifiers and verifies antenna or sectorto-sector isolation.

**2-Port Phase in Vector Measurements** measure S<sub>21</sub> phase to characterize transmission devices such as filters and amplifiers.

The optional built-in bias-tee supplies power to active devices through the instrument's RF In port, eliminating the need for an external power supply.

# **Power Meters**

The analyzer is equipped with an RF power meter and an optical power meter.

The RF power meter performs two different methods of power measurement. The first is an internal power measurement for standard power testing without the assistance of external power sensors and the second interfaces with an external power sensor for highaccuracy power measurements.

The optical power meter measures optical power for single-mode and multimode connectors via an external optical power sensor.

# **RF Power Meter (Standard)**

# Internal Power Measurement

- Frequency range: 10 MHz to 4 GHz/8 GHz
- Dynamic range: -120 to +20 dBm/+25 dBm
- Measurement type: RMS or peak

# External Power Measurement

- JD732B: Terminating power sensor (average)
- JD734B: Terminating power sensor (peak)
- JD736B: Terminating power sensor (average and peak)
  - Frequency range: 20 MHz to 3.8 GHz
  - Dynamic range: -30 to +20 dBm
- JD731B: Directional (through line) power sensor
  - Frequency range: 300 MHz to 3.8 GHz
  - Dynamic range: average 0.15 to 150 W, peak 4 to 400 W
  - Measurement:
    - Forward average power
    - Reverse average power
    - Forward peak power
    - VSWR
- JD733A: Directional (through line) power sensor
  - Frequency range: 150 MHz to 3.5 GHz
  - Dynamic range: average/peak 0.1 to 50 W
  - Measurement:
    - Forward average power
    - Reverse average power
    - Forward peak power
    - VSWR

# **Optical Power Meter**

# Miniature USB 2.0 Optical Power Sensors

- MP-60A
  - Wavelength range: 780 to 1650 nm
  - Dynamic range: 1300, 1310, 1490, 1550 nm:
     -50 to +10 dBm
     850 nm: -45 to +10 dBm
- MP-80A
  - Wavelength range: 780 to 1650 nm
  - Dynamic range: 1300, 1550 nm: -35 to +23 dBm;
     850 nm: -30 to +23 dBm



Power sensors

The power meter analysis has user-definable pass/fail limits and displays test results in dBm and watts. Power measurements can be set as absolute measurements displayed in dBm or as relative measurements displayed in dB.

The analyzer displays power levels in two formats, as a real-time value in an analog meter and as a power-level trend through time in a histogram chart.



Power meter test (RF or optical)

\*CellAdvisor JD785 only

JD730-series high-precision RF power sensors measure RF power connected via USB to the analyzer.

The analyzer controls terminating power sensors (JD732B, JD734B, and JD736B), making it a highly accurate RF power meter for out-of-service applications up to 3.8 GHz with a -30 to +20 dBm measurement range.

The analyzer controls directional power sensors (JD731B and JD733A) measuring output power and impedance matching for in-service systems. These power sensors can handle up to 150 W of power, eliminating the need for attenuators.

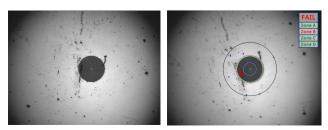
The analyzer controls optical power sensors (MP-series) to measure optical power quickly and easily in single-mode or multimode.

This optical power meter offers a well-organized solution for fiber inspection.

Fiber Inspection\* eliminates the most common fiber link problems by verifying that connectors are not contaminated. Only the JD785 can quickly and easily troubleshoot and certify fiber connection quality and cleanliness. Connecting the optional P5000i Fiber Microscope lets users quickly inspect and clean fiber connections with a clear pass/fail indication. The free FiberChekPRO<sup>™</sup> application can be used on a PC/laptop with the P5000i microscope to perform the same fiber analysis in parallel using the instrument to test RF and using the PC/laptop to test fiber. Users also can inspect, test, and certify any fiber connector and instantly generate comprehensive pass/fail summary reports.



P5000i microscope



Fiber passed

Fiber failed

# **Interference Analyzer**

The Interference Analyzer (option 011) function is extremely effective for locating and identifying periodic or intermittent RF interference. Interference signals derive from several kinds of licensed or unlicensed transmitters that cause dropped calls and poor service quality.

- Spectrum analyzer
  - Sound indicator
  - AM/FM audio demodulation
  - Interference ID
  - Spectrum recorder
- Spectrogram
- Receive signal strength indicator (RSSI)
- Interference finder
- Spectrum replayer
- Dual spectrogram

# Measurements

A spectrum analyzer can perform spectrum clearance, capturing just the events where the received signal exceeds the defined power limit.

The audible tone volume is proportional to the signal's power strength. In addition, a built-in AM/FM audio demodulator conveniently identifies AM/FM signals.

Interference ID automatically classifies interfering signals and lists the possible signal types corresponding to the signal selected.

Spectrogram captures spectrum activity over time and uses various colors to differentiate spectrum power levels.

The spectrogram is effective for identifying periodic or intermittent signals. Post-processing analysis can be made for each measurement over time using a time cursor.



 ${\it Interference analysis test-Spectrogram}$ 

**RSSI** is a multisignal tracking metric that is particularly useful for measuring power-level variations over time.

The RSSI measurement lets you assign a power limit line for audible alarms and increase alarm counters every time a signal exceeds a defined limit line.

For long-term analysis, the spectrogram and RSSI measurements can be automatically saved into an external USB memory. Post-analysis can be performed with JDViewer application software.

Mode: Interference	e Analyzer		RSSI				Measure
Center Frequency: Channel: Channel Standard:	893.370 000 MHz 779 FWD Band 0 (800)	Attenuat		M) Trig	1 Reference: 19er Source: 19er:	External 10 MHz Internal Internal	Spectrum
	Scale Unit:	dBm		M6: 89	6.250 000 M	Hz, -101.84 dBm	Spectrogram
Mode	-40.0						
Sweep	-60.0		M514	MI	M2		5
Detector RMS -	-80.0	na falanaana		л <u>М</u> б	Х	M3 ▼	RSSI
now (m)	120.0						
VBW [A]	-40.0 Center : 893		MHz Fr	equency	Span : 30	3.000 000 MHz Alarm Count: 0	
VBW [A] 3 kHz Sweep Time 2.49 sec	Scale Unit:		MHz Fr		Span : 30		
VBW [A] 3 kHz Sweep Time 2.49 sec Average -	-40.0 -60.0		MHz Fr	equency	Span : 30		
VBW [A] 3 kHz Sweep Time 2.49 sec Average - 1 -	-40.0 -60.0 -80.0			count	Span : 30		
VBW [A] 3 kHz Sweep Time 2.49 sec Average 1 Limit Line	Scale Unit: -40.0 -60.0 -80.0 100.0 120.0 -140.0 Start: 0 Marker Fr M1:	dBm eq (MHz) 893.37	Max (dBm) -79.75	Count Min (dBm) -84.21	Avg (dBm) -81.87	Alarm Count: 0	
VBW [A] 3 kHz 5weep Time 2.49 sec Average - 1 - Limit Line	Scale Unit: -40.0 -60.0 -80.0 100.0 -120.	dBm eq (MHz) 893.37 900.03 904.95	Max (dBm) -79.75 -85.52 -100.52	Count Min (dBm) -84.21 -87.72 -104.11	Avg (dBm) -81.87 -86.51 -102.21	Alarm Count: 0	
VBW [A] 3 kHz Sweep Time 2.49 sec Average - 1 -	-40.0 -60.0 -60.0 100.0 120.0 -40.0 Start: 0 Marker Fr M1: M2: M3: M4:	dBm eq (MHz) 893.37 900.03	Max (dBm) -79.75 -85.52	Count Min (dBm) -84.21 -87.72	Avg (dBm) -81.87 -86.51	Alarm Count: 0	

Interference analysis test — RSSI

**Interference Finder** is an automatic triangulation algorithm that uses GPS coordinates to locate possible interference sources based on three measurements.

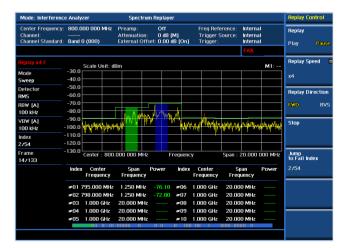
The interference finder calculates possible interference locations using its inscribed circle or circumscribed circle based on measured intersection points.



Interference analysis test — Interference Finder

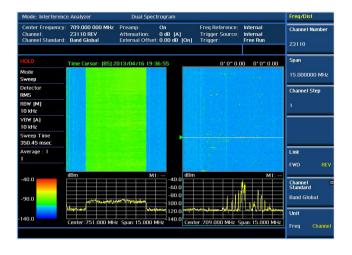
**Spectrum Replayer** lets users retrieve and replay recorded spectrum analyzer traces in interference analysis mode. These traces can be played back in the spectrogram or RSSI.

Users can configure the limit line to create failure points when signals exceed it. The failure points are clearly displayed on the trace timeline for quick access during playback.



Interference analysis test — Spectrum Replayer

**Dual Spectrogram** captures the spectral activities for two different bands over time to identify periodic or intermittent band signals.



Interference analysis test — Dual Spectrogram

**Radar Chart** displays an RSSI with azimuth information so that a user can quickly locate interference. CellAdvisor should be used in conjunction with an AntennaAdvisor handle that has a built-in compass, LNA, GPS, and YAGI antenna.



Interference analysis test — Radar Chart (measurement)

# Signal Analyzer

The signal analyzer performs 3GPP/3GPP2/IEEE802.16standard RF compliance testing for power and spectrum as well as modulation analysis. It performs standardsbased measurements with a single-button push, indicating pass/fail based on standards or user-defined limits.

The auto measure capability lets users easily set up test scenarios with programmed measurement schedules such as start time, test duration, test cycles, and test metrics. Then, based on the user-defined conditions, the analylzer tests up to 10 different carriers and automatically saves the corresponding results.

The Over-the-Air (OTA) Analyzer function provides OTA measurements to quickly perform base station characterization. This measurement capability is especially useful for testing cell sites without interrupting service are those that are not easily accessible.





The signal analyzer provides these measurement capabilities:

- Spectrum analysis
- RF analysis
- Modulation analysis
- Auto measure

Modulation analysis can be performed for these wireless technologies:

- cdmaOne/cdma2000 (option 020)
- EV-DO (option 021)
- GSM/GPRS/EDGE (option 022)
- WCDMA/HSPA+ (option 023)
- TD-SCDMA (option 025)
- Mobile WiMAX (option 026)
- LTE-FDD (option 028)
- LTE-Advanced—FDD (option 030)
- LTE-TDD (option 029)
- LTE-Advanced —TDD (option 031)

Over-the-air (OTA) analyses include:

- cdmaOne/cdma2000 (option 040)
- EV-DO (option 041)
- GSM/GPRS/EDGE (option 042)
- WCDMA/HSPA+ (option 043)
- TD-SCDMA (option 045)
- Mobile WiMAX (option 046)
- LTE-FDD (option 048)
- LTE-TDD (option 049)

# Signal Analyzer Detailed Feature Matrix

	Feature		GSM/GPRS/EDGE	WCDMA/HSPA+	Technology LTE/LTE-Advanced—FDD	LTE/LTE-Advanced—TD
	reature		(Option 022)	(Option 023)	(Option 028 /030)	(Option 029 /031)
RF analysis	Channel	power	(0)0101022)	(0)0000025)		
		d bandwidth				
	· · ·	n emission mask			-	
	ACP(L)R					
	Multi-AC	P(L)R				
		emissions				
Aodulation	Power	Slot				
inalysis		Frame				
		Mask				
		Timogram				
	Constella	-		•	MBMS	•
	Code dor	main power				
	Mid-amb	ole power				
	Code pov	wer				
	Code erro	or				
	RCDE					
Code	Codograi	m				
	RCSI					
	CDP table					
	Spectral	flatness				
	EVM vs.	subcarrier				
	EVM vs.	symbol				
	Data cha	nnel			MBMS	MBMS
	Control c				MBMS	MBMS
	Subfram	e			MBMS	MBMS
	Frame				MBMS	
	-	Inment error			•	•
		cation map			MBMS	MBMS
	Auto me					
	-	atistics CCDF			•	•
	Carrier A	ggregation			•	
			(Option 042)	(Option 043)	(Option 048)	(Option 049)
)TA analysis	Scanner		Channel/Frequency	Channel/Scramble	Channel/ID	Channel/ID
	Multipat	h profile				
	Preamble	e power trend				
		ion analyzer				
	Code dor	main power				
	Sync-DL	ID vs. tau				
	Sync-DL	ID analyzer				
	Control c	hannel			MBMS	MBMS
	Datagrar	n				
	Route ma	ар			-	

# Signal Analyzer Detailed Feature Matrix (Continued)

Features			Technology							
	Feature	cd	maOne/cdma2000	EV-DO	TD-SCDMA	Mobile WiMAX				
			(Option 020)	(Option 021)	(Option 025)	(Option 026)				
RF analysis	Channel power									
Occup	Occupied band	width								
	Spectrum emiss									
	mask									
	ACP(L)R									
	Multi-ACP(L)R									
	Spurious emission	ons								
Modulation	Power Slot			Idle/Active						
analysis	vs. time Frame									
	Mask									
	Timog	ram								
	Constellation									
	Code domain po	ower								
	Mid-amble pow	/er								
	Code power									
	Code error				•					
	Codogram									
	RCSI									
	CDP table									
	Spectral flatnes	S								
	EVM vs. subcarr	rier								
	EVM vs. symbol									
	Data channel									
	Control channel									
	Subframe									
	Frame									
	Time alignment	error								
	Data allocation	map								
	Auto measure									
	Power statistics	CCDF	•							
			(Option 040)	(Option 041)	(Option 045)	(Option 046)				
OTA analysis	Scanner		Channel/PN	Channel/PN	Sync-DL ID	Preamble				
	Multipath profil	le			Sync-DL ID					
	Preamble powe	r trend								
	Modulation ana	llyzer								
	Code domain po	ower								
	Sync-DL ID vs. t	au								
	Sync-DL ID anal	lyzer								
	Control channel									
	Datagram									
	Route map									

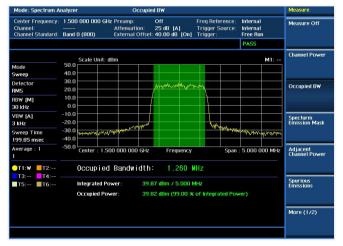
# **RF** Analysis

**Channel Power** measures a signal's total RF power, spectral density, and peak-to-average ratio (PAR) in a specified channel bandwidth.



RF analysis — Channel Power

**Occupied BW** measures the frequency bandwidth containing 99 percent of the power for total integrated and occupied power.



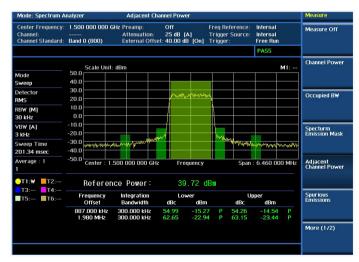
RF analysis — Occupied Bandwidth

**Spectrum Emission Mask** compares the total power level within the defined carrier bandwidth and the given offset frequencies on each side of the carrier frequency against allowable standards.



RF analysis — Spectrum Emission Mask

Adjacent Channel Power Ratio or Adjacent Channel Leakage Ratio measures RF power leakage in adjacent channels and its ratios per specified standards

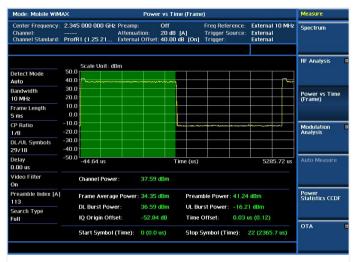


RF analysis — Adjacent Channel Power

**The Spurious Emissions** measurement identifies and determines spurious emissions power levels in certain frequency bands.

# **Modulation Analysis**

**Power vs. Time (Frame)** verifies, with LTE-TDD, WiMAX, and GSM, that the transmitter output power has the correct amplitude, shape, and timing according to the standards.



Modulation analysis - Power vs. Time

**Constellation** provides with multimedia broadcast/ multicast services (MBMS), modulation quality metrics (EVM) for data and/or control channels, at its corresponding modulation scheme, such as GMSK, QPSK, 16 QAM and 64 QAM.

Mode: LTE - FDD		Const	ellation			Modulation
Center Frequency: 8 Channel: - Channel Standard: B		Preamp: Attenuation: External Offs	Off 10 dB [A] et: 40.00 dB [On]	Freq Reference: Trigger Source: Trigger:	Internal Internal Internal	Constellation
					PASS	
Detect Mode DD 10 MHz				R5 Pow -2.43 d		Data Channel
'HICH Ng /6	000	000		1.67 %	_QP5K: _16QAM:	Control Channe
FI [A] Intenna port [A]	0			PDSCH.	_64QAM:	Subframe
DSCH Precoding Off DSCH Threshold 20.00 dB				1.05 % Data EV 5.25 %	/M RM5: (1.26%) /M Peak: (6.69%)	Frame
yclic Prefix Iormal	0			Frequer	ool #7,5C #510 n <b>cy Error:</b> Hz7-0.020 ppm	Time Alignmen Error
ell ID [A]				0.68 us		Data Allocation Map

Modulation analysis — Data Constellation

**Code Domain** measures with CDMA/EV-DO and WCDMA/HSPA+, spread code channel power levels across the RF channel, normalized to total power.

Code domain power (CDP) shows the signal's physical channels indicating the various spread factors using different colors to easily differentiate the traffic types carried within the signal.



Modulation analysis - Code Domain Power

**Code Power** provides the power data for an individual code channel and layer for a specified time slot. It displays the power of the 16 codes of a specified signal.

**Code Error** shows the power data and error data for an individual code channel and layer for a specified time simultaneously.

**Relative Code Domain Error** is computed by projecting the error vector onto the code domain at a specified spreading factor.



Modulation analysis - Relative Code Domain Error

# **Modulation Analysis (Continued)**

**Codogram** or **Datagram** displays code power variations over time to give a clear view of each channel's traffic load at any given time.

Mode: CDMA		Modulation			
Center Frequency: Channel: Channel Standard:	872.100 000 MHz 70 F₩D Band 0 (800)	Preamp: Off Attenuation: 0 dB [A] External Offset: 0.00 dB [Off]	Freq Reference: Trigger Source: Trigger:		Constellation
	Scale Unit: Sec			Count:11	Code Domain Powe
Detect Mode IS95/CDMA2000					
Reference Relative				14 M	Codogram
PN Offset [A] 308			<b>P. 6</b> .6.2	100 CAN	
PN Increment 1					RCSI
Threshold -27.00 dB					
Code Order Bit Reverse				and the	CDP Table
Q-Paging ₩128,80 [Off]	Scale Unit: dB	Code Utilization:	47.7.0	M1:	
-25	0.0 10.0 20.0 40.0 50.0 0				
	50.0	WalshCode		127	

 ${\sf Modulation}\ {\sf analysis}-{\sf Codogram}$ 

**RCSI** (received code strength indicator) shows, with CDMA/EV-DO and WCDMA/HSPA+, power variations over time for control channels.

The analyzer can automatically save codogram and RCSI measurements into external USB memory for long-term analysis or for post-analysis with JDViewer application software.



Modulation analysis - RCSI

**Spectral Flatness** measures, with Mobile WiMAX, the constellation's flatness energy per the standards.



Modulation analysis — Spectral Flatness

**EVM vs. Subcarrier** shows, with Mobile WiMAX, the error vector magnitude representing the average constellation error for OFDMA subcarriers.

**EVM vs. Symbol** shows, with Mobile WiMAX, the error vector magnitude representing the average constellation error for OFDMA symbols.

**Complementary Cumulative Distribution Function** (CCDF) characterizes the statistical power level distribution at any given time.

**Data Channel** measures, with LTE and MBMS, selected resource block or control channel constellation and modulation quality at any subframe.

Mode: LTE - TDD		Modulation				
Center Frequency: Channel: Channel Standard:	751.000 000 MHz  Band 33 (1900)	Preamp: Attenuation: External Offse		Freq Reference: Trigger Source: Trigger:		Constellation
					PASS	
	Resource Bloc	k Power	Subframe #: 0		Marker: RB#0	Data Channel
Detect Mode	Scale Unit: d	Bm				
TDD 10 MHz	40.0					
HICH Ng 76	20.0					Control Chann
Jp-Down Config	-20.0					
	-40.0					Subframe
	-60.0		Resource Block		49	
ntenna port [A]						
ANTU ANTI	I-Q Diagram o	I Current Block	Subframe #: 0,	RB#∶U		Time Alianme
PDSCH Threshold			RB Power:	12.14 dBm		Error
20.00 dB			Modulation Forma	t: QPSK		
DCCH Threshold 10.00 dB			IQ Origin Offset:	-58.86 dB		Data Allocation Ma
yclic Prefix Iormal			EVM RMS:	0.81 % (0.91	<b>K</b> )	
ell ID [A]			EVM Peak:	2.01 % (2.79	K)	
en io [A]				@ Symbol #9	.SC #7	

 ${\sf Modulation}\ {\sf analysis} - {\sf Data}\ {\sf Channel}$ 

# **Modulation Analysis (Continued)**

**Subframe** measures, with LTE and MBMS, the data and control channel power and modulation quality in any subframe.

Mode: LTE - TDD			frame		Internal	Modulation
Center Frequency: Channel: Channel Standard:		ttenuation:	Off 5 dB [A] set: 40.00 dB [0	Freq Reference Trigger Source Dn] Trigger:		Constellation
					PASS	
	Subframe #: 0					Data Channel
Detect Mode	Channel	EVM (%)	Power (dBm)	Modulation Type	REG/RBs	
TDD_10 MHz	P-SS	1.13	1.33	Z-Chu		
PHICH Ng	5-55	0.94	1.32	BPSK		
1/6	PBCH	1.24	1.31	QP5K		Control Channe
Up-Down Config	PCFICH	0.86	1.30	QPSK		
Op-Down Config N	PHICH	25.03	1.87	BPSK		
	PDCCH	1.17	2.37	QPSK	84/G	-
CFI [A]	RS	1.16	1.31	QPSK		Subframe
	PDSCH_QPSK			QPSK		
Antenna port [A]	PDSCH_16QAM			16QAM		
ANTO ANT1	PDSCH_64QAM	1.12	1.30	64QAM	50/B	
	Unallocated				0/B	Time Alignment Error
PDSCH Threshold -20.00 dB	SubFrame Power: OFDM Symbol Po			ency Error: 13.97 H Error: 0.37 us	z/0.019 ppm	
PDCCH Threshold -10.00 dB	Data EVM RMS: Data EVM Peak:	Data Allocation Map				
Cyclic Prefix Normal	RS EVM RMS: RS EVM Peak:	1.16 % (1 2.65 % (3		5ymbol #4,5C #262		
Cell ID [A]	Cell ID: 1		oud ID: 0	Sector ID:		

Modulation analysis — Subframe

**Frame** measures, with LTE and MBMS, the power and modulation quality for all data and control channels in a frame.

Mode: LTE - FDD		Fr	ame			Modulation
Center Frequency: 8 Channel: - Channel Standard: B	A1	eamp: tenuation: ternal Offs	Off 10 dB [A] et: 40.00 dB [0	Freq Reference: Trigger Source: Dn] Trigger:	Internal Internal Internal	Constellation
					PASS	
	Subframe #: 8					Data Channel
Detect Mode	Channel	EVM (%)	Power (dBm)	Modulation Type	REG/RBs	
DD 10 MHz	P-55	1.12	0.04	Z-Chu		
PHICH Ng	5-55	1.00	0.04	BPSK		
1/6	PBCH	1.18	0.03	QPSK		Control Channe
	PCFICH	0.90	-2.38	QPSK		
	PHICH	1.03	-2.33	BPSK		
	PDCCH	1.13	-1.32	QPSK	9007G	-
FI [A]	RS	1.17	-2.38	QP5K		Subframe
	PDSCH_QPSK	1.74	-8.38	QPSK	2507B	
Antenna port [A]	PDSCH_16QAM	1.07	0.06	16QAM	250/B	
ANTO ANTI	PDSCH_64QAM			64QAM		
PDSCH Precoding	Unallocated				07B	Frame
Off PDSCH Threshold -20.00 dB	Frame Avg Power OFDM Symbol Po			ency Error: -17.47 i igin Offset: -52.36 c		im :
PDCCH Threshold 10.00 dB	EVM RMS: EVM Peak:	1.14 % (1 6.14 % (6	i.14%) @ 9	5ymbol #13,5C #51		Time Alignmen Error
Lyclic Prefix Iormal	Data EVM RMS: Data EVM Peak:	1.18 % (1 6.14 % (6		Symbol #13,5C #51		
ell ID [A]	Cell ID: 1	Gr	oup ID: 0	Sector ID:		Data Allocation Map

Modulation analysis — Frame

**Time Alignment Error** for LTE/MIMO measures MIMO time differences of up to four transmission branches.

Mode: LTE - FDD	Time Alignment Error								
Center Frequency: Channel: Channel Standard:	5230 FWD		Preamp: Attenuation: External Offs	Off 20 dB [A] et: 34.00 dB [O	Trigger 9		External Internal Internal	10 MHz	Constellation
	Histor	y Diagram	i Timi	e Alignment Erro	r				Data Channel
Detect Mode FDD 10 MHz	Scal	e Unit: ns				1			
PHICH Ng	90								Control Channe
176	80								
	60								
FLIAI	50				_				Subframe
A	40		+			-			Jubii ame
Antenna port	30								
	20 10								
									Frame
	00							Count 2	
20.00 dB	Time	Alignment	Error: 3.03	ns RS I	Power Differ	ence: 0	.55 dB		
			Time Alignme Error						
10.00 dB	ANT	RS Pow	rer R5 EVI	4 AN	RS Pow	ver R	S EVM		
lormal	0	14.24 dB	m 1.23 s		14.79 dB	m 2	.96 %		
ell ID [A]	Cell ID	: 1	Gr	oup ID: 0	Secto	or ID:			Data Allocation Ma

Modulation analysis — Time Alignment Error

**Data Allocation Map** measures, with LTE and MBMS, the power level for all resource blocks across subframes and shows data utilization within a frame.



Modulation analysis — Data Allocation Map

# **Modulation Analysis (Continued)**

**Auto Measure** lets users easily and quickly check the RF and modulation parameters with the push of a button. All base stations can be tested uniformly using the same procedure with virtually no errors because of test variability. Additionally, this function reduces human error and improves efficiency. Predefined tests enable users at all skill levels to obtain consistent, accurate results.

Center Freque	ocu · 751 6	00 000 MUz		Page : 1 of			Results Sett
Channel Stand					ber : 5230 FWI	1	
Start Time : 2					2012/07/14 0		Diminute Density
	Channel P			Off		to 45.00 dBm	Display Result
		Bandwidth		8 94 MHz		10.00 MHz	Full O
RF Analysis		Emission Ma	ik			3GPP	ran Q
	Adjacent	Channel Leaka	age Ratio			3GPP	
		acent Channel		atio		3GPP	View Carrier
	Frame Av	erage Power		-	18.00	to 22.00 dBm	The second second
	Time Aliq				<	= 90.00 ns	Carrier 1
	Frequency	/ Error		0.00 ppm	-0.0	5 to 0.05 ppm	contract (
	PDSCH	QPSK			M EVM	64QAM EVM	
	rusch	60.16 %	<= 18.50 %	35.83 %	<= 13.50 %	15.31 % <= 9.00 %	Page Up
Modulation	Data		RMS EVM			eak EVM	
Modulation	Data	Off		- 18.50 %	Off	<= 18.50 %	
	Ctrl CH	RS E		P-SS		S-SS EVM	
Analysis			<= 18.50 %		<= 18.50 %	Off <= 18.50 %	Page Down
	RS Power			Off		to 18.00 dBm	roge boim
	P-SS Pow			Off		to 22.00 dBm	
	S-SS Pow			Off		to 22.00 dBm	
	PBCH Pov			Off		to 22.00 dBm	
	SubFrame OFDM Por			Off		to 22.00 dBm to 22.00 dBm	
	Time Frr			Off		to 22.00 aBm 10 to 2.00 us	
	10 Origin			Off		-30.00 dB	

RF and Modulation analysis — Auto Measure

**Carrier Aggregation** performs up to five interband and/or intraband component carriers, performing a complete characterization in each carrier including power level, modulation quality in data, and control channels.

Mode: LTE - FDD		Carrier A	ggregation			Measure Setup
Center Frequency: Channel: Channel Standard:	*********	Preamp: Attenuation: External Offs	Off 15 dB [A] et: 0.00 dB [On]	Freq Reference: Trigger Source: Trigger:	internal Internal Internal	CA Configuration
					FAIL	
Subframe #: 0	CC1 764.00 MHz	CC2 774.00 MHz	CC3 784.00 MHz	CC4 794.00 MHz	cci	Subframe No
Power (dBm)						0
Subframe					╞┼┼┼┼┼┼┼	
-55	-36.71	-36.68	-37.04	-37.56		
-55	-36.71	-36.67	-37.04	-37.56		PDSCH Thresho
BCH	-33.71	-33.68	-34.04	-34.57		
IS	-36.70	-36.67	-37.04	-37.57	qc5	-20.00 dB
ata QPSK	-36.79	-36.75	-37.12	-37.65		
ata 16 QAM						DDCCI I Desert
ata 64 QAM						PDSCH Precodi
VM (%)						On G
-55	1.26	1.31	1.34	1.26	CCB IIIII	
-55	1.25	1.20	1.27	1.37		PDCCH Thresh
BCH	1.40	1.24	1.20	1.33		
5	1.32		1.24	1.24		-10.00 dB
ata QPSK	1.26	1.25	1.16	1.25	┝┼┼╦┼┼┼╞╌	-10.00 08
ata 16 QAM						
ata 64 QAM					ICC A I I I I I I I I I I I I I I I I I	PDCCH Mode
						REG A
ell ID	10	10	10	10		
requency Error	-17.39 Hz	-17.34 Hz	-17.37 Hz	-17.35 Hz		
AE	0.00 ns	7.20 ns	4.20 ns	-7.90 ns		MIMO
ntenna Port						

Modulation analysis — Carrier Aggregation

# **OTA Analysis**

**ID (Channel Scanner)** measures the strongest of six received cell identifiers, providing all relevant information such as PCI, RSRP, and RSRQ.



OTA analysis — ID (Channel Scanner)

# **OTA Control Channel with LTE and MBMS** provides signal performance metrics for locations served by the base station, including multipath profile indicating reflected signal strength.

Mode: LTE - TDD Center Frequency: Channel: Channel Standard:	36041 FWD	GHz Preamp: Attenuation		Freq Reference: Trigger Source: ] Trigger:	GP5 Internal Internal	OTA ID Scanner
	History Di	agram PS 0	Avg Pwr: -20.65 d	Pro Post Ava P	PA55	Multipath Profil
Detect Mode			arg 1 #120.00 0		W127.50 dbiii	
TDD Downlink	30 Scale Un					
	10					
Bandwidth	-10					Control Channe
10 MHz	-30					
Cyclic Prefix						
Normal	-50					
Cell ID [A]	-70		Count		10	Datagram
1						Datayiani
Antenna port	Summary	Table Cell	D: 1 Group ID:	0 Sector ID: 1	Subframe #: 0	
0	Channel	Power (dBm)	Power (dB)	EVM RMS (%)	EVM Peak (%)	
	P-SS	-20.47	0.05	1.19		6
	5-55	-20.45	0.07	1.32		
	PBCH	-20.10	0.42	1.13	2.92	
	PCFICH	-20.19	0.33	4.27		
	RS O	-20.52	0.00	2.01		
	RS 1	-19.87	0.65	2.17		
		Error: -0.6	3 Hz 7 -0.001 ppn	n		
	Frequency					
		ment Error: 3.00	) ns			

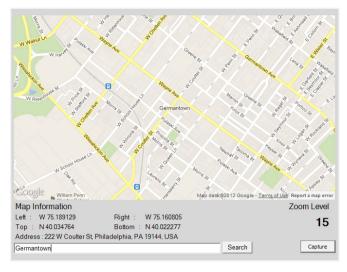
OTA analysis — Control Channels

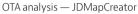
**Datagram** measures, with LTE, the power level for all the resource blocks across time and shows data utilization over time.

Mode: LTE - FDD		OTA Data	agram			ΑΤΟ
Center Frequency: Channel: Channel Standard:	751.000 000 MHz 5230 FWD Band 13 (700)	Preamp: Attenuation: External Offset	Off 0 dB [A] : 40.00 dB [Off]	Freq Reference: Trigger Source: Trigger:	GPS Internal Internal	ID Scanner
	Scale Unit: Sec				Count:4	Multipath Profil
Detect Mode FDD Downlink						
Bandwidth 10 MHz						Control Channel
Cell ID (A) 104						
Eyclic Prefix Normal						Datagram
Subframe )						
PDSCH Threshold -20.00 dB						
	20.0 Scale Unit: dBr	n Data Util	ization: 2.0 %	Marker: RB#	:0, -94.32 dBm	
-70 -1	50.0					
			esource Block (F		49	

OTA analysis — OTA Datagram

JDMapCreator can generate a sizable map so CellAdvisor can zoom-in the map down to two depths.





# **RFoFiber**

The analyzer measures RF over fiber to monitor the fiber link status between REC (BBU) and RE (RRH), and it can emulate the REC to verify the RRH cabling and operational status at the ground via fiber.

# Capabilities

- Layer-2 monitoring
- Layer-2 term
- Interference analyzer
  - spectrum analyzer
    - Sound indicator
    - AM/FM audio demodulation
    - Interference ID
    - Spectrum recorder
  - Spectrogram
  - RSSI
  - Spectrum replayer
- PIM detection
  - Single radio
  - Multiple radios
- RFoCPRI signal generator
  - LTE-FDD
  - LTE-TDD

**Route Map** measures the OTA performance of a cell site in a defined service area by plotting the corresponding OTA metric in a map, which is then tracked with the instrument's GPS.



OTA analysis — Route Map

**JDMapCreator** creates the desired map of interest from a picture file for indoor coverage, or geo-coded maps for outdoor coverage that can then be loaded to the analyzer using a USB memory device.

The route map feature is included in Spectrum Analyzer mode and in Signal Analyzer OTA mode.

- RFoOBSAI signal generator
  - LTE-FDD
- RFoCPRI signal analyzer
  - LTE-FDD
  - LTE-TDD
- RFoOBSAI signal analyzer
  - LTE-FDD
- BBU emulation
  - Installation verification
  - Spectrum clearance
  - Coverage range
  - PIM analysis

# Measurement

**Layer 2 Monitoring** is an in-service measurement that enables monitoring of the Layer-1 link maintenance alarms delivered on the Layer-2 L1 in-band protocol as well as optical power being received.



RFoCPRI – Layer 2 Monitoring

Mode: RFoOBSAI	Layer 2 Monitorir	ng	Measure
Event Logging:	Off Start Time: 05/20 2 Elapsed Time: 00:00:0		Layer 2 Monitorin
Link Rate 6144.0 Mbps	SFP/SFP+ PORT 2 Current History	SFP/SFP+ PORT 1 Current History	Layer 2 Term
	LOS	LOS LOF Optic Rx Level Optic Tx Level KX 302, Works: O Messages Address: 0x01+6//153600	Interference Analyzer PIM Detection
	SPPSP+PORT 2 Information Wavelength: Wendor: AVAGO Wendor PN: APBK-57R5APZ Wendor Rev: TP-Ower Level Upp: Average Power Downman Rev: 4300 Mbps Mon Rate:Mbps Max Rate:	SEP/SPF + POR1 1         Information           Wavelength:         FINISAR CORP.           Vendor PN:         FINISAR CORP.           Vendor PN:         FINISS2P3BCV           Vendor PN:         FINISS2P3BCV           Vomoria Rate:         A           Power Lowel Type:         A           Vomina Rate:	

RFoOBSAI – Layer 2 Monitoring

Layer 2 Term is an out-of-service measurement that also enables monitoring of the Layer-1 link maintenance alarms delivered on the Layer-2 L1 in-band protocol as well as optical power being received. Another benefit of this function is to emulate the baseband unit and support the start-up process of the RRH so users can verify the optical cabling and proper RRH operation at the ground.





# Interference Analyzer

Interference analyzer captures I/Q data from the fiber link and shows the uplink and downlink spectrum. RFoFiber does not require tower climbs to locate and identify interference signals present on the uplink band.

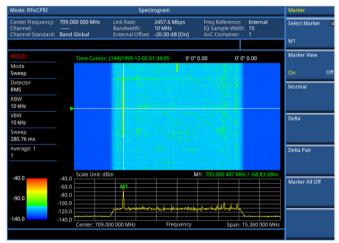
**Spectrum Analyzer** enables users to see and record the uplink and downlink spectrum for further analysis later. It provides a more effective way to observe interference for TDD systems because it completely separates the uplink signal from downlink.



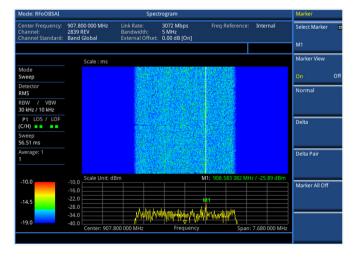


RFoOBSAI – Spectrum

**Spectrogram** captures spectrum and displays it as a waterfall diagram to identify signal interference easily and quickly. Time cursor and Marker enable time and frequency tracking for the intermittent interference signals.



RFoCPRI - Spectrogram



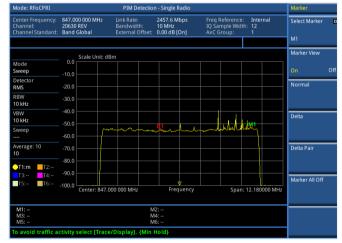
RFoOBSAI – Spectrogram

**Spectrum Replayer** enables users to replay a recorded baseband spectrum achieved over fiber link to better understand the nature of interference signal under investigation.





**PIM Detection** enables PIM detection on the radio system uplink. PIM detection can be achieved differently based on the number of radios that share the same RF/coaxial antenna system. Users can easily check the PIM generated by a single radio occupying wide band or multiple radios with different frequencies.



RFoCPRI – PIM detection

Mode: RFoOBSALL	E-FDD	Sub	frame			Measure S	etup
Center Frequency: Channel: Channel Standard:		Link Rate: Bandwidth: External Offset:	3072 Mbps 10 MHz 0.00 dB [On]	Freq Reference Rx RP3 Type: Rx RP3 Addres	LTE	Cell ID 1	
					PASS	Auto	Manua
	Subframe #: 0					Miscellane	ous (
P1 LOS / LOF	Channel	EVM (%)	Power (dB)	Modulation Type	REG/RBs		
(C/H)	P-SS	0.21	2.43	Z-chu			
P1 Rx Optic	S-SS	0.19	2.43	BPSK			_
(C/H)	PBCH	0.20	2.43	QPSK.		Source	1
PHICH Ng	PCFICH	0.20	0.00	QPSK .			
1/6	PHICH	0.25	0.00	BPSK			
	PDCCH	0.23	1.06	QPSK	90/G		
MBMS	RS	0.22	0.00	QPSK		IQ Invert	
	PDSCH QPSK	0.36	-6.00	QPSK.	25/B		
CFI [A]	PDSCH 16 QAX	0.17	2.35	16 QAM	25/B	On	of
	PDSCH 64 QAX	N		64 QAM		011	
Antenna Port [A]	Unallocated				0/B	Thru	
PDSCH Precoding Off	Subframe Powe OFDM Symbol P				/ 0.000 ppm ) µs	On	or
PDSCH Threshold -20.00 dB	Data EVM RMS: Data EVM Peak	0.20%(43	.09% ) 3.89% ) @ Symb	ol #10.5C #433		Clear Histo	ny .
Cyclic Prefix Normal	RS EVM RMS: RS EVM Peak:	0.22 % (13					
Cell ID [A]	IQimbalance:	99.92 %				More (2/2)	)
	Cell ID: 1	6	oup ID: 0	Sector ID			

Antenna RRH Coax Fiber Feeder

RFoOBSAI LTE-FDD signal analyzer window

Mode: RFoCPRI LTE	FDD	Cont	rol Channel			Modulation
Center Frequency: Channel: Channel Standard:	2.020 000 000 GHz  Band Global	Link Rate: Bandwidth: External Offse	2457.6 Mbps 10 MHz e: 0.00 dB [On]	Freq Refe IQ Sampl AxC Grou	e Width: 15	Constellation
					PASS	
	Channe	I Summary	Subframe #: 0	Subframe	Power: -20.16 dBm	Data Channel
P1 LOS / LOF	Cell ID: 1	Group ID: 0	Sector ID: 1 N	o of Control (	CFI): 1 (0x6db6db6d)	
(C/H)	Chan	nel E	VM (%)	Power (dB)	Modulation Type	
PHICH Ng 1/6	P-S	5	0.21	2.43	Z-Chu	Control Channel
	S-S	5	0.19	2.43	BPSK	
MBMS Off	PBC	н	0.20	2.43	QPSK	
	PCFI	CH	0.20	0.00	QPSK	
CFI [A]	PHIC		0.25	0.00	BPSK	Subframe
Antenna Port [A]	PDCC		0.23	1.06	QPSK	
ANTO III ANT1	RS		0.22	0.00	QPSK	J
	I-Q Diagr	am 🛛	P-SS			Frame
			Modulation For Frequency Error			
PDCCH Threshold -10.00 dB			IQ Origin Offset	0.000		Time Alignment Error
Cyclic Prefix Normal			EVM RMS:		6 ( 6.83 % )	
Cell ID [A] 1			EVM Peak:		6 ( 603.77 % ) 1bol #6,SC #298	Data Allocation Map

RFoCPRI — DL signal analysis window



### RRH CPRI status and active software

# **BBU Emulation**

The BBU emulation function (option 101) lets CellAdvisor emulate as a baseband unit and performs the necessary functions of a BBU for testing purposes. This function helps verify the installation of fiber cabling between the BBU and RRH, the coaxial cabling between the RRH and antennas, and the spectrum clearance and coverage range of the cell site.

Mode: RFoCPRI		Profiling			Trace/Display
RRH Profiling:		tart Time: 10/28 lapsed Time:	23:22:02 Profiling	; Data: 0 Bytes	Select Parameter
P1 LOS / LOF	RRH Description				
(C/H) = = = = = = = = = = = = = = = = = = =	Vendor: Technology: Uplink Start Frequen Uplink Stop Frequen		Downlink Start Freque Downlink Stop Freque Downlink Max Power: Downlink Min Power:	ncy: 787.00 MHz	
	SFP Information Port 1		Port 2		
	Wavelength: Vender:	1310 nm FINISAR CORP.	Wavelength: Vender:	None None	
SFP information	Vendor PN: Vendor Rev: Power Level Type: Diagnostic Byte:	FTLF1421P1BTL-AW A Average Power 88	Vendor PN: Vendor Rev: Power Level Type: Diagnostic Byte:	None None None None	
	Nominal Rate: Min Rate: Max Rate:	3100 Mbps Mbps Mbps	Nominal Rate: Min Rate: Max Rate:	None None None	
	SN:	PPS0NC2	SN:	None	

**RRH SFP information** 

# **Channel Scanner**

The Channel Scanner function (option 012) can measure up to 20 independent channels for any cellular technology at any channel or frequency. It also shows the power level for each signal type.

Mode: Scanner			Channel Scanr	1er			Measure
Start Frequency: Start Channel: Channel Standard:	1846.25 MHz 125 F₩D Band 4 (KR PC	Pream Attenu S) Extern			Freq Reference Trigger Source Trigger:		Channel Scanne
Detect Mode	Scale Uni 20.0 40.0	t: dBm				M1 :	Frequency Scanner
Detector -:	BO.0 BO.0						Custom Scanne
DOW IM1							
	20.0 Start : 12	5	Ch	annel		Stop :600	
-1: 30 kHz -1: VBW [A] 30 kHz	20.0 Start : 12 Channel T		Ch	annel		Stop :600	
30 kHz VBW [A] 30 kHz Integration BW	Start :12		Ch	annel No	Channel	Stop :600 Level (dBm)	
30 kHz VBW [A] 30 kHz Integration BW	Start : 12 Channel T	able			Channel 375		
30 kHz VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step	Start : 12 Channel T No	able Channel	Level (dBm)	No		Level (dBm)	
30 kHz VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step	Start : 125 Channel T No 1	able Channel 125	Level (dBm) -82.69	No 11	375	Level (dBm) -83.39	
30 kHz VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step 25	Start : 123 Channel T No 1 2	able Channel 125 150	Level (dBm) -82.69 -83.65	No 11 12	375 400	Level (dBm) -83.39 -75.42	
30 kHz VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step 25	Start : 125 Channel T No 1 2 3	able Channel 125 150 175	Level (dBm) -82.69 -83.65 -83.67	No 11 12 13	375 400 425	Level (dBm) -83.39 -75.42 -58.83	
30 kHz VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step 25	Start : 125 Channel T No 1 2 3 4	able Channel 125 150 175 200	Level (dBm) -82.69 -83.65 -83.67 -83.67 -84.40	No 11 12 13 14	375 400 425 450	Level (dBm) 83.39 75.42 58.83 63.49	
30 kHz VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step 25	Start : 125 Channel T No 1 2 3 4 5	Table Channel 125 150 175 200 225	Level (dBm) -82.69 -83.65 -83.67 -84.40 -83.54	No 11 12 13 14 15	375 400 425 450 475	Level (dBm) -83.39 -75.42 -58.83 -63.49 -60.43	
30 kHz VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step 25	Start : 12:           Channel T           No           1           2           3           4           5           6	Channel           125           150           175           200           225           250	Level (dBm) -82.69 -83.65 -83.67 -84.40 -83.54 -84.03	No 11 12 13 14 15 16	375 400 425 450 475 500	Level (dBm) -83.39 -75.42 -58.83 -63.49 -60.43 -64.76	
30 kHz VBW [A] 30 kHz	Channel T           No           1           2           3           4           5           6           7	able Channel 125 150 175 200 225 250 275	Level (dBm) -82.69 -83.65 -83.67 -84.40 -83.54 -84.03 -82.87	No 11 12 13 14 15 16 17	375 400 425 450 475 500 525	Level (dBm) 83.39 75.42 58.83 63.49 60.43 64.76 59.59	

Channel Scanner

# StrataSync\*

The CellAdvisor JD780Aseries analyzers are compatible with the VIAVI



StrataSync cloud to manage instrument inventory,to locate each piece of equipment and to identify which engineer is using it. StrataSync also helps to keep instruments current through remote upgrades to ensure all instruments have the latest firmware. It also centralizes configuration setting and distribution to ensure that engineers are using the same instrument settings to achieve consistent measurements. Once testing is complete, measurement results can be uploaded into StrataSync for secure storage and sharing. Engineers who are unable to resolve a problem can share measurement results with an expert to get analysis help from anywhere without having the expert be near the instrument.

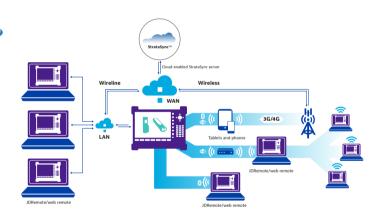
- Manage asset inventory
- Remotely distribute instrument upgrades
- Centralize configuration sharing

\* CellAdvisor JD785 only

- Offers test data management
  - Trace files
  - Screenshots
  - Remote analysis

# **Bluetooth and WiFi Connectivity**

Bluetooth and WiFi connectivity (options 006 and 016 respectively) provide safer and easier long-distance testing with the instrument housed at the top of the tower and controlled remotely via Bluetooth or Wi-Fi using a USB WiFi dongle. Tests are conveniently made from the ground. Users can also transfer files from the instrument using file transfer. They can also tether the instrument to an Android smartphone or tablet with a data service connection to upload or download data to the VIAVI StrataSync cloud.



Bluetooth and WiFi connectivity

# **GPS Receiver and Antenna**

The GPS receiver (option 010) gives the location (latitude, longitude, and altitude) and timing for highlyaccurate frequency measurements to independently verify base-station timing.

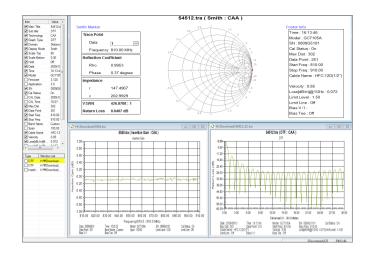


Analyzer with GPS antenna

# **Application Software**

### **JDViewer Features**

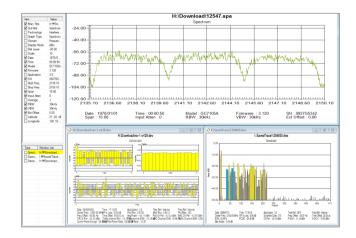
- Communicates with the analyzer via LAN or USB
- Retrieves measured or saved measurements
- Exports measurement results
- Generates and prints configurable reports
- Creates a composite file of multiple spectrogram traces
- Analyzes measurement results allowing for assignment of multiple markers and limit lines
- Creates user-defined settings for channel power, occupied bandwidth, SEM, and ACLR
- Registers and edits user-definable cable types and frequency bands
- Creates automatic testing scenarios for GSM, CDMA/ EV-DO, WCDMA/HSPA+, Mobile WiMAX, and LTE
- Creates signal strength maps as well as over-theair signal analysis maps for GSM, CDMA/EV-DO, WCDMA/HSPA+, Mobile WiMAX, and LTE



JDViewer VSWR, DTF, Smith chart



JDViewer OTA mapping



JDViewer spectrum, demodulation

# **JDRemote Features**

This capability permits full remote control of the instrument through a software client. Control can either be via directly connected USB, network LAN connections, or Bluetooth.

The analyzer communicates with two Windows-based applications:

- JDViewer for post-processing, report generation, personalized settings, and coverage map creation
- JDRemote for full remote control



Analyzer with JDRemote



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To reach the VIAVI office nearest you, visit viavisolutions.com/contact

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