CellAdvisor™

JD745B/JD785B Base Station Analyzers

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™, 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

*CellAdvisor JD785 only

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	100 kHz to 4 GHz
Cable and antenna analyzer	5 MHz to 4 GHz
RF power meter	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

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.

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

The outdoor display mode enables easier reading in direct sunlight

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.

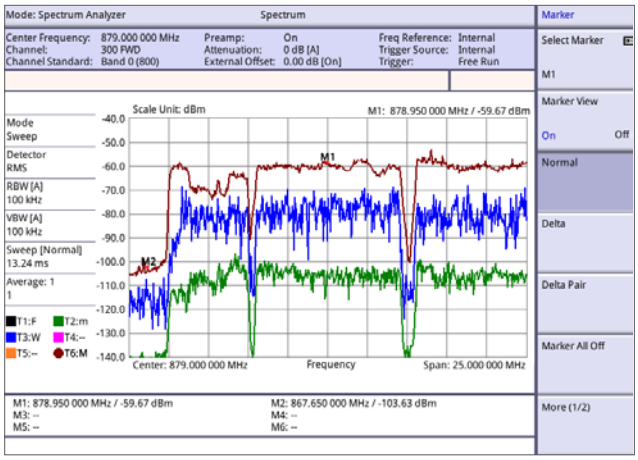
Auto Measure can be easily executed so the instrument automatically configures and tests every aspect for all carriers regardless of their frequency or modulation type. The analyzer's configurable channel scanner can track on one measurement screen the power levels for each of 20 carriers operating at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

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.



Outdoor display mode

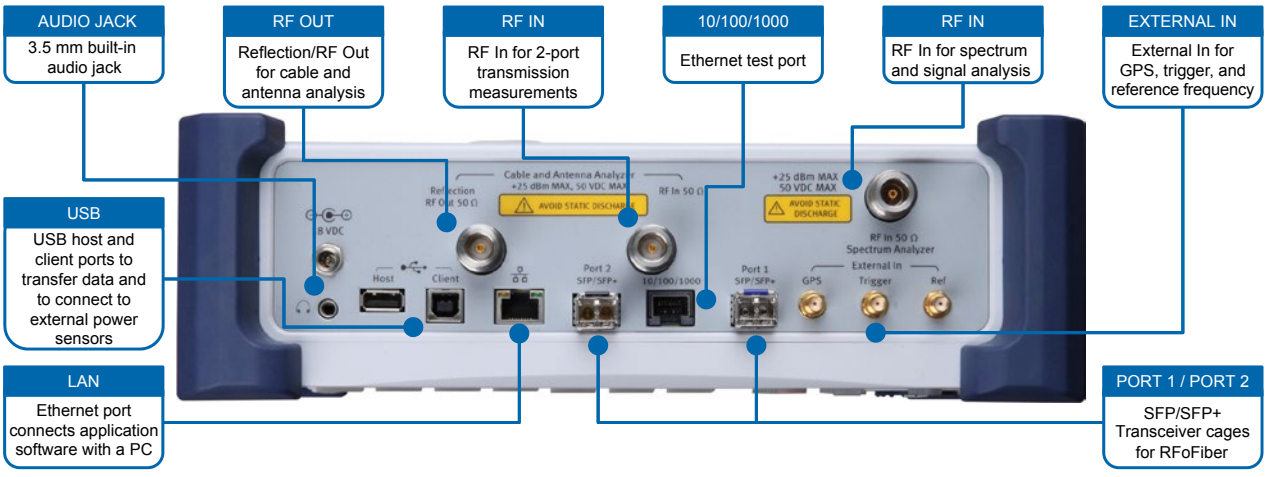
RFoFiber (RFoCPRI/RFoOBSAI)

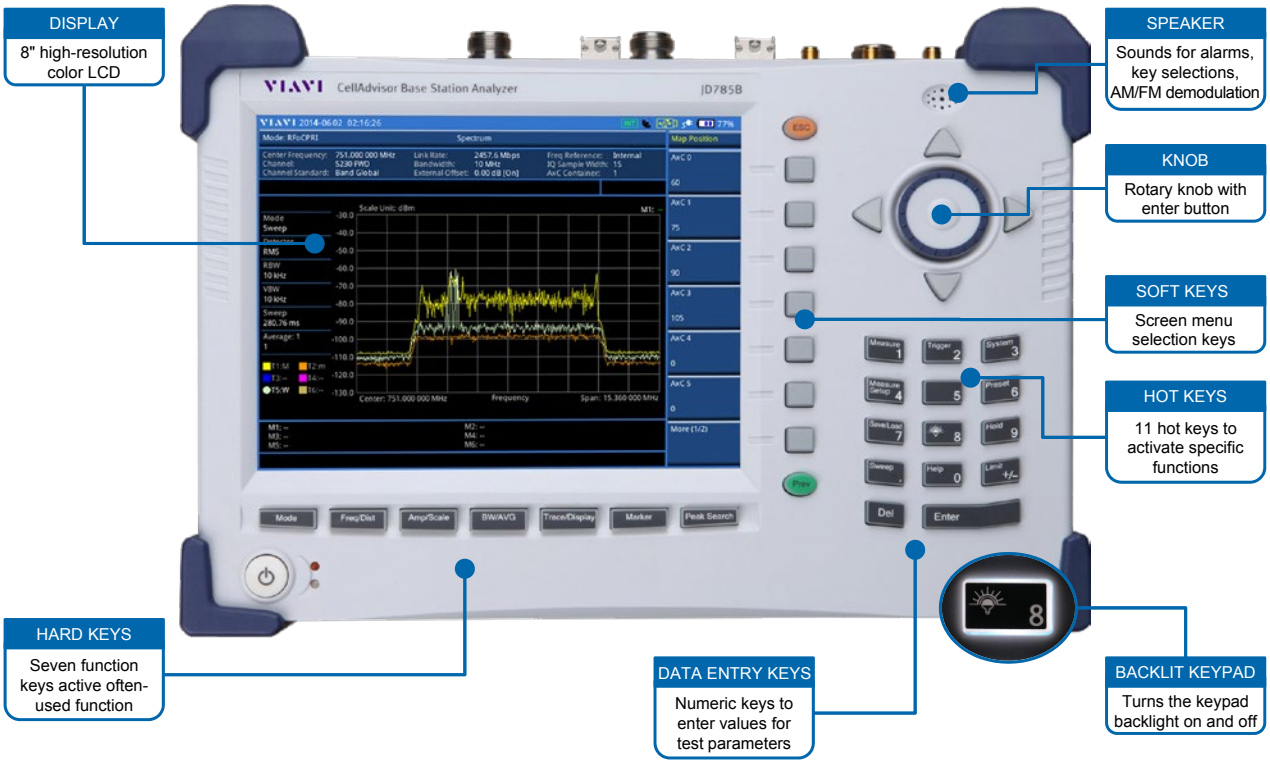
Modern cell sites have a distributed architecture that replaces coax-based feeders with fiber-based feeders and, therefore, significantly reduces signal loss and reflection problems. However, since all RF interfaces reside on the RRH, any RF maintenance or troubleshooting requires reaching the tower 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





Spectrum Analyzer 100 kHz to 4 GHz (JD745B) 9 kHz to 8 GHz (JD785B) Built-in pre-amplifier Zero span with gate sweep	Locates and identifies various signals. Detects signals as low as –160 dBm/ –165 dBm with better than 1 dB measurement accuracy. Triggers pulse or burst signals such as WiMAX, GSM, and TD-SCDMA.
Cable and Antenna Analyzer 5 MHz to 4 GHz (JD745B) 5 MHz to 6 GHz (JD785B)	Provides cable and antenna characterization for proper power transfer from the radio to the antenna. Locates failure points for effective troubleshooting. Verifies conformance to cable specifications.
RF Power Meter 10 MHz to 4 GHz (JD745B) 10 MHz to 8 GHz (JD785B)	Integrated RF power meter eliminates the need for a separate instrument and measures power with or without a power sensor.
2-Port Transmission Measurements (option 001)	Verifies passive and active devices such as filters and amplifiers.
Bias Tee (option 002)	Supplies up to 32 VDC built-in bias to active devices such as amplifiers.
RFoFiber/CW Signal Generator (options 003, 081, 082, 086)	Supports continuous wave (CW) generation and generates LTE FDD and TDD signals.
RFoFiber/Interference Analyzer (options 008, 060–073)	Enables RF measurements over fiber without the need to climb the tower to access the remote radio head.
Bluetooth Connectivity (option 006)	Provides remote control and monitoring capability with JDRemote via Bluetooth interface.
GPS Receiver and Antenna (option 010)	Provides geographical location and highly-accurate frequency, and time for precise measurements.
Interference Analyzer (option 011)	Provides the required spectrogram and multisignal RSSI parameters to properly monitor, identify, and locate interference signals. In addition, it can generate a variable audible tone based on signal strength.
Channel Scanner (option 012)	An intuitive graphical representation of 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 and multimode connectors via an optical power sensor (MP-60A or MP-80A).
Signal Analyzer (options 020-029)	Provides 3GPP/3GPP2/IEEE802.16 conformance testing for RF characteristics as well as modulation analysis of 2G to 4G wireless technologies.
RFoFiber Signal Analyzer (options 091, 092, 096)	TheRFoFiber Signal Analyzer supports analysis for LTE-FDD/TDD signals such as modulation accuracy test.
Over-the-Air Analyzer (options 040 to 049)	Characterizes transmission quality at any location providing reflective measurements and identifying signals transmitted from various sites.
BBU Emulation Support (options 101)	Emulates BBU test functions *without* a BBU connection and tests RF directly from the BBU (RFoCPRI).

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 wireless-signal 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

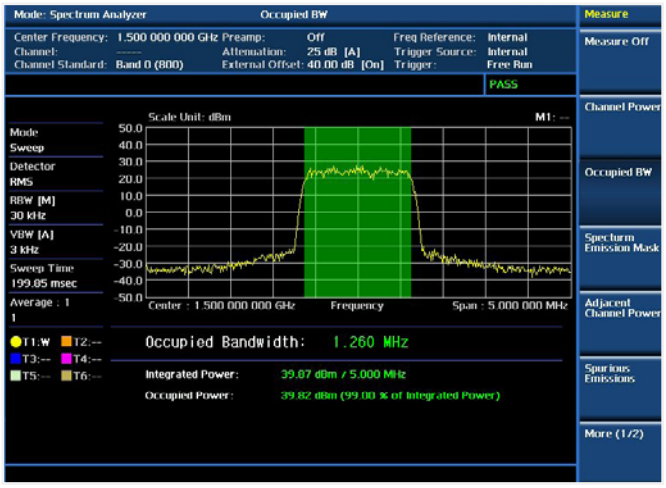
- Built-in preamplifier
- Zero span with gated sweep
- AM/FM audio demodulation
- Multiple detectors: normal, RMS, sample, negative, peak
- Advanced marker: frequency counter, noise marker
- Limit line
- Up to six markers and six traces

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

RF test — Channel 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

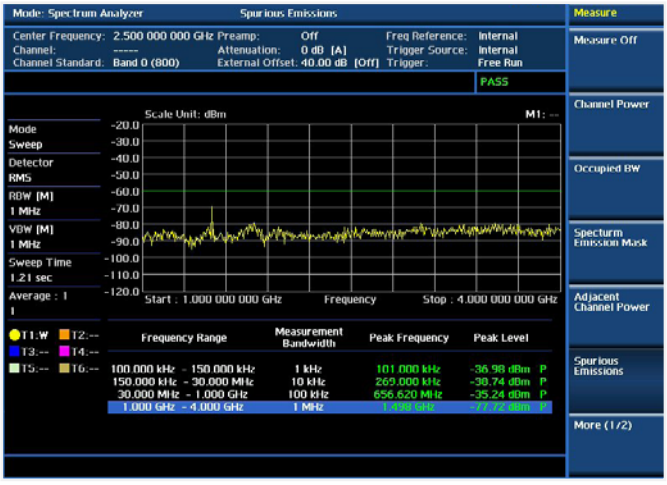
Spectrum Emission Mask (SEM) compares the total power level within the defined carrier bandwidth and the given offset frequencies to defined mask limits with pass/fail results.

RF test — Spectrum Emission Mask

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 — Adjacent Channel Power

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.

RF test — Dual Spectrum

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

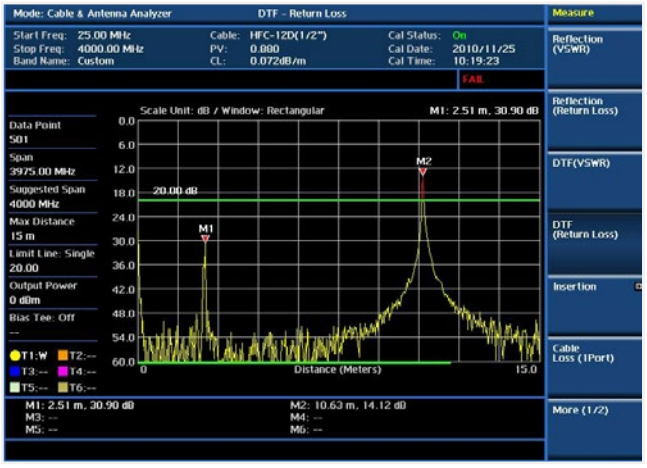
- Reflection
  - Voltage standing-wave ratio (VSWR)
  - Return loss
- DTF
  - VSWR
  - Return loss
- Cable loss (1-port)
- Port phase
- Smith chart
- 2-port transmission measurements (option 001)
  - Scalar measurements
  - Vector measurements

Measurements

Reflection – Return Loss measures complete cell-site 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 cell-site 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.

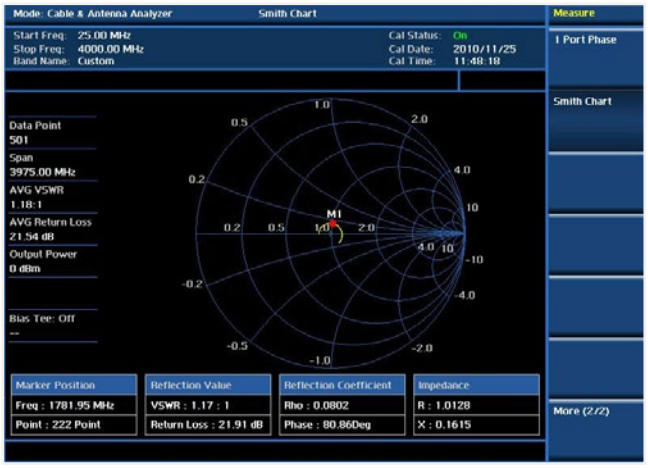


Cable and antenna test — Distance to Fault

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.

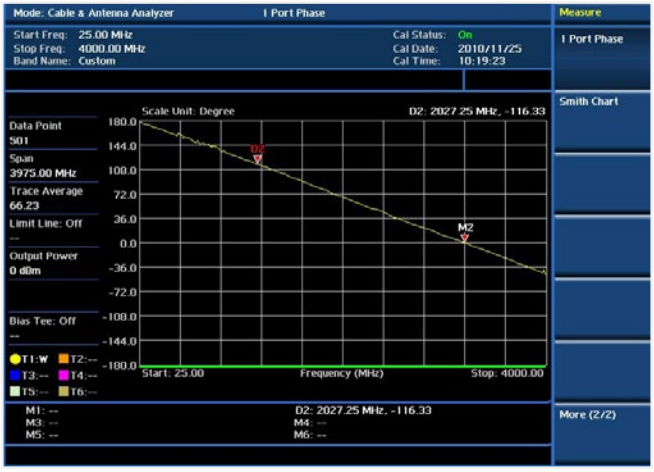
Cable and antenna test — Cable Loss

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.



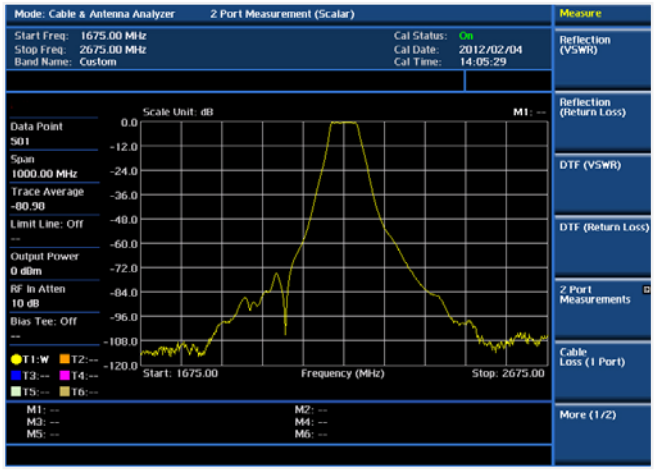
Cable and antenna test — Smith Chart

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 sector-to-sector isolation.

2-Port Phase in Vector Measurements measure S_{21} 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 high-accuracy 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.

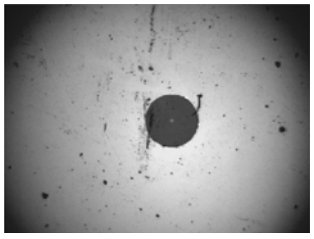
The analyzer controls directional power sensors (JD731B and JD733A) measuring output power and impedance matching for in-service systems. These power sensors can handle up to 150 W of power, eliminating the need for attenuators.

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

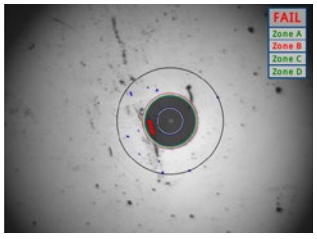
This optical power meter offers a well-organized solution for fiber inspection.

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™ 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

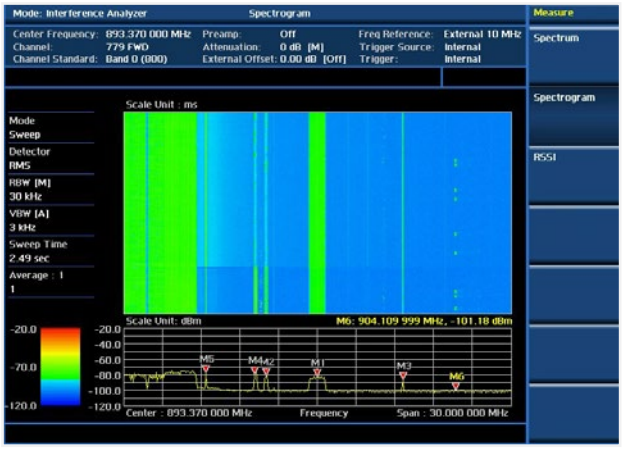
A spectrum analyzer can perform spectrum clearance, capturing just the events where the received signal exceeds the defined power limit.

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.



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.

Interference analysis test — RSSI

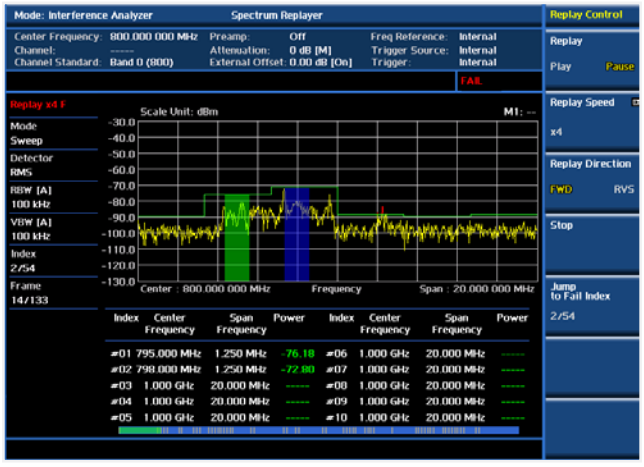
Interference Finder is an automatic triangulation algorithm that uses GPS coordinates to locate possible interference sources based on three measurements.

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

Interference analysis test — Interference Finder

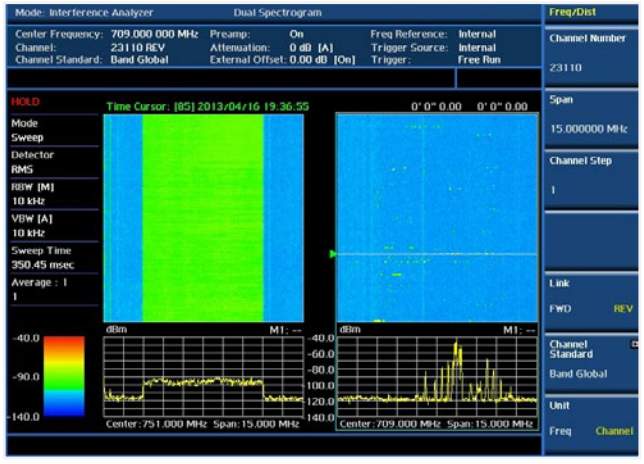
Spectrum Replayer lets users retrieve and replay recorded spectrum analyzer traces in interference analysis mode. These traces can be played back in the spectrogram or RSSI.

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.



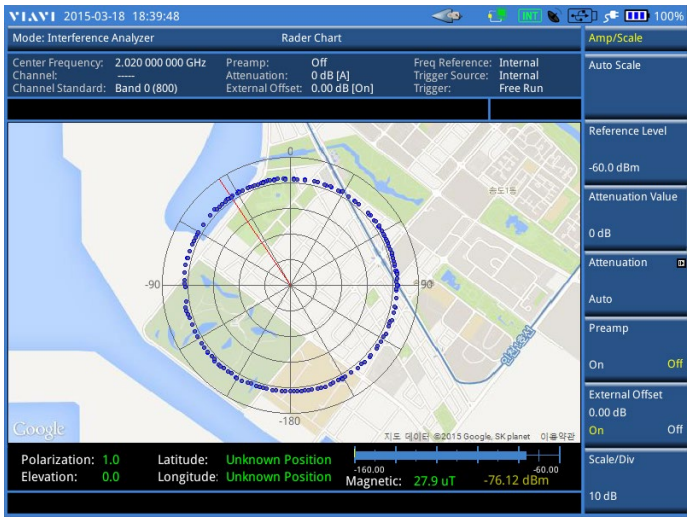
Interference analysis test — Spectrum Replayer

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/IEEE802.16-standard RF compliance testing for power and spectrum as well as modulation analysis. It performs standards-based 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

Features			Technology			
	Feature		GSM/GPRS/EDGE	WCDMA/HSPA+	LTE/LTE-Advanced—FDD	LTE/LTE-Advanced—TDD
			(Option 022)	*(Option 023)*	*(Option 028 /030)*	*(Option 029 /031)*
RF analysis	Channel power		■	■	■	■
	Occupied bandwidth		■	■	■	■
	Spectrum emission mask		■	■	■	■
	ACP(L)R			■	■	■
	Multi-ACP(L)R			■	■	■
	Spurious emissions		■	■	■	■
Modulation analysis	Power vs. time	Slot	■			■
		Frame	■		■	■
		Mask				
		Timogram				
	Constellation		■	■	■ MBMS	■
	Code domain power			■		
	Mid-amble power					
	Code power					
	Code error					
	RCDE			■		
	Codogram			■		
	RCSI			■		
	CDP table			■		
	Spectral flatness					
	EVM vs. subcarrier					
	EVM vs. symbol					
	Data channel				■ MBMS	■ MBMS
	Control channel				■ MBMS	■ MBMS
	Subframe				■ MBMS	■ MBMS
	Frame				■ MBMS	
	Time alignment error				■	■
	Data allocation map				■ MBMS	■ MBMS
	Auto measure		■	■	■	■
	Power statistics CCDF			■	■	■
	Carrier Aggregation				■	■
			(Option 042)	*(Option 043)*	*(Option 048)*	*(Option 049)*
OTA analysis	Scanner		Channel/Frequency	Channel/Scramble	Channel/ID	Channel/ID
	Multipath profile		■	■	■	■
	Preamble power trend					
	Modulation analyzer		■			
	Code domain power			■		
	Sync-DL ID vs. tau					
	Sync-DL ID analyzer					
	Control channel				■ MBMS	■ MBMS
	Datagram				■	■
	Route map			■	■	■

Signal Analyzer Detailed Feature Matrix (Continued)

Features			Technology			
	Feature		cdmaOne/cdma2000	EV-DO	TD-SCDMA	Mobile WiMAX
			(Option 020)	*(Option 021)*	*(Option 025)*	*(Option 026)*
RF analysis	Channel power		■	■	■	■
	Occupied bandwidth		■	■	■	■
	Spectrum emission mask		■	■	■	■
	ACP(L)R		■	■	■	■
	Multi-ACP(L)R		■	■	■	■
	Spurious emissions		■	■	■	■
Modulation analysis	Power vs. time	Slot		Idle/Active	■	
		Frame			■	■
		Mask			■	
		Timogram			■	
	Constellation		■	■	■	■
	Code domain power		■	■		
	Mid-amble power				■	
	Code power				■	
	Code error				■	
	Codogram		■	■		
	RCSI		■	■		
	CDP table		■	■		
	Spectral flatness					■
	EVM vs. subcarrier					■
	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 profile		■	■	Sync-DL ID	■
	Preamble power trend					■
	Modulation analyzer					
	Code domain power		■	■		
	Sync-DL ID vs. tau				■	
	Sync-DL ID analyzer				■	
	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.

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.

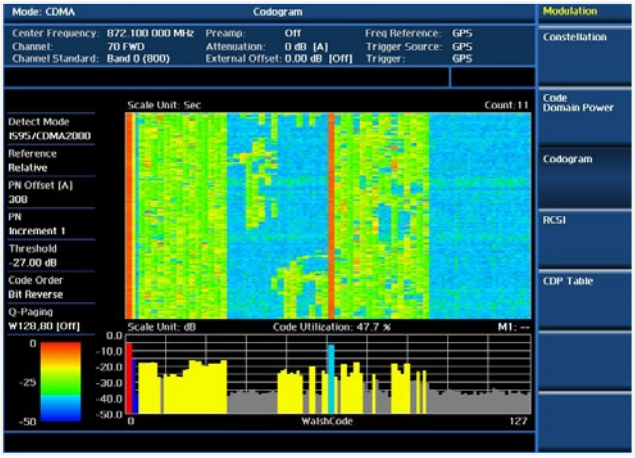
Code Error shows the power data and error data for an individual code channel and layer for a specified time simultaneously.

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.



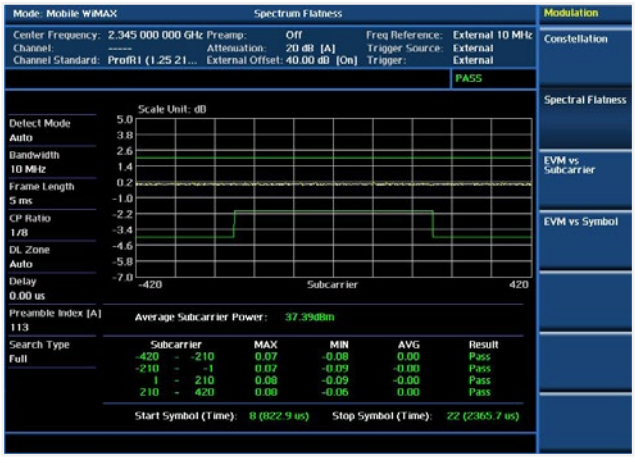
Modulation analysis — Codogram

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.



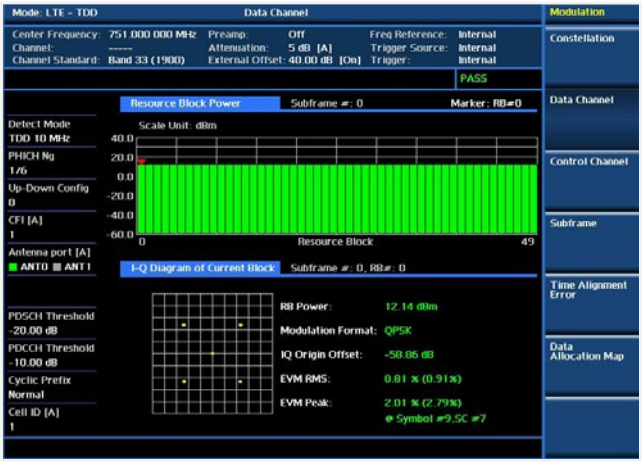
Modulation analysis — Spectral Flatness

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.

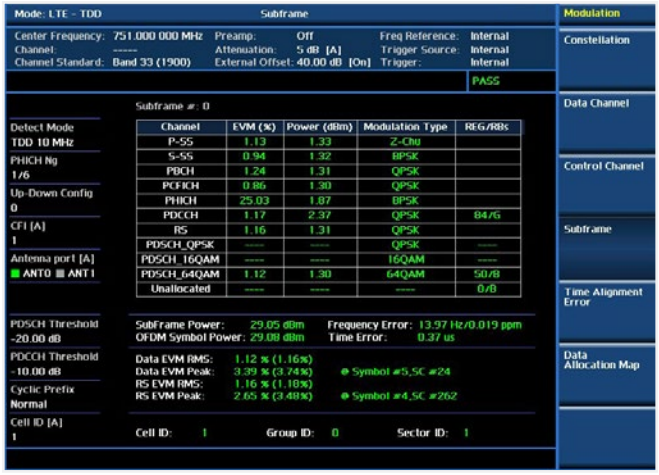
Data Channel measures, with LTE and MBMS, selected resource block or control channel constellation and modulation quality at any subframe.



Modulation analysis — Data Channels

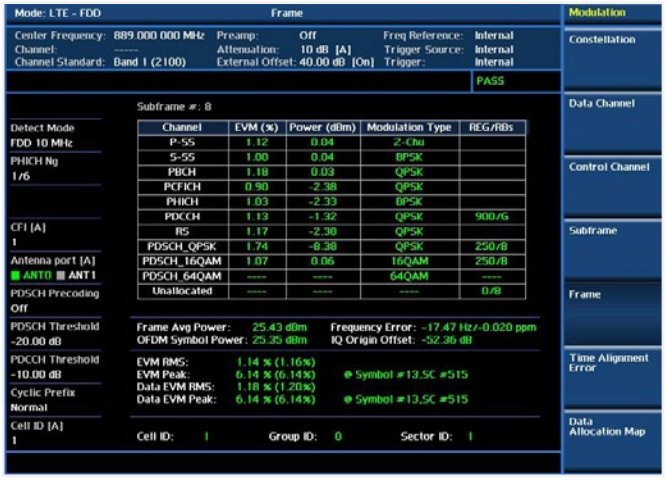
Modulation Analysis (Continued)

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



Modulation analysis — Subframe

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



Modulation analysis — Frame

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

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.

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.

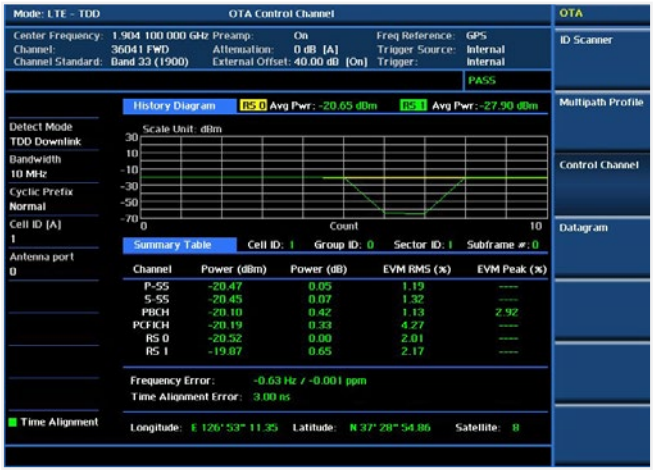
Modulation analysis — Carrier Aggregation

OTA Analysis

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

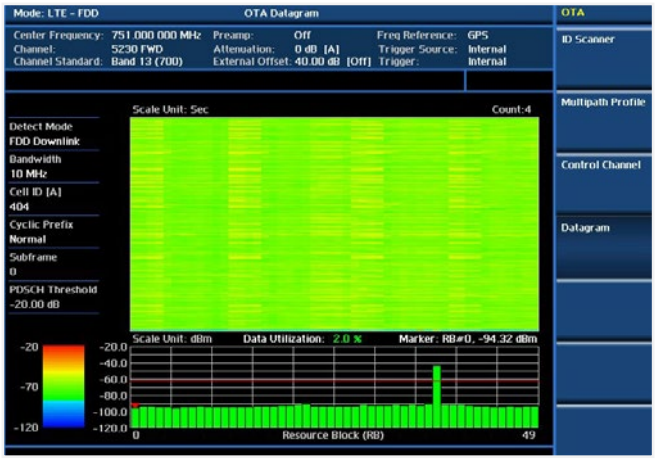
OTA analysis — ID (Channel Scanner)

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.



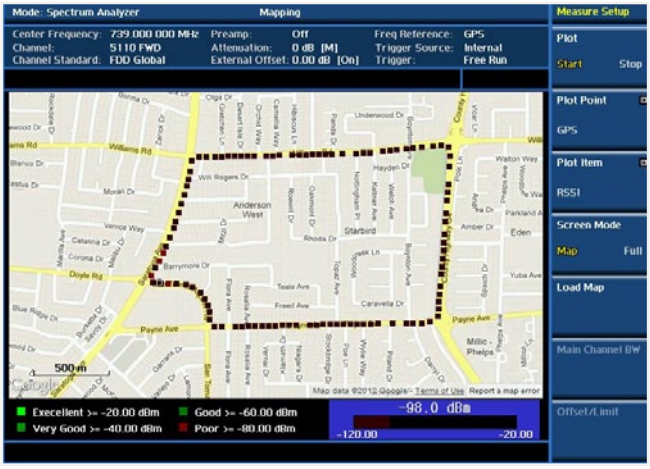
OTA analysis — Control Channels

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



OTA analysis — OTA Datagram

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.

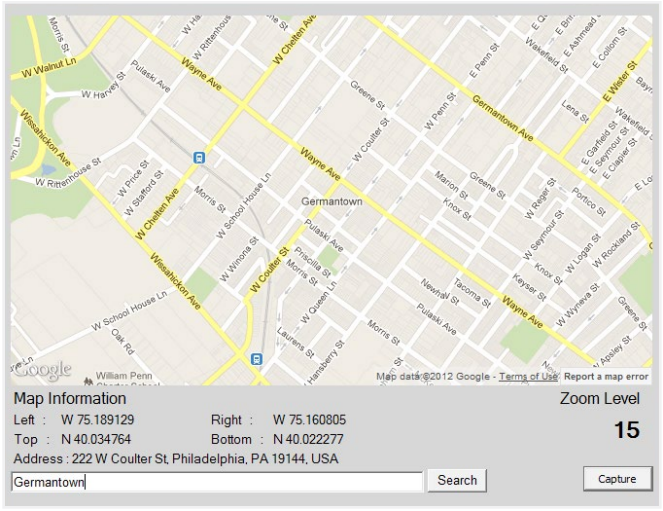


OTA analysis — Route Map

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.

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



OTA analysis — JDMapCreator

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
- 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

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.

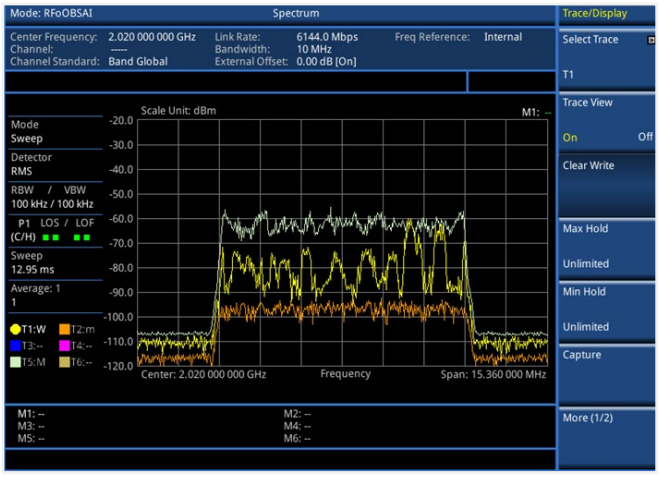
RFoCPRI – Layer 2 Term

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.

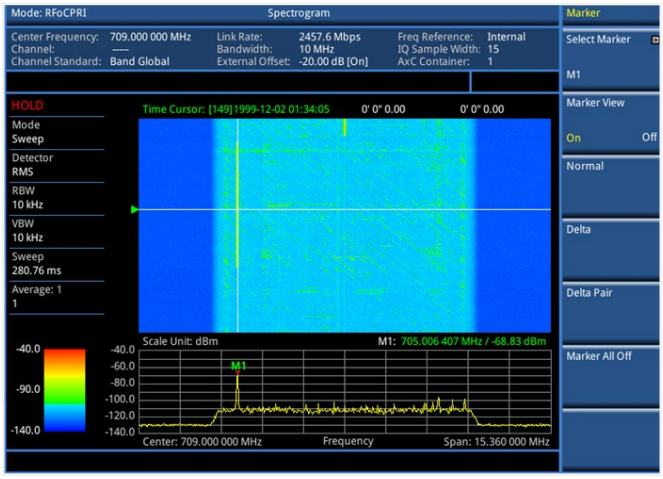
Spectrum Analyzer enables users to see and record the uplink and downlink spectrum for further analysis later. It provides a more effective way to observe interference for TDD systems because it completely separates the uplink signal from downlink.

RFoCPRI – Spectrum

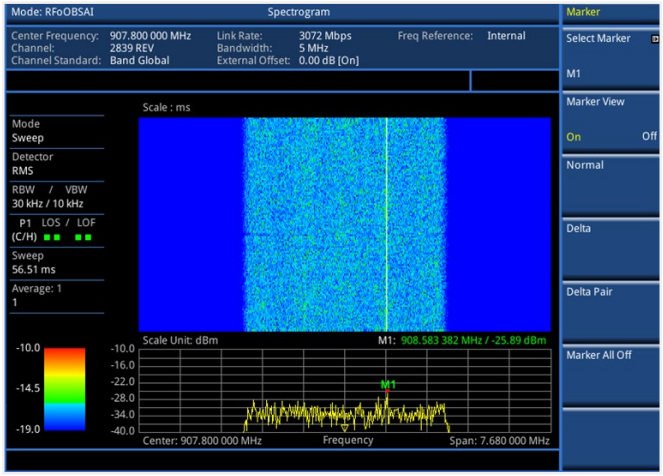


RFoOBSAI – Spectrum

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.

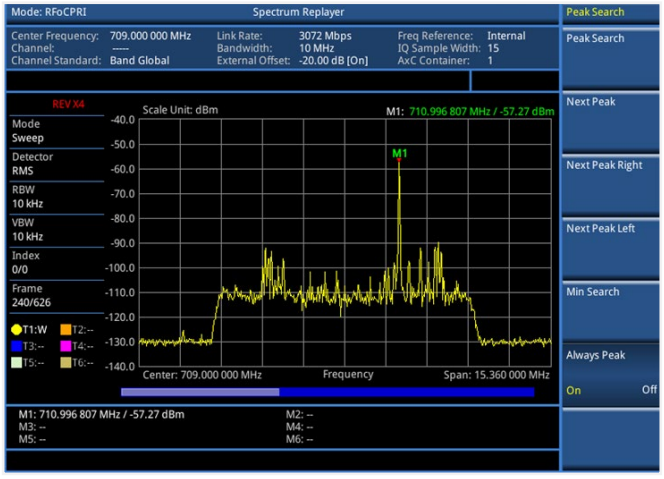


RFoCPRI - Spectrogram



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.



RFoCPRI - Spectrum replayer

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.

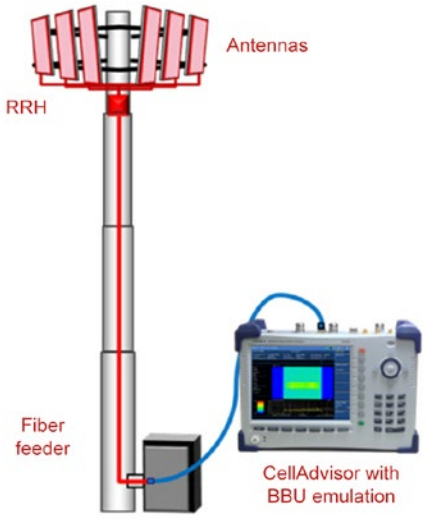
RFoCPRI – PIM detection

RFoOBSAI LTE-FDD signal analyzer window

RFoCPRI — DL signal analysis window

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.



RRH CPRI status and active software

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.

Channel Scanner

StrataSync*

The CellAdvisor JD780A-series 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.

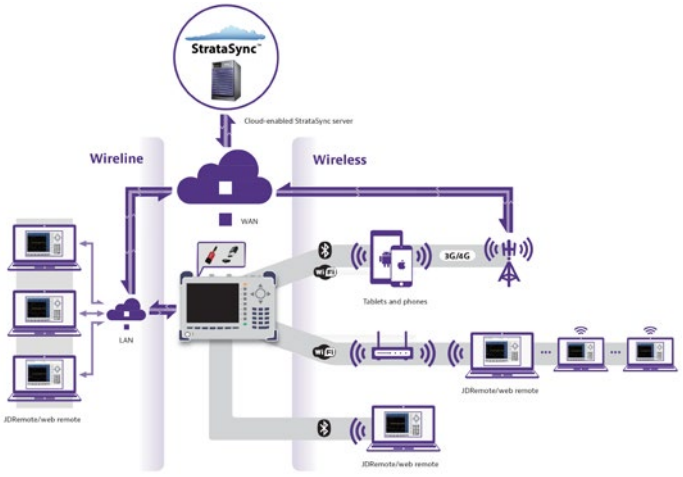
- Manage asset inventory
- Remotely distribute instrument upgrades
- Centralize configuration sharing
- Offers test data management
  - Trace files
  - Screenshots
  - Remote analysis

StrataSync™

* CellAdvisor JD785 only

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

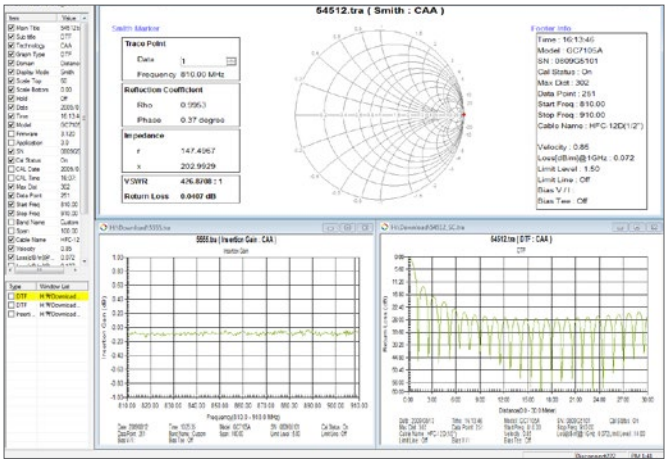
The GPS receiver (option 010) gives the location (latitude, longitude, and altitude) and timing for highly-accurate frequency measurements to independently verify base-station timing.

Analyzer with GPS antenna

Application Software

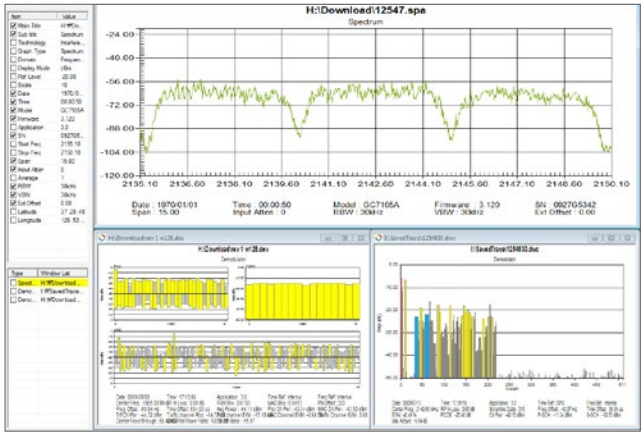
JDViewer Features

- 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-the-air 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

VIAVI Solutions

Data Sheet

VIAVI
CellAdvisor™

JD745B Base Station Analyzer Specifications

Spectrum Analyzer (standard)

Frequency		
Frequency range	100 kHz to 4 GHz	
Frequency accuracy	± (Readout frequency x Internal 10MHz Frequency reference accuracy + RBW centering + 2 Hz + 0.5 x Horizontal resolution)	
Internal 10 MHz Frequency Reference		
Accuracy	±0.05 ppm + aging (0 to 50°C) ±0.01 ppm, after 15 minutes of GPS Lock (0 to 50°C)	
Aging	±0.5 ppm/year	
Frequency Span		
Range	0 Hz (zero span) 10 Hz to full span	
Resolution	1 Hz	
Resolution Bandwidth (RBW)		
–3 dB bandwidth	1 Hz to 3 MHz	1-3-10 sequence
Accuracy	±10% (nominal)	
Video Bandwidth (VBW)		
–3 dB bandwidth	1 Hz to 3 MHz	1-3-10 sequence
Accuracy	±10% (nominal)	
Single Sideband (SSB) Phase Noise		
Fc 1 GHz, RBW 10 kHz, VBW 1 kHz, RMS detector		
Carrier Offset 30 kHz 100 kHz 1 MHz	 <–90 dBc/Hz (typical) <–95 dBc/Hz (typical) <–102 dBc/Hz (typical)	
Measurement Range		
DANL to +20 dBm		
Input attenuator range	0 to 50 dB, 5 dB steps	
Maximum Input Level		
Average continuous power	+20 dBm	
DC voltage	±50 V DC	

Spectrum Analyzer: 100 kHz to 4 GHz

Cable and Antenna Analyzer: 5 MHz to 4 GHz

Power Meter: 10 MHz to 4 GHz

Specification Conditions

JD745B specifications apply under these conditions:

- The instrument has been turned on for at least 15 minutes
- The instrument is operating within a valid calibration period
- Data with no tolerance are considered typical values
- Cable and antenna measurements apply after calibration to the OSL standard
- Typical and nominal values are defined as:
  - Typical: expected performance of the instrument operating at 20 to 30°C after being at this temperature for 15 minutes
  - Nominal: a general, descriptive term or parameter

Displayed Average Noise Level (DANL)		
1 Hz RBW, 1 Hz VBW, 50 Ω termination, 0 dB attenuation, RMS detector		
Preamplifier Off		
10 MHz to 2.3 GHz	–140 dBm (–146 dBm, typical)	
>2.3 GHz to 3 GHz	–138 dBm (–144 dBm, typical)	
>3 GHz to 4 GHz	–135 dBm (–140 dBm, typical)	
Preamplifier On		
10 MHz to 2.3 GHz	–155 dBm (–160 dBm, typical)	
>2.3 GHz to 3 GHz	–153 dBm (–158 dBm, typical)	
>3 GHz to 4 GHz	–150 dBm (–156 dBm, typical)	
Display Range		
Log scale and units (10 divisions displayed)	1 to 20 dB/division in 1 dB steps dBm, dBV, dBmV, dBμV	
Linear scale and units (10 divisions displayed)	V, mV, mW, W	
Detectors	Normal, positive peak, sample, negative peak, RMS	
Number of traces	6	
Trace functions	Clear/write, maximum hold, minimum hold, capture, load view on/off, trace math	
Total Absolute Amplitude Accuracy		
Preamplifier off, power level >–50 dBm, auto-coupled (20 to 30°C)		
5 MHz to 4 GHz	±1.25 dB, ±0.5 dB (typical)	Attenuation <40 dB
	±1.55 dB, ±1.0 dB (typical)	Attenuation ≥40 dB
Reference Level		
Setting range	–120 to +100 dBm	
Setting Resolution		
Log scale	0.1 dB	
Linear scale	1% of reference level	
Markers		
Marker types	Normal, delta, delta pair, noise, frequency count marker	
Number of markers	6	
Marker functions	Peak, next peak, next peak left, next peak right, minimum search marker to center/start/stop, always peak on/off	
RF Input VSWR		
20 MHz to 4 GHz	1.5:1 (typical)	
Second Harmonic Distortion		
Mixer level	–25 dBm	
10 MHz to 1.3 GHz	<–65 dBc (typical)	
>1.3 GHz to 4 GHz	<–70 dBc (typical)	
Third-Order Inter-Modulation (third-order intercept: TOI)		
200 MHz to 2 GHz	+10 dBm (typical)	
>2 GHz to 4 GHz	+12 dBm (typical)	

Spurious		
Inherent residual response Input terminated, 0 dB attenuation, preamplifier off, RBW at 10 kHz, Sweep mode		
20 MHz to 3 GHz	–90 dBm (nominal)	
>3 GHz to 4 GHz	–85 dBm (nominal)	
Exceptions	< –70 dBm at 85.6MHz/ 227.88/ 770.4/ 1791.8/ 2647.8/ 2927.3/ 3195.2/ 3915.1/ 3640 MHz	
Input-related spurious	<–67 dBc (nominal)	
Dynamic Range		
2/3 (TOI-DANL) in 1 Hz RBW	>95 dB	
Sweep Time		
Range	80 ms to 1000 s 24 μs to 200 s	Span = 0 Hz (zero span)
Accuracy	±2%	Span = 0 Hz (zero span)
Mode	Continuous, single	
Gated Sweep		
Trigger source	External, video, and GPS	
Gate length	1 μs to 100 ms	
Gate delay	0 to 100 ms	
Trigger		
Trigger source	Free run, video, external, GPS	
Trigger Delay		
Range	0 to 200 s	
Resolution	6 μs	
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		

* CW signal generator (Option 003) can be set up simultaneously.

Cable and Antenna Analyzer (standard)

Frequency	
Range	5 MHz to 4 GHz
Resolution	10 kHz
Accuracy	±25 ppm + aging (20 to 30C°)
Aging	±5 ppm
Data Points	
126, 251, 501, 1001	
Measurement Speed	
1.65 ms/point (nominal)	
Measurement Accuracy	
Corrected directivity	40 dB
Reflection uncertainty	±(0.3 + |20log (1+10$^{-EP/20}$)|) (typical) EP = directivity – measured return loss
Output Power	
High	0 dBm (typical)
Low	–30 dBm (typical)
Dynamic Range	
Reflection	60 dB
Maximum Input Level	
Average continuous power	+25 dBm (nominal)
DC voltage	±50 V DC
Interference Immunity On channel On frequency	 +17 dBm at >1.4 MHz from carrier frequency (nominal) 0 dBm within ±10 kHz from the carrier frequency (nominal)
Measurements	
Reflection (VSWR) VSWR range Return loss range Resolution	 1 to 65 0 to 60 dB 0.01
Distance to Fault (DTF) Vertical VSWR range Vertical return loss range Vertical resolution Horizontal range Horizontal resolution	 1 to 65 1 to 60 dB 0.01 0 to (# of data points – 1) x horizontal resolution Maximum = 1500 m (4921 ft) (1.5 x 10^8) x (V_p)/delta V_p = propagation velocity Delta = stop freq – start freq (Hz)
Cable Loss (1-port) Range Resolution	 0 to 30 dB 0.01 dB
1-Port Phase Range Resolution	 –180 to +180° 0.01°
Smith Chart Resolution	 0.01

RF Power Meter (standard)

General Parameters			
Display range	100 to +100 dBm		
Offset range	0 to 60 dB		
Resolution	0.01 dB or 0.1 x W (x = m, u, p)		
Internal RF Power Sensor			
Frequency range	10 MHz to 4 GHz		
Span	100 kHz to 100 MHz		
Dynamic range	–120 to +20 dBm		
Maximum power	+20 dBm		
Accuracy	Same as spectrum analyzer		
External RF Power Sensors			
Directional	**JD731B**		**JD733A**
Frequency range	300 MHz to 3.8 GHz		150 MHz to 3.5 GHz
Dynamic range	0.15 to 150 W (average) 4 to 400 W (peak)		0.1 to 50 W (average) 0.1 to 50 W (peak)
Connector type	Type-N female on both ends		
Measurement type	Forward/reverse average power, forward peak power, VSWR		
Accuracy	±(4% of reading + 0.05 W)[1,2]		
Terminating	**JD732B**	**JD734B**	**JD736B**
Frequency range	20 MHz to 3.8 GHz		
Dynamic range	–30 to +20 dBm		
Connector type	Type-N male		
Measurement type	Average	Peak	Average and peak
Accuracy	±7%[1]		

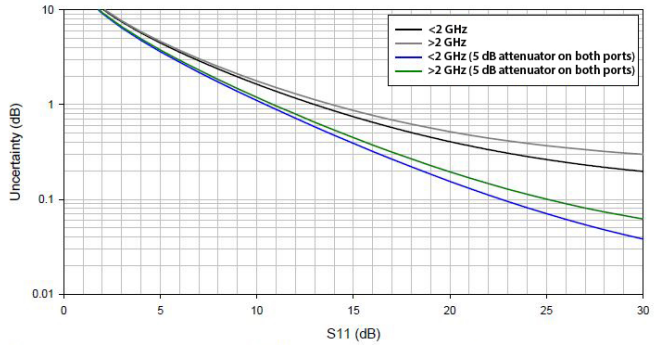
Optical Power Meter (Standard)

Optical Power Meter		
Display range	–100 to +100 dBm	
Offset range	0 to 60 dB	
Resolution	0.01 dB or 0.1 mW	
External Optical Power Sensors		
	MP-60A	**MP-80A**
Wavelength range	780 to 1650 nm	
Max permitted input level	+10 dBm	+23 dBm
Connector type	Type-N female on both ends	
Connector input	Universal 2.5 and 1.25 mm	
Accuracy	±5%	

1. CW condition at 25°C ±10°C
2. Forward power

2-Port Transmission Measurements (Option 001)

Frequency	
Frequency range	5 MHz to 4 GHz
Frequency resolution	10 kHz
Transmission uncertainty	



Use 5 dB attenuators on both ports to lessen uncertainty.

Output Power	
High	0 dBm (typical)
Low	–30 dBm (typical)
Measurement Speed	
Vector	2.2 ms/point (nominal)
Dynamic Range	
Vector	5 MHz to 3 GHz, 80 dB >3 GHz to 4 GHz, 75 dB
Scalar	5 MHz to 4 GHz, >100 dB
Measurements	
Insertion Loss/Gain Range Resolution	 –120 to 100 dB 0.01 dB
2-Port Phase Range Resolution	 –180 to +180° 0.01°

Bias-Tee (Option 002)

Voltage	
Voltage range	+12 to +32 V
Voltage resolution	0.1 V
Power	
8 W Max	

CW Signal Generator (Option 003)

Frequency	
Frequency range	25 MHz to 4 GHz
Frequency reference	±25 ppm Maximum
Frequency resolution	10 kHz
Output Power	
Range	0 dBm, –30 to –80 dBm
Step	1 dB
Accuracy	±1.5 dB, (0 dBm, -30 to -70 dBm) ± 2.5 dB (-70 to -80 dBm) (15 to 35°C)

GPS Receiver and Antenna (Option 010)

GPS Indicator		
Latitude, longitude, altitude		
High-Frequency Accuracy		
Spectrum, interference, and signal analyzer		
GPS lock	±10 ppb	
Hold over (for 3 days)	±50 ppb (0 to 50°C)	15 minutes after satellite locked
Connector	SMA, female	

Interference Analyzer (Option 011)

Measurements	
Spectrum analyzer	Sound indicator, AM/FM audio demodulation, interference ID, spectrum recorder
Spectrogram	Collect up to 72 hours of data
RSSI	Collect up to 72 hours of data
Interference finder	
Spectrum replayer	
Dual spectrogram	

Channel Scanner (Option 012)

Frequency Range	
10 MHz to 4 GHz	
Measurement Range	
-110 to +20 dBm	
Measurements	
Channel scanner	1 to 20 channels
Frequency scanner	1 to 20 frequencies
Custom scanner	1 to 20 channels or frequencies

Bluetooth Connectivity (Option 013)

Personal area network (PAN)
File transfer profile (FTP)

WiFi Connectivity (Option 016)

Measurements	
Interface type	USB LAN card
Interface standard	IEEE 802.11 b/g/n
Chipset	RealTek, Ralink
USB wireless mode	Infrastructure mode
Web-based remote control	Internet Exporer, Chrome, Safari
Internet protocol version	IPvc4, IPv6

cdmaOne/cdma2000® Signal Analyzer (Options 020 and 040)

General Parameters		
Frequency range	Band 0 to 10	
Input signal level	–40 to +20 dBm	
RF channel power accuracy	±1.0 dB (typical)	
CDMA compatibility	cdmaOne and cdma2000	
Frequency error	±10 Hz + ref freq accuracy	99% confidence level
Rho accuracy	±0.005	0.9 < Rho < 1.0
Residual Rho	>0.995 (typical)	
PN offset	1 x 64 chips	
Code domain power	±0.5 dB relative power ±1.5 dB absolute power	Code channel power >–25 dB Code channel power >–25 dB
Pilot power accuracy	±1.0 dB (typical)	
Time offset	±1.0 µs, ±0.5 µs (typical)	External trigger

Measurements

Option 020

Channel Power	Rel power at defined range	Time offset	Pilot, Paging, Sync, Q-Paging	Frequency error
Channel power	***Multi-ACPR***	Carrier feed-through	***CDP Table***	Time offset
Spectral density	Lowest reference power	PN offset	Reference power	Carrier feed-through
Peak to average power	Highest reference power	***Code Domain Power***	Code utilization	Pilot power
Occupied Bandwidth	Abs power at defined range	Abs/Rel code power	Code, spreading factor	Max inactive power
Occupied bandwidth	Rel power at defined range	Channel power	Allocation (channel type)	PN offset
Integrated power	***Spurious Emissions***	Power bar graph (Abs/Rel)	Relative, absolute power	***Power Statistics CCDF***
Occupied power	Peak freq at defined range	Pilot, paging, sync, Q-paging	***Auto Measure***	
Spectrum Emission Mask	Peak level at defined range	Max, avg active power	Channel power	
Reference power	***Constellation***	Max, avg inactive power	Occupied bandwidth	
Peak level at defined range	Pilot power	PN offset	Spectrum emission mask	
ACPR	Rho	***Codogram***	ACPR	
Reference power	EVM	Code utilization	Multi-ACPR	
Abs power at defined range	Frequency error	***RCSI***	Rho	

Option 040

Channel Scanner (up to 6)	Ec/Io, pilot power, delay	PN offset	Peak amplifier capacity	
Frequencies or channels	***Multipath Profile***	Pilot, paging, sync, Q-paging power	Average amplifier capacity	
Channel power, PN offset	Channel power	Max, avg active power	Code utilization	
Pilot power, Ec/Io	Multipath power	Max, avg inactive power	Peak utilization	
PN Scanner (up to 6)	Ec/Io, delay	Frequency error	Average utilization	
Channel power	***Code Domain Power***	Time offset, Rho, EVM	***Route Map***	
Pilot dominance	Abs/Rel code power	Carrier feed-through	Pilot power	
PN offset	Channel power	Amplifier capacity	Ec/Io	

Longitude, latitude, and satellite in all screens

EV-DO Signal Analyzer (Options 021 and 041)

General Parameters		
Frequency range	Band 0 to 10	
Input signal level	–40 to +20 dBm	
RF channel power accuracy	±1.0 dB (typical)	
EV-DO compatibility	Rev 0, Rev A and Rev B	
Frequency error	±10 Hz + ref freq accuracy	99% confidence level
Rho accuracy	±0.005	0.9 < Rho < 1.0
Residual Rho	>0.995 (typical)	
PN offset	1 x 64 chips	
Code domain power	±0.5 dB relative power ±1.5 dB absolute power	Code channel power >–25 dB Code channel power >–25 dB
Pilot power accuracy	±1.0 dB (typical)	
Time offset	±1.0 µs, ±0.5 µs (typical)	External trigger

Measurements

Option 021

Channel Power	Abs power at defined range	Pilot, MAC, data EVM	Data channel power	Spectrum emission mask
Channel power	Rel power at defined range	***Constellation (pilot, MAC 64/128, and data)***	Slot average power	ACPR
Spectral density	***Spurious Emissions***	Channel power	Max, avg active power	Multi-ACPR
Peak to average power	Peak frequency at defined range	Rho, EVM, peak CDE	Max, avg inactive power	Pilot, MAC, data power
Occupied Bandwidth	Peak level at defined range	Frequency error	PN offset	On/off ratio
Occupied bandwidth	***Power vs. Time (idle and active slot)***	Time offset	***MAC Codogram***	PvsT mask (idle slot) or PvsT mask (active slot)
Integrated power	Slot average power	Carrier feed-through	Code utilization	Frequency error
Occupied power	On/off ratio	PN offset	***RCSI***	Time offset
Spectrum Emission Mask	Idle activity	Modulation type*	Slot, pilot, MAC, data	Carrier feed-through
Reference power	Pilot, MAC, data power	***Code Domain Power (pilot and MAC 4/128)***	***MAC CDP Table***	Pilot, MAC, data Rho
Peak level at defined range	***Constellation (composite 64/128)***	Pilot/MAC channel power	Reference power	Max inactive I/Q power
ACPR	Channel power	Slot average power	Code utilization	PN offset
Reference power	Rho, EVM, Peak CDE	Max active I/Q power	Code, spreading factor	***Power Statistics CCDF***
Abs power at defined range	Frequency error	Avg active I/Q power	Allocation (channel type)	
Rel power at defined range	Time offset	Max inactive I/Q power	Relative, absolute power	
Multi-ACPR	Carrier feed-through	Avg inactive I/Q power	***Auto Measure***	
Lowest reference power	PN offset	PN offset	Channel power	
Highest reference power	Pilot, MAC, data power	***Code Domain Power (data)***	Occupied bandwidth	

Option 041

Channel Scanner (up to 6)	Pilot dominance	Ec/Io, delay	(Composite) EVM	Code utilization
Frequencies or channels	PN offset	***Code Domain Power***	Frequency error	Peak utilization
PN offset	Ec/Io, pilot power, delay	Slot average power	Time offset	Average utilization
Pilot, MAC, data power	***Multipath Profile***	PN offset	Carrier feed-through	***Route Map***
PN Scanner (up to 6)	Channel power	Pilot, MAC,data power	Max active I/Q power	Pilot power
Channel power	Multipath power	Pilot, MAC, data Rho	Avg active I/Q power	Ec/Io

Longitude, latitude, and satellite in all screens

*Measurement is performed in Data Constellation only.

GSM/GPRS/EDGE Signal Analyzer (Options 022 and 042)

General Parameters		
Frequency range	450 MHz to 500 MHz 820 MHz to 965 MHz 1.705 GHz to 1.995 GHz	
Input signal range	–40 to +20 dBm	
Burst power	±1.0 dB	
Frequency error	±10 Hz + reference-frequency accuracy	99% confidence level
GMSK modulation quality		
Phase RMS Accuracy Residual error Phase peak accuracy 8 PSK modulation quality	 ±1.0 degrees 0.7 degrees (typical) ±2.0 degrees	 (0 < Phase RMS < 8) (0 < Phase peak < 30)
EVM Accuracy Residual error RF power vs. time	±1.5% 2.5% ±0.25 symbol	(2% < EVM < 8%)

Measurements				
		Option 022		
Channel Power	Peak level at defined range	TSC (Slot 0 to 7)	C/I*	PvsT – Mask
Channel power	***Spurious Emissions***	***Constellation***	EVM RMS*	Frame average power
Spectral density	Peak frequency at defined range	Burst power	EVM Peak*	Frequency error
Peak to average power	Peak level at defined range	Modulation type	EVM 95th*	Phase error RMS
Occupied Bandwidth	***Power vs. Time (slot)***	Frequency error	***Auto Measure***	Phase error peak
Occupied bandwidth	Burst power	Phase error RMS	Channel power	EVM RMS*
Integrated power	Max/min point	Phase error peak	Occupied bandwidth	EVM Peak*
Occupied power	***Power vs. Tme (frame)***	I/Q origin offset*	Spectrum emission mask	I/Q origin offset
Spectrum Emission Mask	Frame average power	TSC	Spurious emission mask	C/I*
Reference power	Burst power (Slot 0 to 7)	BSIC	Burst power	
		Option 042		
Channel/Frequency Scanner	BSIC (NCC, BCC)	SNR, delay	Frame average power	Modulation type
Channels or frequencies	***Multipath Profile***	***Modulation Analyzer***	BSIC, frame no. and time	
Absolute power	(10 strongest)	Frame avg power trend	C/I, frequency error	
Group (traffic, control)	Frame average power	C/I trend	Burst power	

Longitude, latitude, and satellite in all screens

* Measurements performed for 8PSK modulation signals (edge) only.

WCDMA/HSPA + Signal Analyzer (Options 023 and 043)

General Parameters		
Frequency range	Band 1 to 14, 19 to 22, 25, 26	
Input signal range	–40 to +20 dBm	
RF channel power accuracy	±1.0 dB, ±0.7 dB (typical)	
Occupied bandwidth accuracy	±100 kHz	
Adjacent channel leakage ratio (ACLR)	<–56 dB, ±0.7 dB at 5 MHz offset, <–58 dB, ±0.8 dB at 10 MHz offset	
WCDMA modulation	QPSK	
HSPA+ modulations	QPSK, 16 QAM, 64 QAM	
Frequency error	±10 Hz + reference-frequency accuracy	99% confidence level
EVM accuracy	±2.0%	2% ≤ EVM ≤ 20%
Residual EVM	2.5% (typical)	
Code domain power	±0.5 dB relative power ±1.5 dB absolute power	Code channel power >–25 dB Code channel power >–25 dB
CPICH power accuracy	±0.8 dB (typical)	

Measurements

Option 023

Channel Power	Abs power at defined range	Max, avg active power	Allocation (channel type)
Channel power	Rel power at defined range	Max, avg inactive power	EVM, modulation type
Spectral density	***Spurious Emissions***	Scramble code	Relative, absolute power
Peak to average power	Peak frequency at defined range	***Relative Code Domain Error***	***Auto Measure***
Occupied Bandwidth	Peak level at defined range	Abs/Rel code power	Channel power
Occupied bandwidth	***Constellation***	Code error	Occupied bandwidth
Integrated power	CPICH power	Individual code EVM, RCDE, and its constellation	Spectrum emission mask
Occupied power	Rho, EVM	Channel power	ACLR
Spectrum Emission Mask	Peak CDE	Power bar graph (Abs/Rel/Delta power) CPICH, P-CCPCH, S-CCPCH, PICH,P-SCH, S-SCH	Multi-ACLR
Reference power	Frequency error	Avg RCDE QPSK, 16 QAM, 64 QAM	Spurious emission mask
Peak level at defined range	Time offset	***Codogram***	Frequency error
ACLR	Carrier feed-through	Code utilization	EVM
Reference power	Scramble code	***RCSI***	Peak CDE
Abs power at defined range	***Code Domain Power***	CPICH, P-CCPCH, S-CCPCH, PICH, P-SCH, S-SCH	Carrier feed-through
Rel power at defined range	Abs/Rel code power	***CDP Table***	CPICH absolute power
Multi-ACLR	Individual code EVM and its constellation	Reference power	CPICH relative power
Lowest reference power	Channel power	Code utilization	Max inactive power
Highest reference power	Power bar graph (Abs/Rel/Delta power) CPICH, P-CCPCH, S-CCPCH PICH, P-SCH, S-SCH	Code, spreading factor	Scramble code
			Power Statistics CCDF

Option 043

Channel Scanner (up to 6)	***Multipath Profile***	CPICH, P-CCPCH, S-CCPCH, PICH, P-SCH, S-SCH	Amplifier capacity
Frequencies or channels	Channel, multipath power	Max, avg active power	Peak amplifier capacity
Channel power, scramble code, CPICH power, Ec/Io	Ec/Io, delay	Max, avg inactive power	Average amplifier capacity
Scramble Scanner (up to 6)	***Code Domain Power***	Frequency error	Code, peak utilization
Channel power	Abs/Rel code power	Time offset, Rho	Average utilization
CPICH dominance	Individual code EVM	Carrier feed-through	***Route Map***
Scramble code	Channel power	(Composite) EVM	CPICH power, Ec/Io
Ec/Io, CPICH power, delay	Scramble code	CPICH EVM, P-CCPCH EVM	

Longitude, latitude, and satellite in all screen

TD-SCDMA Signal Analyzer (Options 025 and 045)

General Parameters		
Frequency range	1.785 GHz to 2.22 GHz	
Input signal level	−40 to +25 dBm	
Channel power (RRC) accuracy	±1.0 dB (typical)	
Modulations	QPSK, 8 PSK, 16 QAM, 64 QAM	
Frequency error	±10 Hz + ref freq accuracy	99% confidence level
Residual EVM (RMS)	2.0% (typical)	P-CCPCH slot and 1 channel
Time error (Tau)	±1.0 µs (typical)	External trigger
Spreading factor	Auto (DL, UL), 1, 2, 4, 8, 16	

Measurements

Option 025

Channel Power	***Power vs. Time (slot)***	***Constellation***	Code Power and Error Chart	Peak CDE
Channel power	Slot power	Rho	Constellation diagram for Individual code	Max inactive power
Spectral density	DwPTS power	EVM RMS, EVM peak	Data format	Spurious Emission
Peak to average power	UpPTS power	Peak CDE	Slot, DwPTS power	
Occupied Bandwidth	On/off slot ratio	Frequency error	No. of active code	
Occupied bandwidth	Slot PAR	I/Q origin offset	Scramble code	
Integrated power	DwPTS code	Time offset	Max active code power	
Occupied power	***Power vs. Time (frame)***	***Midamble Power***	Avg active code power	
Spectrum Emission Mask	Slot Power, Data Power (L), Midamble Power, Data Power (R), Time offset of all TS (from TS0 to TS7) and DwPTS, UpPTS	Slot power	Max inactive code power	
Reference power		DwPTS power	Avg inactive code power	
Peak level at defined range		Midamble power (1 to 16)	Peak CDE and peak active CDE	
ACLR		***Code Power***	***Auto Measure***	
Reference power		Individual code EVM and its constellation	Channel power	
Abs power at defined range		Constellation diagram for Individual code	Occupied bandwidth	
Rel power at defined range		(Modulation) format	Spectrum emission mask	
Multi-ACLR		Slot power, DwPTS power	ACLR	
Lowest reference power		No. of active code	Multi-ACLR	
Highest reference power		Scramble code	Slot power	
Abs power at defined range	***Power vs. Time (mask)***	Max active code power	DwPTS power	
Rel power at defined range	Slot power	Avg active code power	UpPTS power	
Spurious Emissions	On/off slot ratio	Max inactive code power	On/off slot ratio	
Peak frequency at defined range	Off power	Avg inactive code power	Frequency error	
Peak level at defined range	***Timogram***	***Code Error***	EVM RMS	

Option 045

Sync-DL ID Scanner (32)	***Sync-DL ID vs. Tau (up to 6)***	Ec/Io, Tau	DwPTS power	DwPTS Power
Scramble code group	ID, power, Ec/Io, Tau	DwPTS power	Pilot dominance	
Ec/Io, Tau	DwPTS power	Pilot dominance	EVM, frequency error	
DwPTS power	Pilot dominance	***Sync-DL ID Analyzer***	Ec/Io, CINR	
Pilot dominance	***Sync-DL ID Multipath***	DwPTS power, Ec/Io trend	***Route Map***	

Longitude, latitude, and satellite in all screens

Mobile WiMAX Signal Analyzer (Options 026 and 046)

General Parameters		
Frequency range	2.1 GHz to 2.7 GHz 3.4 GHz to 3.85 GHz	
Input signal level	–40 to +20 dBm	
Channel power accuracy	±1.0 dB (typical)	
Supported bandwidth	7 MHz, 8.75 MHz, and 10 MHz	
Frequency error	±10 Hz + reference-frequency accuracy	99% confidence level
Residual EVM (RMS)	1.5% (typical)	

Measurements				
Option 026				
Channel Power	Peak level at defined range	Frequency error	***EVM vs. Symbol***	Frame average power
Channel power	***Power vs. Time (frame)***	Time offset	RCE RMS, RCE peak	Time offset
Spectral density	Channel power	Segment ID, cell ID	EVM RMS, EVM peak	I/Q origin offset
Peak to average power	Frame average power	Preamble index	Segment ID, cell ID	Spectral flatness
Occupied Bandwidth	Preamble power	***Spectral Flatness***	Preamble index	Frequency error
Occupied bandwidth	DL burst power	Average subcarrier power	***Auto Measure***	RCE RMS
Integrated power	UL burst power	Subcarrier power variation	Channel power	RCE peak
Occupied power	I/Q origin offset	Max, min, avg power	Occupied bandwidth	EVM RMS
Spectrum Emission Mask	Time offset	***EVM vs. Subcarrier***	Spectrum emission mask	EVM peak
Reference power	***Constellation***	RCE RMS, RCE peak	Spurious emission mask	***Power Statistics CCDF***
Peak level at defined range	Channel power	EVM RMS, EVM peak	Preamble power	
Spurious Emissions	RCE RMS, RCE peak	Segment ID, cell ID	DL burst power	
Peak frequency at defined range	EVM RMS, EVM peak	Preamble index	UL burst power	
Option 046				
Preamble Scanner (up to 6)	Total preamble power	Preamble power	Time offset	
Total preamble power	Multipath power	Frame avg power	***Route Map***	
Preamble, relative power	Relative power, delay	Relative power	Preamble power	
Cell ID, sector ID	Preamble power trend	C/I		
Time offset	***Preamble Power Trend***	Preamble		
Multipath Profile	Relative power trend	Cell ID, sector ID		

Longitude, latitude, and satellite in all screens

LTE/LTE-Advanced – FDD Signal Analyzer (Options 028/030/032 and 048)

General Parameters		
Frequency range	Band 1 to 14, 17 to 26	
Input signal level	−40 to +20 dBm	
Channel power accuracy	±1.0 dB (typical)	
Supported bandwidths	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, and 20 MHz	
Frequency error	±10 Hz + reference-frequency accuracy	99% confidence level
Residual EVM (RMS)	2.0% (typical)	Data EVM

Measurements

Option 028/030/032

Channel Power	***Power vs. Time (frame)***	***Control Channel***	Data EVM RMS, peak	Antenna 1 RS power and EVM	PDSCH/Data* 64 QAM EVM
Channel power	Frame average power	Control channel summary (P-SS, S-SS, PBCH, PCFICH, PHICH, PDCCH, RS, MBSFN*)	RS EVM RMS, peak		PDSCH 256QAM EVM
Spectral density	Subframe power		Cell, group, sector ID	Antenna 2 RS power and EVM**	Data EVM RMS, peak
Peak to average power	First slot power		***Frame***		RS, P-SS, S-SS EVM
Occupied Bandwidth	Second slot power		MBSFN*	Antenna 3 RS power and EVM**	RS, P-SS, S-SS power
Occupied bandwidth	Cell ID, I/Q origin offset	EVM, relative or absolute power, modulation type	Frame summary table (P-SS, S-SS, PBCH, PCFICH, PHICH, PDCCH, RS, MBSFN*, PDSCH/Data* QPSK, PDSCDH/Data* 16 QAM, PDSCH/Data* 64 QAM, PDSCH 256QAM)		PBCH power
Integrated power	Time offset			***Data Allocation Map***	Subframe power
Occupied power	***Constellation***	Each control channels'		Data allocation vs frame	OFDM power
Spectrum Emission Mask	MBSFN*	I/Q diagram		Resource block power	Time error
	RS TX power	Modulation format		OFDM symbol power	I/Q origin offset
Reference power	PDSCH/Data* QPSK EVM	Frequency error		Data utilization	***Carrier Aggregation****
Peak level at defined range	PDSCH/Data* 16 QAM EVM	I/Q origin offset	EVM, relative or absolute power, modulation type	Data allocation vs subframe	Component carriers: up to 5
ACLR	PDSCH/Data* 64 QAM EVM	EVM RMS, EVM peak		Resource block power	
	PDSCH 256QAM EVM				
Reference power	Data EVM RMS	***Subframe***	Frame average power	Data utilization	Subframe power
Abs power at defined range	Data EVM peak	MBSFN*	OFDM symbol power	***Auto Measure***	P-SS, S-SS, PBCH, RS power and EVM
	Frequency error	Subframe summary table (P-SS, S-SS, PBCH, PCFICH, PHICH, PDCCH, RS, MBSFN*, PDSCH/Data* QPSK, PDSCH/Data* 16 QAM, PDSCH/Data* 64 QAM, PDSCH 256QAM)	Frequency error	Channel power	
Rel power at defined range	Time error		I/Q origin offset	Occupied bandwidth	PDSCH/Data* QPSK power and EVM
Multi-ACLR	***Data Channel***		EVM RMS, peak	Spectrum emission mask	PDSCH/Data* 16 QAM power and EVM
Lowest reference power	MBSFN*		Data EVM RMS, peak	ACLR	PDSCH/Data* 64 QAM power and EVM
Highest reference power	Resource block power		Cell, group, sector ID	Multi-ACLR	
Abs power at defined range	I/Q diagram		***Time Alignment Error***	Spurious emission mask	PDSCH 256QAM EVM
	RB power	EVM, relative or absolute power, modulation type	Time alignment error trend	Frame average power	Cell ID
					Frequency error
Rel power at defined range	Modulation format			Time alignment error	Time alignment error
Spurious Emissions	I/Q origin offset	Subframe power	Time alignment error	Frequency error	Antenna port
Peak frequency at defined range	EVM RMS, EVM peak	OFDM symbol power	RS power difference	MBSFN*	***Power Statistics CCDF***
		Frequency, time error	Antenna 0 RS power and EVM	PDSCH/Data* QPSK EVM	
Peak level at defined range				PDSCH/Data* 16 QAM EVM	

Option 048

Channel Scanner (up to 6)	***ID Scanner (up to 6)***	***Multipath Profile***	Control channel table	PMCH subframe power*	***Route Map***
Frequency or channels	RSRP/RSRQ dominance	Cell, group, sector ID	(P-SS, S-SS, PBCH, PCFICH, RS 0, RS 1, RS 2**, RS 3**, MBSFN RS*)	Time alignment error	RSRP
Cell, group, sector ID	S-SS RSSI dominance	Ant 0 RS Ec/Io, delay		Time offset	RSRQ
Channel power	S-SS Ec/Io dominance	Ant 1 RS Ec/Io, delay		***Datagram***	RS-SINR
RSRP/RSRQ	Cell, group, sector ID	Ant 2 RS Ec/Io**, delay**	Absolute power	Datagram	S-SS RSSI
RS-SINR	RSRP/RSRQ	Ant 3 RS Ec/Io**, delay**	Relative power	Resource block power	P-SS/S-SS Power
Antenna port	RS-SINR/S-SS RSSI	***Control Channel***	EVM RMS, phase	Data utilization	S-SS Ec/Io
	P-SS/S-SS Power	RS power trend	Frequency error		
	S-SS Ec/Io	Cell, group, sector ID			

Longitude, latitude, and satellite in all screens

*Measurement is performed when MBMS is enabled.

**Measurement is performed when option 030 is enabled.

LTE/LTE-Advanced – TDD Signal Analyzer (Options 029/031/033 and 049)

General Parameters		
Frequency range	Band 33 to 43	
Input signal level	–40 to +20 dBm	
Channel power accuracy	±1.0 dB (typical)	
Supported bandwidth	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, and 20 MHz	
Frequency error	±10 Hz + reference-frequency accuracy	99% confidence level
Residual EVM (RMS)	2.0% (typical)	Data EVM

Measurements

Option 029/031/033

Channel Power	***Spurious Emissions***	Data EVM peak	***Subframe***	Antenna 3 RS power and EVM**	PDSCH/Data* 64 QAM EVM
Channel power	Peak frequency at defined range	Frequency error	MBSFN*		PDSCH 256QAM EVM
Spectral density		Time error	Subframe summary table (P-SS, S-SS, PBCH, PCFICH, PHICH, PDCCH, RS, MBSFN*, PDSCH/Data* QPSK, PDSCH/Data* 16 QAM, PDSCH/Data* 64 QAM, PDSCH 256QAM)	Cell, group, sector ID	Data EVM RMS, peak
Peak to average power	Peak level at defined range	***Data Channel***		***Data Allocation Map***	RS, P-SS, S-SS EVM
Occupied Bandwidth		MBSFN*		Data allocation vs frame	RS, P-SS, S-SS power
Occupied bandwidth	***Power vs. Time (frame)***	Resource block power		Resource block power	PBCH power
Integrated power	Frame average power	I/Q diagram		OFDM symbol power	Subframe power
Occupied power	Subframe power	RB power		Data utilization	OFDM power
Spectrum Emission Mask	First slot power	Modulation format	EVM, relative or absolute power, modulation type	Data allocation vs subframe	Time error
Reference power	Second slot power	I/Q origin offset			I/Q origin offset
Peak level at defined range	Cell ID, I/Q origin offset	EVM RMS, EVM peak	Subframe power	Resource block power	***Carrier Aggregation****
	Time offset	***Control Channel***	OFDM symbol power	Data utilization	Component carriers: up to 5
ACLR	***Power vs. Time (slot)***	Control channel summary (P-SS, S-SS, PBCH, PCFICH, PHICH, PDCCH, RS, MBSFN*)	Frequency, time error	***Auto Measure***	
Reference power	Slot average power		Data EVM RMS, peak	Channel power	Subframe power
Abs power at defined range	Transient period length		RS EVM RMS, peak	Occupied bandwidth	P-SS, S-SS, PBCH, RS power and EVM
	Off power		Cell, group, sector ID	Spectrum emission mask	
Rel power at defined range	***Constellation***	EVM, relative or absolute power, modulation type	***Time Alignment Error***	ACLR	PDSCH/Data* QPSK power and EVM
	MBSFN*		Time alignment error trend	Mult-ACLR	
Multi-ACLR	RS TX power	Each control channels'	Time alignment error	Spurious emission mask	PDSCH/Data* 16 QAM power and EVM
Lowest reference power	PDSCH/Data* QPSK EVM	I/Q diagram	RS power difference	Slot average power	
Highest reference power	PDSCH/Data* 16 QAM EVM	Modulation format	Antenna 0 RS power and EVM	Off power	PDSCH/Data* 64 QAM power and EVM
Abs power at defined range		Frequency error		Transition period	
	PDSCH/Data* 64 QAM EVM			Time alignment error	PDSCH 256QAM EVM
	PDSCH 256QAM EVM	I/Q origin offset	Antenna 1 RS power and EVM	MBSFN*	Cell ID
Rel power at defined range	Data EVM RMS	EVM RMS, EVM peak		PDSCH/Data* QPSK EVM	Frequency error
			Antenna 2 RS power and EVM**		Time alignment error
				PDSCH/Data* 16 QAM EVM	Antenna port
					Power Statistics CCDF

Option 049

Channel Scanner (up to 6)	***ID Scanner (up to 6)***	***Multipath Profile***	***Control Channel***	EVM RSM, phase	***Route Map***
	RSRP/RSRQ dominance	Cell, group, sector ID	RS power trend	Frequency error	RSRP
Frequency or channels	S-SS RSSI dominance	Ant 0 RS Ec/Io, delay	Cell, group, sector ID	PMCH subframe power*	RSRQ
Cell, group, sector ID	S-SS Ec/Io dominance	Ant 1 RS Ec/Io, delay	Control channel table (P-SS, S-SS, PBCH, PCFICH, RS 0, RS 1, RS 2**, RS 3**, MBSFN RS*)	Time alignment error	RS-SINR
Channel power	Cell, group, sector ID	Ant 2 RS Ec/Io**, delay**		Time offset	S-SS RSSI
RSRP/RSRQ	RSRP/RSRQ	Ant 3 RS Ec/Io**, delay**		***Datagram***	P-SS, S-SS power
RS-SINR	RS-SINR/S-SS RSSI			Datagram	S-SS Ec/Io
Antenna port	P-SS/S-SS power		Absolute power	Resource block power	
	S-SS Ec/Io		Relative power	Data utilization	

Longitude, latitude, and satellite in all screens

*Measurement is performed when MBMS is enabled.

**Measurement is performed when option 031 is enabled.

NB-IoT Signal Analyzer (Option 034)

General Parameters		
Operation Mode	In Band, Guard band, and Standalone	
Input signal level	–40 to +25 dBm	
Channel power accuracy	±1.0 dB (typical)	
Supported bandwidths	180 kHz	
Measurement Type	Frame, Subframe	
Frequency error	±10 Hz + ref freq accuracy	99% confidence level
Residual EVM (RMS)	2.0% (typical)	Data EVM

Measurement		
Option 034		
RF Analysis		**Modulation Analysis**
Channel Power	***Spectrum Emission Mask***	***IQ Diagram*** Constellation diagram, Modulation Format, Frequency error, IQ Origin offset, EVM RMS/Peak
Channel power	Reference Power	
Spectral density	Peak level at defined range	
Peak to average Power	***ACLR***	
Occupied bandwidth	Reference Power	**Channel Summary** EVM, Power (dBm), and Modulation type of: Frame (Subframe) Power, NPSS, NSSS, NPBCH, NPDSCH, NRS0 (NRS1), PCI
Occupied Bandwidth	Abs. power at defined range	
Integrated Power	Rel. power at defined range	
Occupied power	***Spurious Emission***	
	Peak frequency at defined range	
	Peak level at defined range	

EMF Analyzer (Option 050)

General Parameters	
Supported Antenna	Isotropic Antenna G700050380 26 MHz to 3 GHz
Mode	Sweep / FFT
Trace	X-Axis, Y-Axis, Z-Axis, Current, Isotropic, Isotropic Accumulated
Limit lines	MSL, ICNIRP
Dwell Time	1 to 60s
Measurement Time	1 to 30 min (# of measurement= Measurement Time / (Dwell Time x 3)
Units	dBµV/m, dBmV/m, dBV/m, V/m, W/m^2, dBm/m^2, dBW/m^2, A/m, dBA/m, and Watt/cm^2.
Miscellaneous	Spectrum logging and Replay Export to CSV PDF Report Generation

Measurement		
Option 050 and G700050380		
Trace: X-Axis, Y-Axis, Z-Axis, Current, Isotropic, Isotropic Accumulated	Isotropic EMF Power: AVG, Max, Min	Accumulated Isotropic EMF Power: AVG, Max, Min

RFoCPRI/Interference Analyzer (Options 008, 060, 061, 062, 063, 064, and 065)

General Parameters		
Optical interface	Dual SFP/SFP+ (supports all MSA-compliant SFP modules)	
Line rates	614.4 Mbps (1x) , 1228.8 Mbps (2x)	Option 008 and 060
	2457.6 Mbps (4x)	Option 008 and 061
	3072.0 Mbps (5x)	Option 008 and 062
	4915.2 Mbps (8x)	Option 008 and 063
	6144.0 Mbps (10x)	Option 008 and 064
	9830.4 Mbps (16x)	Option 008 and 065
Resolution Bandwidth (RBW)		
–3 dB bandwidth	1 kHz to 10 kHz (span ≤ 3.84 MHz) 1 KHz to 100 kHz (3.84 MHz < span < 30.86 MHz)	1-3-10 sequence
Accuracy	±10% (nominal)	
VBW		
–3 dB bandwidth	1 Hz to 100 KHz	1-3-10 sequence
Accuracy	±10% (nominal)	
CPRI Parameter		
IQ Sample width	4 – 20 bits	
Mapping method	1 and 3	
TX clock	Internal/External/Recovered	
Port type	Master/Slave	
Map position	AxC#0 – AxC#7	
Bandwidth	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz	

RFoCPRI™ GSM Interference Analyzer (Option 068)

General Parameters					
Optical interface		Dual SFP/SFP+ (supports all MSA compliant SFP modules)			
Line rates		614.4 Mbps (1x), 1228.8 Mbps (2x), 2457.6 Mbps (4x), 3072.0 Mbps (5x), 4915.2 Mbps (8x), 6144.0 Mbps (10x), 9830.4 Mbps (16x)			
Resolution Bandwidth (RBW)		1 KHz to 30 kHz (Span≤960 kHz)			
		Accuracy		±10% (nominal)	
Video Bandwidth (RBW)		1 Hz to 30 KHz			
		Accuracy		±10% (nominal)	
CPRI Parameter					
IQ Sample Width		4 – 20 bits			
Sample Rate		960 KHz			
Mapping		NA=1, S=1, K=4, NC=1			
TX clock		Internal/External/Recovered			
Port type		Master/Slave			
Measurements					
Layer-2 Monitoring		**Layer-2 Term**		**Layer-2 Term (cont.)**	
Port 1	**Port 2**	**Port 1 or 2 (exclusive)**		**Error**	
LOS	LOS	LOS	Error rate	Code	Single/rate
LOF	LOF	LOF	K30.7	Error rate	Single/rate
RAI	RAI	Optic RX level	dBm	K30.7	
SDI	SDI	Optic TX level	dBm	**Interference analyzer**	
Optic RX level	Optic RX level	Port Type	Master	Spectrum	
SFP Information	**SFP Information**	Protocol Version	1 to 10	Sound indicator	
Wavelength	Wavelength	C&M HDLC rate (kbps)	No HDLC, 240, 480, 960, 1920, 2400	Interference ID	
Vendor	Vendor	C&M Ethernet Subchannel number	20 to 63	Spectrogram	
Vendor PN	Vendor PN	Word Sync Loss Event		RSSI	
Vendor rev	Vendor rev	Code Violation		Spectrum Replayer	
Power level type	Power level type	K30.7 words		Dual Spectrum	
Diagnostic byte	Diagnostic byte	Frame Sync Loss Events		Dual Spectrogram	
Nominal rate	Nominal rate	**Alarm Injection**		Quad Spectrum	
Min rate	Min rate	R-LOS	SDI	**PIM Detection**	
Max RX level	Max RX level	R-LOF	RAI	Single Carrier	
Max TX level	Max TX level			Multi Carrier	
				PIM Calculator	

RFoOBSAI™ Interference Analyzer (Options 070, 071, 072, and 073)

General Parameters		
Optical interface	Dual SFP/SFP+ (supports all MSA-compliant SFP modules)	
Line rates	768 Mbps (1x)	Option 070
	1536 Mbps (2x)	Option 071
	3072 Mbps (4x)	Option 072
	6144 Mbps (8x)	Option 073
Resolution Bandwidth (RBW)	1 kHz to 10 kHz (span ≤3.84 MHz) 1 KHz to 100 kHz (3.84 MHz < span ≤30.86 MHz	
	Accuracy	±10% (nominal)
Video bandwidth (RBW)	1 Hz to 100 KHz	
	Accuracy	±10% (nominal)
RP3 type	LTE (FDD/TDD), UMTS (FDD)	
RP3 address	Hexadecimal	
TX clock	Internal/External/Recovered	
Port type	Master/Slave	
Bandwidth	LTE-FDD/TDD: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz UMTS: 3MHz for downlink, 5MHz for Uplink	
RP3 address list	RP3 address, technology, scrambler seed*, message count*	
Scrambler seed	Nx7 Index: 0 – 17, step 1	

Measurements				
Layer-2 Monitoring		**Layer-2 Term**		**Interference Analyzer**
Port 1	***Port 2***	***Port 1 or 2 (exclusive)***		Spectrum
LOS	LOS	LOS		Interference ID
LOF	LOF	LOF		Sound Indicator
Code violation	Code violation	Optic RX level	dBm	Spectrogram
K30.7 words	K30.7 words	Optic TX level	dBm	RSSI
Optic RX level	Optic RX level	Port Type	Master	Spectrum Replayer
Optic TX level	Optic TX level	TX state	State machine	Dual Spectrum
Messages address	Message address	RX state	State machine	Dual Spectrogram
Message counter	Message counter	TX address	RP3 address (hexadecimal)	Quad Spectrum
SFP Information	***SFP Information***	RX address	RP3 address (hexadecimal)	***PIM Detection***
Wavelength	Wavelength	Word sync loss event		Single Carrier
Vendor	Vendor	Code violation		Multi Carrier
Vendor PN	Vendor PN	K30.7 words		PIM Calculator
Vendor rev	Vendor rev	Frame sync loss events		
Power level type	Power level type	***Alarm Injection***		
Diagnostic byte	Diagnostic byte	K30.7	Single	
Nominal rate	Nominal rate	***Error Injection***		
Min rate	Min rate	Code	Single/rate	
Max RX level	Max RX level	Error rate	1E-3 to 1E-9	
Max TX level	Max TX level			

*Available only when the link rate is 6.1 Gbps.

RFoCPRI™ LTE-FDD Signal Generator (Option 081)

General Parameters		
Optical interface	Dual SFP/SFP+ (supports all MSA-compliant SFP modules)	
Link Rate	614.4 Mbps (1x), 1228.8 Mbps (2x), 2457.6 Mbps (4x), 3072.0 Mbps (5x), 4915.2 Mbps (8x), 6144.0 Mbps (10x), 9830.4 Mbps (16x)	
IQ Sample width	8 – 20 bits	
Mapping method	1 and 3	
Waveform	CW: Single Tone, Two Tones Waveform: E-TM1.1, E-TM1.2, E-TM2, E-TM3.1, E-TM3.2, E-TM3.3, Custom	
Bandwidth	5 MHz, 10 MHz, 15 MHz, 20 MHz	
Sampling Frequency	N x 3.84 MHz (N=2, 4, 6, 8)	
Gain dynamic range	0 to –50 dB	
Frequency error	±10 Hz + ref freq accuracy	99% confidence level
Residual EVM (RMS)	0.2% (typical)	Data EVM

RFoCPRI LTE-TDD Signal Generator (Option 082)

General Parameters	
Optical Hardware (Option 008)	
Optical interface	Dual SFP/SFP+ (supports all MSA-compliant SFP modules)
CPRI Parameter	
Line coding	8B/10B
Line rates	614.4 Mbps (1x), 1228.8 Mbps (2x), 2457.6 Mbps (4x), 3072.0 Mbps (5x), 4915.2 Mbps (8x), 6144.0 Mbps (10x), 9830.4 Mbps (16x)
CPRI Parameter	
IQ sample width	8 - 20 bits
Mapping method	1 and 3
Waveform	CW: Single Tone, Two Tones Waveform: E-TM1.1, E-TM1.2, E-TM2, E-TM3.1, E-TM3.2, E-TM3.3, Custom
Bandwidth	5 MHz, 10 MHz, 15 MHz, 20 MHz
Sampling frequency	N x 3.84 MHz (N=2, 4, 6, 8)
Gain dynamic range	0 to –50 dB
Frequency error	±10 Hz + ref freq accuracy, 99% confidence level
Residual EVM (RMS)	0.02% (typical), data EVM

RFoCPRI LTE-FDD Multi Carrier Signal Generator (Option 083)

General Parameters		
Optical Hardware (Option 008)		
Interface	Two SFP/SFP+ ports (supports all MSA compliant SFP modules)	
Max TX	4 carriers / SFP port, Dual port operation is available	
CPRI Parameter		
Line coding 8B/10B	Line coding 8B/10B	
Line rates	614.4 Mbps (1x), 1228.8 Mbps (2x), 2457.6 Mbps (4x), 3072.0 Mbps (5x), 4915.2 Mbps (8x), 6144.0 Mbps (10x), 9830.4 Mbps (16x)	
IQ Sample width	8 – 20 bits	
Waveform mapping	Carrier / TX Container /Map Position	
Mapping Method	1 and 3	
Waveform	CW, CW (two tone), LTE-FDD E-TM1.1, E-TM1.2, E-TM2, E-TM3.1, E-TM3.2, E-TM3.3, Custom	
Bandwidth	5 MHz, 10 MHz, 15 MHz, 20 MHz	
Sampling Frequency	N x 3.84 MHz (N=2, 4, 6, 8)	
Gain dynamic range	0 to –50 dB	
Frequency error	±10 Hz + ref freq accuracy, 99% confidence level	
Residual EVM (RMS)	0.02% (typical), Data EVM	
Measurement		
PIM Analysis (Option 101)		
Single Port Sweep mode	**Multi Port Sweep Mode**	**Multi Port Wideband Mode**
Possible PIM Order	Possible PIM Order	Flatness
Possible PIM Frequency	Possible PIM Frequency	Level Diff
PIM level	PIM level	Possible PIM
PIM Detection with Two CW Tones		PIM Detection with up to 8 LTE carriers (2 SFP ports x 4 carriers)

RFoCPRI LTE-TDD Multi Carrier Signal Generator (Option 084)

General Parameters		
Optical Hardware (Option 008)		
Interface	Two SFP/SFP+ ports (supports all MSA compliant SFP modules)	
Max TX	4 carriers / SFP port, Dual port operation is available	
CPRI Parameter		
Line coding 8B/10B	Line coding 8B/10B	
Line rates	614.4 Mbps (1x), 1228.8 Mbps (2x), 2457.6 Mbps (4x), 3072.0 Mbps (5x), 4915.2 Mbps (8x), 6144.0 Mbps (10x), 9830.4 Mbps (16x)	
IQ Sample width	8 – 20 bits	
Waveform mapping	Carrier / TX Container /Map Position	
Mapping Method	1 and 3	
Waveform	CW, CW (two tone), LTE-FDD E-TM1.1, E-TM1.2, E-TM2, E-TM3.1, E-TM3.2, E-TM3.3, Custom	
Bandwidth	5 MHz, 10 MHz, 15 MHz, 20 MHz	
Sampling Frequency	N x 3.84 MHz (N=2, 4, 6, 8)	
Gain dynamic range	0 to –50 dB	
Frequency error	±10 Hz + ref freq accuracy, 99% confidence level	
Residual EVM (RMS)	0.02% (typical), Data EVM	
Measurement		
PIM Analysis (Option 101)		
Single Port Sweep mode	**Multi Port Sweep Mode**	**Multi Port Wideband Mode**
Possible PIM Order	Possible PIM Order	Flatness
Possible PIM Frequency	Possible PIM Frequency	Level Diff
PIM level	PIM level	Possible PIM
PIM Detection with Two CW Tones		PIM Detection with up to 8 LTE carriers (2 SFP ports x 4 carriers)

RFoOBSAI™ LTE-FDD Signal Generator (Option 086)

General Parameters	
Optical Hardware (Option 008)	
Optical interface	Dual SFP/SFP+ (supports all MSA-compliant SFP modules)
OBSAI Parameter	
Line coding	8B/10B
Line rates	768 Mbps (Option 070) 1536 Mbps (Option 071) 3072 Mbps (Option 072) 6144 Mbps (Option 073)
CPRI Parameter	
RP3 type	LTE
RP3 address	Hexadecimal
Waveform	CW: Single Tone, Two Tones Waveform: E-TM1.1, E-TM1.2, E-TM2, E-TM3.1, E-TM3.2, E-TM3.3, Custom
Bandwidth	5 MHz, 10 MHz, 15 MHz, 20 MHz
Sampling frequency	N x 3.84 MHz (N=2, 4, 6, 8)
Gain dynamic range	0 to −50 dB
Frequency error	±10 Hz + ref freq accuracy, 99% confidence level
Residual EVM (RMS)	0.02% (typical), data EVM

RFoCPRI LTE-FDD Signal Analyzer (Option 091)

General Parameters				
Optical interface	Dual SFP/SFP+ (supports all MSA-compliant SFP modules)			
Link rate	614.4 Mbps (1x), 1228.8 Mbps (2x), 2457.6 Mbps (4x), 3072.0 Mbps (5x), 4915.2 Mbps (8x), 6144.0 Mbps (10x), 9830.4 Mbps (16x)			
RBW	100 kHz			
IQ sample width	Downlink: 8 – 20 bits			
Mapping method	1 and 3			
AxC container/Carrier	Up to 8 AxC container per carrier			
LTE signal bandwidth	5 MHz, 10MHz, 15MHz, 20MHz			
Span	Fixed and equal to sampling frequency of LTE signal.			
Frequency error	±10 Hz + ref freq accuracy		99% confidence level	
Residual EVM (RMS)	0.02% (typical)		Data EVM	
Measurements				
		Option 091		
Channel Power	***Power vs. Time (frame)***	***Control Channel***	Data EVM RMS, peak	Antenna 1 RS power and EVM
Channel power	Frame average power	Control channel summary (P-SS, S-SS, PBCH, PCFICH, PHICH, PDCCH, RS, MBSFN*)	RS EVM RMS, peak	***Data Allocation Map***
Spectral density	Subframe power		Cell, group, sector ID	Data allocation vs frame
Peak to average power	First slot power		***Frame***	Resource block power
Occupied Bandwidth	Second slot power		MBSFN*	OFDM symbol power
Occupied bandwidth	Cell ID, I/Q origin offset	EVM, relative or absolute power, modulation type	Frame summary table (P-SS, S-SS, PBCH, PC-FICH, PHICH, PDCCH, RS, MBSFN*, PDSCH/Data* QPSK, PDSCDH/Data* 16 QAM, PDSCH/Data* 64 QAM)	Data utilization
Integrated power	Time offset			Data allocation vs subframe
Occupied power	***Constellation***	Each control channels'		Resource block power
	MBSFN*	I/Q diagram		Data utilization
	RS TX power	Modulation format		***Power Statistics CCDF***
	PDSCH/data* QPSK EVM	Frequency error		
	PDSCH/data* 16 QAM EVM	I/Q origin offset	EVM, relative or absolute power, modulation type	
	PDSCH/data* 64 QAM EVM	EVM RMS, EVM peak		
	Data EVM RMS	***Subframe***	Frame average power	
	Data EVM peak	MBSFN*	OFDM symbol power	
	Frequency error	Subframe summary table (P-SS, S-SS, PBCH, PCFICH, PHICH, PDCCH, RS, MBSFN*, PDSCH/data* QPSK, PDSCH/data* 16 QAM, PDSCH/data* 64 QAM)	Frequency error	
	Time error		I/Q origin offset	
	Data Channel		EVM RMS, peak	
	MBSFN*		Data EVM RMS, peak	
	Resource block power		Cell, group, sector ID	
	I/Q diagram		***Time Alignment Error***	
	RB power modulation format	EVM, relative or absolute power, modulation type	Time alignment error trend	
			Time alignment error	
	I/Q origin offset	Subframe power	RS power difference	
	EVM RMS, EVM peak	OFDM symbol power	Antenna 0 RS power and EVM	
		Frequency, time error		

RFoCPRI LTE-TDD Signal Analyzer (Option 092)

General Parameters	
Optical Hardware (Option 008)	
Interface	Dual SFP/SFP+ (supports all MSA-compliant SFP modules)
CPRI Parameter	
Line coding	8B/10B
Line rates	614.4 Mbps (1x), 1228.8 Mbps (2x), 2457.6 Mbps (4x), 3072.0 Mbps (5x), 4915.2 Mbps (8x), 6144.0 Mbps (10x), 9830.4 Mbps (16x)
Resolution Bandwidth (RBW)	
–3 dB bandwidth	100 kHz
Accuracy	±10% (nominal)
CPRI Parameter	
IQ sample width	8 - 20 bits
Mapping method	1 and 3
TX clock	Internal/External/Recovered
Port type	Master/Slave
Map position	AxC#0 – AxC#7
Bandwidth	5 MHz, 10 MHz, 15 MHz, 20 MHz
Span	Fixed and equal to sampling frequency of LTE signal
Frequency error	±10 Hz + ref freq accuracy, 99% confidence level
Residual EVM (RMS)	0.02% (typical), Data EVM

Measurements

Option 92			
Channel Power	***Constellation***	***Subframe***	***Data Allocation Map***
Channel power	MBSFN*	MBSFN*	Data allocation vs. frame
Spectral density	RS TX Power	Subframe Summary	Resource block power
Peak to average power	PDSCH/data* QPSK EVM	EVM, Abs. and Rel. power	OFDM symbol power
Occupied bandwidth	PDSCH/data* 16QAM EVM	Subframe power	Data utilization
Occupied bandwidth	PDSCH/data* 64QAM EVM	OFDM symbol power	Data allocation vs Subframe
Integrated Power	Data EVM RMS, peak	Frequency error	Resource block power
Occupied power	Frequency error	Time error	Data utilization
Power vs. Time (Frame)	Time error	Data EVM RMS, peak	***Power Statistics CCDF***
Frame average power	***Control Channel***	RS EVM RMS, peak	Average power
Subframe power	Control channel summary	Cell, group, sector ID	Peak power crest factor
First Slot power	EVM, Rel or Abs power of each control channel	***Time Alignment Error***	
Second slot power		Time alignment error trend	
Cell ID, I/Q origin offset	IQ Diagram	Time alignment error	
Time offset	Modulation format	RS power difference	
Power vs. Time (Slot)	Frequency error	Antenna 0 RS power, EVM	
Slot average power	I/Q origin offset	Antenna 1 RS power, EVM	
Transient period length	Control EVM RMS, peak	Cell, group, sector ID	
Off power	**Data Channel**		
	MBSFN*		
	Resource block power		
	I/Q diagram		
	RB power		
	Modulation format		
	I/Q origin offset		
	EVM RMS, peak		

Longitude, latitude, and satellite in all screens

RFoOBSAI LTE-FDD Signal Analyzer (Option 096)

General Parameters	
Optical Hardware (Option 008)	
Interface	Dual SFP/SFP+ (supports all MSA-compliant SFP modules)
OBSAI Parameter	
Line coding	8B/10B
Line rates	768 Mbps (Option 070) 1536 Mbps (Option 071) 3072 Mbps (Option 072) 6144 Mbps (Option 073)
Resolution Bandwidth (RBW)	
–3 dB bandwidth	100 kHz
Accuracy	±10% (nominal)
OBSAI Parameter	
RP3 type	LTE-FDD
RP3 address	Hexadecimal
TX clock	Internal/External/Recovered
Port type	Master/Slave
Bandwidth	3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz
RP3 address list	RP3 address, technology, scrambler seed*, message count*
Scrambler seed	Nx7 index: 0 – 17, step 1

Measurements

Option 96

Channel Power	***Constellation***	***Subframe***	***Frame***
Channel power	MBSFN*	MBSFN*	MBSFN*
Spectral density	RS TX power	Subframe summary	Frame summary
Peak to average power	PDSCH/data* QPSK EVM	EVM, Abs. and Rel. power	EVM, Abs. and Rel. power
Occupied bandwidth	PDSCH/data* 16 QAM EVM	Subframe power	Frame average power
Occupied bandwidth	PDSCH/data* 64 QAM EVM	OFDM symbol power	OFDM symbol power
Integrated Power	Data EVM RMS, peak	Frequency error	Frequency error
Occupied power	Frequency error	Time error	IQ origin offset
Power vs. Time (Frame)	Time error	Data EVM RMS, peak	Data EVM RMS, peak
Frame average power	***Control Channel***	RS EVM RMS, peak	Control EVM RMS, peak
Subframe power	Control channel summary	Cell, group, sector ID	Cell, group, sector ID
First Slot power	EVM, Rel or Abs power of each control channel	***Time Alignment Error***	***Data Allocation Map***
Second slot power		Time alignment error trend	Data allocation vs. frame
Cell ID, I/Q origin offset	IQ Diagram	Time alignment error	Resource block power
Time offset	Modulation format	RS power difference	OFDM symbol power
Power Statistics CCDF	Frequency error	Antenna 0 RS power, EVM	Data utilization
Average power	I/Q origin offset	Antenna 1 RS power, EVM	Data allocation vs. subframe
Peak power crest factor	Control EVM RMS, peak	Cell, group, sector ID	Resource block power
	Data Channel		Data Utilization
	MBSFN*		
	Resource block power		
	I/Q diagram		
	RB power		
	Modulation format		
	I/Q origin offset		
	EVM RMS, peak		

Longitude, latitude, and satellite in all screens

RFoCPRI BBU-Emulation for Alcatel-Lucent (Option 101)

General Parameters	
Optical Hardware (Option 008)	
Interface	Dual SFP/SFP+ (supports all MAS-compliant SFP modules)
Max TX	4 Carriers/ SFP Port with Option 083 or 084, Dual port operation
CPRI Parameter	
Line Coding	8B/10B
Line Rate	614.4 Mbps (1x), 1228.8 Mbps (2x), 2457.6 Mbps (4x), 3072.0 Mbps (5x), 4915.2 Mbps (8x), 6144.0 Mbps (10x), 9830.4 Mbps (16x)
Sampling Rates (fs)	3.84 MHz, 7.68 MHz, 15.36 MHz, 23.04 MHz, 30.72MHz
Channel Bandwidth	3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz,
NV (NC*K-NA*s)	0
IQ Sample width	4 – 20 bits
Mapping Method	1 and 3
TX Clock	Internal, External, Recovered
Port Type	Master

Measurements			
Option 101		**Option 101 and 081 (082)**	**Option 101 and 083 (084)**
Configuration Verification: Carrier Information	***RET Information***	***Coverage Range***	***PIM Analysis-Single Port Sweep Mode***
RRH Description Carrier Information RRH Description	ALD Device Information Antenna Device Data Alarm Status	Spectrum, Downlink Power, Downlink VSWR, Uplink VSWR, Antenna Tilt	TX Power, Possible PIM Order, Possible PIM Frequency, PIM Level
Configuration Verification: CPRI & Active SW	***Spectrum Clearance***		***PIM Analysis-Multi Port Sweep Mode***
CPRI State Active SW	Spectrum Spectrogram RSSI Dual Spectrum Dual Spectrogram		TX Power, Possible PIM Order, Possible PIM Frequency, PIM Level
Configuration Verification: SFP Information	***Link Status***		***PIM Analysis-Multi Port Wideband Mode***
RRH Description SFP Information	LOS, LOF, RAI, SDI, Optic RX Level, Optic TX Level Protocol Version, C&M HDLC Rate, C&M Eth Subchannel Number, Start-up Status, WSLE, CV, K30.7, FSLE		Spectrum, TX Power, Spectral Flatness
Configuration Verification: RTD Information			
RRH Description RTD Information			

Layer-2 BERT (Option 110)

General Parameters		
Optical interface	Dual SFP/SFP+ (supports all MSA compliant SFP modules)	
Line rates	614.4 Mbps (1x), 1228.8 Mbps (2x), 2457.6 Mbps (4x), 3072.0 Mbps (5x), 4915.2 Mbps (8x), 6144.0 Mbps (10x), 9830.4 Mbps (16x)	
TX clock	Internal/External/Recovered	
Port	SFP Port 1 and Port 2 (Dual independent operation)	
Port type	Master/Slave	
Alarm / Error Injection	Alarm	R-LOS/R-LOF/RAI/SDI
	Error	Code/ K30.7/ Bit
	Insert Type	Single/ Rate
Bit Pattern	Live, Digital Word, ANSI 2^{23}–1, ANSI 2^{23}–1 Inv, ANSI 2^{31}–1, ANSI 2^{31}–1 Inv, ANSI 2^{20}–1, ANSI 2^{20}–1 Inv, ANSI 2^{15}–1, ANSI 2^{15}–1 Inv, ANSI 2^{11}–1, ANSI 2^{11}–1 Inv, ITU 2^{23}–1, ITU 2^{23}–1 Inv , ITU 2^{31}–1, ITU 2^{31}–1 Inv, ITU 2^{15}–1, ITU 2^{15}–1 Inv, ITU 2^{11}–1, ITU 2^{11}–1 Inv	
Bit Pattern Mapping mode	Bulk mode for whole payload	
	Channelized mode for AxC Group	Bandwidth: 5MHz, 10MHz, 15MHz, 20MHz
		Map Position: AxC 0 - 7
Round Trip Delay	Resolution: ns (min step: 1ns)	

Measurements			
Common			
LOS	RAI	Pattern Sync	Optic Rx level
LOF	SDI		Optic Tx level

BERT	**Count**	**L1 Inband**
Code Violation	Rx Code Words	RX Protocol Version
Code Violation Rate	Tx Code Words	Rx C&M HDLC Rate (kbps)
RX K30.7 Words	Rx Frame	Rx C&M Eth Subchannel Number
Word Sync Loss Events	Tx Frame	TX Protocol Version
Frame Sync Loss Events	Round Trip Delay	TX C&M HDLC Rate (kbps)
Bit Errors	Round Trip Delay (Offset)	TX C&M Eth Subchannel Number
Bit Error Rate	Round Trip Delay (avg)	Port Type
Svc Disruption (ms)	Round Trip Delay (min)	Start-up State
	Round Trip Delay (max)	

General Information

Inputs and Outputs		
RF In Connector Impedance Damage level	Spectrum analyzer Type-N, female 50 Ω (nominal) >+40 dBm, ±50 V DC (nominal)	
Reflection/RF Out Connector Impedance Damage level	Cable and antenna analyzer Type-N, female 50 Ω (nominal) >+37 dBm, ±50 V DC (nominal)	
RF In Connector Impedance Damage level	Cable and antenna analyzer Type-N, female 50 Ω (nominal) >+25 dBm, ±50 V DC (nominal)	
External Trigger, GPS Connector Impedance	 SMA, female 50 Ω (nominal)	
External Ref Connector Impedance Input frequency Input range	 SMA, female 50 Ω (nominal) 10 MHz, 13 MHz, 15 MHz –5 to +5 dBm	
USB USB host[1] USB client[2]	 Type A, 1 port Type B, 1 port	
SFP Cage Port 1 Port 2	 RFoFiber (with option 008) SFP/SFP+ compatible	
LAN[3]	RJ45, 10/100Base-T	
Audio jack	3.5 mm headphone jack	
External power	5.5 mm barrel connector	
Speaker	Built-in speaker	
Display		
Type	Resistive touch screen	
Size	8 inch, LED backlight, transflective LCD with anti-glare coating	
Power		
External DC input	18 to 19 V DC	
Power consumption	42 W	54 W maximum (when charging battery)

Battery		
Type	10.8 V, 7800 mA/hr (Lithium ion)	
Operating time	>3 hr (typical at spectrum analyzer)	
Charge time	3 hr (while not operating) 9 hr (while operating)	
Charging temperature	0 to 45°C (32 to 104°F) ≤85% RH	
Discharging temperature	–20 to 55°C (4 to 131°F) ≤85% RH	
Storage temperature[4]	0 to 25°C (32 to 77°F)	
Data Storage		
Internal	Maximum 512 MB	
External[5]	Up to 32 GB with FAT32 format	
Environmental		
Operating Temperature		
AC power	0 to 40C (without derating on battery charging)	
	-10 to 55C (with derating on battery charging)	
Battery	0 to 40C (without derating on battery operating time)	
	-10 to 55C (with derating on battery operating time)	
Maximum humidity	95% RH (noncondensing)	
Shock and vibration	MIL-PRF-28800F class 2	
Storage temperature[6]	–30 to 71°C (–22 to 160°F)	
EMC		
IEC/EN 61326-1:2013 (complies with European EMC)		
CISPR11:2009 +A1:2010		
ESD		
IEC/EN 61000-4-2		
Size and Weight (standard configuration)		
Weight (with battery)	Standard	4.17 kg (9.19 lb)
	Fully loaded	4.34 kg (9.57 lb)
Size (W x H x D)	295 x 195 x 82 mm	
Warranty		
3 years		
Calibration Cycle		
1 year		

1. Connects flash drive, power sensor, EZ-Cal kit, and fiber microscope.
2. Data transfer and PC Application based remote control.
3. Data transfer or PC Application/Web-based remote control.
4. 20 to 85% RH, store battery pack in low-humidity environment; extended exposure to temperature above 45°C could significantly degrade battery performance and life.
5. Supports USB 2.0 compatible memory devices.
6. With the battery pack removed.

Ordering Information

Description	Part Number
Standard CellAdvisor Base Station Analyzer	
Base station analyzer includes: Spectrum analyzer 100 kHz to 4 GHz RF power meter 10 MHz to 4 GHz Cable and antenna 5 MHz to 4 GHz	JD745B[1,2]
Options NOTE: Upgrade options for the JD745B use the designation JD745BU before the respective last three-digit option number.	
2 Port transmission measurements for JD745B[3]	JD745B001
Bias Tee for JD745B[4]	JD745B002
CW signal generator for JD745B	JD745B003
Optical hardware for JD745B[5]	JD745B008
GPS receiver and antenna for JD745B	JD745B010
Interference analyzer for JD745B[6,7]	JD745B011
Channel scanner for JD745B	JD745B012
Bluetooth connectivity for JD745B[8]	JD745B013
LTE-FDD RAN performance indicator for JD745B[9]	JD745B014
LTE-TDD RAN performance indicator for JD745B[10]	JD745B015
Wi-Fi connectivity for JD745B[11]	JD745B016
cdmaOne/cdma2000 analyzer for JD745B	JD745B020
EV-DO analyzer for JD745B[12]	JD745B021
GSM/GPRS/EDGE analyzer for JD745B	JD745B022
WCDMA/HSPA+ analyzer for JD745B	JD745B023
TD-SCDMA analyzer for JD745B	JD745B025
Mobile WiMAX analyzer for JD745B	JD745B026
LTE - FDD analyzer for JD745B[13]	JD745B028
LTE - TDD analyzer for JD745B[13]	JD745B029
LTE Advanced - FDD analyzer for JD745B[14,15]	JD745B030
LTE Advanced - TDD analyzer for JD745B[15,16]	JD745B031
LTE-FDD 256 QAM Demodulator for JD745B[17]	JD745B032
LTE-TDD 256 QAM Demodulator for JD745B[18]	JD745B033
NB-IoT Analyzer for JD745B[14]	JD745B034
cdmaOne/cdma2000 OTA analyzer for JD745B[19]	JD745B040
EV-DO OTA analyzer for JD745B[19]	JD745B041
GSM/GPRS/EDGE OTA analyzer for JD745B[19]	JD745B042
WCDMA/HSPA+ OTA analyzer for JD745B[19]	JD745B043
TD-SCDMA OTA analyzer for JD745B[19]	JD745B045
Mobile WiMAX OTA analyzer for JD745B[19]	JD745B046
LTE - FDD OTA analyzer for JD745B[19]	JD745B048
LTE - TDD OTA analyzer for JD745B[19]	JD745B049
EMF analyzer for JD745B[20]	JD745B050
RFoCPRI 614M & 1.2G interference analyzer for JD745B[21,22]	JD745B060
RFoCPRI 2.4G interference analyzer for JD745B[21,22]	JD745B061
RFoCPRI 3.1G interference analyzer for JD745B[21,22]	JD745B062
RFoCPRI 4.9G interference analyzer for JD745B[21,22]	JD745B063
RFoCPRI 6.1G interference analyzer for JD745B[21,22]	JD745B064
RFoCPRI 9.8G interference analyzer for JD745B[21,22]	JD745B065
RFoCPRI GSM interference analyzer for JD745B[21,22,23]	JD745B068

Description	Part Number
RFoOBSAI 768M Interference analyzer for JD745B[21,22]	JD745B070
RFoOBSAI 1.5G interference analyzer for JD745B[21,22]	JD745B071
RFoOBSAI 3.1G interference analyzer for JD745B[21,22]	JD745B072
RFoOBSAI 6.1G interference analyzer for JD745B[21,22]	JD745B073
RFoCPRI LTE-FDD signal generator for JD745B[21,22,23]	JD745B081
RFoCPRI LTE-TDD signal generator for JD745B[21,22,23]	JD745B082
RFoCPRI LTE-FDD multi carrier signal generator for JD745B[21,22,24]	JD745B083
RFoCPRI LTE-TDD multi carrier signal generator for JD745B[21,22,25]	JD745B084
RFoOBSAI LTE-FDD signal generator for JD745B[21,22,26]	JD745B086
RFoCPRI LTE-FDD signal analyzer for JD745B[21,22,23]	JD745B091
RFoCPRI LTE-TDD signal analyzer for JD745B[21,22,23]	JD745B092
RFoOBSAI LTE-FDD signal analyzer for JD745B[21,22,26]	JD745B096
ALU BBU emulation for JD745B[21,22]	JD745B101
CPRI Layer-2 BERT for JD745B[21,22,23]	JD745B110
Reserved for VZW[21, 22]	JD780B102
2 port transmission measurements floating license for JD740B/JD780B	JD780B001-FL
GPS receiver and antenna floating license for JD740B/JD780B	JD780B010-FL
Interference analyzer floating license for JD740B/JD780B	JD780B011-FL
Channel scanner floating license for JD740B/JD780B	JD780B012-FL
Bluetooth connectivity floating license for JD740B/JD780B	JD780B013-FL
LTE-FDD RAN performance indicator floating license for JD740B/JD780B	JD780B014-FL
LTE-TDD RAN performance indicator floating license for JD740B/JD780B	JD780B015-FL
Wi-Fi connectivity floating license for JD740B/JD780B	JD780B016-FL
cdmaOne/cdma2000 analyzer floating license for JD740B/JD780B	JD780B020-FL
EV-DO analyzer floating license for JD740B/JD780B	JD780B021-FL
GSM/GPRS/EDGE analyzer floating license for JD740B/JD780B	JD780B022-FL
WCDMA/HSPA+ analyzer floating license for JD740B/JD780B	JD780B023-FL
TD-SCDMA analyzer floating license for JD740B/JD780B	JD780B025-FL
Mobile WiMAX analyzer floating license for JD740B/JD780B	JD780B026-FL
LTE - FDD analyzer floating license for JD740B/JD780B	JD780B028-FL
LTE - TDD analyzer floating license for JD740B/JD780B	JD780B029-FL
LTE Advanced - FDD analyzer floating license for JD740B/JD780B	JD780B030-FL
LTE Advanced - TDD analyzer floating license for JD740B/JD780B	JD780B031-FL
LTE-FDD 256 QAM Demodulator floating license for JD740B/JD780B	JD780B032-FL
LTE-TDD 256 QAM Demodulator floating license for JD740B/JD780B	JD780B033-FL
NB-IoT Analyzer floating license for JD740B/JD780B	JD780B034-FL

Ordering Information (Continued)

cdmaOne/cdma2000 OTA analyzer floating license for JD740B/JD780B	JD780B040-FL
Description	**Part Number**
EV-DO OTA analyzer floating license for JD740B/JD780B	JD780B041-FL
GSM/GPRS/EDGE OTA analyzer floating license for JD740B/JD780B	JD780B042-FL
WCDMA/HSPA+ OTA analyzer floating license for JD740B/JD780B	JD780B043-FL
TD-SCDMA OTA analyzer floating license for JD740B/JD780B	JD780B045-FL
Mobile WiMAX OTA analyzer floating license for JD740B/JD780B	JD780B046-FL
LTE - FDD OTA analyzer floating license for JD740B/JD780B	JD780B048-FL
LTE - TDD OTA analyzer floating license for JD740B/JD780B	JD780B049-FL
EMF analyzer floating license for JD740B/JD780B	JD780B050-FL
RFoCPRI 614M & 1.2G interference analyzer floating license for JD740B/JD780B	JD780B060-FL
RFoCPRI 2.4G interference analyzer floating license for JD740B/JD780B	JD780B061-FL
RFoCPRI 3.1G interference analyzer floating license for JD740B/JD780B	JD780B062-FL
RFoCPRI 4.9G interference analyzer floating license for JD740B/JD780B	JD780B063-FL
RFoCPRI 6.1G interference analyzer floating license for JD740B/JD780B	JD780B064-FL
RFoCPRI 9.8G interference analyzer floating license for JD740B/JD780B	JD780B065-FL
RFoCPRI GSM interference analyzer floating license for JD740B/JD780B	JD780B068-FL
RFoOBSAI 768M interference analyzer floating license for JD740B/JD780B	JD780B070-FL
RFoOBSAI 1.5G interference analyzer floating license for JD740B/JD780B	JD780B071-FL
RFoOBSAI 3.1G interference analyzer floating license for JD740B/JD780B	JD780B072-FL
RFoOBSAI 6.1G interference analyzer floating license for JD740B/JD780B	JD780B073-FL
RFoCPRI LTE-FDD signal generator floating license for JD740B/JD780B	JD780B081-FL
RFoCPRI LTE-TDD signal generator floating license for JD740B/JD780B	JD780B082-FL
RFoCPRI LTE-FDD multi carrier signal generator floating license for JD740B/JD780B	JD780B083-FL
RFoCPRI LTE-TDD multi carrier signal generator floating license for JD740B/JD780B	JD780B084-FL
RFoOBSAI LTE-FDD signal generator floating license for JD740B/JD780B	JD780B086-FL
RFoCPRI LTE-FDD signal analyzer floating license for JD740B/JD780B	JD780B091-FL
RFoCPRI LTE-TDD signal analyzer floating license for JD740B/JD780B	JD780B092-FL
RFoOBSAI LTE-FDD signal analyzer floating license for JD740B/JD780B	JD780B096-FL
ALU BBU emulation floating license for JD740B/JD780B	JD780B101-FL
Layer-2 BERT floating license for JD740B/JD780B	JD780B110-FL
Description	**Part Number**
Optional Accessories	
Accessory — RF Calibrators (General)	
Y- calibration kit Type-N(m), DC to 6 GHz, 50 ohm	JD78050509
Y- calibration kit DIN(m), DC to 6 GHz, 50 ohm	JD78050510
EZ-Cal kit Type-N(m), DC to 6 GHz, 50 ohm	JD70050509
Dual port Type-N 6 GHz calibration kit (Includes 1x JD78050509 Y- calibration kit, 2x G700050530 RF Cable, and 2x G700050575 RF Adapter Type-N(f) to Type-N(f))	JD78050507
Dual port DIN 6 GHz calibration kit (Includes 1x JD78050510 DIN Y- calibration kit, 2x G710050536 RF Cable, and 2x G700050572 RF Adapter DIN(m) to DIN(m))	JD78050508
50 ohm Load, DC to 4 GHz, 1 W	GC72550511
Accessory - RF Cables (Cables)	
RF cable DC to 8 GHz Type-N(m) to Type-N(m), 1.0 m	G700050530
RF cable DC to 8 GHz Type-N(m) to Type-N(f), 1.5 m	G700050531
RF cable DC to 8 GHz Type-N(m) to Type-N(f), 3.0 m	G700050532
RF cable DC to 18 GHz Type-N(m) to SMA(m), 1.5 m	G710050533
RF cable DC to 18 GHz Type-N(m) to QMA(m), 1.5 m	G710050534
RF cable DC to 18 GHz Type-N(m) to SMB(m),1.5 m	G710050535
RF cable DC to 6 GHz Type-N(m) to DIN(f), 1.5 m	G710050536
RF cable DC to 4 GHz Type-N(m) to 1.0/2.3 (m), 1.5 m	G710050537
Phase-stable RF cable w grip DC to 6 GHz Type-N(m) to Type-N(f), 1.5 m	G700050540
Phase-stable RF cable w grip DC to 6 GHz Type-N(m) to DIN(f), 1.5 m	G700050541
RF cable DC to 18 GHz Type-N(m) to Type-N(f), 1.5 m	G710050531
Accessory - Optic Cables (Cables)	
SM/LC T-Jumper and 1.5 m fiber cable	G700050401
MM/LC T-Jumper and 1.5 m fiber cable	G700050402
Accessory - RF Antennas (General)	
RF omni antenna Type-N(m), 806 to 896 MHz	G700050353
RF omni antenna Type-N(m), 870 to 960 MHz	G700050354
RF omni antenna Type-N(m), 1710 to 2170 MHz	G700050355
RF omni antenna Type-N(m), 720 to 800 MHz	G700050356
RF omni antenna Type-N(m), 2300 to 2700 MHz	G700050357
Mag mount RF omni antenna Type-N(m), 689 to 1200 MHz, 1700 to 2700 MHz, 3000 to 6000 MHz	G700050358
RF Omni Antenna N(m), 2.4 GHz to 2.5 GHz, 4.5 dBi, and 5.150 GHz to 5.850 GHz, 7 dBi	G700050359
RF yagi antenna Type-N(f), 1750 to 2390 MHz, 10.2 dBd	G700050363
RF yagi antenna Type-N(f), 806 to 896 MHz, 10.2 dBd	G700050364
RF yagi antenna Type-N(f), 866 to 960 MHz, 9.8 dBd	G700050365
RF yagi antenna SMA(f), 700 to 4000 MHz, 1.85 dBd	G700050366
RF yagi antenna SMA(f), 700 to 6000 MHz, 2.85 dBd	G700050367

Ordering Information (Continued)

Isotropic Antenna Type-N(m), 26 MHz to 3 GHz	G700050380
Description	**Part Number**
Accessory - RF Power Sensor (General)	
Directional power sensor (peak and average power) 300 to 3800 MHz	JD731B
Terminating power sensor (Average Power) 20 to 3800 MHz	JD732B
Directional power sensor (peak and average power) 150 to 3500 MHz	JD733A
Terminating power sensor (peak power) 20 to 3800 MHz	JD734B
Terminating power sensor (average/peak power) 20 to 3800 MHz	JD736B
Accessory - RF Adapters (Connector & Adapters)	
Adapter Type-N(m) to DIN(f), DC to 7.5 GHz, 50 ohm	G700050571
Adapter DIN(m) to DIN(m), DC to 7.5 GHz, 50 ohm	G700050572
Adapter Type-N(m) to SMA(f) DC to 18 GHz, 50 ohm	G700050573
Adapter Type-N(m) to BNC(f), DC to 4 GHz, 50 ohm	G700050574
Adapter Type-N(f) to Type-N(f), DC to 18 GHz 50 ohm	G700050575
Adapter Type-N(m) to DIN(m), DC to 7.5 GHz, 50 ohm	G700050576
Adapter Type-N(f) to DIN(f), DC to 7.5 GHz, 50 ohm	G700050577
Adapter Type-N(f) to DIN(m), DC to 7.5 GHz, 50 ohm	G700050578
Adapter DIN(f) to DIN(f), DC to 7.5 GHz, 50 ohm	G700050579
Adapter Type-N(m) to Type-N(m), DC to 11 GHz 50 ohm	G700050580
Adapter N(m) to QMA(f), DC to 6.0 GHz, 50 ohm	G700050581
Adapter N(m) to QMA(m), DC to 6.0 GHz, 50 ohm	G700050582
Adapter N(m) to 4.1/9.5 MINI DIN (f), DC to 6.0 GHz, 50 ohm	G700050583
Adapter N(m) to 4.1/9.5 MINI DIN (m), DC to 6.0 GHz, 0 ohm	G700050584
Adapter N(m) to 4.3-10 (f), DC to 6.0 GHz, 50 ohm	G700050585
Adapter N(m) to 4.3-10 (m), DC to 6.0 GHz, 50 ohm	G700050586
Adapter Type-N(m) to DIN(f), DC to 4 GHz, 50 ohm	G710050571
Adapter N(f) to N(f), DC to 4 GHz, 50 ohm	G710050575
Adapter Type-N(f) to DIN(f), DC to 4 GHz, 50 ohm	G710050577
Adapter Type-N(f) to DIN(m), DC to 7 GHz, 50 ohm	G710050578
Accessory - RF Miscellaneous (General)	
Attenuator 40 dB, 100 W, DC to 4 GHz (unidirectional)	G710050581
RF directional coupler, 700 to 4000 MHz, 30 dB, 50 W Input/output; Type-N(m) to Type-N(f), tap off; Type-N(f)	G710050585
RF combiner, 700 to 4000 MHz, Type-N(f) to Type-N(m)	G710050586
4x1 RF combiner, 700 to 4000 MHz, Type-N(f) to Type-N(m)	G710050587
Bandpass filter 696 MHz to 716 MHz, N(m) to N(f), 50 ohm	G700050601
Bandpass filter 776 MHz to 788 MHz, N(m) to N(f), 50 ohm	G700050602
Bandpass filter 806 MHz to 849 MHz, N(m) to N(f), 50 ohm	G700050603
Bandpass filter 1710 MHz to 1755 MHz, N(m) to N(f), 50 ohm	G700050604
Bandpass filter 1850 MHz to 1910 MHz, N(m) to N(f), 50 ohm	G700050605
Description	**Part Number**
Bandpass filter 703 MHz to 748 MHz, N(m) to N(f), 50 ohm	G700050606
Bandpass filter 832 MHz to 862 MHz, N(m) to N(f), 50 ohm	G700050607
Bandpass filter 880 MHz to 915 MHz, N(m) to N(f), 50 ohm	G700050608
Bandpass filter 1710 MHz to 1785 MHz, N(m) to N(f), 50 ohm	G700050609
Bandpass filter 1920 MHz to 1980 MHz, N(m) to N(f), 50 ohm	G700050610
Bandpass filter 2500 MHz to 2570 MHz, N(m) to N(f), 50 ohm	G700050611
Accessory - General	
2 port USB hub	G700050200
USB Bluetooth dongle and dipole antenna 5 dBi	JD70050006
GPS antenna for JD740 and JD780 series	JD71050351
AntennaAdvisor handle	JD70050007
Cross LAN cable (6ft)	G700550335
USB A to B cable (1.8m)	GC73050515
> 1GB USB memory	GC72450518
Stylus pen	G710550316
Accessory - Battery & Chargers	
Rechargeable lithium ion battery	G710550325
JD700B series AC/DC power adapter_90 W_15 V	JD70050326
Automotive cigarette lighter/12V DC adapter	G710550323
External battery charger	G710550324
Accessory - Manual & Documentation	
JD700B series user's guide - printed version	JD700B362
Accessory - Carrying Case	
Soft carrying case	JD74050341
Hard carrying Case	JD71050342
Hard carrying case with wheels	JD70050342
CellAdvisor backpack carrying case	JD70050343
Optional TAP	
Optical nTAP, three-channel, 50 µm, MM, LC, 50/50 split ratio	TO3-M5-LC-55-K
Optical nTAP, three-channel, 9 µm, SM, LC, 50/50 split ratio	TO3-SM-LC-55-K
Optional SFP Transceiver	
SFP 4G/2G/1G Fibre Channel & 1G Ethernet, 850nm, 150-500m, SX	CSFP-4G-8-1
SFP 4G/ 2G/ 1G Fibre Channel & 1G Ethernet, 1310nm, 5km, LX	CSFP-4G-3-1
SFP 4G/2G/1G Fibre Channel & 1G Ethernet, 1310nm, 20km, LX	CSFP-4G-3-2
SFP+ 8G/4G/2G Fibre Channel, 6G/4.9G CPRI 850 nm MM Multirate	CSFP-PLUS-8G-8-1
SFP+ 8G/4G/2G Fibre Channel, 6G/4.9G CPRI 1310nm SM, 10km	CSFP-PLUS-8G-3-1
SFP+ 1G/10G Ethernet, 1G/10G Fiber Channel & 9.8G CPRI, 850nm, MM, 300m	SFPPLUS-1GE-10GE-8-1

Ordering Information (Continued)

SFP+ 1G/10G Ethernet, 1G/10G Fiber Channel & 9.8G CPRI, 1310nm, SM, 10km[32]	SFPPLUS-1GE-10GE-3-1
Description	**Part Number**
Optical Power Meters and Fiber Microscope Kits	
USB optical power meter with software, 2.5 and 1.25 mm interfaces, 30-inch USB extender, and carry- ing pouch	MP-60A
USB optical power meter — high power, with software, 2.5 and 1.25 mm interfaces, 30-inch USB extender, and carrying pouch	MP-80A
KIT: FBP-P5000i digital probe, FiberChekPRO software, case, and four tips	FBP-SD101
KIT: FBP-P5000i digital probe, FiberChekPRO software, case, and seven tips	FBP-MTS-101
KIT: FBP-P5000i digital probe, MP-60A USB power meter, FiberChekPRO software, case, tips, and adapters	FIT-SD103
KIT: FBP-P5000i digital probe, MP-60A USB power meter, FiberChekPRO software, case, tips, adapters, and cleaning materials	FIT-SD103-C
KIT: FBP-P5000i digital probe, MP-80A USB power meter, FiberChekPRO software, case, tips, and adapters	FIT-SD113

1. Supplied accessories: User's Guide, USB Memory (1GB), Cross LAN Cable, USB Cable, DC car adapter, Li-Ion Battery, AC/DC adapter, Stylus Pen
2. Highly recommended using the Calibration Kit (JD78050509, JD78050510, JD70050509)
3. Highly recommended using the Calibration Kit (JD78050507, JD78050508) and Bias Tee (option 002)
4. Requires option 001
5. Needs for RFoFIBER options 060,061,062,063,064,065,068,070,071,072,073,081,082,083,084,086,091,092,096,101
6. Needs Omni or Yagi antenna
7. Highly recommended adding option 010
8. Includes a Bluetooth USB dongles with 5 dBi dipole antennas (JD70050006)
9. Requires option 013 and option 028 and Needs TrueSite(FTA)
10. Requires option 013 and option 029 and Needs TrueSite(FTA)
11. Includes a Wi-Fi USB dongle
12. Requires option 020
13. Highly recommended using the RF Directional Coupler or RF combiner (G710050585 or G710050586)
14. Requires option 028
15. Highly recommended using the 4x1 RF combiner (G710050587)
16. Requires option 029
17. Requires option 030
18. Requires option 031
19. Requires option 010
20. Requires G700050380
21. Requires option 008, Including Layer2 Term and Monitoring
22. Needs proper SFP/SFP+ Transceiver and Optical Tap or thur mode fiber cable (G700050401 or G700050402)
23. Requires at least one of RFoCPRI Interference Analyzer options (option 060 to 065), needs each of the respective/corresponding Interference Analyzer line rate
24. Requires option 081

VIAVI Solutions

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30176035 906 0818