Brochure

CellAdvisor

JD748B/JD788B Signal Analyzers



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VIAVI Solutions

Introduction

A CellAdvisor[™] JD748B/JD788B signal 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, an RF/optical power meter, interference analysis, a channel scanner, and signal analysis.

Standard features include:

- Spectrum analyzer
- RF power meter

Advanced features include:

- Interference analysis
- Channel scanner
- 2-port transmission*
- CW signal generator*
- GPS receiver
- Optical power meter
- Fiber inspection with pass/fail (requires P5000i microscope)*
- Cloud enabled asset management 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 JD788B 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®



JD748B signal analyzer

Spectrum analyzer	10
RF power meter	10

100 kHz to 4 GHz 10 MHz to 4 GHz



JD788B signal analyzer

Spectrum analyzer	
RF power meter	

9 kHz to 8 GHz 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.

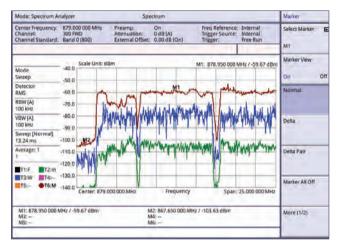
Auto Measure can be easily executed so the instrument automatically configures and tests every aspect for all carriers regardless of their frequency or modulation type. The analyzer's configurable channel scanner can track on one measurement screen the power levels for each of 20 carriers operating at 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 to external impacts exceeding the MIL-PRF-28800F class 2 specification.



Outdoor display mode

RFoCPRI

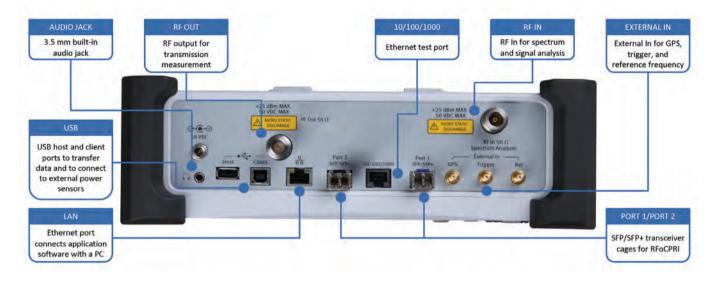
Modern cell sites have a distributed architecture that replaces coax-based feeders with fiber-based feeders and, therefore, significantly reduces signal loss and reflection problems. However, since all RF interfaces reside on the RRH, any RF maintenance or troubleshooting requires reaching the tower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



RFoCPRI reduces risky cell tower climbs, letting technicians test safely from the ground

RFoCPRI technology enables cell technicians to verify the CPRI 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 RFoCPRI is that it enables monitoring and analyses of mobile terminal (uplink), PIM detection, as well as the radio's signal (downlink) interference over a CPRI link.

Integrated Functionality





Spectrum analyzer 100 kHz to 4 GHz (JD748A) 9 kHz to 8 GHz (JD788A)	Locates and identifies various signals over frequency ranges up to 4 GHz/8 GHz.
Built-in pre-amplifier	Detects signals as low as –160 dBm/ –165 dBm with better than 1 dB mea- surement accuracy.
Zero span with gate sweep	Triggers pulse or burst signal such as WiMAX, GSM, and TD-SCDMA.
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.
CW signal generator* (option 003)	Provides a sine wave or continuous wave (CW) source for measurements such as those used for isolating a repeater.
RFoCPRI/interference analyzer (option 008, 060–065)	Enables RF measurements over CPRI 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 interfer- ence signals. In addition, it can generate a variable audible tone based on signal strength.
Channel scanner (option 012)	Intuitive graphical representation of the signal's power for each of the 20 user-definable carriers (frequencies or channels) for quick identification of improper power levels.
Optical power meter	Measures optical power for all sin- gle-mode and multimode connectors via an optical power sensor (MP-60A or MP-80A).
Signal analyzer (options 020 to 029)	Provides 3GPP/3GPP2/IEEE802.16 con- formance testing for RF characteristics as well as modulation analysis of 2G to 4G wireless technologies.
Over-the-air analyzer (options 040 to 049)	Characterizes transmission quality at any location providing reflective measurements and identifying signals transmitted from various sites.

Spectrum Analyzer

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

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

Capabilities

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

Measurements

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



* CellAdvisor JD788B only

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.



Power Meters

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

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

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

RF Power Meter (standard)

Internal power measurement

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

External power measurement

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

RF test — Dual Spectrum

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 JD788B 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 measurement range of -30 to +20 dBm.

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.

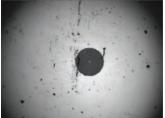
The analyzer controls optical power sensors (MP-series) to measure optical power quickly and easily in single-mode or multimode.

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

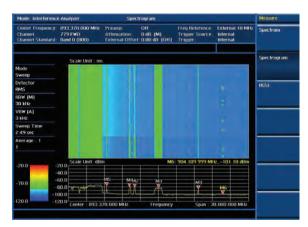
A spectrum analyzer can perform spectrum clearance, capturing just the events where the received signal exceeds the defined power limit.

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.

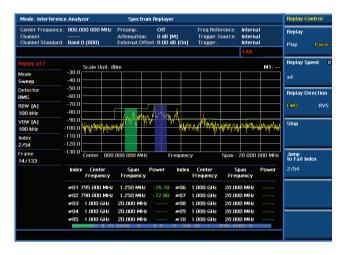
The interference finder calculates possible interference locations using its inscribed circle or circumscribed circle based on measured intersection points.



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

Signal Analyzer

The signal analyzer performs 3GPP/3GPP2/IEEE802.16standard 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 userdefined 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)

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	1			1	Technology	
	Feature		GSM/GPRS/EDGE	WCDMA/HSPA+	LTE/LTE-Advanced—FDD	LTE/LTE-Advanced—TI
	1		(Option 022)	(Option 023)	(Option 028 /030)	(Option 029 /031)
F analysis	Channel			•		
		d bandwidth				
		n emission mask	•			•
	ACP(L)R			•		
	Multi-AC					
		emissions	•			
1odulation	Power	Slot				
nalysis	vs. time	Traine	•			
		Mask				
		Timogram				
	Constella	ation		-	MBMS	
		main power		•		
		ole power				
	Code po					
	Code err	or				
	RCDE					
	Codogra	m				
	RCSI					
	CDP tab					
	Spectral					
		subcarrier				
	EVM vs.					
	Data cha	annel			MBMS	MBMS
	Control	channel			MBMS	MBMS
	Subfram	e			MBMS	MBMS
	Frame				MBMS	
	Time alio	gnment error				
		ocation map				
		·			MBMS	MBMS
	Auto me	asure				•
	Power st	atistics CCDF		•		•
	Carrier A	ggregation			•	•
			(Option 042)	(Option 043)	(Option 048)	(Option 049)
TA analysis	Scanner		Channel/Frequency	Channel/Scramble	Channel/ID	Channel/ID
	Multipat	h profile		•	•	•
	Preamble	e power trend				
	Modulat	ion analyzer				
	Code do	main power				
	Sync-DL	ID vs. tau				
	Sync-DL	ID analyzer				
	Control o	channel			MBMS	MBMS
	Datagra					•
	Route m	ар		•		•

Features				Teo	hnology	
	Feature		cdmaOne/cdma2000	EV-DO	TD-SCDMA	Mobile WiMAX
			(Option 020)	(Option 021)	(Option 025)	(Option 026)
RF analysis	Channel	power				
	Occupie	d bandwidth				
		m emission				
	mask					
	ACP(L)R					
	Multi-A	CP(L)R				
	Spurious	s emissions				
Modulation	Power	Slot		Idle/Active		
analysis	vs. time	Frame				
		Mask				
		Timogram			•	
	Constell	ation				
	Code do	main power				
	Mid-am	ble power				
	Code po	wer				
	Code eri	or				
	Codogra	im				
	RCSI					
	CDP tab	le				
	Spectral	flatness				•
	EVM vs.	subcarrier				•
	EVM vs.	symbol				•
	Data cha	annel				
	Control	channel				
	Subfram	ne				
	Frame					
		gnment error				
	Data allo	ocation map				
	Auto me					
	Power s	tatistics CCDF	-			
			(Option 040)	(Option 041)	(Option 045)	(Option 046)
OTA analysis	Scanner		Channel/PN	Channel/PN	Sync-DL ID	Preamble
	· · · ·	th profile			Sync-DL ID	
		e power trend				
		tion analyzer				
		main power				
		. ID vs. tau			•	
		ID analyzer				
	Control					
	Datagra					
	Route m	ар	•		•	

Signal Analyzer Detailed Feature Matrix

RF Analysis

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

Mode: Spectrum A	Channel Power									Measure			
Center Frequency. Channel. Channel Standard			^	Itenuatio		Off 25 dB [A] 40 00 dB		Trig	ger S	rence iource.	Intern Intern Free B	al	Measure Off
											PASS		
		Scale I	nit: dØm									MI:	Channel Power
Mode Sweep	50.0 40.0					<u> </u>		1					
Detector	30.0 20.0					مردند <u>ار من</u>	-	ening.					Occupied BW
RBW (M) 30 kHz	10.0												
VBW [A] 3 kHz	-10.0 -20.0								L.				Specturm Emission Mask
Sweep Time 199.85 msec	-30.0 -40.0	and And	y you doto	An and a second	VP-			Ť.	1192-	- Martin	- derivery	viewen A	
Average : 1 1	-50.0	Center	: 1.500 (000 000	GHz	Frequ	ency			Span	: 5.000	SHM 000	Adjacent Channel Power
TI:W T2:		Chann	nel Po	wer:	39	9.80 dBr	n /	1.2	30	MHz			
T5: T6:		Spectra PAR:	I Density	-21.1 3.90		m / Hz							Spurious Emissions
													More (1/2)

RF analysis — Channel Power

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

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



RF analysis — Occupied Bandwidth

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.

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 (Frame)

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.

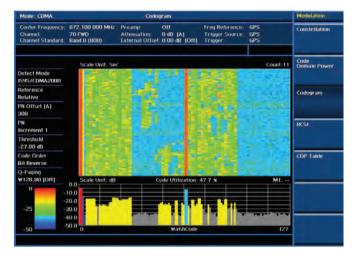
Code Error shows the power data and error data for an individual code channel and layer for a specified time simultaneously.

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

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



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

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

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



Modulation analysis - RCSI

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



Modulation analysis — Spectral Flatness

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

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

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

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



Modulation analysis — Data Channels

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

Mode: LTE - TDD		Sub	frame			Modulation
Center Frequency: Channel: Channel Standard:	A	reamp: Itenuation: xternal Offs	Off 5 dB [A] et: 40,00 dB [0	Freq Reference Trigger Source 20) Trigger		Constellation
					PASS	-
	Subframe #: 0					Data Channel
Detect Mode	Channel	EVM (%)	Power (dBm)	Modulation Type	REG/RBs	
TDD 10 MHz	P-SS	1.13	1.33	Z-Chu		
PHICH No	5-55	0.94	1,32	BPSK		
1/6	PBCH	1.24	1.31	QPSK		Control Channe
Up-Down Config	PCFICH	0.86	1.30	QP5K		
a a connu	PHICH	25.03	1.87	BPSK		
	PDCCH	1.17	2,37	QP5K	84/G	
CFI [A]	RS	1.16	1.31	QPSK		Subframe
1	PDSCH_QP5K	_		QP5K	_	
Antenna port [A]	PDSCH_16QAM	****		IGQAM		
ANTO ANTI	PD5CH_64QAM	1.12	1,30	64QAM	50/8	-
	Unallocated		-		0/8	Time Alignment Error
PDSCH Threshold -20.00 dB	SubFrame Power OFDM Symbol Po			ency Error: 13.971 Error: 0.37 us	12/0.019 ppm	
PDCCH Threshold -10.00 dB	Data EVM RMS: Data EVM Peak:	1.12 x () 3.39 x (3	3,74%) @ 5	ymbol =5,5C =24		Data Aflocation Map
Cyclic Prefix Normal	RS EVM RMS: RS EVM Peak:	1.16 \$ () 2.65 \$ (2		iymbol #4,5C #262		1 million 1
Cell ID [A]	Cell ID: 1	Gr	oup ID: 0	Sector ID:		

Modulation analysis — Subframe

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

Mode: LTE - FDD		Fr	ame			Modulation
Center Frequency: Channel Channel Standard:		Preamp: Attenuation: External Offs	0ff [A] 8b 01 [6] 8b 00.04 fe	Freg Reference: Trigger Source: 3n] Trigger:	internal Internal Internal	Constellation
					PASS	
	Subframe w: 8					Data Channel
Detect Mode	Channel	EVM (%)	Power (dBm)	Modulation Type	REG/R8s	
FDD 10 MHz	P-55	1.12	0.04	Z-Chu		and the second se
PHICH Ng	5-55	1.00	0.04	BPSK		Concession of the local division of the loca
1/6	PBCH	1.18	0.03	QPSK		Control Channe
	PCFICH	0.90	-2.38	QP5K		
	PHICH	1.03	-2.33	BPSK		
	PDCCH	1.13	-1.32	QPSK	900/G	
CFI [A]	RS	1.17	-2.38	QPSK		Subframe
1	PDSCH_QPSK	1,74	-8,38	QPSK	25078	
Antenna port [A]	PDSCH_16QAN	1.07	0.06	16QAM	250/8	
ANTO ANTI	PDSCH_64QAN	1		64QAM		
PDSCH Precoding Off	Unallocated	-	_	_	0/8	Frame
PDSCH Threshold -20.00 dB	Frame Avg Powe OFDM Symbol P			ency Error: -17.47 H igin Offset: -52.36 d		
PDCCH Threshold -10.00 dB	EVM RMS: EVM Peak:	1.14 \$ (1	.14%) @ 5	wmbol #13,5C #51		Time Alignment Error
Cyclic Prefix Normal	Data EVM RMS: Data EVM Peak:	1.18 % (1 6.14 % (6		ymbol =13,5C =51		
Cell ID [A]	Cell ID: (Gr	oup ID: 0	Sector ID:		Data Aflocation Map

Modulation analysis — Frame

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

Mode: LTE - FDD		Modulation				
Center Frequency Channel. Channel Standard	5230 FWD	Preamp. Off Attenuation. 20 External Offset: 34	dB IA] T	req Reference rigger Source. rigger	External 10 MHz Internal Internal	Constellation
	History Dags	m Time Align	ment Error			Data Channel
Detect Mode FDD-10 MHz	Scale Unit: r	uś				
PHICH Ng 176	90 60 70 60					Control Channe
CFI [A] NA Antenna port O	50 40 30 20					Subframe
			_		Count 2	Frame
	Time Alignme	nt Error: 3.03 ns ower RS EVM		r Difference: 0 RS Power R	S EVM	Time Alignmen Error
Cyclic Prefix Normal	0 14.24	18m 1.23 %	4. 1	4.79 dBm 2	96 %	
Cell ID [A]	Cell ID.	Group ID:		Sector ID:		Data Allocation Maj

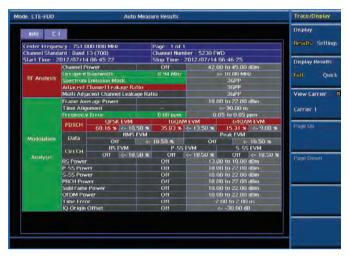
Modulation analysis — Time Alignment Error

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

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.

Mode: LTE - FDD		Carrier A	ggregation			Measure Setup
Center Frequency Channel: Channel Standard	********	Preamp Attenuation External Offse	Off 15 dB [A] et: 0.00 dB [On]	Freq Reference: Trigger Source: Trigger:	Internal Internal Internal	CA Configuration
					FAL	
Subframe #: 0	CC1 764.00 MHz	CC2 774.00 MHz	CC3 784.00 MHz	794.00 MHz	ce 1	Subframe No
¹ ower (dBm)						0
Subframe						u.
-55	-36.71	-36,68	-37,04	-37.56		
-55	-36.71	-36.67	-37.04			PDSCH Thresho
POCH	-33.71	-33.68	-34.04	-34.57		
35	-36.70	-36.67	-37.04	-37.57	aor	-20.00 dB
bata QPSK	-36.79	-36,75	-37,12	-37,65		Contraction of
ata 16 QAM						PDSCH Precodi
Data 64 QAM						POSCHPICIOU
YM (96)						On C
-55	1.26	1.31	1.34	1.26	OCRUTIN	
-55	1.25	1.20	1.27	1.37		POCCH Thresh
всн	1.40	1.24	1.20	1.33		rocerrinein
				1.24	+++++++++++++++++++++++++++++++++++++++	and the second
ula QPSK	1.26	1.25	1,16	1.25		-10.00 dB
ata 16 QAM						
ata 64 QAM					CCALL L	PDCCH Mode
						REG A
ell ID	10	to	10	Ť0		
requency Error	-17.39 Hz	-17.34 Hz	-17.37 Hz	-17.35 Hz		
AE	0.00 ns	7.20 ms	4.20 ns	-7.90 ns		MIMO
Intenna Port	0 1 2 3			00 = 1 = 2 = 3		and the second se
						4x4

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.

Mode: LTE - FDD			OTA ID 5	canner					014
Center Frequency: Channel: Channel Standard.		Atten	ip: uation: nal Offset	On 0 d8 (. 0.00 d1	AI T	req Refere rigger Sou rigger:	rce: Inte	rnal rnal rnal	ID Scanner
	Metric	RSR		5-55 R		RSRQ		Eczla 📕	Multipath Profi
Detect Mode EDD Downlink	Dominance (dB) Scale Unit: -20			3.0		0.24 ile Unit: (di		3.00	
Cell ID [A]	-20				4				Control Channe
Cyclic Pretix Normal	-80				-12				
	-120 439 436			_	-20 43				Datagram
	Detected ID	Cell II Lisi		ing orde	r of RSRP		Cell ID		1.
	IDs Cell (Grp, Sctr)	RSRP (dBm)	RSRQ R (dB)	(dB)	S-SS RSSI (dBm)	Power P-SS	(dBm) 5-55	Ec/lo (dB) S-SS	1
		66.20		28.41	-47.70	-65.30	-65.63	-3.86	
		-66.97 -68.83		28.66 36.74	-50.71 -48.43	-69.11 -67.51	-68.63 -66.35	-6.96 -4.58	
		**							_
	Latitude:	0.0.0.0	0	Longitu	ide: 0'0"	0.00	Catoli	lite: 0	

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 Control Channel 1 904 100 000 GHz Presmo: On Freq Beference: GPS 30041 FMD Altenation: 0.08 (A) Trigger Source: Internat Band 33 (1900) External Orset: 40.00 40 1001 Trigger: Internat						
					PASS		
	History Di	agram RS 0 A	vg Pwr: -20.65 dB	n RS 1 Avg P	wr:-27,90 dBm	Multipath Profil	
Detect Mode TDD Downlink	Scale Un	it: dBm					
Bandwidth 10 MHz	-10					Control Channe	
Cyclic Prefix Normal	-30 -50						
Cell ID [A]	-70 0 Summary	Table - Cell R	Count): 1 Group ID: 1	T Sector ID: 1	10 Subframe #: U	Datagram	
Antenna port 0	Channel	Power (dBm)	Power (dB)	EVM RMS (%)	EVM Peak (%)		
	P-SS	-20.47	0.05	1.19			
	S-SS PBCH	-20.45	0.07	1.32	and a second		
	PECH	-20.10	0.42	1.13	2.98		
	BS 0	-20.52	0.00	2 01			
	RS 1	-19.87	0.65	2.17		1	
	Frequency	Error: -0.6	3 Hz / -0.001 ppm				
	Time Align	ment Error: 3.00					
Time Alignment			Latitude: N 3	128-54.80 5	iatellite: 8		

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

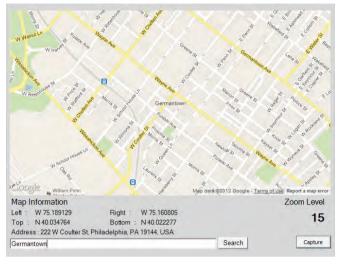
Route Map measures the OTA performance of a cell site in a defined service area by plotting the corresponding OTA metric in a map, which is then tracked with the instrument's GPS.



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.

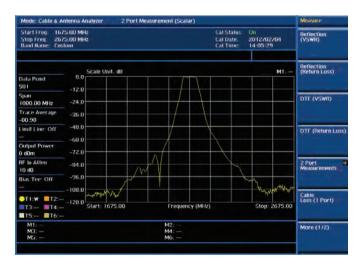


OTA analysis — JDMapCreator

2-Port Transmission

The 2-Port Transmission Measurement (Scalar)

(Option 001) feature* fully characterizes the DUT with dynamics over 110 dB.



2-Port Measurement (Scalar) function

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.

* CellAdvisor JD788B only

RFoCPRI

The analyzer measures RF over CPRI to monitor the CPRI 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

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.

Mode: RFoCPRI	Layer 2 Monitor	***	SaverLoad
Event Logging:	Off Start Time: 12/02 Elapsed Time: 00:01;	Save	
Link Rate	SFP/SFP+PORT2 Current History	SIP/SIP+ PORT1 Corrent History	Load
6144 Mbps	LOS CARACTERISTICS	LOS CF LOF RAI SDI Optic Rx Level -2.4 dB (s.	Filé Manager
	SFP/SFF+PORT2 Information Wavelength: 1310 cm Exploiting Vendor RN: EOD-130-19 Vendor RN: EOD-130-19 Vendor RN: 100-190-190-190 Porwir Lewit Type. Average Power Diagnostic Byte: 104 Norminal Rate: G300 Mbtt/sec Mix Rate: —Mbtt/sec Mix Rate:Mbtt/sec Mix Rate: 1Mbtt/sec Mix Rate: 1Mbtt/sec Mix Rate: 1	SEPISEP PORT I Information Worklength: 1310 nm Vendor: RE- ptotolink Vendor: Rec. 10 Power Lives I Special Rec. 10 Power Lives I Special Rec. 10 Normial Rec. 300 Mitotasec Min Rate: — Mbitotasec Min Rate: — Mbitoface Max Rate — Mbitoface Max Rate - 1.49988 dbm	Save Type
			dia xi

RFoCPRI — 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

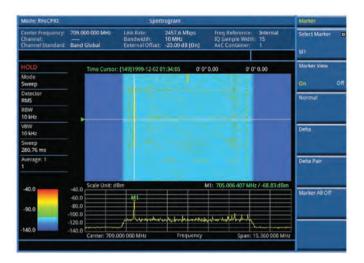
Interference Analyzer

Interference analyzer captures I/Q data from the CPRI link and shows the uplink and downlink spectrum. RFoCPRI 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.

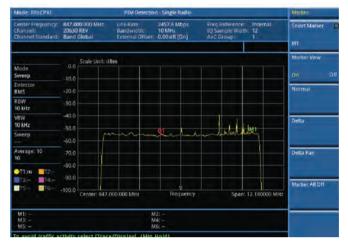


Spectrogram captures spectrum and displays it as a waterfall diagram to identify signal interference easily and quickly. Time cursor and Marker enable time and frequency tracking for the intermittent interference signals.



RFoCPRI — Spectrogram

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 — Detection - Single Radio

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



RFoCPRI — Spectrum Replayer

Channel Scanner

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

Mode Scanner	lode: Scanner Channel Scanner							
Start Frequency: Start Channel, Channel Standard:	1846.25 MHz 125 FWD Band 4 (KR PC	Attenuat	Off tion: 0.08 (/ Offset: 0.00 dE		Freq Reference: Trigger Source: Trigger:	internal Internal Free Run	Channel Scanner	
Détéct Modé Range	-20.0 -40.0 -60.0 -80.0	t: dBm				M1 :	Frequency Scanner	
RMS RBW [M]	100.0 120.0 Start : 12			annel		Stop : 600		
30 kHz VBW [A] 30 kHz	Channel 1							
VBW [A]			Level (dBm)	No	Channel	Level (dilm)		
VBW (A) 30 kHz	Channel 1	Table			Channel 375	Level (dtim) -83.39		
VBW [A] 30 kHz integration BW 1.23 MHz Channel Step	Channel T No	Fable Champel	Level (dBm)	Na		Contraction of the second s		
VBW (A) 30 kHz Integration BW 1.23 MHz	Channel 1 No	Table Channel 125	Level (dBm) -82 69	Na 11	375	-83,39		
VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step	Channel 1 No 1 2	Fable Channel 125 150	Level (d8m) -82.69 -83.65	No 11 12	375 400	-83.39 -75.42		
VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step 25	Channel 1 No 1 2 3	Fable Channel 125 150 175	Level (dBm) -82.69 -83.65 -83.67	No 11 12 13	375 400 425	-83.39 -75.42 -58.83		
VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step 25	Channel 1 No 1 2 3 4	fable Channel 125 150 175 200	Level (dBm) -82.69 -83.05 -83.67 -84.40	No 11 12 13 14	375 400 425 450 475 500	-83.39 -75.42 -58.83 -63.49 -60.43 -64.76		
VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step 25	Channel 1 No 1 2 3 4 5	fable Channel 125 150 175 200 225	Level (dBm) -82.69 -83.65 -83.67 -84.40 -83.54	No 11 12 13 14 15	375 400 425 450 475	-83.39 -75.42 -58.83 -63.49 -60.43		
VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step 25	Channel 1 No 1 2 3 4 5 6	Gable Channel 125 150 175 200 225 250 250 275 300	Level (dBm) -82.69 -83.65 -83.67 -84.40 -83.54 -84.03	No 11 12 13 14 15 16	375 400 425 450 475 500	-83.39 -75.42 -58.83 -63.49 -60.43 -64.76		
VBW [A] 30 kHz Integration BW 1.23 MHz Channel Step 25	Channel 1 No 1 2 3 4 5 6 7	Fable Channel 125 150 175 200 225 250 250 275	Level (dim) -422 69 -83.65 -83.67 -94.40 -83.54 -84.03 -82.87	No 11 12 13 14 15 16 17	375 400 425 450 475 500 525	-83.39 -75.42 -58.83 -63.49 -60.43 -64.76 -59.59		

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

Bluetooth Connectivity

Bluetooth connectivity (option 006) provides safer and easier long-distance testing with the instrument housed at the top of the tower and controlled remotely via Bluetooth. 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 connectivity

GPS Receiver and Antenna

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



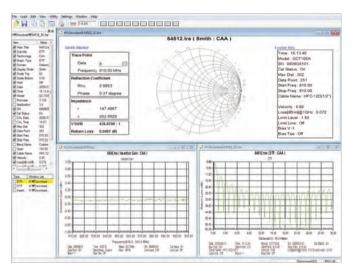
Analyzer with GPS antenna

* CellAdvisor JD788B only

Application Software

JDViewer Features

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

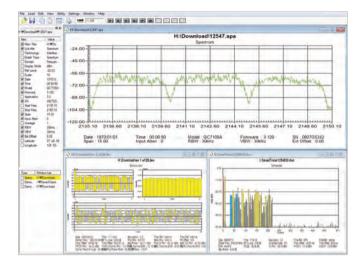


JDViewer VSWR, DTF, Smith chart





JDViewer OTA mapping



JDViewer spectrum, demodulation

JDRemote Features

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

The analyzer communicates with two Windows-based applications:

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

