



COMMUNICATIONS TEST & MEASUREMENT SOLUTIONS

## MTS/T-BERD 8000 Platform Optical Spectrum Analyzer Modules



MTS/T-BERD platform

### Key Features

- In-band capability for true OSNR measurements in ROADM and 40G networks
- Ultra-high optical resolution
- Industry-leading wavelength accuracy guaranteed over instruments lifetime
- Future-proof signal analysis for data rates of 40/100G, and next-generation modulation formats
- Channel drop function for single channel isolation and tunable filter applications.
- PMD test option based on fixed analyzer method.

### Applications

- Commissioning and maintenance of current and next generation DWDM systems
- Provisioning and maintenance of ROADM networks
- Installation and maintenance of CWDM networks
- Testing of 40G and 100G networks
- Spectral testing of optical components

### Full-band, high-performance Optical Spectrum Analyzers for testing optical systems and components

Targeted at providing advanced test solutions, the OSA-150, OSA-180 and the OSA-500 are the next generation of JDSU's DWDM analyzer modules.

A new monochromator design provides ultra high optical resolution, and outstanding wavelength accuracy in a small and rugged OSA module, offering the best field solution for testing DWDM and CWDM networks during installation, maintenance and trouble shooting.

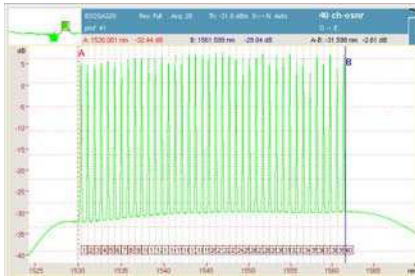
The JDSU OSA modules differentiate by the optical measurement resolution and are graded into three classes:

- The OSA-150 is JDSU's basic OSA with an optical resolution of 100 pm to measure CWDM and DWDM networks with moderate channel spacing of 100 GHz to CWDM.
- The high resolution OSA-18x DWDM analyzers are suited for testing DWDM networks with tight channel spacing down to 50GHz. In addition the OSA-181 provides a unique channel drop function to isolate single DWDM channels from the spectrum.
- The ultra high resolution OSA-500 and OSA-500R have an industry leading resolution bandwidth of 35 pm for measurements in ultra DWDM networks with channel spacing down to 25 Hz.

The OSA-500R is equipped additionally with a new technique to measure the true OSNR in ROADM systems and 40G systems.



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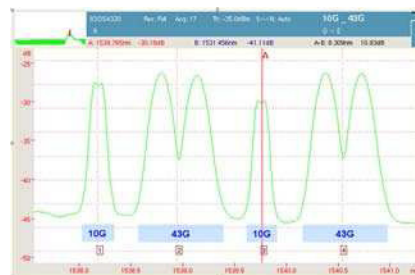
40 channel DWDM system



Instrument setup



Graphical and tabular display showing pass/fail indicators and out-of-range values



Precise and correct detection of new modulation formats

**Advanced optical performance**

JDSU’s OSA family combines outstanding wavelength accuracy, high dynamic range and an ultra-high resolution. All instruments are equipped with an internal wavelength reference for online calibration without requiring disruption of in-progress measurements. The internal wavelength calibrator is based on a physical constant reference that guarantees unsurpassed wavelength accuracy over the instrument’s lifetime without the need of external recalibration (JDSU patents), saving recalibration cost.

**One-step system qualification**

One-button auto-testing guarantees that technicians need no special training to carry out a DWDM test, making JDSU’s instruments suitable for both novice and expert technicians. An Auto-Test mode automatically identifies WDM channels, selects the appropriate wavelength range, and provides auto scaling and system qualification according to pre-defined parameters.

**Flexible measurement capability**

In-depth analysis, featuring statistical evaluation, and automatic storage capabilities, is provided. This allows for DWDM system performance verification, including the variation of optical system parameters (wavelength, power, and OSNR) as well as a series of measurements over a defined period of time. Resulting reports are provided with average, minimum, maximum, and standard deviation values of the measured parameters over time.

**Powerful pass/fail link manager**

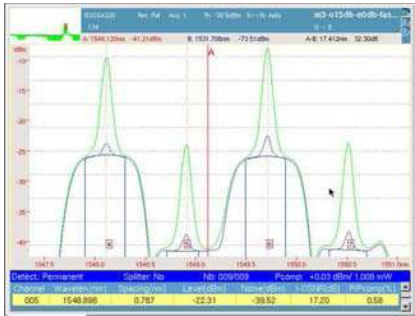
Graphical and tabular display formats can be selected to assist in the installation, verification, and troubleshooting of multi-channel DWDM systems. Built-in test functions deliver automatic pass/fail evaluations based on pre-defined alarms, saving time and providing technicians with a quick and intuitive overview of the complete set of results.

**Measurement of signals at high data rates and new modulation formats**

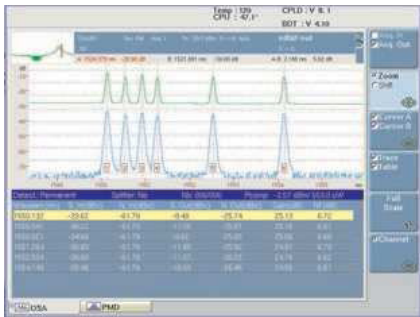
Data rates at 10 Gbps or higher have a larger optical bandwidth than the resolution bandwidth of an OSA, and with new modulation formats like duobinary (DB), differential phase shift keying (DPSK) or quadratur phase shift keying (QPSK), the spectral shape of a signal will change from one peak to multiple peaks. Regular OSAs will no longer correctly measure the central wavelength and the total signal power of such transmission signals.

JDSU OSAs are prepared for these scenarios as they have a new signal analysis for accurate measurement of total channel power and center wavelength of modulated signals. All results will be presented in the WDM table.

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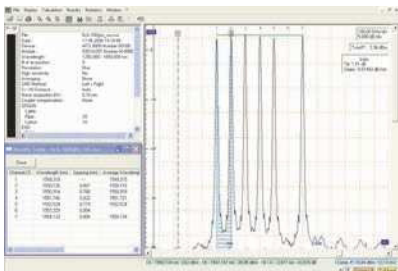
In-band noise measurement of optical channels passing different routes in a ROADM network



EDFA test application



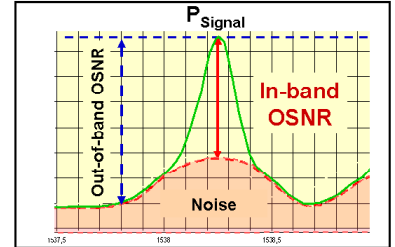
Drift analysis



Offline analysis OFS-100

**New in-band OSNR measurement technique**

In ROADM networks the noise floor in between optical channels is suppressed by the optical filters inside the ROADMs. In systems transmitting ultra high data rates like 40G/100G at tight channel spacing of 50 GHz, the modulation bandwidth is larger than the channel bandwidth thus leading to overlapping spectra. Both effects make conventional OSNR measurement based on the IEC interpolation method unreliable.



The OSA-500R is JDSU's second generation of optical spectrum analyzers performing the in-band OSNR. A new optical polarization splitting (OPS) method (patent pending) is used to suppress the transmission signal and to get access to the noise value inside the optical channel for measuring the true in-band OSNR. The only viable solution for any test scenarios, whatever the ROADM filter types, data rate or modulation formats.

**Built-in test applications**

Test applications for optical amplifiers (EDFA) and laser sources (DFB) facilitate network component verification.

**Drift measurements**

For optical performance monitoring it is essential to measure the key parameters over time. The built-in drift test application provides the result of power, wavelength and OSNR over a customer definable time frame in a graphical and numerical format. Drift measurements are important in CWDM networks with uncooled laser, which have a typical wavelength of 0.1 nm/°C.

**PMD test options**

With the PMD option, the OSA can measure the differential group delay (DGD) for PMD characterization of optical fibers and systems. The measurement is based on the fixed analyzer method (TIA/EIA FOTP-113) together with a broadband source and a variable polarizer.

**Channel isolation (drop) and dual-port options**

A unique channel isolation option is provided to extract a single DWDM channel from the entire spectrum for further analysis with a SONET/SDH or Ethernet analyzer at data rates up to 12.5 Gbps. The built-in tracking function provides wavelength locking to the peak of the selected channel in order to avoid channel frequency drift problems during long-term measurements. The dual-port option (JDSU patents) provides simultaneous measurement of two optical signals, measuring the input and output of an optical amplifier at the same time, for example.

**Advanced analysis solution**

JDSU's OFS-100 Optical FiberTrace Software is a PC-based software application within a true Microsoft Windows environment, offering post-analysis capabilities and the generation of detailed, professional OSA reports.

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Specifications

**Full-band WDM analyzer  
OSA-150**

**Operating modes**

WDM, Drift

**Spectral measurement ranges**

Wavelength range	1250 to 1650 nm
Measurement samples	120,000
No. of optical channels	256
Wavelength calibration <sup>(1)</sup>	internal, online.
Wavelength accuracy <sup>(2)</sup>	± 100 pm
Readout resolution	1 pm
Resolution bandwidth (FWHM) <sup>(2)</sup>	100 pm

**Power measurement ranges**

Dynamic range <sup>(3)</sup>	-60 to +15 dBm
Absolute accuracy <sup>(2, 4)</sup>	± 0.6 dB
Total safe power	+23 dBm
Readout resolution	0.01 dB
Scanning time (full band) (C-band)	<5 s <1 s

**Optical rejection ratio (ORR) <sup>(2)</sup>**

at ± 25 GHz (± 0.2 nm)	not specified
at ± 50 GHz (± 0.4 nm)	40 dBc
at ± 100 GHz (± 0.8 nm)	>43 dBc

**Full band DWDM Analyzer  
OSA-180 / OSA-181**

**Operating modes**

WDM, Drift, DFB, LED, FPL, EDFA

**Spectral measurement ranges**

Wavelength range	1250 to 1650 nm
Measurement samples	120,000
No. of optical channels	256
Wavelength calibration <sup>(1)</sup>	internal, online.
Wavelength accuracy <sup>(2)</sup>	typ. ± 20 pm
Readout resolution	1 pm
Resolution bandwidth (FWHM) <sup>(2)</sup>	typ. 70 pm

**Power measurement ranges**

Dynamic range <sup>(3)</sup>	-65 to +23 dBm
Absolute accuracy <sup>(2, 4)</sup>	typ. ± 0.5 dB
Linearity <sup>(5)</sup>	± 0.1 dB
Total safe power	+23 dBm
Readout resolution	0.01 dB
Scanning time (full band) (C-band)	<5 s <1 s

**Optical rejection ratio (ORR) <sup>(2)</sup>**

at ± 25 GHz (± 0.2 nm)	typ. 35 dBc
at ± 50 GHz (± 0.4 nm)	typ. 45 dBc

**Channel drop option (OSA-181 only)**

Wavelength range	1300 to 1650 nm
Data rates	up to 12.5 Gbps
Spectral filter bandwidth	>20 GHz
Insertion loss <sup>(6)</sup>	typ. <12 dB
Tracking mode	Auto wavelength control

**High Perf. DWDM Analyzer  
OSA-500 / OSA-500R**

**Operating modes**

WDM, Drift, DFB, LED, FPL, EDFA  
In-band OSNR <sup>(OSA-500R only)</sup>

**Spectral measurement ranges**

Wavelength range	1250 to 1650 nm
Measurement samples	120,000
No. of optical channels	256
Wavelength calibration <sup>(1)</sup>	internal, online.
Wavelength accuracy <sup>(2)</sup>	typ. ± 10 pm
Readout resolution	1 pm
Resolution bandwidth (FWHM) <sup>(2)</sup>	typ. 35 pm

**Power measurement ranges**

Dynamic range <sup>(3)</sup>	-70 to +20 dBm
Absolute accuracy <sup>(2, 4)</sup>	typ. ± 0.5 dB
Linearity <sup>(5)</sup>	± 0.1 dB
Total safe power <sup>(12)</sup>	+23 dBm
Readout resolution	0.01 dB
Scanning time (full band) (C-band)	<5 s <1 s

**Optical rejection ratio (ORR) <sup>(2, 11)</sup>**

at ± 25 GHz (± 0.2 nm)	typ. 45 dBc
at ± 50 GHz (± 0.4 nm)	typ. 50 dBc

**In-band OSNR<sup>(10)</sup> (OSA-500R only)**

I-OSNR dynamic range	up to >30 dB
PMD tolerance <sup>(7)</sup>	up to 25 ps
Measurement accuracy <sup>(8)</sup>	typ. ± 0.5 dB
Data signals	up to 100 Gbps
Measurement time <sup>(9)</sup>	<2 min

(1) Built-in, physical constant wavelength calibrator, needs no re-calibration  
 (2) Typical for 1520 to 1565 nm at 18° to 28 °C  
 (3) Max. power per channel +15 dBm  
 (4) At -10 dBm, including PDL  
 (5) -45 dBm to +10 dBm, at 23 °C

(6) 1520 to 1620 nm at 23 °C  
 (7) For data rates up to 10 Gbps  
 (8) For OSNR ≤ 25 dB and PMD <25 ps  
 For data rates of ≥ 40 Gbps with ≥ 100 GHz ch- spacing typically ± 1 dB  
 (9) Fast mode, independent of no of channels

(10) only valid for OSA-500R  
 (11) For OSA-500R ORR is reduced by 3 dB  
 (12) +20 dBm for OSA-500R

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## Specifications

### General specifications

#### Display modes

Graph, WDM table, graph and table

#### Optical ports (physical contact interfaces)

Input port	SM
Output port (drop port OSA-181)	SM
Optical return loss	>35 dB
Interface	Universal connectors/PC
Optical adapters	FC, SC, ST, LC, DIN

#### Temperature

Operating	+5 to +50 °C / 41 to 122 °F
Storage	-20 to +60 °C / -4 to 140 °F

#### Weight (module only)

OSA-150/18x/500	2.2 kg / 4.6 lbs
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#### Size (module only)

OSA-150/18x/500	50 x 250 x 305 mm / 2 x 10 x 12 in
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OSA modules

### OSA Selection Guide

A comprehensive portfolio to better match your application requirements.

Instrument class	Technology Ch-spacing	CWDM 20 nm	DWDM 100 GHz	Application		Channel drop	ROADM in-band OSNR
				DWDM 50 GHz	UDWDM 25 GHz		
Basic OSA	OSA-150	X	X	-	-	-	-
High resolution OSA	OSA-180	X	X	X	-	-	-
	OSA-181	X	X	X	-	X	-
Ultra high resolution OSA	OSA-500	X	X	X	X	-	-
	OSA-500R	X	X	X	X	-	X

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 Ordering information for Full-band DWDM analyzers
 

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**Basic OSAs**

2281/91.15	OSA-150
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**High-resolution OSAs**

2281/91.18	OSA-180
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2281/91.22	OSA-181, with channel drop 12.5G
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**Ultra-high resolution OSAs**

2281/91.51	OSA-500, high performance DWDM OSA
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2281/91.55	OSA-500R, high performance DWDM & ROADM OSA
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**PMD test option (for OSA-18x/500/500R)**

2281/91.11	PMD test kit includes PMD evaluation SW plus
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2279/31	OBS-55, Optical Broadband Source plus
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2271/01	OVP-15, Optical Variable Polarizer
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**Application software**

EOFS100	Optical fiber trace software for post-analysis
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EOFS200	Optical fiber trace software for cable acceptance report generation
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**Test & Measurement Regional Sales**

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