

# FTBx-5245/5255

## OPTICAL SPECTRUM ANALYZERS



100G 400G

WDM AWARE™  
TECHNOLOGY



EXFO TFv  
Test function virtualization



EXFO Connect  
compatible



Feature(s) of this product is/are protected by one or more of: US patents 6,612,750; US patents 8,373,852; US patent 6,636,306 and equivalent patents pending and granted in other countries; US patent 8,358,930 and equivalent patents pending and granted in other countries; US patent 8,787,753; US patent 8,364,034 and equivalent patents pending and granted in other countries; US patent 9,438,336 and equivalent patents pending and/or granted in other countries; patent appl. US 2014/0086574 A1; and US design patent D737,429; US patent 7,167,655; US design patent D798,171 and equivalent(s) in other countries; and US design patent D842,144; US patent 10,128,975.

Highly accurate, easy-to-use intelligent optical spectrum analyzers (OSAs) for analysis of CWDM and DWDM networks.

## KEY FEATURES

### Field testing

Robust in-service Pol-Mux OSNR for 100G/200G/400G (FTBx-5255)

Industry's only all-in-one OSA covering all applications: high speed (100G+ in-service OSNR), CWDM, O- and L-band testing

Portable solution for spectral characterization of DWDM/CWDM networks

Industry's smallest OSA/transport solution in a single platform (FTB-4 Pro)

Pol-Mux OSNR option compliant with IEC 61282-12 standard

Large 10-inch display screen on the FTB-2 and FTB-4 Pro platforms

### Lab/manufacturing testing

Ideal for field and lab: compatible with FTB-2/FTB-2 Pro, FTB-4 Pro and LTB-8 platforms

Flexibility to analyze WDM, EDFA, drift, spectral transmittance, and Fabry-Perot and DFB lasers

Wide range of measurements (SMSR, FWHM spectral width, 20 dB linewidth)

One-button operation for easy setup and automatic measurement

## COMPATIBLE PLATFORMS



Rackmount platform  
LTB-8



Platform  
FTB-2/FTB-2 Pro



Platform  
FTB-4 Pro



## POWERFUL FEATURES FOR LAB AND MANUFACTURING

The FTBx-5245/5255 is an easy-to-use OSA offering a wide range of measurement modes tailored to the needs of users working in R&D and manufacturing.



### Favorites button

The Favorites button provides direct access to your defined configuration list—right in the field.

### Trace comparison

Deploy and commission your network right from day one. Then, as maintenance, upgrades and troubleshooting occur, compare the latest measurement with the original ones. Rapidly and directly see all changes, those made deliberately and otherwise.



### SCPI commands

It is possible to control the OSA remotely with SCPI commands for the WDM, Fabry-Perot, DFB and spectral transmittance modes.



### Print to PDF

Generate a PDF report directly from the unit, making it much quicker and easier to convert reports into an email-friendly format.

### Drift measurements

You can monitor power, wavelengths and OSNR over time. You can also visualize the current and historical status of all channels in a single interface called drift dashboard, which enables you to view any value that displays a change in state (i.e., when a threshold is crossed). You can also build a drift trace from a past DWDM acquisition.



### Advanced EDFA analysis

Since amplifiers are critical elements in all networks, it is crucial to ensure that they are optimized, that the gain is well-distributed and that the output power is flat. Now, you can further optimize EDFAs by measuring key parameters, such as gain per channel, noise figure, gain flatness and gain slope. More importantly, you can save and print this valuable information.



### Accurate spectral transmittance

With the advent of larger spectral content through the implementation of 100G+ signals, knowing the bandwidth of a given filter is critical. The Spectral Transmittance software feature compares the filtered wavelength to the nominal one, showing insertion loss, channel isolation and bandwidth at different power levels.



### Laser analysis

Make sure that your transmitters are within specifications. With the DFB Laser Analysis feature, you can characterize a DFB laser source for central wavelength, peak power, bandwidth, SMSR and much more. Automatically characterize Fabry-Perot lasers for central wavelength, RMS width and full-width half-max (FWHM).



## LTB-8 EIGHT-SLOT RACKMOUNT PLATFORM

WINDOWS ENVIRONMENT | BUILT-IN APPLICATIONS | THIRD-PARTY APPLICATIONS  
SCALABLE | HOT-SWAPPABLE MODULES | USB

## ALL-IN-ONE OSA COVERING ALL SPECTRAL TESTING APPLICATIONS

The new FTBx-5255 is the only OSA on the market to address all applications in a single module:

- › High-speed DWDM, with OSNR measurements from 10G to 400G, including in-service Pol-Mux OSNR
- › CWDM spectral analysis
- › Spectral analysis of pluggable transceivers (CFP, XFP) on the O-band, 1300 nm region, as well as L-band transceivers

## OSNR MEASUREMENTS FROM 10G TO 400G

OSNR has long been recognized as a key performance indicator in wavelength-division multiplexing (WDM) networks, because it provides a multichannel assessment of signal quality in a very short time. In addition, OSNR can predict bit error rate (BER) within just a few minutes, while typical BER tests must run for hours, or days.

**WDM AWARE™**  
POL-MUX TECHNOLOGY

The IEC 61280-2-9 standard defines OSNR measurement as the power ratio between the signal power and the noise at half the distance between the peaks. However, in ROADM or 40 Gbit/s systems, this method may lead to incorrect results, because the noise level between the peaks is no longer directly correlated with the noise level at the channel wavelength. EXFO's in-band OSNR answers this challenge.

For Pol-Mux signals at 40G, 100G and 200G, neither the IEC nor the in-band method work. This calls for a new measurement method: Pol-Mux OSNR.

## FIRST POL-MUX OSA ON THE MARKET FOR 100G/200G/400G SIGNALS

The commissioning assistant, which is the key feature of the Pol-Mux OSA, is perfect for Pol-Mux OSNR measurements during turn-up. Based on the channel shutdown method, it provides highly accurate amplified spontaneous emission (ASE) OSNR measurements.

The commissioning assistant can be utilized after the user has first taken a measurement at the receiver with all of the channels turned on, and then acquired a series of traces, each taken with one channel turned off. The Pol-Mux OSA then performs the Pol-Mux OSNR calculations via a user-friendly wizard.

The commissioning assistant therefore greatly accelerates OSNR measurements based on the channel shutdown method and drastically reduces potential human errors. In addition, the commissioning assistant complies with two standards: the IEC-61282-12 standard and the China Communications Standards Association (CCSA) method YD/T 2147-2010.



## NEW IN-SERVICE POL-MUX OSNR

With the advent of EXFO's in-service Pol-Mux OSNR method (INSPM), the wait for a non-intrusive Pol-Mux OSNR method that works on live networks is now over! This robust method features a high dynamic range and provides very accurate Pol-Mux OSNR values for 40G/100G/200G/400G<sup>a</sup> signals. The INSPM software option, available on the FTBx-5255, provides OSNR values that are calculated using the amplified spontaneous emission (ASE) noise level, using an approach that is insensitive to nonlinear effects. It is the preferred method for reducing coherent network outages, pinpointing defective amplifiers and decreasing troubleshooting time.

## THE RIGHT OSNR METHOD FOR ACCURATE OSNR MEASUREMENTS

Using the wrong OSNR method on a given signal can induce OSN errors ranging from a few dB to over 10 dB, a significant inaccuracy. The choice of the right OSNR method depends on just two factors: the signal data rate and the presence or absence of ROADMs.

DATA RATE	ROADM PRESENT	OSNR METHOD	OSA MODULE
10G	No	IEC 61280-2-9	FTBx-5245/5255
10G	Yes or no	In-band	FTBx-5245-P/5255
Non-coherent 40G	Yes or no	In-band	FTBx-5245-P/5255
Coherent 40G/100G/200G/400G (at commissioning)	Yes or no	Pol-Mux (commissioning assistant)	FTBx-5245-P/5255
Coherent 40G/100G/200G/400G (live network)	Yes or no	In-service Pol-Mux	FTBx-5255

## POWERFUL PLATFORMS, POWERFUL COMBO

The FTBx-5245/5255 OSA test module is supported on the compact and portable FTB-2/ FTB-2 Pro and FTB-4 Pro platforms, or in the rack-mountable LTB-8 platform. The FTB-2 and FTB-4 Pro are the market's most compact high-speed deployment and multiservice testing solutions to deliver all the tools needed for maximum field efficiency. The platforms' 10-inch, high-resolution, widescreen display clearly shows the details of complex multichannel DWDM traces acquired with the OSA.



When equipped with the commissioning assistant option or the in-service Pol-Mux option, this versatile OSA can be combined with the FTB-88100NGE/88200NGE Power Blazer module (a 100G SONET, SDH, OTN and Ethernet tester), supported on the FTB-4 Pro platform, to create the industry's smallest OSA/transport solution in a single platform for commissioning 40G/400G circuits.

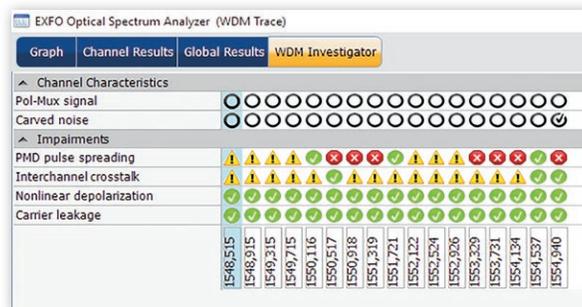
The LTB-8 offers hot-swapping capability for the modules, great automation capabilities and several connectivity options (USB3, LAN, Sync and AMT port).

a. In-service Pol-Mux OSNR supported only on single-carrier 400G signals and 400G signals with  $\geq 50$  GHz spacings.

## IMPAIRMENT IDENTIFICATION FOR FASTER TROUBLESHOOTING

Operators want to reduce their OPEX, yet WDM networks are becoming increasingly complex, with new technologies being deployed (tighter channel spacing, polarization-multiplexed signals, etc.) that increase the number of potential causes for failure. While past impairment types were relatively few and well-known (excessive loss, high dispersion, excessive ASE noise), these newly deployed technologies give rise to previously uncommon impairments, such as crosstalk and nonlinear effects. As such, telecommunications companies need to find ways to identify these impairments and their impact on signal degradation.

This is now possible with EXFO's WDM Investigator, which provides detailed information about the signal and noise for each direct detect channel. This efficient impairment identification makes it possible to pinpoint the defective component more rapidly, thus decreasing troubleshooting time and OPEX. The WDM Investigator provides information on link characteristics, such as the presence of polarization-multiplexed signals or the presence of carved noise due to filters or ROADMs. It also checks for the presence of several types of impairments (crosstalk, nonlinear effects, carrier leakage and PMD pulse spreading) and provides an assessment of their severity (OK, warning, risk).



## SOFTWARE TEST TOOLS

This series of platform-based software testing tools enhance the value of the FTB-2, FTB-4 Pro and LTB-8 platforms, providing additional testing capabilities without the need for additional modules or units.

### ConnectorMax

#### ConnectorMax2—Software applications

Providing lightning-fast results in the first step of fiber-link testing, ConnectorMax2 is the industry's first platform-based, automated inspection application; it delivers quick pass/fail assessment of connector endfaces and is specifically designed to save both time and money in the field.



**EXFO TFv**  
Test function virtualization

#### FTB OnDemand: time-based software licenses

Part of EXFO Test Function Virtualization—TFv, FTB OnDemand enables customers to activate a specific software option for a specific period of time, on a specific module. This flexibility is perfect for situations where a test function is only needed for a specific project or to try a software option before purchase. In-band OSNR, WDM Investigator, commissioning assistant, in-service Pol-Mux OSNR and the advanced options are available through FTB OnDemand.

SPECIFICATIONS<sup>a</sup>

SPECTRAL MEASUREMENT		
	FTBx-5245	FTBx-5255
Wavelength range (nm)	1250 to 1650	1250 to 1650
Wavelength uncertainty (nm)	±0.05 <sup>b</sup> ±0.01 <sup>b, c, d</sup>	±0.025 <sup>b</sup> ±0.010 <sup>b, c, d</sup>
Reference	Internal <sup>e</sup>	Internal <sup>e</sup>
Resolution bandwidth (RBW) (nm) <sup>f</sup>	0.065 <sup>d, g</sup>	0.035 <sup>b, d</sup> <0.02 (high resolution mode) <sup>b, d, h</sup>
Wavelength linearity (nm)	±0.01 <sup>d, i</sup>	±0.01 <sup>d, i</sup>
Wavelength repeatability 2σ (nm)	±0.003 <sup>j</sup>	±0.003 <sup>j</sup>
Analysis mode	WDM, EDFA, drift, spectral transmittance, DFB, FP	WDM, EDFA, drift, spectral transmittance, DFB, FP

POWER MEASUREMENT			
	FTBx-5245	FTBx-5255	HPW option
Dynamic range (dBm) (per channel) <sup>b</sup>	-80 <sup>k</sup> to 18	-80 <sup>k</sup> to 18	-75 <sup>k</sup> to 23
Maximum total safe power (dBm)	23	23	29
Absolute power uncertainty (dB)	±0.5 <sup>l</sup>	±0.5 <sup>l</sup>	±0.5 <sup>l</sup>
Power repeatability 2σ (dB)	±0.02 <sup>j</sup>	±0.02 <sup>j</sup>	±0.02 <sup>j</sup>

OPTICAL MEASUREMENT			
	FTBx-5245	FTBx-5255	HPW option
Optical rejection ratio (dB) <sup>m</sup> at 0.2 nm (25 GHz) at 0.4 nm (50 GHz)	35 (40 typical) 45 (50 typical)	45 (50 typical) 50 (55 typical)	
Channel spacing	25 to 200 GHz, CWDM	12.5 to 200 GHz, CWDM	
PDL (dB) <sup>m</sup>	±0.08 <sup>d</sup>	±0.06 <sup>d</sup>	±0.1 <sup>d</sup>
ORL (dB)	≥40	≥40	
Measurement time (s) (includes scanning, analysis and display)	<1.0 <sup>d, n</sup>	<1.0 <sup>d, n</sup>	

IN-BAND OSNR MEASUREMENT <sup>d</sup>		
	FTBx-5245-P only	FTBx-5255
OSNR dynamic range (dB)	>35 <sup>o</sup>	>35 <sup>o</sup>
OSNR measurement uncertainty (dB)	±0.5 <sup>p</sup>	±0.5 <sup>p</sup>
Repeatability (dB)	±0.2 <sup>q</sup>	±0.2 <sup>q</sup>
Data signals	Up to 100 Gbit/s <sup>r</sup>	Up to 100 Gbit/s <sup>r</sup>

a. All specifications are for a temperature of 23 °C ± 2 °C with an FC connector, unless otherwise specified, after warm-up. Measurements taken on a FTB-2 Pro.

b. From 1520 to 1610 nm.

c. After user calibration in the same test session, within 10 nm from user calibration wavelength.

d. Typical.

e. Integrated and wavelength independent.

f. Full-width half-maximum.

g. From 1300 to 1590 nm.

h. Optimized for higher order modulation format signals.

i. From 1530 to 1570 nm.

j. At 1550 nm, in drift mode. Single scan every 2 seconds, over 2 minutes. With DFB laser.

k. With averaging.

l. At 1550 nm, -10 dBm input.

m. At 1550 nm, with narrow monochromatic light source.

n. 45 nm span, full resolution, 20 peak. On FTB-2 Pro.

o. For an optical noise level of > -55 dBm, > -49 dBm for HPW models.

p. With PMD ≤ 15 ps and no crosstalk, uncertainty specification is valid for OSNR ≤ 25 dB.

With PMD ≤ 15 ps and crosstalk, uncertainty specification is valid for OSNR ≤ 20 dB.

q. Valid for OSNR ≤ 25 dB.

r. Except for polarization-multiplexed and fast polarization-scrambled signals.

## POL-MUX OSNR MEASUREMENT

### Commissioning assistant

Modulation formats	Any, including all coherent/Pol-Mux formats like DP-QPSK, DP-BPSK, DP-8-QAM, DP-16-QAM, DP-64-QAM
Data signals	Up to 400 Gbit/s
Measurements time <sup>a, b</sup>	1 min and 40 s (100 scans) for trace with all channels on. <5 s for traces with a single channel off.

## IN-SERVICE POL-MUX OSNR<sup>a, c</sup>

### FTBx-5255

OSNR dynamic range (dB)	30
OSNR measurement uncertainty (dB)	$\pm 0.5$ <sup>d, e, f</sup>
Repeatability (dB)	$\pm 0.3$ <sup>d, e</sup>

## GENERAL SPECIFICATIONS<sup>a</sup>

Size (H x W x D)	51 mm x 159 mm x 185 mm (2 in x 6 1/4 in x 7 5/16 in)	
Weight	1.2 kg (2.6 lb)	
Temperature	Operating	0 °C to 40 °C (32 °F to 104 °F)
	Storage	-40 °C to 50 °C (-40 °F to 122 °F)
Relative humidity	0 % to 95 % noncondensing	
Connectors	EI (EXFO UPC universal interface) EA (EXFO APC universal interface)	

## LASER SAFETY



a. Typical.

b. 1525 nm to 1570 nm scan. On the FTB-2 Pro platform.

c. For an optical noise level of > -55 dBm in 0.1 nm RBW.

d. For signal rates < 35 Gbaud/s on grid spacing  $\geq$  50 GHz (with or without spectral shaping).

e. Up to 25 dB of OSNR.

f. Up to  $\pm 1.5$  dB when there is the presence of combined typical network variations in nonlinear effects, relative signal or filter wavelength drifts.

## ORDERING INFORMATION

## FTBx-5245-XX-XX-XX

**Model**

FTBx-5245 = Optical spectrum analyzer  
 FTBx-5245-P = Optical spectrum analyzer with polarization controller  
 FTBx-5245-HPW = Optical spectrum analyzer with high power option  
 FTBx-5245-P-HPW = Optical spectrum analyzer with polarization controller and high power option

Example: FTBx-5245-P-EI-EUI-89-INB

**Connector adapter<sup>a</sup>**

EI-EUI-28 = UPC/DIN 47256  
 EI-EUI-89 = UPC/FC narrow key  
 EI-EUI-90 = UPC/ST  
 EI-EUI-91 = UPC/SC  
 EI-EUI-95 = UPC/E-2000  
 EI-EUI-98 = UPC/LC  
 EA-EUI-28 = APC/DIN 47256  
 EA-EUI-89 = APC/FC narrow key  
 EA-EUI-91 = APC/SC  
 EA-EUI-95 = APC/E-2000  
 EA-EUI-98 = APC/LC

**Software option**

00 = Without software option  
 Adv = Enables advanced measurement mode  
 InB = Enables the in-band OSNR option<sup>b</sup>  
 Inv = Enables the WDM Investigator option<sup>b, c</sup>  
 Com = Enables the commissioning assistant option<sup>b, c</sup>

## FTBx-5255-XX-XX

**Model**

FTBx-5255 = Optical Spectrum Analyzer with polarization controller  
 FTBx-5255-HPW = Optical spectrum analyzer with polarization controller and high power option

Example: FTBx-5255-EI-EUI-89-COM

**Connector adapter<sup>a</sup>**

EI-EUI-28 = UPC/DIN 47256  
 EI-EUI-89 = UPC/FC narrow key  
 EI-EUI-90 = UPC/ST  
 EI-EUI-91 = UPC/SC  
 EI-EUI-95 = UPC/E-2000  
 EI-EUI-98 = UPC/LC  
 EA-EUI-28 = APC/DIN 47256  
 EA-EUI-89 = APC/FC narrow key  
 EA-EUI-91 = APC/SC  
 EA-EUI-95 = APC/E-2000  
 EA-EUI-98 = APC/LC

**Software option**

Adv = Enables advanced measurement mode<sup>d</sup>  
 InB = Enables the in-band OSNR option<sup>d</sup>  
 Inv = Enables the WDM Investigator option  
 Com = Enables the commissioning assistant option  
 INSPM = Enables the in-service Pol-Mux OSNR option<sup>e</sup>

a. EXFO universal interface is protected by US patent 6,612,750.

b. Available only with FTBx-5245-P and FTBx-5245-P-HPW.

c. Available only if InB is enabled.

d. Always included.

e. Available only if the Com option is enabled.

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