FTBx-5245/5255 Optical Spectrum Analyzers

**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
- **Compact Platform**
  - FTB-2/FTB-2 Pro
- **Platform**
  - FTB-4 Pro

Features of this product are protected by: 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 D797429.

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

Optical signal-to-noise ratio (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.

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 (INSMP), 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* signals. The INSMP 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.

<table>
<thead>
<tr>
<th>Data rate</th>
<th>ROADM present</th>
<th>OSNR method</th>
<th>OSA Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>10G</td>
<td>no</td>
<td>IEC 61280-2-9</td>
<td>FTBx-5245/5255</td>
</tr>
<tr>
<td>10G</td>
<td>yes or no</td>
<td>in-band</td>
<td>FTBx-5245-P/5255</td>
</tr>
<tr>
<td>Non-coherent 40G</td>
<td>yes or no</td>
<td>in-band</td>
<td>FTBx-5245-P/5255</td>
</tr>
<tr>
<td>Coherent 40G/100G</td>
<td>yes or no</td>
<td>Pol-Mux (commissioning assistant)</td>
<td>FTBx-5245-P/5255</td>
</tr>
<tr>
<td>Coherent 40G/100G</td>
<td>yes or no</td>
<td>in-service Pol-Mux</td>
<td>FTBx-5255</td>
</tr>
<tr>
<td>Coherent 40G/200G</td>
<td>yes or no</td>
<td>in-service Pol-Mux</td>
<td>FTBx-5255</td>
</tr>
<tr>
<td>Coherent 40G/400G</td>
<td>yes or no</td>
<td>in-service Pol-Mux</td>
<td>FTBx-5255</td>
</tr>
</tbody>
</table>

* In-service Pol-Mux OSNR supported only on single-carrier 400G signals and 400G signals with ≥ 50 GHz spacings.

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).
**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).

**TIME-BASED SOFTWARE LICENSES WITH FTB OnDemand**

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.

**SOFTWARE TEST TOOLS**

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

**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.
### SPECIFICATIONS

#### SPECTRAL MEASUREMENT

<table>
<thead>
<tr>
<th>Specification</th>
<th>FTBx-5245</th>
<th>FTBx-5255</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength range (nm)</td>
<td>1250 to 1650</td>
<td>1250 to 1650</td>
</tr>
<tr>
<td>Wavelength uncertainty (nm)</td>
<td>±0.05 ( \text{b,c,d} )</td>
<td>±0.025 ( \text{b,c,d} )</td>
</tr>
<tr>
<td>Reference</td>
<td>Internal ( \text{e} )</td>
<td>Internal ( \text{e} )</td>
</tr>
<tr>
<td>Resolution bandwidth (RBW) (nm)</td>
<td>0.065 ( \text{\textsuperscript{a,g}} )</td>
<td>0.035 ( \text{\textsuperscript{h,d}} )</td>
</tr>
<tr>
<td>Wavelength linearity (nm)</td>
<td>±0.01 ( \text{\textsuperscript{d,i}} )</td>
<td>±0.01 ( \text{\textsuperscript{d,i}} )</td>
</tr>
<tr>
<td>Wavelength repeatability 2( \sigma ) (nm)</td>
<td>±0.003 ( \text{i} )</td>
<td>±0.003 ( \text{i} )</td>
</tr>
<tr>
<td>Analysis mode</td>
<td>WDM, EDFA, drift, spectral transmittance, DFB, FP</td>
<td>WDM, EDFA, drift, spectral transmittance, DFB, FP</td>
</tr>
</tbody>
</table>

#### POWER MEASUREMENT

<table>
<thead>
<tr>
<th>Specification</th>
<th>FTBx-5245</th>
<th>FTBx-5255</th>
<th>HPW option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic range (dBm) (per channel)</td>
<td>( \text{-80 to 18} )</td>
<td>( \text{-80 to 18} )</td>
<td>( \text{-75 to 23} )</td>
</tr>
<tr>
<td>Maximum total safe power (dBm)</td>
<td>23</td>
<td>23</td>
<td>29</td>
</tr>
<tr>
<td>Absolute power uncertainty (dB)</td>
<td>±0.5 ( \text{\textsuperscript{i}} )</td>
<td>±0.5 ( \text{\textsuperscript{i}} )</td>
<td>±0.5 ( \text{\textsuperscript{i}} )</td>
</tr>
<tr>
<td>Power repeatability 2( \sigma ) (dB)</td>
<td>±0.02 ( \text{i} )</td>
<td>±0.02 ( \text{i} )</td>
<td>±0.02 ( \text{i} )</td>
</tr>
</tbody>
</table>

#### OPTICAL MEASUREMENT

<table>
<thead>
<tr>
<th>Specification</th>
<th>FTBx-5245</th>
<th>FTBx-5255</th>
<th>HPW option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical rejection ratio (dB) ( \text{\textsuperscript{m}} ) at 0.2 nm (25 GHz)</td>
<td>35 (40 typical)</td>
<td>45 (50 typical)</td>
<td>50 (55 typical)</td>
</tr>
<tr>
<td>Channel spacing</td>
<td>25 to 200 GHz, CWDM</td>
<td>12.5 to 200 GHz, CWDM</td>
<td></td>
</tr>
<tr>
<td>PDL (dB) ( \text{\textsuperscript{n}} )</td>
<td>±0.08 ( \text{\textsuperscript{d}} )</td>
<td>±0.06 ( \text{\textsuperscript{d}} )</td>
<td>±0.1 ( \text{\textsuperscript{d}} )</td>
</tr>
<tr>
<td>ORL (dB)</td>
<td>≥40</td>
<td>≥40</td>
<td>≥40</td>
</tr>
<tr>
<td>Measurement time (s) (includes scanning, analysis and display)</td>
<td>&lt;1.0 ( \text{\textsuperscript{d,n}} )</td>
<td>&lt;1.0 ( \text{\textsuperscript{d,n}} )</td>
<td>&lt;1.0 ( \text{\textsuperscript{d,n}} )</td>
</tr>
</tbody>
</table>

#### IN-BAND OSNR MEASUREMENT

<table>
<thead>
<tr>
<th>Specification</th>
<th>FTBx-5245-P only</th>
<th>FTBx-5255</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSNR dynamic range (dB)</td>
<td>&gt;35 ( \text{\textsuperscript{o}} )</td>
<td>&gt;35 ( \text{\textsuperscript{o}} )</td>
</tr>
<tr>
<td>OSNR measurement uncertainty (dB)</td>
<td>±0.5 ( \text{\textsuperscript{p}} )</td>
<td>±0.5 ( \text{\textsuperscript{p}} )</td>
</tr>
<tr>
<td>Repeatability (dB)</td>
<td>±0.2 ( \text{\textsuperscript{q}} )</td>
<td>±0.2 ( \text{\textsuperscript{q}} )</td>
</tr>
<tr>
<td>Data signals</td>
<td>Up to 100 Gbit/s ( \text{\textsuperscript{r}} )</td>
<td>Up to 100 Gbit/s ( \text{\textsuperscript{r}} )</td>
</tr>
</tbody>
</table>

#### Notes

- \( \text{a} \). All specifications are for a temperature of 23 °C ± 2 °C with an FC connector, unless otherwise specified. With warm-up. Measurements taken on a FTB-2 Pro.
- \( \text{b} \). From 1520 to 1610 nm.
- \( \text{c} \). After user calibration in the same test session, within 10 nm from user calibration wavelength.
- \( \text{d} \). Typical.
- \( \text{e} \). Integrated and wavelength independent.
- \( \text{f} \). Full-width half-maximum.
- \( \text{g} \). From 1300 to 1590 nm.
- \( \text{h} \). Optimized for higher order modulation format signals.
- \( \text{i} \). From 1530 to 1570 nm.
- \( \text{j} \). At 1550 nm, in drift mode. Single scan every 2 seconds, over 2 minutes. With DFB laser.
- \( \text{k} \). With averaging.
- \( \text{l} \). At 1550 nm, –10 dBm input.
- \( \text{m} \). At 1550 nm, with narrow monochromatic light source.
- \( \text{n} \). 45 nm span, full resolution, 20 peak. On FTB-2 Pro.
- \( \text{o} \). For an optical noise level of > -55 dBm, > -49 dBm for HPW models.
- \( \text{p} \). With PMD ≤15 ps and no crosstalk, uncertainty specification is valid for OSNR > 25 dB.
- \( \text{q} \). Valid for OSNR > 25 dB.
- \( \text{r} \). Except for polarization-multiplexed and fast polarization-scrambled signals.
### POL-MUX OSNR MEASUREMENT

<table>
<thead>
<tr>
<th><strong>Commissioning assistant</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulation formats</td>
</tr>
<tr>
<td>Data signals</td>
</tr>
<tr>
<td>Measurements time</td>
</tr>
</tbody>
</table>

### IN-SERVICE POL-MUX OSNR

<table>
<thead>
<tr>
<th><strong>FTBx-5255</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>OSNR dynamic range (dB)</td>
</tr>
<tr>
<td>OSNR measurement uncertainty (dB)</td>
</tr>
<tr>
<td>Repeatability (dB)</td>
</tr>
</tbody>
</table>

### GENERAL SPECIFICATIONS

<table>
<thead>
<tr>
<th><strong>Temperature</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>operating</td>
</tr>
<tr>
<td>storage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Relative humidity</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 % to 95 % noncondensing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Connectors</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>EI (EXFO UPC Universal Interface)</td>
</tr>
<tr>
<td>EA (EXFO APC Universal Interface)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Size (H x W x D)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>51 mm x 159 mm x 185 mm (2 in x 6 1/4 in x 7 5/16 in)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Weight</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 kg (2.6 lb)</td>
</tr>
</tbody>
</table>

### LASER SAFETY

Class 1 laser product

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**Notes**

a. Typical.
b. 1525 nm to 1570 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 ≥ 50 GHz (with or without spectral shaping).
e. Up to 25 dB of OSNR.
f. Up to ±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**

**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

**Connector adapter** *
- 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-90 = APC/ST
- 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  
- Inv = Enables the WDM Investigator option  
- Com = Enables the commissioning assistant option

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

* EXFO Universal Interface is protected by US patent 6,612,750.

**Notes**
- a. Available only with FTBx-5245-P and FTBx-5245-P-HPW.
- b. Available only if InB is enabled.
- c. Always included.
- d. Available only if the Com option is enabled.

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**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

**Connector adapter** *
- 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-90 = APC/ST
- EA-EUI-91 = APC/SC
- EA-EUI-95 = APC/E-2000
- EA-EUI-98 = APC/LC

**Software option**
- Adv = Enables advanced measurement mode  
- InB = Enables the in-band OSNR option  
- Inv = Enables the WDM Investigator option  
- Com = Enables the commissioning assistant option  
- INSPM = Enables the in-service Pol-Mux OSNR option

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

* EXFO Universal Interface is protected by US patent 6,612,750.