User Guide











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Units of Measurement

Units of measurement in this publication conform to SI standards and practices.

Patents

Feature(s) of this product is/are protected by one or more of US patents 6,636,306; 8,358,930; 8,364,034 and equivalent patents pending and granted in other countries; patent appl. US 2013/0163987 A1; and US patents 6,612,750 and 8,373,852.

Version number:10.0.3

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Certification Information

North America Regulatory Statement

This unit was certified by an agency approved in both Canada and the United States of America. It has been evaluated according to applicable North American approved standards for product safety for use in Canada and the United States.

Electronic test and measurement equipment is exempt from FCC part 15, subpart B compliance in the United States of America and from ICES-003 compliance in Canada. However, EXFO Inc. makes reasonable efforts to ensure compliance to the applicable standards.

The limits set by these standards are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the user guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

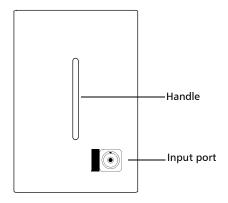
European Community Declaration of Conformity

An electronic version of the declaration of conformity for your product is available on our website at **www.exfo.com**. Refer to the product's page on the Web site for details.

Introducing the FTB-5240S/S-P Optical Spectrum Analyzer

The FTB-5240S/S-P Optical Spectrum Analyzer (OSA) is designed to measure optical power as a function of wavelength or frequency and Optical Signal to Noise Ratio (OSNR).

Your OSA offers truly portable spectral characterization for DWDM network commissioning, as well as InBand Optical Signal to Noise Ratio (OSNR) measurement for ROADM and 40 Gbit/s signals and networks.



Models

The OSA comes in different models:

- ➤ FTB-5240S: The FTB-5240S is a small form factor expert DWDM OSA designed for efficient commissioning, maintenance and troubleshooting of DWDM components and links in the field, from 25 GHz to CWDM. It can measure power as a function of wavelength for new modulation schemes, such as non-return-to-zero (NRZ), duo binary, which present large line widths and often display multiple peaks. In-depth analysis ensures the correct identification and signal measurement of each carrier. It also measures OSNR based on the IEC 61280-2-9 method.
- ➤ FTB-5240S-P: It is the FTB-5240S model with a polarization controller. It is a hardware-ready version of an expert OSA (two-slot unit), without the software to compute the InBand/*i*-InBand OSNR. You can upgrade this model on field using the software key, and it will become fully capable of InBand/*i*-InBand OSNR measurement.
- FTB-5240S-P-InB: It is the FTB-5240 S-P model (two-slot unit) with the software to compute the InBand/i-InBand OSNR. This software allows you to make either IEC-Based OSNR measurements, or In-Band OSNR measurements, required when the inter-channel noise is not representative of the noise under the signal peaks or when crosstalk is dominant.
- ➤ High Power Model (HPW): This model allows you to connect the FTB-5240S or FTB-5240S-P OSA to a network that carries very high optical power. This situation becomes more common with the deployment of latest CATV networks. The sensitivity of this OSA model is shifted accordingly and the module is protected to work under these extended power levels.

Typical Applications

Typical Applications

You can use your OSA for the following tasks:

- > Characterizing channels in the O- to U-band spectra
- > Testing laser sources for spectral purity and power distribution
- > Testing the transmission characteristics of optical devices
- Troubleshooting and monitoring key parameters on CWDM or DWDM signals to check system stability
- > Characterizing all channel spacings, from 50 GHz DWDM to CWDM
- ► Testing high-speed networks (beyond 40 Gbit/s)
- Measuring OSNR, but specifically within the channel (InBand OSNR) for FTB-5240S-P-InB model

Optional Software Packages

Optional Software Packages

Optional software options are available for your application.

Option Name	Description
Advanced (Adv)	The Advanced option gives you access to the following test modes:
	 Drift: time-based WDM analysis for signal monitoring.
	 ST: characterization of the spectral transmittance of optical components such as filters.
	 EDFA: characterization of the performance of an Erbium Doped Fiber Amplifier.
	 DFB: characterization of a DFB laser source.
	► FP: characterization of a Fabry-Perot laser source.
In-Band (InB)	The In-Band option enables you to perform In-Band noise analysis for WDM and WDM drift measurements.
	Note: Not supported by the FTB-5240S module.
	When this option is activated, it is possible to have access to user-defined acquisition and analysis parameters for custom In-Band noise measurement (WDM and WDM drift modes)

Introducing the FTB-5240S/S-P Optical Spectrum Analyzer

Post-Processing Application

Option Name	Description						
WDM Investigator	This option activates the WDM Investigator mode measurement diagnostics.						
(Inv)	When this option is activated, it is possible to have access to qualitative analysis of the noise source in measurement results for each channel through the WDM Investigator dashboard.						
	 Qualitative analysis of the noise source in measurement results for each channel through the WDM Investigator dashboard 						
	 Qualitative analysis of the PMD pulse spreading on live noncoherent signals 						
	Note: Not supported by the FTB-5240S module but supported by the FTB-5240S-P module.						
	Note: The WDM Investigator (Inv) software option is dependent on the InBand (InB) option. The InBand (InB) option must be enabled for the WDM Investigator (Inv) software option to work.						

Post-Processing Application

A post-processing, or offline version of the application is available for you to use on a conventional computer. This offline version has most of the module application, but does not allow you to perform acquisitions. Conventions

Conventions

Before using the product described in this guide, you should understand the following conventions:



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in *death or serious injury*. Do not proceed unless you understand and meet the required conditions.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in *minor or moderate injury*. Do not proceed unless you understand and meet the required conditions.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in *component damage*. Do not proceed unless you understand and meet the required conditions.



IMPORTANT

Refers to information about this product you should not overlook.



Safety Information



WARNING

Do not install or terminate fibers while a light source is active. Never look directly into a live fiber and ensure that your eyes are protected at all times.



WARNING

The use of controls, adjustments and procedures other than those specified herein may result in exposure to hazardous situations or impair the protection provided by this unit.



IMPORTANT

make sure

When you see the following symbol on your unit that you refer to the instructions provided in your user documentation. Ensure that you understand and meet the required conditions before using your product.



MPORTANT

Other safety instructions relevant for your product are located throughout this documentation, depending on the action to perform. Make sure to read them carefully when they apply to your situation.



CAUTION

The following symbol indicates that your unit is equipped with a



Your instrument is a Class 1 laser product in compliance with standards IEC 60825-1: 2007 and 21 CFR 1040.10, except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007. Invisible laser radiation may be encountered at the output port.

The following label indicates that a product contains a Class 1 source:



The maximum input power for the FTB-5240S/S-P Optical Spectrum Analyzer is •••• 4 W. For more information on equipment ratings, refer to the user documentation for your platform.

3 Getting Started with Your OSA

Inserting and Removing Test Modules



CAUTION

Never insert or remove a module while the FTB-200 v2 is turned on. This will result in immediate and irreparable damage to both the module and unit.



CAUTION

To avoid damaging your unit, use it only with modules approved by EXFO.

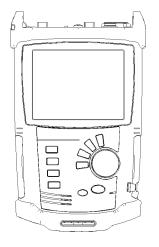


WARNING

When the laser safety LED is flashing, at least one of your modules is emitting an optical signal. Please check all modules, as it might not be the one you are currently using. Inserting and Removing Test Modules

To insert a module into the FTB-200 v2:

- **1.** Turn off your unit.
- **2.** Position the unit so that its front panel is facing you.

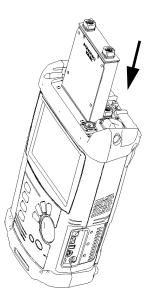


3. Take the module and place it vertically so that the retaining screw hole is at the left of the connector pins.



CAUTION

Inserting a module upside down could result in permanent damage to the module, as the connector pins might be bent.



- **4.** Insert the protruding edges of the module into the grooves of the unit's module slot.
- **5.** Push the module all the way to the bottom of the slot, until the retaining screw makes contact with the unit casing.
- **6.** Place the unit so that its bottom panel is facing you.

Getting Started with Your OSA

Inserting and Removing Test Modules

7. While applying slight pressure to the module, lift the mobile part of the retaining screw and use it to turn the retaining screw clockwise until it is tightened.

This will secure the module into its "seated" position.

Turn retaining screws clockwise

When you turn on the unit, the startup sequence will automatically detect the module.

To remove a module from the FTB-200 v2:

- **1.** Turn off your unit.
- **2.** Position the unit so that the bottom panel is facing you.
- **3.** Lift the mobile part of the retaining screw and use it to turn the retaining screw counterclockwise until it stops.

The module will be slowly released from the slot.

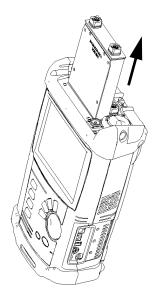
Turn retaining screws counterclockwise

4. Place the unit so that the top panel is facing you.

Getting Started with Your OSA

Inserting and Removing Test Modules

5. Hold the module by its sides or by the handle (*NOT by the connector*) and pull it out.





CAUTION

Pulling out a module by a connector could seriously damage both the module and connector. Always pull out a module by its casing.

6. Cover empty slots with the supplied protective covers.

Starting Module Applications

Your modules can be configured and controlled from their dedicated applications in Compact ToolBox.

To start a module application:

1. From Compact ToolBox, select the module to use.

It will turn blue to indicate that it is highlighted.

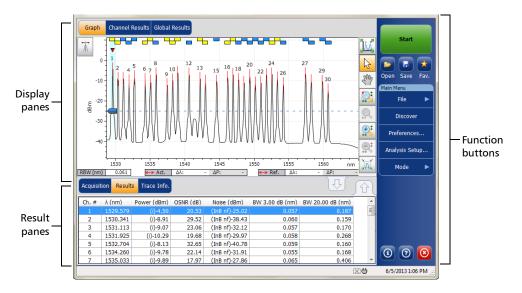
Modules	Programs			ToolBox CE	68% 🗟
Modules		_		Main Menu	
· · · · · · · · · · · · · · · · · · ·				Power	Meter
Local bus (s	trum Analyzer lot) 0			Prot	Эе
				File Mar	nager
				Setu	.p
				System	n Info
Applications					
OSA WDM			Start	5:13 AM 1	./21/2000 @

2. Under Applications, select an application, then press Start.

To start the Power Meter or Probe application:

From Main Menu, press Power Meter or Probe.

The main window (shown below) contains all the commands required to control the OSA:



Note: The illustrations in this user guide may differ slightly from those on your unit depending on the resolution and platform type.

4

Preparing Your OSA for a Test

MPORTANT

For optimal test results, you should allow a minimum warm up period of two hours for your OSA before starting your tests.

Cleaning and Connecting Optical Fibers



IMPORTANT

To ensure maximum power and to avoid erroneous readings:

- Always inspect fiber ends and make sure that they are clean as explained below before inserting them into the port. EXFO is not responsible for damage or errors caused by bad fiber cleaning or handling.
- Ensure that your patchcord has appropriate connectors. Joining mismatched connectors will damage the ferrules.

To connect the fiber-optic cable to the port:

- **1.** Inspect the fiber using a fiber inspection microscope. If the fiber is clean, proceed to connecting it to the port. If the fiber is dirty, clean it as explained below.
- **2.** Clean the fiber ends as follows:
 - **2a.** Gently wipe the fiber end with a lint-free swab dipped in isopropyl alcohol.
 - **2b.** Use compressed air to dry completely.
 - **2c.** Visually inspect the fiber end to ensure its cleanliness.

Cleaning and Connecting Optical Fibers

3. Carefully align the connector and port to prevent the fiber end from touching the outside of the port or rubbing against other surfaces.

If your connector features a key, ensure that it is fully fitted into the port's corresponding notch.

4. Push the connector in so that the fiber-optic cable is firmly in place, thus ensuring adequate contact.

If your connector features a screwsleeve, tighten the connector enough to firmly maintain the fiber in place. Do not overtighten, as this will damage the fiber and the port.

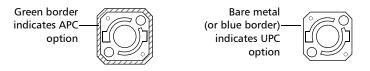
Note: If your fiber-optic cable is not properly aligned and/or connected, you will notice heavy loss and reflection.

EXFO uses good quality connectors in compliance with EIA-455-21A standards.

To keep connectors clean and in good condition, EXFO strongly recommends inspecting them with a fiber inspection probe before connecting them. Failure to do so will result in permanent damage to the connectors and degradation in measurements.

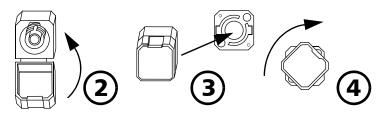
Installing the EXFO Universal Interface (EUI)

The EUI fixed baseplate is available for connectors with angled (APC) or non-angled (UPC) polishing. A green border around the baseplate indicates that it is for APC-type connectors.



To install an EUI connector adapter onto the EUI baseplate:

1. Hold the EUI connector adapter so the dust cap opens downwards.



- 2. Close the dust cap in order to hold the connector adapter more firmly.
- **3.** Insert the connector adapter into the baseplate.
- **4.** While pushing firmly, turn the connector adapter clockwise on the baseplate to lock it in place.

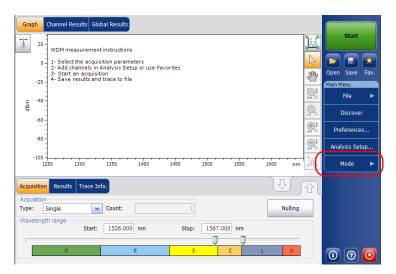
Selecting a Test Mode

Your module gives you different ways to test all your DWDM systems:

- WDM: Allows you to analyze an optical link. By default, the WDM test mode is selected.
- > Drift: Allows you to monitor an optical link for a fixed duration.
- > DFB: Allows you to characterize a DFB laser source.
- ► Fabry-Perot (FP): Allows you to characterize a Fabry-Perot laser source.
- Spectral Transmittance: Allows you to characterize the spectral transmittance of optical components such as filters.
- EDFA: Allows you to characterize the performance of an Erbium Doped Fiber Amplifier (EDFA) using the OSA module in field deployed systems (NB measurement assumes transmission conditions).

To select a test mode:

1. From the Main Menu, press Mode.



- Graph Channel Results Global Results ¥ 20 WDM measurement instructions 1- Select the acquisition parameters 2- Add channels in Analysis Setup or use Favorites 3- Start an acquisition 4- Save results and trace to file 0 Open Save Fai SW -20 Rac -40 dBm 11 WDM -60 Ð Drift -80 <u>e</u>t Spec. Trans. -100 -1450 1300 1350 1400 1500 1550 1250 1600 nm EDFA Acquisition Results Trace Info. Acquisition Nulling - Count: Type: Wavelength range Start: 1525.000 nm Stop: 1565.000 nm F С U 0 0 0
- 2. Select the desired test mode. The DFB and FP sources are under the **Sources** item.

Once you select the mode, you will notice a \checkmark against the selected mode and all the tabs on the main window and the main menu will change accordingly.

After selecting the test mode, you must configure it. You will find specific instructions for your test mode in the corresponding related chapters.

Switching Modes While a Trace is Open

If you switch test modes while a trace is already on-screen, the trace will be loaded in the new selected mode and analyzed using the current analysis setup, if the test modes are compatible.

WDM, Spectral Transmittance and EDFA test modes are made to ease the switch between the modes. The table below indicates the equivalencies between the trace types. For example, an active trace in WDM mode becomes an output trace in EDFA mode, and vice-versa.

WDM	ST	EDFA
Active	Output	Output
Reference	Input	Input

Nulling Electrical Offsets

The offset nulling process provides a zero-power reference measurement, thus eliminating the effects of electronic offsets and dark current due to detectors.

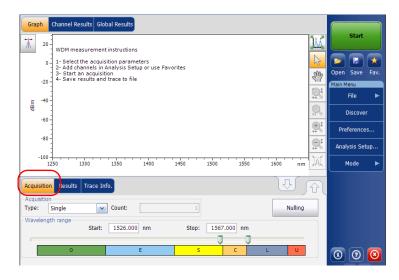
Temperature and humidity variations affect the performance of electronic circuits and optical detectors. For this reason, EXFO recommends performing a nulling of the electrical offsets whenever environmental conditions change.

Nulling can be performed for all tests modes. In addition, a nulling is performed automatically each time you start the OSA application, and at regular intervals afterwards.

Note: You cannot perform an offset nulling in the offline version of the application.

To perform an offset nulling:

1. From the main window, select the Acquisition tab.



- 2. Disconnect any incoming signal to obtain an optimal accuracy.
- 3. Press Nulling.

You are notified that the nulling is in progress in the status bar. Nulling should be completed in a few seconds.

Gra	ph	Channel Results Global Results		
*	20	WDM measurement instructions	Ж	Start
	0	1 - Select the acquisition parameters 2 - Add channels in Analysis Setup or use Favorites	\mathbf{k}	
	-20	3- Start an acquisition	En	Open Save Fav. Main Menu
F	-40			File 🕨
B	-60		9	Discover
	-80			Preferences
			₽ ‡	Analysis Setup
	-100 1	250 1300 1350 1400 1450 1500 1550 1600 nm)a(Mode 🕨
Acqu	isitio	n Results Trace Info.	<u>ि</u>	
	isitio	Single Count: 1		
Туре				
~ Wav	eleng	th range Start: 1526.000 nm Stop: 1567.000 nm		
		Ū Ū		
		O E S C L U		0 0 0

Note: Several features, such as the **Start** button and Discover, are not available during the nulling process.

Performing User Calibration

Calibrating your module can help you achieve better results. It is particularly important when the measurement accuracy is critical or when your OSA has experienced unusual shock or vibrations. To reach the highest possible accuracy, you can perform a wavelength or power calibration. Your OSA allows you to modify and read the user calibration values, revert to the factory calibration, load and save the modified user calibration file. The user configuration file (*.txt) contains the reference and modified wavelength and power values.

You can perform user calibration in any test mode. Select a test mode as explained in *Selecting a Test Mode* on page 20, and follow the procedures mentioned below for performing user calibration.

Note: The procedure for performing user calibration is the same for all test modes. The procedure is explained with WDM mode only in this document.



MPORTANT

For optimal results, you should allow a minimum warm up period of two hours for your OSA before performing user calibration.



IMPORTANT

You must clear the correction factor list before making new calibration measurements. If calibration measurements are made when user correction factors are inside the module, the latter will affect the measurements and the calibration results become inapplicable.

- **Note:** If you want to keep the correction factor list for a later use, save it under a different name in the folder.
- **Note:** The user calibration feature is not available in the offline version of the OSA application.

To perform a user calibration:

- **1.** Allow your unit to warm up.
- 2. From the Main Menu, press Analysis Setup.

Graph Channel Results Global Results		
20 WDM measurement instructions	<u>کند</u>	Start
1 - Select the acquisition parameters 2 - Add channels in Analysis Setup or use Favorites	6	
-20 4- Save results and trace to file	SM	Open Save Fav. Main Menu
- 		File 🕨
원	11	Discover
	₽ ‡	Preferences
	<u></u>	Analysis Setup
-100	, AL	Mode 🕨
Acquisition Results Trace Info.	Û	
Acquisition Type: Single Count: 1 Nulling		
Wavelength range Start: 1526.000 nm Stop: 1567.000 nm		
O E S C L U		00

3. Select the **Calibration** tab.

	Gener	ral	Global Th	resholds	Default Thre	sholds	Channels	Favorites	Calibrat	tion		
lí	Correction factors from module											
	Ref. Wavelength OSA Wavelength Reading Ref. Power OSA Power Reading											
	L	.oad	from Mod	ule	Load	l Factor	's			on Factors		
		Writ	te to Modu	le	Save	e Factor	's	fr	om Modu	ıle		
	There are no user correction factors inside the module.											
	?		Impo	rt from T	race				ок	Cancel		

Note: You cannot edit the power or wavelength values directly from the application. The modifications in the user calibration have to be made in a text file, and then it can be loaded in the application.

4. If user correction factors are in the system, press **Clear User Correction Factors from Module**, then confirm your choice.

	Global Th	resholds	Default Thresholds	Channels	Favorites	Calibration
Correctio	n factors fr	om modu	le			
Ref. Wavelength OSA Wa			evelength Reading	Ref. Power	OSA P	ower Reading
1310.154 nm		13	310.166 nm	0.00 dBm	-0).21 dBm
1490.	000 nm	14	190.000 nm	0.00 dBm	0	.06 dBm
					-	
Loar	l from Mod	lule	Load Factor	s		r Correction Facto
	l from Mod te to Modu		Load Factor Save Factor			r Correction Facto om Module
Wr	te to Modu	ile		·s		

5. Take measurements for your test mode.

- **6.** Note the measurements to a .txt file using the following format:
 - > The first column is the reference wavelengths, in nm.
 - > The second column is the wavelength read by your module, in nm.
 - ➤ The third column is the reference power, in dBm.
 - > The fourth column is the power read by your module, in dBm.
- **Note:** The columns are separated by a semi-colon (;). You can have up to 100 calibration points.

Here is an example of a measurement file:

1310.154; 1310.167; -1.34; -1.55 1490.000; 1490.000; 1.09; 1.15 1551.334; 1551.298; -5.20; -5.45 1625.401; 1625.448; 0.00; 0.00

- **Note:** The decimal separator is a point (.). This format is independent of the regional settings.
 - 7. Save your .txt file in a location of your choice.

Preparing Your OSA for a Test

Performing User Calibration

8. Back in the **Calibration** tab on your unit, load the file using **Load Factors**.

General	Global Th	resholds	Default Thresholds	Channels	Favorites	Calibrat	ion			
Correctio	on factors fr	om modu	le							
Ref. Wavelength OSA Wavelength Reading Ref. Power OSA Power Reading										
Loa	d from Mod	lule (Load Factor	's						
						Correcti	on Factors Ile			
W	rite to Modu	le	Save Factor	s						
There are no user correction factors inside the module.										
?	Impo	ort from T	race			ок	Cancel			

9. Select the modified user calibration file and press **Open**.

Look in:	😂 OSA 5240		 G gl 	F 📂 🛄 -	
My Recent Documents	Channels				
My Documents					
My Computer					
My Network Places					
	File name: Files of type:	User Calibration (*.txt)		Ope Canc	

The calibration values will replace the Correction factors list in the **Analysis setup - Calibration** window.

1490.000 nm 1.09 dBm 1.15 dBm 1551.334 nm 1551.298 nm -5.20 dBm -5.45 dBm 1625.401 nm 1625.448 nm 0.00 dBm 0.00 dBm Load from Module Load Factors Clear User Correction Factor for Module			n -1.34 d	Bm	SA Power Reading -1.55 dBm
Load from Module Load Factors Clear User Correction From Module					
Clear User Correction Fa	1625.401 nm	1625.448 nn	1 0.00 d	3m	0.00 dBm
from Module					
	Load from Mot	tule Lo	ad Factors		
				Clear	

Performing User Calibration

10. Press **Write to Module** to apply the modified calibration values to the module.

	General	Global Th	resholds	Default Thresholds	Channels F	avorites C	alibration			
-	Correction factors from file									
	Ref. W	avelength	OSA W	avelength Reading	Ref. Power	OSA Pov	ver Reading			
	1310.154 nm 1310.167			310.167 nm	-1.34 dBm	-1.5	5 dBm			
	1490.	000 nm	14	190.000 nm	1.09 dBm	1.13	5 dBm			
	1551.	334 nm	15	551.298 nm	-5.20 dBm	-5.4	5 dBm			
	1625.	401 nm	10	525.448 nm	0.00 dBm	0.00) dBm			
	Load	I from Mod	ule	Load Facto						
		I from Mod	-	Load Facto			prrection Facto Module	ors		
			-					ors		

			avelength Reading 310.167 nm	Ref. Power -1.34 dBm	OSA Power Rea -1.55 dBm	iaing
1490.000 n		-	90.000 nm	1.09 dBm	1.15 dBm	
1551.334 n			551.298 nm	-5.20 dBm	-5.45 dBm	
1625.401 n	ım	16	525.448 nm	0.00 dBm	0.00 dBm	
Load from	n Mod	ule	Load Facto		ear User Correctio	
Load from Write to			Load Facto Save Facto	C	iear User Correctic from Modul	

11. To verify that the calibration changes are properly applied to the module, press **Load from Module**.

Note: The **OK** and **Cancel** buttons do not have any impact on the calibration page or the correction factors inside the module.

Performing User Calibration

To save a user calibration:

1. From the Main Menu, press Analysis Setup.

Graph Channel Results Global Results	
T 20 WDM measurement instructions	Start
0 1- Select the acquisition parameters 2- Add channels in Analysis Setup or use Favorites	Open Save Fav.
-20 3- Start an acquisition 4- Save results and trace to file	Main Menu
<u>€</u> ⁴⁰	File 🕨
-60 -	Discover
-80 -	Preferences
-100	Analysis Setup
1250 1300 1350 1400 1450 1500 1550 1600 nm	Mode 🕨
Acquisition Results Trace Info.	
Acquisition Type: Single Count: 1 Nulling	
Wavelength range Start: 1526.000 nm Stop: 1567.000 nm	
O E S C L U	00

Ref. Wavelength		avelength Reading	Ref. Power	OSA Power Rea	iding
		310.167 nm	-1.34 dBm	-1.55 dBm	
1490.000 nm	-	190.000 nm	1.09 dBm	1.15 dBm	
1551.334 nm	13	551.298 nm	-5.20 dBm	-5.45 dBm	
1625.401 nm	10	525.448 nm	0.00 dBm	0.00 dBm	
Load from Mag	tulo	Load Earth			
Load from Mod	dule	Load Facto		lear User Correction	
Load from Moo Write to Modu		Load Facto	C	lear User Correctio from Modu	
			C		

2. Select the **Calibration** tab.

Performing User Calibration

	Global Th	resholds	Default Thresholds	Channels	Favorites Calibration	on		
Correctio	n factors fro	om file				_		
Ref. W	Ref. Wavelength OSA Wavelength Reading Ref. Power OSA Power Readin							
1310.	1310.154 nm 1310.167 nm			-1.34 dBm	-1.55 dBm			
1490.	000 nm	14	190.000 nm	1.09 dBm	1.15 dBm			
1551.	334 nm	15	551.298 nm	-5.20 dBm	-5.45 dBm			
1625.	401 nm	16	525.448 nm	0.00 dBm	0.00 dBm			
	Load from Module Load Factors							
Loa	d from Mod	ule	Load Facto		Clear User Correctio			
	d from Mod Ite to Modu		Load Facto Save Facto		Clear User Correctio from Modul			

3. Press Save Factors, to save the modified user calibration values.

Using the Autonaming Feature

Defining a file autonaming format will allow you to quickly and automatically name traces in a sequential order. The customized name appears when the file is saved using the Save As option. You can select which fields you want to include in the file name and the order in which they should be displayed.

The Link ID is used by the application to suggest a file name when you want to save the current acquisition. The link parameters are prefix and suffix values (file names) for the link IDs.

- **Note:** The autonaming feature is not available in the offline application.
- **Note:** The procedure below uses the WDM test mode as an example, but the autonaming feature is available for all test modes.

Using the Autonaming Feature

To customize the file name:

1. From the **Main Menu**, press **Preferences**.

Gra	ph	Channel Results Global Results		
7	20	WDM measurement instructions	<u>۸۸</u>	Start
	0	- 2- Add channels in Analysis Setup or use Favorites	2	
	-20		SW)	Open Save Fav. Main Menu
dBm	-40	4	2	File 🕨
8	-60		Q,	Discover
	-80		₽ (Preferences
			<u>R</u>	Analysis Setup
	-100	250 1300 1350 1400 1450 1500 1550 1600 nm	ÌA.	Mode 🕨
Acqu	isitio	Results Trace Info.	2	
 Acqu Type 		Single Count: 1 Nulling		
Wav	eleng	th range Start: 1526.000 nm Stop: 1567.000 nm		
			-	

2. Select the File Name tab.

General	Information	Comments	Display	WDM Results	File Name	
File name	components	presence and	ordering			
Com	ponent					
💥 Wav	elength range					
🗙 Acqu	isition type					
🗶 Scan	count					
🗶 Link	(D					
Cable	ID			_		
Fiber	ID			_		
Loca	tion description	1 I				
File name	preview 50_Single_1_a	abcd bp 3.osa	wdm			
					Restore Defaul	ts
?					ОК	Cancel

- **3.** Select which parameters you want to include in the file name from the list of available choices:
 - Wavelength/frequency range: current wavelength/frequency acquisition range.
 - ► Acquisition type: current acquisition type.
 - Scan count: current number of scans in the acquisition tab.
 - Link ID: prefix value for the link ID configured in the Preferences-Information tab.
 - Cable ID: prefix value for the cable ID configured in the Preferences-General tab.
 - ➤ Fiber ID: prefix value for the fiber ID configured in the Preferences-General tab.
 - Location description: location description provided in the Preferences-Information tab.

Preparing Your OSA for a Test

4. Press the up or down arrows to change the order in which the field values will appear in the file name.

Based on your selection, a preview of the file name is displayed under **File name preview**. The field values are separated with an underscore (_).

General	Information	Comments	Display	WDM Results	File Name	
- File name	components	presence and	d ordering			
Com	ponent					
🔀 Wave	elength range					
🗶 Acqu	isition type					
🗶 Scan	count					
🗶 Link I	ID .					
Cable				_		
Fiber				_		
Locat	tion description	ı				
- File name	preview					
	50_Single_1_a	abcd bp 3.osa	awdm			
		-				
					Restore Default	s
3					ОК	Cancel

5. Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default settings.

Setting Up the Instrument in WDM Mode

Before performing a spectral analysis in the WDM mode, you must set up the test application with the appropriate parameters, as explained in this chapter.

Select the WDM test mode as explained in *Selecting a Test Mode* on page 20 before setting up the WDM test parameters.

- The preferences are the result displayed in the graph and tables, as well as the job information and related comments saved with each file.
- The analysis parameters include the channel list details, pass-fail threshold settings and allows you to select the noise and power calculation methods.
- The *acquisition parameters* include the type of measurement you want to perform and the wavelength range.

See *Defining Preferences* on page 43, *Setting Up WDM Analysis Parameters* on page 59 and *Setting Up Acquisition Parameters* on page 86 for more details.

5

You can set up your unit in different manners, depending on your testing needs.

- ➤ The preferred way is to use the complete analysis setup parameters and complete the information in all tables, as explained in *Setting Up WDM Analysis Parameters* on page 59. This setup will be used for the next acquisition.
- ➤ The easiest way to set up the instrument, especially when the operator does not know in advance what to expect at the input of the module is to use the **Discover** button. After the **Discover** button has been pressed, a measurement and analysis will be performed according to the best setup determined by the instrument and this setup will be used for the next scan. This is explained in *Using the Discover Feature* on page 239.
- ➤ The most efficient way to set up the instrument is to use one of the favorites configurations, uploading a pre-customized acquisition and analysis setup configuration. The operator in the field only has to press the the button, select the appropriate configuration and press Start. As an example, a pre-customized configuration could be: "32 channels DWDM 50GHz"; "Toronto-Montreal CWDM" or "Vendor ABC DWDM ROADM 40Gb". This is explained in *Managing Favorites* on page 250.
- ➤ You can also import the setup from the current trace. This method will take the data and channel information from the current trace and apply them in the corresponding tabs. For more information, see *Setting Up WDM Analysis Parameters* on page 59.

Defining Preferences

The preferences window allows you to set general information and comments on trace, set display parameters and customize the WDM results table.

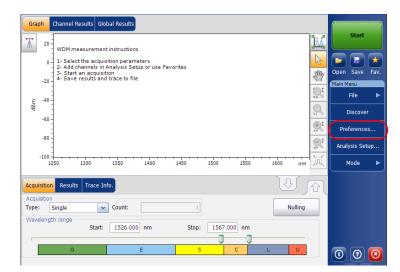
Note: Only the Display and WDM Results tabs are available in offline mode.

Defining Trace Information

The trace information relates to the description of the job to be done, cable and job IDs, and any relevant information about what is being tested.

To enter general information:

1. From the Main Menu, press Preferences.



2. Select the **General** tab.

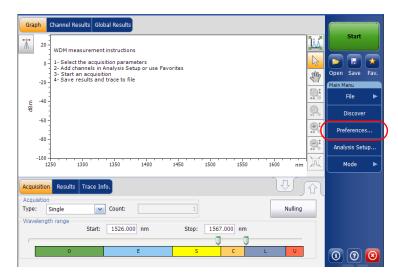
General Information	Comments	Display	WDM Results	File Name	
General Job ID:	My :	Job			
Cable ID:	12_	3343			
Fiber ID:					
Customer:					
Company:	You	r Company			
Operator:	You				
Maintenance reason:					
				(Clear
?				ОК	Cancel

- **3.** Define the general parameters as needed.
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Clear** to clear all the changes made in the **General** tab.

To enter link and location information:

1. From the Main Menu, press Preferences.



2. Select the **Information** tab.

General Information	Comments	Display	WDM Results	File Name	
System and link informa	tion				
Link ID prefix:	abco	d bp			
Starting value:			3		
	×	Auto incre	ment		
Orientation:	Nor	thbound	~		
System:					
Location information					
Network element:	Trai	nsmitter	~		
Test point:	Inp	ut	~		
Description:					
				Restore Defaul	ts
0				ОК	Cancel

3. Under **System and link information**, define the following parameters as needed:

General Information	Comments	Display	WDM Results	File Name	
System and link inform	ation				
Link ID prefix:	abc	d bp			
Starting value:			3		
	×	Auto incre	ment		
Orientation:	Nor	thbound	~		
System:					
Location information					
Network element:	Tra	nsmitter	×		
Test point:	Inp	ut	~		
Description:					
				Restore Defau	lts
0				ок	Cancel

- ► Link ID prefix: The prefix value for the link ID. You can enter any alphanumeric value.
- > Starting value: The suffix increment starting value for the link ID.

This value is incremented each time a new file is saved provided the **Auto Increment** option is selected.

IMPORTANT

If the Auto Increment option is not selected, you have to manually change the file name when saving the trace file, otherwise the application will overwrite the previously saved file.

- > Orientation: The orientation of the link.
- > System: Information about the system under test.

4. Under **Location Information**, define the following parameters as needed:

General Information	Comments Displ	ay WDM Results	File Name	
System and link informa	ation			
Link ID prefix:	abcd bp			
Starting value:		3		
	🗶 Auto in	crement		
Orientation:	Northboun	d 🖌		
System:				
Location information —				
Network element:	Transmitte	r 🖌		
Test point:	Input	~		
Description:				
		_	Restore Defau	lts
0			ОК	Cancel

- > Network element: Sets the type of network element.
- Test point: Sets the location where the test is performed on the link.
- > Description: Enter the description of location if required.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Defining Preferences

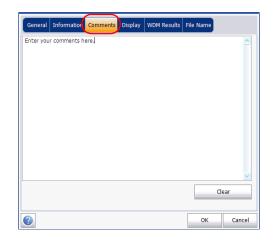
To enter comments:

1. From the **Main Menu**, press **Preferences**.

Graph Channel Results Global Results	
The 20 WDM measurement instructions	Start
1 - Select the acquisition parameters 2 - Add channels in Analysis Setup or use Favorites	
3- Start an acquisition 4- Save results and trace to file	Main Menu
€ ⁴⁰	File 🕨
-50	Discover
-80	- \ /
1250 1300 1350 1400 1450 1500 1550 1600 nm Ak	Mode ►
Acquisition Results Trace Info.	
Type: Single Count: 1 Nulling	
Wavelength range Start: 1526.000 nm Stop: 1567.000 nm	
	000

Defining Preferences

2. Select the **Comments** tab.



- **3.** Enter your comments for the current trace.
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Clear** to clear all the changes made in the **Comments** tab.

Defining Display Parameters

The application allows you to set display settings for the acquisition trace. You can set the spectral unit for the trace and the results table. You can also select the label that should appear on the peaks of the trace.

To define display parameters:

1. From the Main Menu, press Preferences.

WDM measurement instructions 0 1 2 2 3 5 6 -60 -80 -100	Start No Open Save Fax. Main Menu File Discover Preferences Analysis Setup Mode
Acquisition Results Trace Info. Acquisition Type: Single ✓ Type: Single ✓ Count: 1 Wavelength range Start: 1526.000 nm Stop: 1567.000 nm Ø E S C L U	

Defining Preferences

2. Select the **Display** tab.

General Information C	nmen's Display V/DM Results File Name
General Spectral unit:	
	nm
Label on peak in graph:	Channel name
Empty results channel:	Show
Horizontal markers:	Show
Graph color scheme:	White background
	Restore Defaults

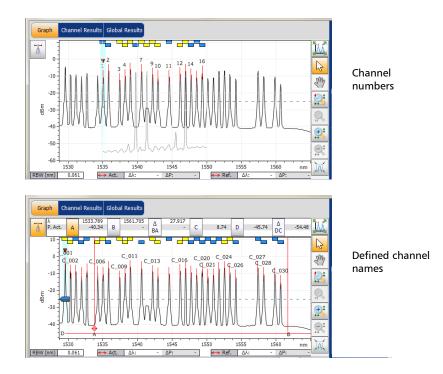
3. Select the spectral unit you want to work with, either nm or THz.

General Information Comment	s Display WDM Results File	Name
General Spectral unit:	nm 💌	
Label on peak in graph:	Channel name	
Empty results channel:	Show	
Horizontal markers:	Show	
Graph color scheme:	White background	
	Res	tore Defaults
	L.	
0		OK Cancel

Setting Up the Instrument in WDM Mode

4. Select the label that will appear on the peaks in the graph, either the channel name, its number, or nothing.

General Information	Comments Display WDM Re	sults File Name
General Spectral unit:	nm	
Label on peak in graph:	Channel name	
Empty results channel:	Show	~
Horizontal markers:	Show	
Graph color scheme:	White background	~
		Restore Defaults
		OK Cancel



Note: The channel name and channel number cannot be shown at the same time.

Setting Up the Instrument in WDM Mode

5. Select whether you want to show or hide the empty channels from the channel list in the **Results** tab.

	General	Information	Comment	s Display	WDM Res	ults Fil	e Name	
	General Spectral	unit:		nm		~		
	Label on	peak in graph	:	Channel na	me	~		
(Empty re:	sults channel:		Show		~)	
	Horizonta	l markers:		Show		×		
	Graph col	or scheme:		White back	ground	*		
						Re	store Defaul	ts
						Γ	ОК	Cancel
							UK	Cancer

Note: When selected, empty channels are shown on screen and in the report files.

6. Select whether you want to show the horizontal markers or the integrated power and the Δ trace in the marker toolbar.

General Information Comment	ts Display WDM Results File Name
General Spectral unit:	nm
Label on peak in graph:	Channel name
Empty results channel:	Show
Horizontal markers:	Show
Graph color scheme:	White background
	Restore Defaults
0	OK Cancel

7. Select the background color scheme for the graph as desired.

General Information	Comments	Display	WDM Results	File Name	
General Spectral unit:	[nm	(~	
Label on peak in graph	:	Channel na	ime (*	
Empty results channel:		Show	(~	
Horizontal markers:		Show		~	
Graph color scheme:		White back	ground	<u> </u>	
				Restore Defaul	ts
0				ОК	Cancel

8. Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Customizing WDM Results Table

It is possible to select which results you would like to be displayed in the **Results** tab of your WDM tests.

To customize the results table:

1. From the Main Menu, press Preferences.

20 WDM measurement instructions Image: Start 1 - Select the acquisition parameters 2. Add channels in Analysis Setup or use Favorites 2. Add channels in Analysis Setup or use Favorites 3. Start medusition 2. Start medusition Image: Start medusition 2. Start medusition Image: Start medusition 2. Add channels in Analysis Setup or use Favorites Image: Start medusition 3. Start medusition Image: Start medusition 2. Add channels in Analysis Setup or use Favorites Image: Start medusition 3. Sever results and trace to file Image: Start medusition 4. Acquisition Image: Start medusition 1. Sever results Image: Start medusition Acquisition Image: Start medusition Vavelength range Start medusition num Vavelength range Start medusition num 0 E S 0 E S 0 E S 0 E S 0 E S 0 E S 0 E S	Graph Channel Results Glo	bal Results							
2- Add channels in Analysis Setup or use Favorites 3- Start an acquisition 4- Save results and trace to file 40 40 4- Save results and trace to file 4- Save results 4- Save res	20-	instructions					<u>)</u>	St	art
-20 4- Save results and trace to File -60 -60 -60 -60 -60 -60 -80 -60 -60 -100 1300 1350 1400 Acquisition Results Trace Info. Acquisition Count: 1 Type: Single Count: Wavelength range Start: 1526.000 nm	- 2- Add channels in	Analysis Setup or use Fa	avorites						
50 -40 -40 -60 -60 -60 -60 -60 -60 -700 Discover Preferences -100 -100 -1300 1350 1400 1450 1500 1500 mm Analysis Setup Acquisition Results Trace Info.	-20 - 3- Start an acquisit 4- Save results and	ion trace to file							
-60 -80 -80 -100 -1250 1300 1350 1400 1400 1450 1500 1500 1500 1500 1500 1500 1500 1500 1500 1500 1500 1500 1500 1500 1500 1600 1500 1600 1500 1600 1500 1600 1500 1600 1500 1600 1500 1600 1500 1600 1500 1600 1500 1600 1500 1500 1600 1500 1600 1500 1600 1500 1600 1500 1600 1500 1600 1	E -40 -								
-80 -80 -100							O ,	Disc	over
Analysis Setup 100 1350 1400 1450 1500 1550 1600 nm Analysis Setup Acquisition Results Trace Info. Image: Count: Image: Count: </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Prefer</td> <td>ences</td>								Prefer	ences
1250 1300 1350 1400 1450 1500 1550 1600 nm Acquisition Acquisition Results Trace Info. Image: Count: Im								Analysis	Setup
Acquisition Type: Single Count: 1 Nulling Wavelength range Start: 1526.000 nm Stop: 1567.000 nm		1350 1400	1450	1500	1550	1600		Mod	le 🕨
Type: Single Count: 1 Nulling Wavelength range Start: 1526.000 nm Stop: 1567.000 nm	Acquisition Results Trace In	fo.				J	آثار ا		
Start: 1526.000 nm Stop: 1567.000 nm	Type: Single 💌	Count:				N	ulling		
		1526.000 nm	Stop:	1567.00) nm				
	0	E	S	<u> </u>	c Ť	L	U		

2. Select the WDM Results tab.

General	Information	Comments	Display WDM	Results	File Name	
WDM Re	sults column pr	esence and o	rdering			
Colu	imn Name					
🔀 Nam	e					
Χ λ						
🗙 Sign	al Power					
🗶 OSN	R					
× Nois	e					
🗙 BW	3.00 dB					
🗶 BW	at x dB					
Χ Δλ						
🗙 λ Pe	ak					
🗙 Δλ Ρ	eak					
					Restore Defau	ilts
0					ОК	Cancel

- **3.** Select which parameters you want to display in the **Results** tab from the list of available choices:
 - ► Name: name of channel.
 - λ (Center wavelength/frequency): spectral center-of-mass for the peak in that channel.
 - Signal Power: signal power for the selected channel (excludes noise).
 - OSNR: optical signal to noise ratio, given by Signal power (according to the current calculation method, in dBm), minus Noise (according to the current calculation method, in dBm).
 - ➤ Noise: noise level for the selected channel. The type of noise is indicated in front of the measurement (IEC, Fit, Inb, Inb nf).
 - ► BW 3.00 dB: bandwidth measured by taking the width of a signal at 50 % linear power of the peak, or -3 dB from the peak.
 - BW at x dB: bandwidth measured by taking the width of a signal at x dB from the peak.

- $\Delta \lambda / f$: deviation of the spectral center of mass for the peak in that channel.
- > λ/f Peak: spectral peak in that channel.
- > $\Delta\lambda/f$ Peak: deviation of the spectral peak in that channel.
- **4.** Press the up or down arrows to change the order in which the columns will appear in the **Results** tab.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Setting Up WDM Analysis Parameters

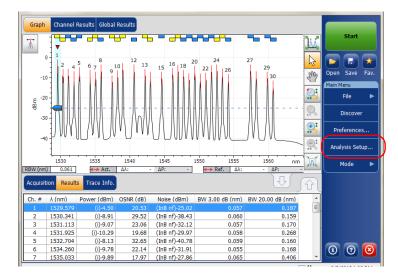
This section presents the various analysis settings for the application, particularly the channel list and settings. You can set the default channel parameters, channel list, global thresholds, default channel thresholds, manage favorite configurations and perform user calibration.

Note: When you change the analysis setup parameters, the new settings are active as soon as you confirm your choice. The current trace is re-analyzed, and the analysis setup parameters will be applied to the global results and channel results for the following acquisitions.

You can either set each parameter individually, or use parameters from the current trace and import them.

To import the parameters from the current trace:

- **1.** Make sure that you have a trace on-screen.
- 2. From the Main Menu, press Analysis Setup.



General Global Thresholds	Default Thresholds	Channels	Favorites	Calibrati	on
Default channel settings Activate default channel					
Channel width:	50.0	GHz	- Sna	ap to ITU	grid
Signal power calculation:	Integrated signal p	iower -	•		
Noise for OSNR:	5th order poly fit	•	•		
OSNR distance:	100.0	GHz (pea	k to fit zon	e center)	
Noise region:	100.0	GHz (fit z	one)		
Global analysis parameters					
Peak detection level:		-35.0	0 dBm		
RBW for OSNR:	Instrument's RBW	•	•		
Wavelength offset:		0.00	0 nm		
Power offset:		0.0	0 dB ≈10	0.0%	Edit %
Bandwidth at:		20.0	0 dB		
			Res	tore Defa	ults
Import from 1	race			ок	Cancel

3. From any tab, press **Import from Trace**.

4. Press **OK** to confirm the changes.

Defining General Settings

The general analysis parameters for WDM acquisitions affect the calculation of the results. Any change you make to the settings affect future traces, or you can apply them to the active trace when reanalyzing it.

IMPORTANT

In the General tab, you can set the default channel parameters. Any channel found during an acquisition that is not defined in the channel list will be analyzed according to the default channel settings.

To define general settings:

1. From the Main Menu, press Analysis Setup.

Graph Channel Results Global Results					
20 WDM measurement instructions	Ж	Start			
0. 1 - Select the acquisition parameters 2 - Add channels in Analysis Setup or use Favorites	2				
3 - Start an acquisition -20 4- Save results and trace to file	Sm	Open Save Fav. Main Menu			
 		File			
토 -40 - 평 - -60 -	No.	Discover			
-80 -		Preferences			
	2	Analysis Setup			
-100	, A	Mode 🕨			
Acquisition Results Trace Info.	Û				
Acquisition Type: Single Count: 1 Nulling					
Wavelength range Start: 1526.000 nm Stop: 1567.000 nm					
		00			

2. Select the General tab.

$\left\{ \right.$	General	Global Thresholds	Default Threshold	s Cha	nnels	Favorites	Calibra	tion	
	Default channel settings Activate default channel								
	Channel	width:	50.0	GHz	•	Sna	ip to ITU	grid	
	Signal po	wer calculation:	Integrated signal p	ower	•				
	Noise for	OSNR:	5th order poly fit		-				
	OSNR dis	tance:	100.0	GHz	(peak	to fit zon	e center])	
	Noise reg	ion:	100.0	GHz	(fit zo	ne)			
	Global analysis parameters								
1	Peak det	ection level:			-35.00	dBm			
	RBW for (OSNR:	Instrument's RBW		•				
	Waveleng	th offset:			0.000	nm	_		
	Power off	set:			0.00	dB ≈100	0.0%	Edit %	
	Bandwidt	h at:			20.00	dB			
						Res	tore Defa	aults	
Import from Trace							ок	Cancel	

3. Under **Default channel settings**, define the following parameters as needed:

General Global Thresholds	Default Threshold	Channels	Favorites	Calibrat	ion				
Default channel settings Image: Setting									
Channel width:	50.0	GHz	- 🗌 Sna	p to ITU	grid				
Signal power calculation:	Integrated signal power 👻								
Noise for OSNR:	5th order poly fit								
OSNR distance:	100.0	GHz (pea	eak to fit zone center)						
Noise region:	100.0	GHz (fit z	one)						
Global analysis parameters									
Peak detection level:		-35.0	0 dBm						
RBW for OSNR:	Instrument's RBW	•	•						
Wavelength offset:		0.00	0 nm						
Power offset:		0.0	0 dB ≈100	.0%	Edit %				
Bandwidth at:	20.00		0 dB	dB					
Restore Defaults									
Import from T	race			ок	Cancel				

 Clear the Activate default channel option to use the currently defined channel list for analysis. This reduces the analysis time by eliminating the peak detection over the complete spectral range. The peaks outside the defined channel list will not be analyzed. Channel width (GHz or nm): indicates the limit inside which the power values will be considered in the channel.

For default channels, the channel width that sets the limits of the channel, should be the same as the channel distance or smaller (channel distance is defined while creating a channel list). If the channel width is not compatible with the channel spacing, either a single peak may be found for two distinct channels and two analysis would be performed and displayed for that peak, or, it is possible that two peaks may be found within the same channel and be considered as one multi-peak signal. With this result, you can use markers to find the spacing between adjacent channels or to find the channel width.

- Snap to ITU Grid: When selected, each detected peak will be defined by the nearest ITU channel. The ITU grid is based on the selected channel width.
- Signal power calculation: indicates which calculation method to apply for signal power value.

Integrated signal power: The integrated signal power represents the sum of the power values included between the channel limits of this channel, minus the estimated noise contribution between the same boundaries. In some cases, for instance CATV signals, signals with high-frequency modulation, or signals with an inherent line width similar or larger than the OSA's resolution bandwidth, this calculation becomes a better estimation of the true signal power.

Peak signal power: The peak signal power represents the maximum power value inside the channel. Note that it differs a little from the peak measurement on the spectrum due to the fact that the estimated noise is subtracted to get the peak signal power.

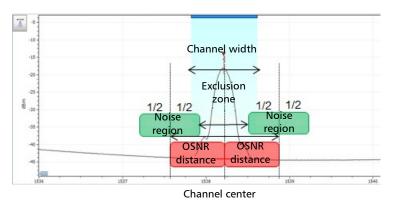
Total channel power: The total channel power represents the sum of the integrated signal power and of the noise within the channel. The OSNR calculation is not performed when the signal power calculation type is the total channel power.

 Noise for OSNR: indicates which calculation method to use for OSNR value.

Fixed range IEC based (IEC): The IEC method uses the interpolation of noise measured on both sides of the signal to estimate the noise level. The position at which the noise is estimated from the center wavelength is given by the OSNR distance.

InBand (InB): The InBand method uses a series of scans having different polarization states to calculate the noise level under the peak (InBand).

InBand narrow filter (InB nf): The InBand narrow filter method uses additional processing to provide an accurate OSNR value for the narrow carved noise. This is because with narrow filters, the noise level under the peak is not uniform and the OSNR value depends on the processing width selected. ➤ Fifth order polynomial fit (Fit): The fifth order polyfit method calculates the noise curve and thus the signal to noise ratio. The OSA will approximate the noise curve using a fifth order polynomial fit. This fit definition relies on fit and exclusion zones. Only the points in the fit zones are used to calculate the fifth order polynomial fit. If you select the fifth order polyfit method, you have to define the fit and exclusion zones for your tests using the OSNR distance and noise region fields. The exclusion zone is indirectly obtained from the OSNR distance.



OSNR distance (GHz or nm): Except for the fifth order polyfit selection, the OSNR distance is automatically set at the channel edge, that is, at half of the channel width from the center wavelength.

For the fifth order polyfit, the OSNR distance corresponds to the distance from the channel peak to the center of the fit zone. It is independent of the channel width.

 Noise region: The noise region, or fit zone, defines the region where the polynomial fit applies. Two identical regions are centered at the OSNR distance.

4. Under **Global analysis parameters**, define the following parameters as needed:

			Default Threshold	6 Cha	nnels F	avorites (Calibrat	ion
		annel settings æ default channel						
	Channel wi	dth:	50.0	GHz	•	Snap	to ITU	grid
	Signal pow	er calculation:	Integrated signal p	ower	•			
	Noise for C	SNR:	5th order poly fit		-			
	OSNR dista	ince:	100.0	GHz	(peak	to fit zone (center)	
	Noise regio	on:	100.0	GHz	(fit zor	ne)		
	Global anal	sis parameters						
1	Peak detec	tion level:			-35.00	dBm		
	RBW for OS	SNR:	Instrument's RBW		•			
	Wavelengt	h offset:			0.000	nm	_	
	Power offs	et:			0.00	dB ≈100.0	0%	Edit %
	Bandwidth	at:			20.00	dB		
						Resto	re Defa	iults
	0	Import from T	race			0	к	Cancel

- Peak detection level (dBm): indicates the minimum power level from where the peak can be considered as a signal.
- RBW for OSNR (nm): indicates the resolution bandwidth selected for the OSNR calculation. This parameter is generally set to 0.1 nm to allow for a common basis of comparison between different OSAs having different effective resolutions. The instrument's RBW value is written below the graph. This parameter does not actually have an effect on the acquisition, but is only a normalization factor used to provide the OSNR value in a standardized manner.

- ➤ Wavelength offset (nm): indicates the offset value applied on the wavelength. This does not replace a calibration performed at EXFO, but it can help you temporarily sharpen the specifications if you have determined that, for example, your modules are used beyond the normal allowed use. Entering a value in THz is not possible. When an offset is applied, it is indicated at the bottom of the graph (λ ←).
- ➤ Power offset (dB): indicates the offset value applied on the power. This does not replace a calibration performed at EXFO, but it can help you achieve the specifications if you have determined that, for example, your modules are used beyond the normal allowed use. When an offset is applied, it is indicated at the bottom of the graph (P ↔).

To edit the power offset as a tap percentage, press the **Edit %** button.

Power Offset	×
Edit percentage:	
100	% ≈ 0 dB
ОК	Cancel

The percentage value entered in **Edit percentage** will be converted to a corresponding equivalent value in dB.

- Bandwidth at (dB): Set the power level used, relative to the channel peak power, to compute the second bandwidth result.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Defining Global Thresholds

Any change you make to the global threshold settings affect future traces, or you can apply them to the active trace when reanalyzing it.

The application allows you to activate and deactivate the threshold functionality with a single control. When thresholds are globally enabled, the results are displayed with the Pass/Fail status based on various settings (global results, channel results). In addition, a global pass/fail status is also displayed in the **Global Results** tab (See *Global Results Tab* on page 270).

When thresholds are globally disabled, results are displayed without a Pass/Fail status and the Global pass/fail status will not be active in the **Global Results** tab. The **P**/**F** column under the results table will not be displayed.

	Global Results		7	Start
 Global Results 		_	Pass/fail status	Start
Channel count	3	B		
Empty channel count		0 =	Not Active	
Average signal power	-18.67 dBr	n		
Signal power flatness	7.50 d	в		Open Save Fav.
Average OSNR	28.24 d	в		Main Menu
OSNR flatness	9.11 d	в		File 🕨
Total power in scan range	-2.73 dBr	n		
 Global Analysis Parameter 	'S			Discover
Peak detection level	-35.00 dBr	n		
RBW for OSNR	0.065 nr	n		Preferences
Wavelength offset	0.000 nr	n		
Power offset	0.00 d	в		Analysis Setup
Bandwidth at	20.00 d	в		
 Default Channel Parameter 	ers	•		Mode 🕨
Acquisition Results Trace	Info.		A U	
Acquisition type:	InBand		*	
Number of scans:	200			
	1520.000 nm		E	
of construction of construction	1570.000 nm			
	Factory			
	4/9/2009			
	8/6/2009 6:42:35 AM 8/6/2009 6:44:56 AM		Trace Identification	0 0 0

You can set your pass/fail threshold limits in different ways depending on the type of test you are performing.

Threshold Limit	Definition
None	No threshold limit is set. The results will be displayed without a Pass/Fail verdict.
Min. only	The threshold limit is set for a minimum value only. The Pass/Fail verdict is declared as Pass (in green), when the value is equal to or greater than the minimum threshold set. The verdict is declared as Fail (in red), when the value is below the minimum threshold set.
Max. only	The threshold limit is set for a maximum value only. The Pass/Fail verdict is declared as Pass (in green), when the value is equal to or less than the maximum threshold set. The verdict is declared as Fail (in red), when the value is above the maximum threshold set.
Min. and Max.	The threshold limit is set for the minimum and maximum value. The Pass/Fail verdict is declared as Pass (in green), when the value is equal to or within the minimum and maximum thresholds set. The Pass/Fail verdict is declared as Fail (in red), when the value is beyond the minimum or maximum thresholds set.
Use Default	When this limit is set, the corresponding threshold set for the default channels in the Analysis Setup tab will be applied to the channel.
Max. Deviation	The threshold limit is set for the deviation value. The Pass/Fail verdict is declared as Pass (in green), when the value is equal to or within the deviation threshold set. The Pass/Fail verdict is declared as Fail (in red), when the value is beyond deviation threshold set.

To define global thresholds:

1. From the Main Menu, press Analysis Setup.

Graph Channel Results Global Results		
20 WDM measurement instructions	<u>}</u>	Start
1 - Select the acquisition parameters 2 - Add channels in Analysis Setup or use Favorites	B	
3- Start an acquisition -20 4- Save results and trace to file	Em	Open Save Fav. Main Menu
= = -40 -		File 🕨
E -40 - 89 - 	0	Discover
		Preferences
		Analysis Setup
-100)a(Mode 🕨
	τì	
Acquisition Type: Single Count: 1 Nulling		
Wavelength range		
O E S C L U		0 0 0

2. Select the **Global Thresholds** tab.

3. Select the **Activate all thresholds** option to manually set the global threshold values. If this option is not selected, all the thresholds will be deactivated, results are displayed without a Pass/Fail status and Global pass/fail status are not active in the **Global Results** tab.

General Global Three	sholds	Default Thresholds	Char	nnels	Favorites	Calibrati	on
🗙 Activate all thresho	lds						
Global result threshold	s			Min		Max.	
Min. and max. 👻	Avera	ge signal power		-45	.00	15.00	dBm
Max. only 👻	Signal	power flatness				1.00	dB
Min. and max. 💌	Avera	ge OSNR		5	.00	60.00	dB
Max. only 👻	OSNR	flatness				10.00	dB
Empty channel co	unt						
					Destr	ore Defaul	
					Rest	ne Delau	
Import	from T	race				ок	Cancel

- 4. Enter values in the boxes as explained below:
 - Average signal power (dBm): the sum of the signal powers of all the peaks detected in the current acquisition, divided by the total number of peaks.
 - Signal power flatness (dB): the difference between the maximum and minimum signal power values of the detected peaks, in dB.
 - Average OSNR (dB): the sum of the entire OSNR of the peaks detected in the current acquisition, divided by the total number of peaks.
 - OSNR flatness (dB): the difference between the maximum and minimum OSNR values of the detected peaks, in dB.
 - Empty channel count: The number of empty channels from the channel list.

5. Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Defining Default Thresholds

Default thresholds will be applied to any channel found outside the channel list during the acquisition or re-analysis.

Note: The default thresholds settings are enabled only when the **Activate all** thresholds option is selected in the **Global Thresholds** tab. For more information, see Defining Global Thresholds on page 70.

You can set your pass/fail threshold limits in different ways depending on the type of test you are performing.

Threshold Limit	Definition
None	No threshold limit is set. The results will be displayed without a Pass/Fail verdict.
Min. only	The threshold limit is set for a minimum value only. The Pass/Fail verdict is declared as Pass (in green), when the value is equal to or greater than the minimum threshold set. The verdict is declared as Fail (in red), when the value is below the minimum threshold set.
Max. only	The threshold limit is set for a maximum value only. The Pass/Fail verdict is declared as Pass (in green), when the value is equal to or less than the maximum threshold set. The verdict is declared as Fail (in red), when the value is above the maximum threshold set.
Min. and Max.	The threshold limit is set for the minimum and maximum value. The Pass/Fail verdict is declared as Pass (in green), when the value is equal to or within the minimum and maximum thresholds set. The Pass/Fail verdict is declared as Fail (in red), when the value is beyond the minimum or maximum thresholds set.
Max. Deviation	The threshold limit is set for the deviation value. The Pass/Fail verdict is declared as Pass (in green), when the value is equal to or within the deviation threshold set. The Pass/Fail verdict is declared as Fail (in red), when the value is beyond deviation threshold set.

To define default Thresholds:

1. From the Main Menu, press Analysis Setup.

Graph Channel Results Global Results		
WDM measurement instructions	<u>)</u>	Start
1 - Select the acquisition parameters 2 - Add channels in Analysis Setup or use Favorites	6	
-20 -20 -20	2m	Open Save Fav. Main Menu
: E -40 -	2	File 🕨
트 -40 - 원 - - 50 -	<u>е</u> ,	Discover
	⊕ ‡	Preferences
	.	Analysis Setup
-100	ĴA(Mode 🕨
Acquisition Results Trace Info.	Û	
Acquisition Type: Single Count: 1 Nulling		
Wavelength range Start: 1526.000 nm Stop: 1567.000 nm		
		0 0 0

- General Global Threshol is Default Thresholds Channels Favorites Calibration Default channel Max. Min. Max. deviation - Wavelength 0.020 nm ± Min. and max. Signal power -45.00 15.00 dBm OSNR 5.00 60.00 dB Min. and max. Noise Min. and max. .00 00--40.00 dBm Restore Defaults ? Import from Trace ок Cancel
- 2. Select the **Default Thresholds** tab.

- **3.** Enter values in the boxes as explained below:
 - Wavelength/Frequency (nm/GHz): the channel's central wavelength/frequency.
 - Signal power (dBm): the signal power for the default channel (excludes noise).
 - ▶ Noise (dBm): the level of the noise for the selected channel.
 - OSNR (dB): the optical signal to noise ratio, given by Signal power (according to the current calculation method, in dBm) minus Noise (according to the current calculation method, in dBm).
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

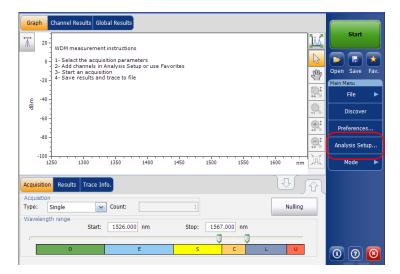
Managing Channels

Testing DWDM systems involves characterizing multiple signals in a link. The application allows you to define channels using a channel editor or quickly generate them from the current data. You can also rapidly create a list of equally spaced channels. Once a channel list is created, you can modify it as needed. You can edit the analysis parameters for one channel or multiple channels.

While creating the channel list, some channels may overlap. When the channel widths are specified in nm, two channels are considered to be overlapping when more than 1.2 GHz (approximately) of frequency range is common between the two channels.

To add a channel list:

1. From the Main Menu, press Analysis Setup.



- 2. Select the Channels tab.
- **3.** By default, the channel list is empty. Press **Add Channels**.

Ge	neral	Global Three	holds Default	Thresholds C	nannels Fa	avorites	Calibration	
Cha	nnel list	t						
	Name	· λ (nm)	Channel Width	Signal P	ower	Noise	e for OSNR	Si ^
×					gnal power			
×	C_002	1532.664	50.0 GHz	Integrated si	gnal power	InBand	narrow filter	
×	C_003	1534.262	50.0 GHz	Integrated si	gnal power	InBand	narrow filter	
×	C_004	1535.818	50.0 GHz	Integrated si	gnal power	InBand	narrow filter	
×	C_005	1537.002	50.0 GHz	Integrated si	gnal power	InBand	narrow filter	
×	C_006	1537.402	50.0 GHz	Integrated si	gnal power	InBand	narrow filter	
×	C_007	1537.797	50.0 GHz	Integrated si	gnal power	InBand	narrow filter	
×	C_008	1538.184	50.0 GHz	Integrated si	gnal power	InBand	narrow filter	
×	C_009	1538.589	50.0 GHz	Integrated si	gnal power	InBand	narrow filter	
×	C_010	1538.976	50.0 GHz	Integrated si	gnal power	InBand	narrow filter	
×	C_011	1539.373	50.0 GHz	Integrated si	gnal power	InBand	narrow filter	
×	C_012	1539.784	50.0 GHz	Integrated si	gnal power	InBand	narrow filter	
×	C_013	1540.559	50.0 GHz	Integrated si	gnal power	InBand	narrow filter	-
•				1				F
		Select All		Unselect All			Delete	
			E	Edit Selection	. (Add	Channels	
?		Import	from Trace				ок	Cance

4. Enter values in the boxes as explained below:

Add channels Start range: Stop range:	1528.773 nm 1560.606 nm
Channel center wavelength:	ITU 100 GHz
Channel distance:	100 📝 GHz 📝
Channel width:	100 🔽 GHz 🗹
Name prefix: Starting value: Increment value:	1 1 Restore Defaults
	Nexure Defaults
0	OK Cancel

- Start range (nm or THz): starting range of the channel list.
- Stop range (nm or THz): ending range of the channel list.
- Channel center wavelength/frequency: spectral center-of-mass for the peak in that channel.
- **Note:** When using the custom channel center wavelength option, the first channel will be centered at the Start Range, and the list will be created using channel distance and channel width.
 - Channel distance (nm or GHz): distance between channels. The value of channel distance will be set depending on the selection made for the channel center wavelength option. The channel distance box will be enabled only when the channel center wavelength option is set to custom.
 - Channel width (nm or GHz): limit inside which the power values will be considered in the channel. Integrated power is calculated on channel width.
 - > Name prefix: adds a prefix to the channel names.

- Starting value: sets the increment starting value for the channel name in the channel list.
- Increment value: sets the increment value for the channel name in the channel list.
- **5.** Press **OK** to return to the **Channels** window, which now lists the added channels.
- **Note:** When new channels are added, the **Use Default thresholds** selection will be applied to the channel parameters.
- **Note:** A warning message will be displayed if channels are overlapping, but the analysis can still be performed on overlapping channels. If any duplicate channels are added, a confirmation message will be displayed to overwrite the existing channels with the duplicate channels.
 - **6.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.
- **Note:** The application displays a message if more than 1000 channels are added. You can exit the **Analysis Setup** window only after deleting the extra channels from the channel list. You can delete the channels manually as required.

To edit the parameters of a specific channel:

1. From the Main Menu, press Analysis Setup.

Graph Channel Results Global Results	
The 20 WDM measurement instructions	Start
1 - Select the acquisition parameters 2- Add channels in Analysis Setup or use Favorites	
3- Start an acquisition 4- Save results and trace to file	Main Menu
е на	
-50	
-80-	
-80	
-100	Mode 🕨
Acquisition Results Trace Info.	1
Acquisition Type: Single Count: 1 Nulling	
Wavelength range Start: 1526.000 nm Stop: 1567.000 nm	
O E S C L U	0 0 0

2. Select the Channels tab.

Ger	neral	Global Three	holds	Default T	ħresholds	Channels	Favorites	Calibrati	on
Chai	nnel lis	t				_			_
	Name	e λ (nm)	Chanr	nel Width	Sign	al Power	Noise	e for OSN	R Si
×					Integrate	d signal pov	ver InBand	narrow fil	lter
×	C_002	1532.664		50.0 GHz	Integrate	d signal pov	ver InBand	narrow fil	ter
×	C_003	1534.262		50.0 GHz	Integrate	d signal pov	ver InBand	narrow fil	
×	C_004	1535.818		50.0 GHz	Integrate	d signal pov	ver InBand	narrow fil	ter
×	C_005	5 1537.002		50.0 GHz	Integrate	d signal pov	ver InBand	narrow fil	ter
×	C_006	5 1537.402		50.0 GHz	Integrate	d signal pov	ver InBand	narrow fil	ter
×	C_007	1537.797		50.0 GHz	Integrate	d signal pov	ver InBand	narrow fil	ter
×	C_008	3 1538.184		50.0 GHz	Integrate	d signal pov	ver InBand	narrow fil	ter
×	C_009	1538.589		50.0 GHz	Integrate	d signal pov	ver InBand	narrow fil	ter
×	C_010	1538.976		50.0 GHz	Integrate	d signal pov	ver InBand	narrow fil	ter
×	C_011	1539.373		50.0 GHz	Integrate	d signal pov	ver InBand	narrow fil	ter
×	C_012	1539.784		50.0 GHz	Integrate	d signal pov	ver InBand	narrow fil	ter
×	C_013	1540.559		50.0 GHz	Integrate	d signal pov	ver InBand	narrow fil	ter
•					1		1		÷.
		Select All			Unselect /	มเ		Delete	
				E	dit Selectio	on	Add	I Channel	s
2		Import	from T	race				ок	Cano

3. Select the channel or channels to be modified in the channel list.

If you want the changes to be applied to all of your channels, press **Select All**. Channels can be selected one by one or all together. You can press **Unselect All** to clear all channel selections. To delete the selected channels, press **Delete**.

4. Press Edit Selection.

General	Global Thr	esholds Default	Thresholds Channels I	Favorites Calibration		
Channel				-	_	
Nar			n Signal Power	Noise for OSNR	Si 4	
× c_0	01 1531.11	7 50.0 GH	z Integrated signal powe	r InBand narrow filter		
× C_0	02 1532.66	4 50.0 GH	z Integrated signal powe	r InBand narrow filter		
× C_0	03 1534.26	2 50.0 GH	z Integrated signal powe	r InBand narrow filter		
🗶 C_0	04 1535.81	8 50.0 GH	z Integrated signal powe	r InBand narrow filter		
X C_0	05 1537.00	2 50.0 GH	z Integrated signal powe	r InBand narrow filter		
X C_0	06 1537.40	2 50.0 GH	z Integrated signal powe	r InBand narrow filter		
X C_0	07 1537.79	7 50.0 GH	z Integrated signal powe	r InBand narrow filter		
X C_0	08 1538.18	4 50.0 GH	z Integrated signal powe	r InBand narrow filter		
× C_0	09 1538.58	9 50.0 GH	z Integrated signal powe	r InBand narrow filter		
× C_0	10 1538.97	6 50.0 GH	z Integrated signal powe	r InBand narrow filter		
× C_0	11 1539.37	3 50.0 GH	z Integrated signal powe	r InBand narrow filter		
× C_0	12 1539.78	4 50.0 GH	z Integrated signal powe	r InBand narrow filter		
× C_0	13 1540.55	9 50.0 GH	z Integrated signal powe	r InBand narrow filter	Ξ.	
•			1	1	F	
	Select All		Unselect All	Delete		
Edit Selection Add Channels						
2	Impo	Import from Trace OK Cancel				

5. Modify the settings as needed. For more information about the settings, see *Defining General Settings* on page 62 and *Defining Default Thresholds* on page 74. If you leave a box empty, it will remain as it was before your changes. Modify appropriate settings.

Channel center: Analysis	192.7000 THz	Char	nnel name:)35
Channel width:	100.0 GHa	•		
Signal power calculation:	Integrated signal power	~		
Noise for OSNR:	Fixed range IEC based	~		
OSNR distance:	50.0 GHz			
Noise region:	5.0 GHz			
			Restore	Defaults
Thresholds		Min.	Max.	
Use default 🛛 🖌 Fi	requency		2.5	GHz
Use default 🛛 🗸 S	ignal power	-45.00	15.00	dBm
Use default 🛛 🗸 N	oise	-99.99	-40.00	dBm
Use default 🛛 🗸 O	SNR	5.00	60.00	dB
			Restore	Defaults
0			Ok	Cancel

- **6.** Press **OK** to return to the **Channels** tab, which now contains the modified settings.
- **7.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Setting Up Acquisition Parameters

Before performing your test, you must set the acquisition type and parameters.

There are five types of acquisitions in WDM mode:

- Single: Spectral measurement is performed once. The results are displayed according to this measurement.
- Averaging: Spectral measurements are performed based on the number of scans that you have entered for this parameter. The trace will be displayed after each acquisition and averaged with the previous traces.
- Real-Time: In real-time acquisition, spectral measurements are performed continuously until you press Stop. No averaging is done for spectral measurements. The graph and results are refreshed after each acquisition.
- InBand: The InBand type acquisition will perform a series of scans in different polarization conditions in order to enable the InBand OSNR calculation.
- ➤ *i*-InBand: The *i*-InBand acquisition enables an adaptive intelligent InBand OSNR calculation that takes into account the multiple scans (up to 500) in various polarization conditions to determine the best available InBand analysis parameters for the signals under test on a per channel basis. With this acquisition type, you do not need to make difficult parameter setting choices (the InBand or InBand narrow filter and number of scans are automatically determined), especially when you are faced with complex system configurations.
- **Note:** The InBand and i-InBand option are available only if the module supports it and you have purchased the corresponding InB software option.

Before performing measurements on an optical spectrum, you must select the wavelength/frequency range to use. You can perform the scan on the full range, on spectral bands, or select a custom range.

Note: The shorter the wavelength or frequency range, the faster the acquisition.

To set parameters in the Acquisition tab:

1. From the main window, select the Acquisition tab.

Graph	Channel Results Global Results		Chard .
20	WDM measurement instructions	<u>) </u>	Start
0	1 - Select the acquisition parameters 2 - Add channels in Analysis Setup or use Favorites	6	
-20	3- Start an acquisition 4- Save results and trace to file	Sm	Open Save Fav.
c -40			File ►
문 -40 뜻 -60		No.	Discover
-80	- - -		Preferences
		S	Analysis Setup
-100	250 1300 1350 1400 1450 1500 1550 1600 nm	<u>م</u> ر	Mode 🕨
Acquisitio	Results Trace Info.	Û	
Type:	Single Count: 1		
Waveleng	th range Start: 1526.000 nm Stop: 1567.000 nm		
	0 E S C L U		00

2. Select the acquisition type.

pe:	Single	*	Count:				Nulling	_
avelen	gth range	Start:	1526.000 nm	Stop:	1567.000 n	ım		
					0	J		
	0		E	S	С	L	U	

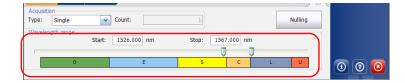
Setting Up the Instrument in WDM Mode

Setting Up Acquisition Parameters

3. If you are performing an averaging type acquisition, enter the number of scans the unit will perform.

If you are performing an InBand type acquisition, either enter the number of scans or select a predefined number of scans the unit will perform.

- **Note:** You cannot modify the number of scans count value if you are performing a single or real-time or i-InBand acquisition.
- Note: In i-InBand mode, the scan count value is always set to 500.
 - 4. Select the wavelength range for your acquisition.



You can select the wavelength range by entering the start and stop values or by selecting a range on the double slider.

To select the wavelength range using the double slider, move the left and right handles on the double slider or simply click on any band.

Note: You can select more than one adjoining ranges to include in your range, for example, S + C.

Setting Up Acquisition Parameters

The wavelength range covered within these bands of the spectra are listed below.

- ▶ O band (original): 1255 to 1365 nm
- ► E band (extended): 1355 to 1465 nm
- ► S band (short wavelengths): 1455 to 1535 nm
- ► C band (conventional "erbium window"): 1525 to 1570 nm
- ► L band (long wavelengths): 1560 to 1630 nm
- ▶ U band (ultralong wavelengths): 1620 to 1650 nm.

6 Setting Up the Instrument in Drift Mode

Before performing a spectral analysis in the Drift mode, you must set up the test application with the appropriate parameters, as explained in this chapter.

Select the Drift test mode as explained in *Selecting a Test Mode* on page 20 before setting up the Drift test parameters.

- The preferences are the result displayed in the graph and tables, as well as the job information and related comments saved with each file.
- The analysis parameters include the channel list details, pass-fail threshold settings and allows you to select the noise and power calculation methods.
- The *acquisition parameters* include the type of measurement you want to perform and the wavelength range.

See *Defining Preferences* on page 93, *Setting Up Drift Analysis Parameters* on page 107 and *Setting Up Acquisition Parameters* on page 131 for more details.

You can set up your unit in different manners, depending on your testing needs.

- ➤ The preferred way is to use the complete analysis setup parameters and complete the information in all tables, as explained in *Setting Up Drift Analysis Parameters* on page 107. This setup will be used for the next acquisition.
- ➤ The easiest way to set up the instrument, especially when the operator does not know in advance what to expect at the input of the module is to use the **Discover** button. After the **Discover** button has been pressed, a measurement and analysis will be performed according to the best setup determined by the instrument and this setup will be used for the next scan. This is explained in *Using the Discover Feature* on page 239.
- ➤ The most efficient way to setup the instrument is to use one of the favorites configurations, uploading a pre-customized acquisition and analysis setup configuration. The operator in the field only has to press the the setup button, select the appropriate configuration and press Start. As an example, a pre-customized configuration could be: "32 channels DWDM 50GHz"; "Toronto-Montreal CWDM" or "Vendor ABC DWDM ROADM 40Gb". This is explained in *Managing Favorites* on page 250.
- ➤ You can also import the setup from the current trace. This method will take the data and channel information from the current trace and apply them in the corresponding tabs. For more information, see *Setting Up Drift Analysis Parameters* on page 107.

Defining Preferences

Defining Preferences

The preferences window allows you to set general information and comments on trace, set display parameters and customize the drift results table.

Note: Only the Display and Drift Results tabs are available in offline mode.

Defining Trace Information

The trace information relates to the description of the job to be done, cable and job IDs, and any relevant information about what is being tested.

To enter general information:

1. From the Main Menu, press Preferences.

	hannel Graph W	OM Graph Channel Res	sults]	Start
0 - 1- 2- 3-	Add channels in A	ition and Drift paramet Analysis Setup or use F to validate all paramet	avorites				Open Save Fav.
-60 - -60 - -80 -							Custom Build Discover
-100	1300	1350 1400	1450 150	0 1550	1600 nm	 M	Preferences Analysis Setup
Acquisition D	rift Settings Cha	nnel History Trace Info			Î		Mode 🕨
Acquisition Type: Sing		Count:	1	Trial Scan	Nullin	g	
Wavelength ra	nge Start:	1535.000 nm	Stop:	1575.000 nm		_	
	0	E	S	c	L U		000

2. Select the **General** tab.

General Information	Comments	Display	Drift Results	File Name	
General Job ID:	You	r Job)
Cable ID:	343	_34			
Fiber ID:					
Customer: Company:	You	r customer	r		
Operator:					
Maintenance reason:					× ×
					Clear
				ОК	Cancel

- **3.** Define the general parameters as needed.
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Clear** to clear all the changes made in the **General** tab.

To enter link and location information:

1. From the **Main Menu**, press **Preferences**.

[™] 20 0	1- Select the a 2- Add channel 3- Make a trial 4- Start a Drift	nent instructions cquisition and Dr ls in Analysis Set scan to validate	ift parameters up or use Favo all parameters	rites				Start Open Save Fav. Main Menu File Custom Build Discover Preferences Analysis Setup
Acquisition	Drift Settings	Channel History	Trace Info.			ĴŶ	<u></u>	Mode ►
Acquisition Type: Si Wavelength		 Count: art: 1535.000) nm	1 Stop:	Trial Scan		Nulling	
	0		E	S	c	L	U	000

2. Select the **Information** tab.

General Information Comm	ents Display	Drift Results	File Name	
- System and link information				
Link ID prefix:				
Starting value:		1		
	🗶 Auto incre	ment		
Orientation:	Northbound	~		
System:				
Location information				
Network element:	Transmitter	~		
Test point:	Output tap	~		
Description:				
			Restore Defau	ts
0			ОК	Cancel

Setting Up the Instrument in Drift Mode

Defining Preferences

- **3.** Under **System and link information**, define the following parameters as needed:
 - Link ID prefix: prefix value for the link ID. You can enter any alphanumeric value.
 - > Starting value: suffix increment starting value for the link ID.

This value is incremented each time a new file is saved provided the **Auto Increment** option is selected.

IMPORTANT

If the Auto Increment option is not selected, you have to manually change the file name when saving the trace file, otherwise the application will overwrite the previously saved file.

- > Orientation: orientation of the link.
- > System: information about the system under test.
- **4.** Under **Location Information**, define the following parameters as needed:
 - > Network element: Sets the type of network element.
 - Test point: Sets the location where the test is performed on the link.
 - > Description: Enter the description of location if required.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Defining Preferences

To enter comments:

1. From the **Main Menu**, press **Preferences**.

Dashboard Channel Graph WDM Graph Channel Results Image: Select the acquisition and Drift parameters 1 - Select the acquisition and Drift parameters 2 - Add channels in Analysis Setup or use Favorites -2-0 -4-5 tart to validate all parameters -4-5 tart to validate all parameters -20 -50 -60 -60 -60 -100 -1250 1300 1350 1400 1450 1500 1550 1600 nm	Start Start Open Save Fav. Main Menu File Custorn Build Otscover Preferences Analysis Setup
Acquisition Drift Settings Channel History Trace Info.	Mode 🕨
Acquisition Type: Single Count: 1 Trial Scan Nulling	0
Wavelength range Start: 1535.000 nm Stop: 1575.000 nm 0 E S C L U	000

Defining Preferences

2. Select the **Comments** tab.

General	Information	Comments	Display	Drift Results	File Name	
Your com	ments here.					2
						Clear
0					ОК	Cancel

- **3.** Enter your comments for the current trace.
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Clear** to clear all the changes made in the **Comments** tab.

Defining Display Parameters

The application allows you to set display settings for the acquisition trace. You can set the spectral unit for the trace and the results table. You can also select the label that should appear on the peaks of the trace.

To define display parameters:

1. From the Main Menu, press Preferences.

Dashboard Channel Graph WDM Graph Channel Results		
Drift measurement instructions		Start
1 0 - 1 - Select the acquisition and Drift parameters 1 - Add channels in Analysis Setup or use Favorites	B	
3- Make a trial scan to validate all parameters -20 4- Start a Drift measurement	E.	Open Save Fav. Main Menu
E -10 - E -		File 🕨
-60 -		Custom Build
-80		Discover
-100	₽:	Preferences
1250 1300 1350 1400 1450 1500 1550 1600 nm)Ať	Analysis Setup
Acquisition Drift Settings Channel History Trace Info.		Mode 🕨
Acquisition Type: Single Count: 1 Trial Scan Nullin	g	
Wavelength range Start: 1535.000 nm Stop: 1575.000 nm		
O E S C L U		000

2. Select the **Display** tab.

General Information Commen	ts Display Drift Results File Name
General Spectral unit:	nm
Label on peak in graph:	Channel name
Empty results channel:	Show
Horizontal markers:	Show
Graph color scheme:	White background
	Restore Defaults
0	OK Cancel

3. Select the spectral unit you want to work with, either nm or THz.

General Information Comment	s Display Drift Results	File Name
General Spectral unit:	nm	
Label on peak in graph:	Channel name	~
Empty results channel:	Show	×
Horizontal markers:	Show	~
Graph color scheme:	White background	×
		Restore Defaults
0		OK Cancel

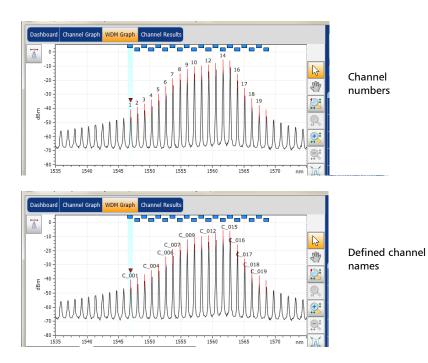
4. Select the label that will appear on the peaks in the graph, either the channel name, its number, or nothing.

Spectral unit:	nm 💌
abel on peak in graph:	
Empty results channel:	Show
Horizontal markers:	Show
Graph color scheme:	White background
	Restore Defaults

Setting Up the Instrument in Drift Mode

Defining Preferences

Note: The channel name and channel number cannot be shown at the same time.



5. Select whether you want to show or hide the empty channels from the channel list in the **Dashboard**, **Channel Graph**, **Channel Results** and **Channel History** tabs.

General Information Comment	s Display Drift Results	File Name	
General Spectral unit:	nm	~	
Label on peak in graph:	Channel name	~	
Empty results channel:	Show		
Horizontal markers:	Show	~	
Graph color scheme:	White background	~	
		Restore Defaul	ts
		ок	Cancel

6. Select whether you want to show the horizontal markers or the integrated power trace in the marker toolbar.

General Information Com	nents Display Drift Results File Name
General Spectral unit:	nm
Label on peak in graph:	Channel name
Empty results channel:	Show
Horizontal markers:	Show
Graph color scheme:	White background
	Restore Defaults
	OK Cancel

7. Select the background color scheme for the graph as desired.

General	Information	Comments	Display	Drift Results	File Name	
General Spectral u	unit:		nm		~	
Label on	peak in graph	: [Channel na	ime	~	
Empty res	sults channel:		Show		~	
Horizonta	I markers:	[Show		~	
Graph col	or scheme:	[White back	ground		
					Restore Defau	lts
?					ОК	Cancel

8. Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Customizing Drift Results Table

It is possible to select which results you would like to be displayed in the **Results** tab of your Drift tests.

To customize the results table:

1. From the **Main Menu**, press **Preferences**.

20 Drift measurement in 0 1- Select the acquisit 2- Add channels in Ar	on and Drift parameters alysis Setup or use Favori validate all parameters		-	37	Start
-100 - 1300	1350 1400 145	50 1500 1550	1600 nm	Ă	Preferences Analysis Setup
Acquisition Drift Settings Chann	el History Trace Info.		Û		Mode 🕨
Acquisition Type: Single • Wavelength range Start:	Count:	1 Trial Scan Stop: 1575.000 nm	Nulling		
0	E	s c	LU		0 0 0

Defining Preferences

2. Select the Drift Results tab.

General	Information	Comments	Display	Drift Resu	Ilts File Nam	•	
Curve sel	ection for Chai	nnel Graph pa	ge			-	
Para	meter Name						
Χ λ							
	l Power						
	<						
					Restore I	Defaults	
						_	
2					OF		Cancel

- **3.** Select which parameters you want to display in the **Channel Graph** tab from the list of available choices:
 - Center wavelength/frequency: spectral center-of-mass for the peak in that channel.
 - Signal Power: signal power for the selected channel (excludes noise).
 - OSNR: Optical Signal to Noise Ratio, given by Signal power (according to the current calculation method, in dBm) minus Noise (according to the current calculation method, in dBm).
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

This section presents the various analysis settings for the application, particularly the channel list and settings. These settings are applied on subsequent acquisitions. You can set the channel list, global thresholds, default channel thresholds, channel parameters, manage favorite configurations and perform user calibration.

Note: The analysis setup parameters will be applied to the global results and channel results, upon the next acquisition.

You can either set each parameter individually, or use parameters from the current trace and import them.

To import the parameters from the current trace:

1. Make sure that you have a trace on-screen.



2. From the Main Menu, press Analysis Setup.

Channel width: Signal power calculation:	100.0 Integrated signal p		Snap to IT	o gilu
Noise for OSNR:	Fixed range IEC b	ased 👻		
OSNR distance:	50.0	GHz		
Noise region:	5.0	GHz		
Global analysis parameters				
Peak detection level:		-60.00	dBm	
RBW for OSNR:	0.100	•	nm	
Wavelength offset:		0.000	nm	
Power offset:		0.00	dB ≈100.0%	Edit %
Bandwidth at:		20.00	dB	
			Restore De	faults

3. From any tab, press **Import from Trace**.

4. Press **OK** to confirm the changes.

Defining General Settings

The general analysis parameters for drift acquisitions affect the calculation of the results. These calculations take place after an acquisition. If these settings are modified, they will be applied to the next acquisition.

IMPORTANT

In the General tab, you can set the default channel parameters. Any channel found during an acquisition that is not defined in the channel list will be analyzed according to the default channel settings.

To define general settings:

1. From the Main Menu, press Analysis Setup.

Dashboard → 20 - -22 - -22 - - -20 - - - - - - - - - - - - - -	Drift measurement i 1- Select the acquis 2- Add channels in A - Make a trial scan 4- Start a Drift meas	ition and Drift parame Analysis Setup or use F to validate all parame	ters Favorites ters			× 50 × 50 × 50 × 50 × 50 × 50 × 50 × 50	Start Open Save Fav. Main Menu File Custom Build Discover Preferences Analysis Setup
Acquisition	Drift Settings Char	nnel History Trace Inf	o.		Ŷ		Mode 🕨
	iingle 👻	Count:	1	Trial Scan	Nullin	g	
Wavelengt	h range Start: O	1535.000 nm	Stop:	1575.000 nm) L U		0 0 0

2. Select the **General** tab.

General Thresholds Chan	nels Favorites	Calibration			
Default channel settings Activate default channel					
Channel width:	10	0.0 GHz	~	Snap to IT	'U grid
Signal power calculation:	Integrated sign	nal power	T		
Noise for OSNR:	Fixed range IE	C based	Ŧ		
OSNR distance:	5	0.0 GHz			
Noise region:		5.0 GHz			
Global analysis parameters					
Peak detection level:		-6	0.00	dBm	
RBW for OSNR:	0.100		•	nm	
Wavelength offset:		0.	.000	nm	
Power offset:		(0.00	dB ≈100.0%	Edit %
Bandwidth at:		2	0.00	dB	
				Restore De	faults
Import f	rom Trace			ОК	Cancel

3. Under **Default channel settings**, define the following parameters as needed:

General Thresholds Char	nnels Favorites Calibration	
Activate default channe	I	
Channel width:	100.0 GHz 👻	Snap to ITU grid
Signal power calculation:	Integrated signal power 👻	
Noise for OSNR:	Fixed range IEC based 🔹	
OSNR distance:	50.0 GHz	
Noise region:	5.0 GHz)
Global analysis parameters		
Peak detection level:	-60.00	dBm
RBW for OSNR:	0.100 -	nm
Wavelength offset:	0.000	nm
Power offset:	0.00	dB ≈100.0% Edit %
Bandwidth at:	20.00	dB
		Restore Defaults

Clear the Activate default channel selection, to use the currently defined channel for analysis. This reduces the analysis time by eliminating the peak detection over the complete spectral range. The peaks outside the defined channel list will not be analyzed.

 Channel width (GHz or nm): indicates the limit inside which the power values will be considered in the channel.

For default channels, the channel width that sets the limits of the channel, should be the same as the channel distance or smaller (channel distance is defined while creating a channel list). If the channel width is not compatible with the channel spacing, either a single peak may be found for two distinct channels and two analysis would be performed and displayed for that peak, or, it is possible that two peaks may be found within the same channel and be considered as one multi-peak signal. With this result, you can use markers to find the spacing between adjacent channels or to find the channel width.

- Snap to ITU Grid: When selected, each detected peak will be defined by the nearest ITU channel. The ITU grid is based on the selected channel width.
- Signal power calculation: indicates which calculation method to apply for signal power value.

Integrated signal power: The integrated signal power represents the sum of the power values included between the channel limits of this channel, minus the estimated noise contribution between the same boundaries. In some cases, for instance CATV signals, signals with high-frequency modulation, or signals with an inherent line width similar or larger than the OSA's resolution bandwidth, this calculation becomes a better estimation of the true signal power. *Peak signal power:* The peak signal power represents the maximum power value inside the channel. Note that it differs a little from the peak measurement on the spectrum due to the fact that the estimated noise is subtracted to get the peak signal power.

Total channel power: The total channel power represents the sum of the integrated signal power and of the noise within the channel.

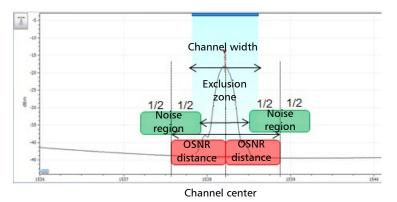
 Noise for OSNR: indicates which calculation method to use for OSNR value.

Fixed range IEC based (IEC): The IEC method uses the interpolation of noise measured on both sides of the signal to estimate the noise level. The position at which the noise is estimated from the center wavelength is given by the OSNR distance.

InBand (InB): The InBand method uses a series of scans having different polarization states to calculate the noise level under the peak (InBand).

InBand narrow filter (InB nf): The InBand narrow filter method uses additional processing to provide an accurate OSNR value for the narrow carved noise. This is because with narrow filters, the noise level under the peak is not uniform and the OSNR value depends on the processing width selected.

Fifth order polynomial fit (Fit): The fifth order polyfit method calculates the noise curve and thus the signal to noise ratio. The OSA will approximate the noise curve using a fifth order polynomial fit. This fit definition relies on fit and exclusion zones. Only the points in the fit zones are used to calculate the fifth order polynomial fit. If you select the fifth order polyfit method, you will have to define the fit and exclusion zones for your tests using the OSNR distance and noise region fields. The exclusion zone is indirectly obtained from the OSNR distance.



 OSNR distance (GHz or nm): Except for the fifth order polyfit selection, the OSNR distance is automatically set at the channel edge, that is, at half of the channel width from the center wavelength.

For the fifth order polyfit, the OSNR distance corresponds to the distance from the channel peak to the center of the fit zone. It is independent of the channel width.

 Noise region: The noise region, or fit zone, defines the region where the polynomial fit applies. Two identical regions are centered at the OSNR distance.

4.	Under Global analysis parameters, define the following parameters
	as needed:

General Thresholds Chan	nels Favorites Calibrati	on		
Default channel settings Activate default channel				
Channel width:	100.0 GHz	Ŧ	Snap to I	TU grid
Signal power calculation:	Integrated signal power	Ŧ		
Noise for OSNR:	Fixed range IEC based	Ŧ		
OSNR distance:	50.0 GHz			
Noise region:	5.0 GHz			
Global analysis parameters				
Peak detection level:		-60.00	dBm	
RBW for OSNR:	0.100	-	nm	
Wavelength offset:		0.000	nm	
Power offset:		0.00	dB ≈100.0%	Edit %
Bandwidth at:		20.00	dB	
			Restore D	efaults
Import f	rom Trace		ОК	Cancel

- Peak detection level (dBm): indicates the minimum power level from where the peak can be considered as a signal.
- RBW for OSNR (nm): indicates the resolution bandwidth selected for the OSNR calculation. This parameter is generally set to 0.1 nm to allow for a common basis of comparison between different OSAs having different effective resolutions. The instrument's RBW value is written below the graph. This parameter does not actually have an effect on the acquisition, but is only a normalization factor used to provide the OSNR value in a standardized manner.

Setting Up the Instrument in Drift Mode

Setting Up Drift Analysis Parameters

- Wavelength offset (nm): indicates the offset value applied on the wavelength. This does not replace a calibration performed at EXFO, but it can help you temporarily sharpen the specifications if you have determined that, for example, your modules are used beyond the normal allowed use. Entering a value in THz is not possible. When an offset is applied, it is indicated at the bottom of the graph (λ <>).
- ➤ Power offset (dB): indicates the offset value applied on the power. This does not replace a calibration performed at EXFO, but it can help you achieve the specifications if you have determined that, for example, your modules are used beyond the normal allowed use. When an offset is applied, it is indicated at the bottom of the graph (P ↔).

To edit the power offset as a tap percentage, press the **Edit %** button.

ower Offset	×
Edit percentage:	
100 % :	⊧0 dB
ОК	Cancel

The percentage value entered in **Edit percentage** will be converted to a corresponding equivalent value in dB.

- Bandwidth at (dB): Set the power level used, relative to the channel peak power, to compute the bandwidth.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Defining Default Channel Thresholds

The thresholds will be applied to any channel found outside the channel list during the next acquisition. Thresholds will be applied to the channel results during the next acquisition.

The application allows you to activate and deactivate the threshold functionality with a single control. When thresholds are globally enabled, the results are displayed with the Pass/Fail status based on various settings.

When thresholds are globally disabled, results are displayed without a Pass/Fail status in the **Channel Graph** and **Channel History** tabs.

Dashboard	Channel Graph	WDM Graph Chan	nel Results				
							Start
nm			C_001				Start
1547.2						13	
1546.8				_		50±	
1546.6							
1546.4							Open Save Fav.
dBm					Signal I	Power P(i)	Main Menu
-35						(+) [‡]	File 🕨
-40				_			
-45						 ‡	Custom Build
-50 -							
dB						OSNR	Discover
30							Preferences
20							
10							Analysis Setup
	04:40:00	04:50:00	05	:00:00	05:10:00		
Acquisition	Drift Settings	hannel History Tra	ce Info.		Ì	T	Mode ►
Item	Reference	Current Drift	Maximum	T Max.	Minimum	T Min.	
λ	1546.877 nm	0.054 nm	1546.931 nm	04:59:00	1546.877 nm	00:00:00	
Power	-41.97 dBm	-0.41 dB	-41.96 dBm	00:02:00	-42.39 dBm	04:57:00	
OSNR	23.23 dB	-0.80 dB	24.12 dB	04:09:00	22.07 dB	00:16:00	
			5				
						1	

When thresholds are globally disabled, the results in the **Channel Results** tab are also displayed without a Pass/Fail status.

Dashboard Channel Graph WDM	Graph Channel Results
Channel number	1 ^
Channel name	C_001
 Channel Results 	
Center wavelength	1546.931 nm ₌
Signal power	(i)-42.39 dBm
OSNR	22.43 dB
Noise	(IEC)-64.81 dBm
Bandwidth 3.00 dB	0.053 nm
Bandwidth 20.00 dB	0.352 nm
ENBW	0.033 nm
 Global Results 	
Ref. empty channel count	0
 Global Analysis Parameters 	
Peak detection level	-60.00 dBm
RBW for OSNR	0.100 nm +

You can set your pass/fail threshold limits in different ways depending on the type of test you are performing.

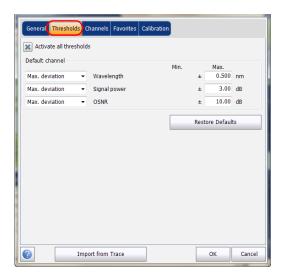
Threshold Limit	Definition
None	No threshold limit is set. The results will be displayed without a Pass/Fail verdict.
Min only	The threshold limit is set for a minimum value only. The Pass/Fail verdict is declared as Pass (in green), when the value is equal to or greater than the minimum threshold set. The verdict is declared as Fail (in red), when the value is below the minimum threshold set.
Max only	The threshold limit is set for a maximum value only. The Pass/Fail verdict is declared as Pass (in green), when the value is equal to or less than the maximum threshold set. The verdict is declared as Fail (in red), when the value is above the maximum threshold set.
Min and Max	The threshold limit is set for the minimum and maximum value. The Pass/Fail verdict is declared as Pass (in green), when the value is equal to or within the minimum and maximum thresholds set. The Pass/Fail verdict is declared as Fail (in red), when the value is beyond the minimum or maximum thresholds set.
Max. Deviation	The threshold limit is set for the deviation value. The Pass/Fail verdict is declared as Pass (in green), when the value is equal to or within the deviation threshold set. The Pass/Fail verdict is declared as Fail (in red), when the value is beyond deviation threshold set.

To define the default channel thresholds:

1. From the Main Menu, press Analysis Setup.

Dashboard Channel Graph WDM Graph Channel Results	Start
2- Add channels in Analysis Setup or use Pavorites - Add channels in Analysis Setup or use Pavorites - 20 4- Start a Drift measurement - 60 - 60 - 60 - 100	Custom Build Custom Build Preferences
Acquisition Drift Settings Channel History Trace Info.	Mode ►
Acquisition Type: Single Count: 1 Trial Scan Nulling	
Wavelength range Start: 1535.000 nm Stop: 1575.000 nm	
O E S C L C U	0 0 0

2. Select the Thresholds tab.



3. Select the **Activate all thresholds** option to manually set the channel threshold values. If this option is not selected, all the thresholds will be deactivated, results are displayed without a Pass/Fail status in the **Channel Graph**, **Channel History** and **Channel Results** tabs.

General Thresholds Ch	annels Favorites Calibration			
Activate all thresholds	\supset			
Default channel Max. deviation Max. deviation Max. deviation Max. deviation	Wavelength Signal power OSNR	Min. ± ±	Max. 0.500 3.00 10.00	dB
		Res	tore Defaul	ts
Impo	rt from Trace		ок	Cancel

- 4. Enter values in the boxes as explained below:
 - ► Wavelength/Frequency (nm/GHz): central wavelength/frequency of the channel.
 - Signal power (dBm): signal power for the selected channel (excludes noise).
 - OSNR (dB): Optical Signal to Noise Ratio, given by Signal power (according to the current calculation method, in dBm) minus Noise (according to the current calculation method, in dBm).
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Managing Channels

Testing DWDM systems involves characterizing multiple signals in a link. The application allows you to define channels using a channel editor or quickly generate them from the current data. You can also rapidly create a list of equally spaced channels. Once a channel list is created, you can modify it as needed. You can edit the analysis parameters for one channel or multiple channels.

While creating the channel list, some channels may overlap. When the channel widths are specified in nm, two channels are considered to be overlapping when more than 1.2 GHz (approximately) of frequency range is common between the two channels.

To add a channel list:

1. From the Main Menu, press Analysis Setup.

-60 -60 -100	Start Start Open Save Fav. Main Menu File Custom Build Discover Preferences Analysis Setup
Acquisition Drift Settings Channel History Trace Info.	Mode 🕨
Acquisition Type: Single V Count: 1 Trial Scan Nulling	
Wavelength range Start: 1535.000 nm Stop: 1575.000 nm 0 E S C L U	000

- **2.** Select the **Channels** tab.
- **3.** By default, the channel list is empty. Press **Add Channels**.

_		ħresho <mark>d</mark> s	Channels Favo	rites Calibration		
Cha	nnel list Name	λ (nm)	Channel Width	Signal Power	Noise for OSM	IR ^
	C 001	1546.877		Integrated signal power		
	C_002	1547.989		Integrated signal power	-	based
	C_003	1549.109		Integrated signal power	-	
	C_004	1550.243	100.0 GHz	Integrated signal power	Fixed range IEC b	based _
	C_005	1551.367	100.0 GHz	Integrated signal power	Fixed range IEC b	
	C_006	1552.487	100.0 GHz	Integrated signal power	Fixed range IEC b	based
	C_007	1553.619	100.0 GHz	Integrated signal power	Fixed range IEC b	based
	C_008	1554.761	100.0 GHz	Integrated signal power	Fixed range IEC b	based
	C_009	1555.893	100.0 GHz	Integrated signal power	Fixed range IEC b	based
	C_010	1557.017	100.0 GHz	Integrated signal power	Fixed range IEC b	based
	C_011	1558.157	100.0 GHz	Integrated signal power	Fixed range IEC b	pased
	C_012	1559.309	100.0 GHz	Integrated signal power	Fixed range IEC b	based
	C_013	1560.445	100.0 GHz	Integrated signal power	Fixed range IEC b	pased 📮
4						P.
	s	elect All		Unselect All	Delete	
			E	dit Selection	Add Channel	s
?]	Im	port from Trace		ОК	Cance

4. Enter values in the boxes as explained below:

Add channels Start range:	1528.773 nm
Stop range:	1560.606 nm
Channel center wavelength:	ITU 100 GHz
Channel distance:	100 🕝 GHz 🥑
Channel width:	100 🖌 GHz
Name prefix:	
Starting value:	1
Increment value:	1
	Restore Defaults
0	OK Cancel

- Start range (nm or THz): starting range of the channel list.
- Stop range (nm or THz): ending range of the channel list.
- Channel center wavelength/frequency: spectral center-of-mass for the peak in that channel.
- **Note:** When using the custom channel center wavelength option, the first channel will be centered at the Start Range, and the list will be created using channel distance and channel width.

- Channel distance (nm or GHz): distance between the channels. The value of channel distance will be set depending on the selection made for the channel center wavelength option. The channel distance box will be enabled only when the channel center wavelength option is set to custom.
- Channel width (nm or GHz): limit inside which the power values will be considered in the channel. Integrated power is calculated on channel width.
- > Name prefix: adds prefix to the channel names.
- Starting Value: increment starting value for the channel name in the channel list.
- Increment value: increment value for the channel name in the channel list.
- **5.** Press **OK** to return to the **Channels** window, which now lists the added channels.
- **Note:** When new channels are added, the Use Default thresholds will be applied to the channel parameters.
- **Note:** A warning message will be displayed if any channels are overlapping, but the analysis can still be performed on overlapping channels. If any duplicate channels are added, a confirmation message will be displayed to overwrite the existing channels with the duplicate channels.
 - **6.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.
- **Note:** The application displays a message if more than 1000 channels are added. You can exit the **Analysis Setup** window only after deleting the extra channels from the channel list. You can delete the channels manually as required.

To edit the parameters of a specific channel:

1. From the Main Menu, press Analysis Setup.

Drift measurement 0 1- Select the acqui 2- Add channels in	sition and Drift parameters Analysis Setup or use Fav to validate all parameters surement	prites	550 1600		Start Open Save Fav. Main Menu File Custom Build Discover Preferences Analysis Setup
Acquisition Drift Settings Cha	nnel History Trace Info.		J	,	Mode 🕨
Acquisition Type: Single	Count:	1 Trial	Scan	Nulling	
Wavelength range Start:	1535.000 nm	Stop: 1575.000	nm		
0	E	S (L	U	0 0 0

2. Select the **Channels** tab.

Ge	neral	Thresholds	Channel	s Fav	orites	Calibr	ation						
Cha	annel list			_			_						
	Name	λ (nm)	Channe	l Width		Signal	Power		No	oise fo	r OSM	٧R	-
	C_001	1546.877	10		Integ	rated	signal po		Fixed		IEC ł		
	C_002	1547.989	10	0.0 GHz	Integ	rated	signal po	wer	Fixed	range	IEC b	based	
	C_003	1549.109	10	0.0 GHz	Integ	rated	signal po	wer	Fixed	range	IEC b	based	
	C_004	1550.243	10	0.0 GHz	Integ	rated	signal po	wer	Fixed	range	IEC b	based	=
	C_005	1551.367	10	0.0 GHz	Integ	rated	signal po	wer	Fixed	range	IEC ł	pased	
	C_006	1552.487	10	0.0 GHz	Integ	rated	signal po	wer	Fixed	range	IEC ł	pased	
	C_007	1553.619	10	0.0 GHz	Integ	rated	signal po	wer	Fixed	range	IEC ł	pased	
	C_008	1554.761	10	0.0 GHz	Integ	rated	signal po	wer	Fixed	range	IEC b	based	
	C_009	1555.893	10	0.0 GHz	Integ	rated	signal po	wer	Fixed	range	IEC b	based	
	C_010	1557.017	10	0.0 GHz	Integ	rated	signal po	wer	Fixed	range	IEC ł	based	
	C_011	1558.157	10	0.0 GHz	Integ	rated	signal po	wer	Fixed	range	IEC ł	based	
	C_012	1559.309	10	0.0 GHz	Integ	rated	signal po	wer	Fixed	range	IEC ł	pased	
	C_013	1560.445	10	0.0 GHz	Integ	rated	signal po	wer	Fixed	range	IEC b	pased	Ŧ
۲												÷	
		Select All			Unsel	ect All				Del	ete		
				I	Edit Sel	ection			Ad	ld Cha	nnel	s	
?	1	Im	port fror	n Trace	,	1				ОК		Car	ncel

3. Select the channel or channels to be modified in the channel list.

If you want the changes to be applied to all of your channels, press **Select All**. Channels can be selected one by one or all together. You can press **Unselect All** to clear all channel selections. To delete the selected channels, press **Delete**.

4. Press Edit Selection.

Genera		hresholds	Channels Favo	rites Calibration		
Channe			al bucht	<i>c</i> : 10	N : (0500	
	me	λ (nm)	Channel Width	Signal Power	Noise for OSNR	Â.
	001	1546.877		Integrated signal power	Fixed range IEC based	
C_	002	1547.989	100.0 GHz	Integrated signal power	Fixed range IEC based	
C_(003	1549.109	100.0 GHz	Integrated signal power	Fixed range IEC based	
C_(004	1550.243	100.0 GHz	Integrated signal power	Fixed range IEC based	=
C_(005	1551.367	100.0 GHz	Integrated signal power	Fixed range IEC based	
C_	006	1552.487	100.0 GHz	Integrated signal power	Fixed range IEC based	
C_	007	1553.619	100.0 GHz	Integrated signal power	Fixed range IEC based	
C_	008	1554.761	100.0 GHz	Integrated signal power	Fixed range IEC based	
C_(009	1555.893	100.0 GHz	Integrated signal power	Fixed range IEC based	
C_(010	1557.017	100.0 GHz	Integrated signal power	Fixed range IEC based	
C_(011	1558.157	100.0 GHz	Integrated signal power	Fixed range IEC based	
C_(012	1559.309	100.0 GHz	Integrated signal power	Fixed range IEC based	
	013	1560.445	100.0 GHz	Integrated signal power	Fixed range IEC based	
٠ [Þ	
	s	elect All		Unselect All	Delete	
			E	dit Selection	Add Channels	
?		Im	port from Trace		OK Car	ncel

Setting Up the Instrument in Drift Mode

Setting Up Drift Analysis Parameters

5. Modify the settings as needed. For more information about the settings, see Managing Channels *on page 123*. If you leave a box empty, it will remain as it was before your changes. Modify appropriate settings.

inalysis						
Channel width:		1	00.0 GHz	~		
Signal power calci	ulation:	Integrated sig	nal power	~		
Noise for OSNR:		Fixed range IE	C based	~		
OSNR distance:	[50.0 GHz			
Noise region:			5.0 GHz			
Noise region:			5.0 GHz		Rest	tore Defaults
			5.0 GHz	Min.	Rest	
Noise region: Thresholds Use default	v Wa	velength	5.0 GHz	Min.	Mai	
Thresholds		velength nal power	5.0 GHz	Min.	Ma: 0.	x

- **6.** Press **OK** to return to the **Channels** tab, which now contains the modified settings.
- **7.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Before performing your test, you must set the acquisition type and parameters from the **Acquisition** tab and other parameters from the **Drift Settings** tab.

There are three types of acquisitions in Drift mode: single, averaging and InBand.

- Single: Spectral measurement is performed once. The results are displayed according to this measurement.
- Averaging: Spectral measurements are performed based on the number of scans that you have entered for this parameter. The trace will be displayed after each acquisition and averaged with the previous traces.
- InBand: The InBand type acquisition will perform a series of scans in different polarization conditions in order to enable the InBand OSNR calculation.

Note: The InBand option is available only if the module supports it.

Before performing measurements on an optical spectrum, you must select the wavelength/frequency range to use. You can perform the scan on the full range, on spectral bands, or select a custom range.

Note: The shorter the wavelength or frequency range, the faster the acquisition.

You can configure the delay, sampling and total duration for a drift measurement. You can also configure the drift files name and select a location where it should be saved.

The application allows you to perform a trial scan while setting up the drift measurement.

To set parameters in the Acquisition tab:

1. From the main window, select the **Acquisition** tab.

Dashboard Channel Graph WDM Graph Channel Results		Start
Drin mesourement insolucions 0 1. Select the acquisition and Drift parameters 2. Add channels in Analysis Setup or use Favorites 3. Make a trial scan to validate all parameters 4.20 4. Start a Drift mesourement	2 8 7	Open Save Fav.
		File Custom Build
		Discover
-100 1250 1300 1350 1400 1450 1500 1550 1600 nm	¥ ∭	Preferences Analysis Setup
Acquisition Drift Settings Channel History Trace Info.		Mode 🕨
Acquisition Type: Single Count: 1 Trial Scan Nulling	,	
Wavelength range Start: 1535.000 nm Stop: 1575.000 nm		
0 E S C conduction U		0 0 0

2. Select the acquisition type.



3. If you are performing an averaging type acquisition, enter the number of scans the unit will perform.

If you are performing an InBand type acquisition, either enter the number of scans or select a predefined number of scans the unit will perform.

- **Note:** You cannot modify the number of scans count value if you are performing a single acquisition.
 - 4. Select the wavelength range for your acquisition.

Acquisiti	on Drift Setti	ngs Char	nel History	Trace Info.				U	Mode
Acquisiti Type:	on Single	•	Count:		1	Trial Sc	an	Nulling	
Waveler	igth range	Start:	1535.000	nm	Stop:	1575.000 n	im		
	0			E	S	c	L	U	00

You can select the wavelength range by entering the start and stop values or by selecting a range on the double slider.

To select the wavelength range using the double slider, move the left and right handles on the double slider or simply click on any band.

Note: You can select more than one adjoining ranges to include in your range, for example, S + C.

Setting Up the Instrument in Drift Mode

Setting Up Acquisition Parameters

The wavelength range covered within these bands of the spectra are listed below.

- ▶ O band (original): 1255 to 1365 nm
- ► E band (extended): 1355 to 1465 nm
- ► S band (short wavelengths): 1455 to 1535 nm
- ► C band (conventional "erbium window"): 1525 to 1570 nm
- ► L band (long wavelengths): 1560 to 1630 nm
- ▶ U band (ultralong wavelengths): 1620 to 1650 nm.

To set parameters in the Drift Settings tab:

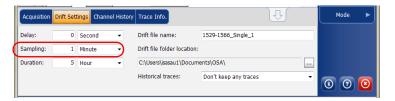
1. From the main window, select the **Drift Settings** tab.

Acquisition	Drift Set		nel History	Trace Info.	Û		Mode 🕨
Delay:	0	Second	•	Drift file name:	1529-1566_Single_1		
Sampling:	1	Minute	•	Drift file folder location:			
Duration:	5	Hour	•	C:\Users\isasau1\Docum	ents\OSA\		
				Historical traces:	Don't keep any traces	•	000
				Historical traces:	Don't keep any traces	•	000

2. Set a delay unit and count before taking the first acquisition in a drift measurement. The application will wait for this time before taking the first acquisition of a drift measurement.



3. Select a sampling unit and enter a sampling count to configure a time that should be elapsed between the start of each acquisition during a drift measurement.



4. Select a duration unit and enter a duration count to configure the total duration of a drift measurement.

Acquisition	Drift Set	tings Channe	el History	Trace Info.	Ŷ		Mode 🕨
Delay:	0	Second	•	Drift file name:	1529-1566_Single_1		
Sampling:	1	Minute	•	Drift file folder location:			
Duration:	5	Hour	•	C:\Users\isasau1\Documents\OSA\			
				Historical traces:	Don't keep any traces	•	000

5. Enter a drift file name that should be used to save the drift file.

Note: This is not available in offline mode.

Acquisition	Drift Settings	Channel Histo	ory Trace Info.			Û	Mode	►
Delay:	0 Sec	ond 👻	Drift file nan	ne:	1529-1566_Single_1			
Sampling:	1 Minu	ute 🔻	Drift file fold	ler location:				
Duration:	5 Hou	r 🔹	C:\Users\isas	au1\Docum	ents\OSA\			
			Historical tra	ices:	Don't keep any traces	•	00	8

6. Select a location where the drift file should be saved.

Delay:	0	Second	-	Drift file name:	1529-1566 Single 1	
		Second				
Sampling:	1	Minute	•	Drift file folder locati	on:	
Duration:	5	Hour	-	C:\Users\isasau1\Doc	uments\OSA\	

7. Select whether you want to keep all of the historical traces in the subfolder, keep only the significant ones, or keep none. The historical traces are stored in separate *.osawdm files.

A significant event is when

- a value from a given channel has crossed its threshold (going from pass to fail).
- ► there is no signal power in a given channel.

These historical files are stored in a dedicated folder having the same name as the associated drift measurement file name.

Note: You can have a maximum of 3 significant traces per channel.

Note: This option is not available in offline mode.

Acquisition	Drift Set	tings Chan	nel History	Trace Info.		<u>₽</u>	м	lode	►
Delay:	0	Second	•	Drift file name:	1529-1566_Single_1				
Sampling:	1	Minute	•	Drift file folder location:					
Duration:	5	Hour	•	C:\Users\isasau1\Docum	ents\OSA\				
			(Historical traces:	Don't keep any traces				
							$\mathbf{\Theta}$	0	8

8. To test your parameters, return to the **Acquisition** tab. Press **Trial Scan** to perform a trial acquisition.

Acquisitio	on Drift Setting	is Char	inel History Trace Info.			0		Mode
Acquisitio Type:	Single	·	Count:	(Trial Scan	\supset	Nulling	
Wavelen	gth range	Start:	1535.000 nm	Stop:	1575.000 nm			
	0		E	S	c	L	U	00

When a trial acquisition is running, the **Start** button is disabled. You are notified that the acquisition is in progress in the status bar.

The trial scan is performed using the analysis setup parameters. When the acquisition is complete, the resulting acquisition is displayed in the **WDM Graph** tab and **Channel Results** tab. The **Channel History** tab displays results as if only time 0:00 was available. The other drift mode tabs are empty (**Dashboard**, **Channel Graph**).

Building a Custom Drift Measurement

You can build a drift measurement using a WDM measurement you already have as a reference. The selected channels and thresholds can be imported from the analysis setup or the reference measurement.

A custom drift measurement is particularly useful for offline processing of your data over time and comparing result variations.

The WDM measurements you add must meet specific criteria to be included in the custom build. The table below describes those compatibility criteria.

Note: Files that are not compatible will automatically be rejected from the custom build measurement.

Criteria	Test	Compatibility Status
Acquisition type	Target WDM measurement acquisition type differs from drift reference trace acquisition type	Compatible with warnings
Acquisition number of scans	Target WDM measurement acquisition number of scans differs from drift reference trace acquisition number of scans.	Compatible with warnings
Spectral range	 Target WDM measurement acquisition spectral range only partially overlaps spectral range of drift reference trace. 	 Compatible with warnings
	 There is no overlap between target WDM measurement spectral range and drift reference trace spectral range. 	➤ Incompatible

Setting Up the Instrument in Drift Mode

Building a Custom Drift Measurement

Criteria	Test	Compatibility Status
Acquisition start time	 Target WDM measurement acquisition start time is identical to another WDM measurement (including the drift reference trace) acquisition time. 	 Compatible with warnings
	 Target WDM measurement acquisition start time overlaps with another WDM measurement (including the drift reference trace) acquisition time range. 	➤ Incompatible
Calibration type (user/factory)	Target WDM measurement instrument's calibration type differs from drift reference trace instrument's calibration type.	Compatible with warnings
Calibration date	Target WDM measurement instrument's calibration date differs from drift reference trace instrument's calibration date	Compatible with warnings
Instrument's model	Target WDM measurement instrument's model differs from drift reference trace instrument's model	Compatible with warnings
Instrument's serial number	Target WDM measurement instrument's serial number differs from drift reference trace instrument's serial number	Compatible with warnings
Instrument's RBW	Target WDM measurement instrument's RBW differs from drift reference trace instrument's RBW	Compatible with warnings

Setting Up the Instrument in Drift Mode

Building a Custom Drift Measurement

Criteria	Test	Compatibility Status
Power offset	Target WDM measurement power offset differs from drift reference trace power offset	Compatible with warnings
Wavelength offset	Target WDM measurement wavelength offset differs from drift reference trace wavelength offset	Compatible with warnings
Noise measurement	Target WDM measurement acquired trace data does not support configured noise measurement analysis parameter. (This criteria is specific for In-Band noise measurement against IEC acquired data)	Compatible with warnings

To build a custom drift measurement:

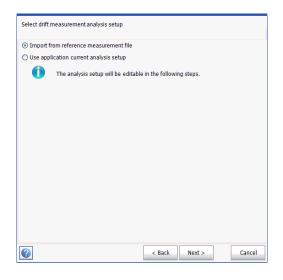
- **1.** If you have not done so already, select the Drift test mode.
- 2. From the main window, select **Custom Build**.
- **3.** Select the reference trace you want to use to build the measurement, then click **Next**.

Select the WDM measurement file containin	g the reference trace	
F:\WDM System 10G 40G ROADM.osawdm		
2	< Back Next >	Cancel

Setting Up the Instrument in Drift Mode

Building a Custom Drift Measurement

4. Select whether you want to import the analysis setup from the selected reference file, or use the settings currently set in your application, then click **Next**.



5. Enter, or review if they were imported, the general details for your measurement. See *Defining General Settings* on page 109 for details on each item.

Default channel settings Activate default channel	91
Channel width:	50.0 GHz 🗸 Snap to ITU grid
Signal power calculation:	Integrated signal power
Noise for OSNR:	InBand narrow filter
OSNR distance:	GHz
Noise region:	GHz
Global analysis parameters	
Peak detection level:	-35.00 dBm
RBW for OSNR:	Instrument's RBW
Bandwidth at:	20.00 dB
	Restore Defaults
	L

6. Click Next.

7. If desired, adjust the threshold settings for your measurement. For details on each item, see *Defining Default Channel Thresholds* on page 117. When you are done, click **Next**.

Adjust analysis setup three	shold parameters			
X Activate all threshold	s			
Default channel Max. deviation Min. and max. Min. and max.	Wavelength Signal power OSNR	Min. -45.00 5.00	15	020 nm .00 dBm .00 dB
			Restore De	faults
		< Back N	lext >	Cancel

8. Select which channels are to be included in the drift measurement. For details on each item, see *Managing Channels* on page 123. When you are done, click **Next**.

	nnel list Name		Channel Width	OSNR Distance	Signal Power	Noise
**		λ (nm)				
*	C_001	1531.117	50.0 GHz	25.0 GHz		
×	C_002		50.0 GHz	25.0 GHz		
	-	1534.262	50.0 GHz	25.0 GHz	Integrated signal power	InBand
	C_004	1535.818	50.0 GHz	25.0 GHz	Integrated signal power	InBand
×	C_005	1537.002	50.0 GHz	25.0 GHz	Integrated signal power	InBand
×	C_006	1537.402	50.0 GHz	25.0 GHz	Integrated signal power	InBand
×	C_007	1537.797	50.0 GHz	25.0 GHz	Integrated signal power	InBand
	C_008	1538.184	50.0 GHz	25.0 GHz	Integrated signal power	InBand
×	C_009	1538.589	50.0 GHz	25.0 GHz	Integrated signal power	InBand
×	C_010	1538.976	50.0 GHz	25.0 GHz	Integrated signal power	InBand
	C_011	1539.373	50.0 GHz	25.0 GHz	Integrated signal power	InBand
	C_012	1539.784	50.0 GHz	25.0 GHz	Integrated signal power	InBand
	C_013	1540.559	50.0 GHz	25.0 GHz	Integrated signal power	InBand N
< (>
	s	elect All		Unselect All	Delete	
			E	dit Selection	Add Chann	els

9. Add one or more measurement files at this point, then click **Next**.

	Clear	Remove	Add	
1		Ш		>
	1			
5		A\1529-1566_Single_2\1529-1		
5		A\1529-1566 Single_2\1529-1 A\1529-1566 Single 2\1529-1		
0		A\1529-1566_Single_2\1529-1 A\1529-1566_Single_2\1529-1		
2		A\1529-1566_Single_2\1529-1		
1		A\1432-1542_Single_1REF.osa		
	D.(100ib0x(0sel Files(05)	A(1529-1500_5mgle_2(1529-1	500_5ingle_2 0000000000	JUS
2	Dul TeolRow User Files (OF	A\1529-1566 Single 2\1529-1	Fee Cingle 2 0000d00b00m0	0.04

10. Before starting the measurement process, you can select what to do with the historical traces (keep them all, keep only the significant ones, or keep none), set the drift file name and its location.

Historical traces:	Keep significant traces	~
Drift file name:	1520-1570_InBand_199_1	
Drift file folder location	1:	
D:\ToolBox\User Files	OSA\	

11. Once you are ready, click **Build**.

Once the process is complete, you can navigate through the results of the built drift.

7 Setting Up the Instrument in DFB Mode

Before performing a spectral analysis in the DFB mode, you must set up your OSA module and the test application with the appropriate parameters, as explained in this chapter.

Select the DFB test mode as explained in *Selecting a Test Mode* on page 20 before setting up the DFB test parameters.

- ➤ The *preferences* are the result displayed in the graph and tables, as well as the job information and related comments saved with each file.
- ➤ The *acquisition parameters* include the type of measurement you want to perform and the wavelength range.

See *Defining Preferences* on page 150 and *Setting Up Acquisition Parameters* on page 160 for more details.

The preferences window allows you to set general information and comments on trace and set display parameters.

Note: In offline mode, only the **Display** tab is available.

Defining Trace Information

The trace information relates to the description of the job to be done, cable and job IDs, and any relevant information about what is being tested.

To enter general information:

1. From the Main Menu, press Preferences.

DFB Graph		
DFB measurement instructions		Start
1 - Select the acquisition parameters 2 - Start an acquisition	6	
3- Save results and trace to file	SM	Open Save Fav. Main Menu
F -40-		File 🕨
ę		Preferences
-60 -		Analysis Setup
-80 -		Mode ►
-100		
Acquisition Results Trace Info.		
Acquisition Type: Single Count: 1 Nulling		
Wavelength range Start: 1529.000 nm Stop: 1566.000 nm		
		0 0 0

2. Select the General tab.

General	Comments	Display	File Name		
General Job ID:	My J	lob]
Cable ID:	12_3	334			
Fiber ID:					
Customer:	You	r Customer			
Company:					
Operator:	You				
Maintenance reason:					
L				C	ear
0				ОК	Cancel

- **3.** Define the general parameters as needed.
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press Clear to clear all the changes made in the General tab.

To enter link and location information:

- DFB Graph Star ₩. 10 2 P 72 * 0 -Sm Open Save Fav -10 -Main Menu -20 File 튭 -30· Preferences. -40 • -50 anaivsis Setup NΛ λλλλλλλλλλλλλλλλ -60 <u>e</u>t Mode Þ 1530 1535 1540 1520 1525 nm RBW (nm) 0.033 Results Trace Info. Acquisition Acquisition Type: Single - Count: Nulling Wavelength range 1570.000 nm Start: 1525.000 nm Stop: 0 0 0 F
- 1. From the Main Menu, press Preferences.

2. Select the **Information** tab.

General Information Com	ments Display File Name	
- System and link information -		
Link ID prefix:	DF	
Starting value:	1	
	🗙 Auto increment	
Orientation:	Southbound 💌	
System:		
-Location information		
Network element:	Transmitter	
Test point:	Input 🖌	
Description:		
		Restore Defaults
		OK Cancel

- **3.** Under **System and link information**, define the following parameters as needed:
 - Link ID prefix: prefix value for the link ID. You can enter any alphanumeric value.
 - > Starting value: suffix increment starting value for the link ID.

This value is incremented each time a new file is saved provided the **Auto Increment** option is selected.



IMPORTANT

If the Auto Increment option is not selected, you have to manually change the file name when saving the trace file, otherwise the application will overwrite the previously saved file.

- > Orientation: orientation of the link.
- > System: information about the system under test.
- **4.** Under **Location Information**, define the following parameters as needed:
 - > Network element: type of network element.
 - > Test point: where the test is performed on the link.
 - > Description: Enter the description of location if required.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

To enter comments:

- DFB Graph Start ₩ 10 2 H 1 0 Open Save Fav. SM -10 Main Menu -20 **!** File E -30 Preferences.. -40 **.** -50 Μλλαλαλαλαλαλαλαλα Analysis Setup.. -60 <u>e</u>t Mode 1530 1535 1540 1520 1525 nm RBW (nm) 0.033 Results Acquisition Acquisition Type: Single - Count: Nulling Wavelength range Start: 1525.000 nm Stop: 1570.000 nm 0 0 0 U E 4/26/2013 11:03 AM ×Ö
- **1.** From the **Main Menu**, press **Preferences**.

2. Select the **Comments** tab.

General	Information	Comments Di	isplay	File Name			
Your com	ments here.						_
						Clear	
						Great	
0					ОК	Ca	ncel

- **3.** Enter your comments for the current trace.
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

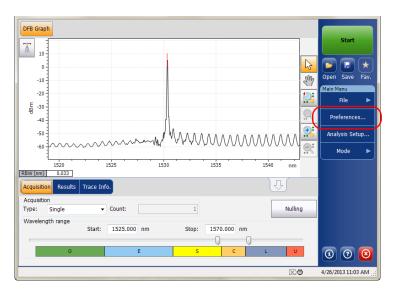
Press **Clear** to clear all the changes made in the **Comments** tab.

Defining Display Parameters

The application allows you to set display settings for the acquisition trace. You can set the spectral unit for the trace and the results table.

To define display parameters:

1. From the Main Menu, press Preferences.



2. Select the **Display** tab.

General	Information	Comment	s Display File Name			
General Spectral (unit:		nm	~]	
Horizonta	I markers:		Show	~		
Graph col	or scheme:		White background	~		
				R	lestore Defaul	ts
2					ОК	Cancel

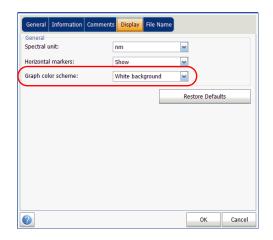
3. Select the spectral unit you want to work with, either nm or THz.

General Information Comment	ts Display File Name	
General		
Spectral unit:	nm 💌	
Horizontal markers:	Show	
Graph color scheme:	White background	
	Restore Defaults	
	OK Cano	el

4. Select whether you want to show the horizontal markers or the integrated power in the marker toolbar.

General Information Comment	s Display File Name
General Spectral unit:	nm
Horizontal markers:	Show
Graph color scheme:	White background
	Restore Defaults
	1
	OK Cancel

5. Select the background color scheme for the graph as desired.



6. Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Setting Up Acquisition Parameters

Before performing your test, you must set the acquisition type and parameters.

There are three types of acquisitions in DFB mode:

- Single: Spectral measurement is performed once. The results are displayed according to this measurement.
- Averaging: Spectral measurements are performed based on the number of scans that you have entered for this parameter. The trace will be displayed after each acquisition and averaged with the previous traces.
- Real-Time: In real-time acquisition, spectral measurements are performed continuously until you press Stop. No averaging is done for spectral measurements. The graph and results are refreshed after each acquisition.

Before performing measurements on an optical spectrum, you must select the wavelength/frequency range to use. You can perform the scan on the full range, on spectral bands, or select a custom range.

- **Note:** The shorter the wavelength or frequency range, the faster the acquisition.
- **Note:** The Acquisition tab is not available in offline mode.

(

nm

Nulling

1540

Setting Up Acquisition Parameters

Fav

File

Analysis Setup..

Mode

0 0 0

To set parameters in the Acquisition tab:

DFB Graph

1530

1535

1570.000 nm

1. From the main window, select the **Acquisition** tab.

2. Select the acquisition type.

Start:

1525

- Count:

1525.000 nm

-20

-50

-60

RBW (nm)

Type: Single Wavelength range

Acquisition

1520

0.033 Results

문 -30 -40

Acquisit	ion	_				
Type:	Single	- Count:	1		Nulling	
Waveler	ngth range					_
		tart: 1525.000 nn	n Stop:	1570.000 nm		
						-
_				<u> </u>		

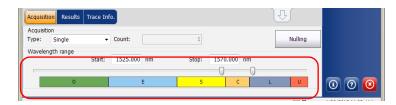
Stop:

- **3.** If you are performing an averaging-type acquisition, enter the number of scans the unit will perform.
- **Note:** You cannot modify the number of scans count value if you are performing a single or real-time acquisition.

Setting Up the Instrument in DFB Mode

Setting Up Acquisition Parameters

4. Select the wavelength range for your acquisition.



You can select the wavelength range by entering the start and stop values or by selecting a range on the double slider.

To select the wavelength range using the double slider, move the left and right handles on the double slider or simply click on any band.

Note: You can select more than one adjoining ranges to include in your range, for example, S + C.

The wavelength range covered within these bands of the spectra are listed below.

- ▶ O band (original): 1255 to 1365 nm
- ► E band (extended): 1355 to 1465 nm
- ► S band (short wavelengths): 1455 to 1535 nm
- ► C band (conventional "erbium window"): 1525 to 1570 nm
- ► L band (long wavelengths): 1560 to 1630 nm
- ▶ U band (ultralong wavelengths): 1620 to 1650 nm.

8 Setting Up the Instrument in FP Mode

Before performing a spectral analysis in the FP mode, you must set up your OSA module and the test application with the appropriate parameters, as explained in this chapter.

Select the FP test mode as explained in *Selecting a Test Mode* on page 20 before setting up the FP test parameters.

- ➤ The *preferences* are the result displayed in the graph and tables, as well as the job information and related comments saved with each file.
- The acquisition parameters include the measurement you want to perform and the wavelength range.

See *Defining Preferences* on page 164 and *Setting Up Acquisition Parameters* on page 173 for more details.

The preferences window allows you to set general information and comments on trace and set display parameters.

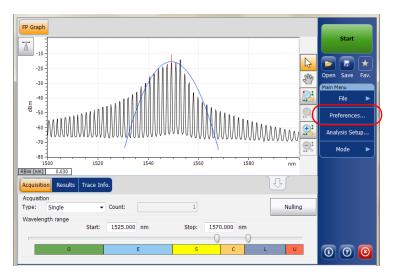
Note: In offline more, only the **Display** tab is available.

Defining Trace Information

The trace information relates to the description of the job to be done, cable and job IDs, and any relevant information about what is being tested.

To enter general information:

1. From the Main Menu, press Preferences.



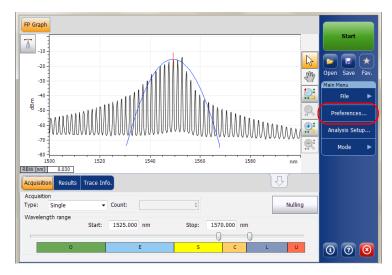
2. Select the **General** tab.

General	Comments	Display	File Name		
General Job ID:	My .	Job			
Cable ID:	12_	334			
Fiber ID:					
Customer:	You	ir Custome	r		
Company:					
Operator:	You	I			
Maintenance reason:					
				C	ear
0				ОК	Cancel

- **3.** Define the general parameters as needed.
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press Clear to clear all the changes made in the General tab.

To enter link and location information:



1. From the Main Menu, press Preferences.

2. Select the **Information** tab.

General Information Com	ments Display File Name	
- System and link information -		
Link ID prefix:	DF	
Starting value:	1	
	🗙 Auto increment	
Orientation:	Southbound	
System:		
Location information		
Network element:	Transmitter 🖌	
Test point:	Input	
Description:		
	Restore Defaul	ts
	ОК	Cancel

- **3.** Under **System and link information**, define the following parameters as needed:
 - Link ID prefix: prefix value for the link ID. You can enter any alphanumeric value.
 - > Starting value: suffix increment starting value for the link ID.

This value is incremented each time a new file is saved provided the **Auto Increment** option is selected.



IMPORTANT

If the Auto Increment option is not selected, you have to manually change the file name when saving the trace file, otherwise the application will overwrite the previously saved file.

- > Orientation: orientation of the link.
- > System: information about the system under test.
- **4.** Under **Location Information**, define the following parameters as needed:
 - > Network element: type of network element.
 - > Test point: where the test is performed on the link.
 - > Description: Enter the description of location if required.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

To enter comments:



1. From the **Main Menu**, press **Preferences**.

2. Select the Comments tab.

General	Information	Comments	Display	File Name			
Your com	ments here.						^
						Clear	
?					ОК	Canc	el

- **3.** Enter your comments for the current trace.
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Clear** to clear all the changes made in the **Comments** tab.

Defining Display Parameters

The application allows you to set display settings for the acquisition trace. You can set the spectral unit for the trace and the results table.

To define display parameters:

1. From the Main Menu, press Preferences.



2. Select the **Display** tab.

	nments Display File Name
General Spectral unit:	nm
Horizontal markers:	Show
Graph color scheme:	White background
	Restore Defaults
2	OK Cancel

3. Select the spectral unit you want to work with, either nm or THz.

General Information Commer	Its Display File Name	
General Spectral unit:	nm	
Horizontal markers:	Show	~
Graph color scheme:	White background	M
		Restore Defaults
2		OK Cancel

Setting Up the Instrument in FP Mode

4. Select whether you want to show the horizontal markers or the integrated power trace in the marker toolbar.

General	Information	Comments	Display File Na	ame
General Spectral u	ınit:	ſ	nm	
Horizonta	I markers:	[Show	
Graph col	or scheme:	[White background	~
				Restore Defaults
2				OK Cancel

5. Select the background color scheme for the graph as desired.

General Information Comment	s Display File Name
General Spectral unit:	nm
Horizontal markers:	Show
Graph color scheme:	White background
	Restore Defaults
0	OK Cancel

6. Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Setting Up Acquisition Parameters

Before performing your test, you must set the acquisition type and parameters.

There are three types of acquisitions in FP mode:

- Single: Spectral measurement is performed once. The results are displayed according to this measurement.
- Averaging: Spectral measurements are performed based on the number of scans that you have entered for this parameter. The trace will be displayed after each acquisition and averaged with the previous traces.
- Real-Time: In real-time acquisition, spectral measurements are performed continuously until you press Stop. No averaging is done for spectral measurements. The graph and results are refreshed after each acquisition.

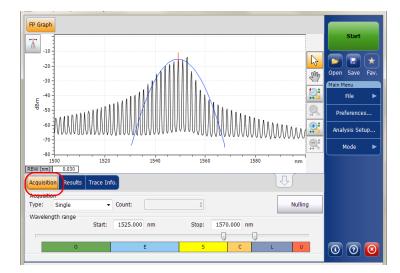
Before performing measurements on an optical spectrum, you must select the wavelength/frequency range to use. You can perform the scan on the full range, on spectral bands, or select a custom range.

Note: The shorter the wavelength or frequency range, the faster the acquisition.

Note: The Acquisition tab is not available in offline mode.

Setting Up Acquisition Parameters

To set parameters in the Acquisition tab:



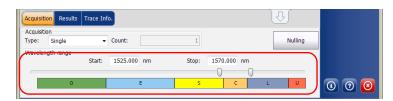
1. From the main window, select the **Acquisition** tab.

2. Select the acquisition type.



- **3.** If you are performing an averaging type acquisition, enter the number of scans the unit will perform.
- **Note:** You cannot modify the number of scans count value if you are performing a single or real-time acquisition.

- Setting Up Acquisition Parameters
- **4.** Select the wavelength range for your acquisition.



You can select the wavelength range by entering the start and stop values or by selecting a range on the double slider.

To select the wavelength range using the double slider, move the left and right handles on the double slider or simply click on any band.

Note: You can select more than one adjoining ranges to include in your range, for example, S + C.

The wavelength range covered within these bands of the spectra are listed below.

- ▶ O band (original): 1255 to 1365 nm
- ► E band (extended): 1355 to 1465 nm
- ► S band (short wavelengths): 1455 to 1535 nm
- ► C band (conventional "erbium window"): 1525 to 1570 nm
- ► L band (long wavelengths): 1560 to 1630 nm
- ▶ U band (ultralong wavelengths): 1620 to 1650 nm.

Before performing a spectral analysis in the Spectral Transmittance mode, you must set up your OSA module and the test application with the appropriate parameters, as explained in this chapter.

Select the Spectral Transmittance test mode as explained in *Selecting a Test Mode* on page 20 before setting up the test parameters.

- ➤ The *preferences* are the result displayed in the graph and tables, as well as the job information and related comments saved with each file.
- ► The *analysis parameters* include the channel details, the nominal wavelength or frequency and the input and output offset values.
- The *acquisition parameters* include the type of measurement you want to perform and the wavelength range.

See *Defining Preferences* on page 178, *Setting Up Spectral Transmittance Analysis Parameters* on page 187 and *Setting Up Acquisition Parameters* on page 195 for more details.

The preferences window allows you to set general information and comments on trace and set display parameters.

Note: In offline mode, only the **Display** tab is available.

Defining Trace Information

The trace information relates to the description of the job to be done, cable and job IDs, and any relevant information about what is being tested.

To enter general information:

1. From the Main Menu, press Preferences.

ST	iraph	ST Results										
Τ.	20 -	Spectral Tra	insmittai	nce measur	rementinstru	ctions					Sta	rt
	0 -	1- Select the 2- Select In 3- Start an	put butt	on in Acquis	eters sition tab					6	Open Sav	e Fav.
	-20 -	4- Select Or 5- Start an	utput bu acquisiti	ton in Acqu on						Sm	Main Menu	
		- 6- Save res	ults and	traces to fi	le						File	►
Бар	-40 -	-								9 ,	Swap T	races
	-60 -	-								B	Preferer	ices
	-80 -	-								<u>⊜</u> ‡	Analysis	Setup
	-100 -										Mode	►
Acqu	12 Jisition	250 130 Results T	10 Trace Inf	1350	1400	1450	1500	1550	1600 nn	1		
	uisition		_]						
Туре		Single	~	Count:		1	Input	Output	Nullin	9		
Wav	elengt	th range	Start:	1529.00	0 nm	Stop:	1566.000	nm				
			o tarti	10201001		5009.				-		
		0			E	S	Ť	Ť	L U		6	

2. Select the General tab.

General Information	Comments	Display	File Name		
General Job ID:	Му	Job			
Cable ID:	12_	334			
Fiber ID:					
Customer:	You	ir Custome	r		
Company:					
Operator:	You	l			
Maintenance reason:					
				C	lear
0				ОК	Cancel

- 3. Define the general parameters as needed.
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press Clear to clear all the changes made in the General tab.

Defining Preferences

To enter link and location information:

1. From the **Main Menu**, press **Preferences**.

ST Graph ST Results			
20 Spectral Transmittance measurement instructions			Start
1 - Select the acquisition parameters 2 - Select Input button in Acquisition tab 3 - Start an acquisition		B	Open Save Fav.
3- Start and acquisition 4- Select Output button in Acquisition tab 20 - 5- Start an acquisition 4- 6- Save results and traces to file		Sm	Main Menu
		2	File ►
특 -40- 명 - -50-			Swap Traces
			Preferences Analysis Setup
-80 -		<u>®</u> ‡	Mode ►
-100	1600 nm	ł	
Acquisition Results Trace Info.	U		
Type: Single Count: 1 Input Output	Nulling		
Wavelength range Start: 1529.000 nm Stop: 1566.000 nm			
0 E 5 C L	U		000

2. Select the **Information** tab.

General Information O	mments Display File Name
System and link information	
Link ID prefix:	DF
Starting value:	1
	X Auto increment
Orientation:	Southbound
System:	
Location information	
Network element:	Transmitter
Test point:	Input
Description:	
	Restore Defaults
?	OK Cancel

Defining Preferences

- **3.** Under **System and link information**, define the following parameters as needed:
 - Link ID prefix: prefix value for the link ID. You can enter any alphanumeric value.
 - Starting value: suffix increment starting value for the link ID.

This value is incremented each time a new file is saved provided the **Auto Increment** option is selected.



IMPORTANT

If the Auto Increment option is not selected, you have to manually change the file name when saving the trace file, otherwise the application will overwrite the previously saved file.

- > Orientation: orientation of the link.
- > System: information on the system under test.
- **4.** Under **Location Information**, define the following parameters as needed:
 - > Network element: network element type.
 - > Test point: where the test is performed on the link.
 - > Description: a description of the location, if required.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Defining Preferences

To enter comments:

1. From the Main Menu, press Preferences.

ST Graph ST Results	
20 Spectral Transmittance measurement instructions	Start
0 1- Select the acquisition parameters 0 2- Select Input button in Acquisition tab 3- Start an acquisition	Open Save Fav.
3- Start an acquisition 4- Select Output tutton in Acquisition tab -20 5- Start an acquisition 5- Start an acquisition 5- Start an acquisition	Main Menu
E 40	File ►
H	Swap Traces Preferences
	Analysis Setup
	Mode ►
-100	
Acquisition Results Trace Info.	
Acquisition Type: Single Count: 1 Output Nulling	
Wavelength range Start: 1529.000 nm Stop: 1566.000 nm	
O E S C L U	000

2. Select the **Comments** tab.

General	Information	Comments	Display	File Name		
Your con	nments here.					<u>^</u>
					C	Zear
					С	Zlear

- **3.** Enter your comments for the current trace.
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Clear** to clear all the changes made in the **Comments** tab.

Defining Display Parameters

The application allows you to set display settings for the acquisition trace. You can set the spectral unit for the trace and the results table.

To define display parameters:

1. From the **Main Menu**, press **Preferences**.

ST Graph ST Results		Start
20 Spectral Transmittance measurement instructions		Start
1- Select the acquisition parameters 2- Select Input button in Acquisition tab	R	Open Save Fav.
3- Start an acquisition 4- Select Output button in Acquisition tab -20 4- Start an acquisition	Sur	Main Menu
 6- Save results and traces to file 		File 🕨
토 -40 - 왕 -	2	Swap Traces
-60 -	∰	Preferences
-80 -	<u>⊜</u> ‡	Analysis Setup
-100		Mode 🕨
1250 1300 1350 1400 1450 1500 1550 1600 nr Acquisition Results Trace Info. Image: Comparison of the second	n	
Acquisition Type: Single Count: 1 Input Output Nullin Vavelendth range	g	
Start: 1529.000 nm Stop: 1566.000 nm		

2. Select the Display tab.

General Information C	mment <mark>i Display</mark> File Name
General Spectral unit:	nm
Horizontal markers:	Show
Graph color scheme:	White background
	Restore Defaults
2	OK Cancel

Defining Preferences

3. Select the spectral unit you want to work with, either nm or THz.

General Information Comment	s Display File Name
General	
Spectral unit:	nm 💌
Horizontal markers:	Show
Graph color scheme:	White background
	Restore Defaults
0	OK Cancel

4. Select whether you want to show the horizontal markers or the integrated power and the Δ trace in the marker toolbar.

General Information Comment	s Display File Name	
General Spectral unit:	nm	
Horizontal markers:	Show	
Graph color scheme:	White background	
		Restore Defaults
		OK Cancel

5. Select the background color scheme for the graph as desired.

General	Information	Comments	s Display File	Name		
General Spectral	unit:		nm		~	
Horizonta	I markers:		Show		~	
Graph co	or scheme:		White backgrour	nd		
					Restore Defau	lts

6. Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Setting Up Spectral Transmittance Analysis Parameters

This section presents the various analysis settings for the application. These settings are applied on subsequent acquisitions/re-analyses.

Note: When you change the analysis setup parameters, the new settings are active as soon as you confirm your choice. The current trace is re-analyzed, and the analysis setup parameters will be applied to the global results and channel results for the following acquisitions.

You can either set each parameter individually, or use parameters from the current trace and import them.

Setting Up Spectral Transmittance Analysis Parameters

To import the parameters from the current trace:

- **1.** Make sure that you have a trace on-screen.
- 2. From the Main Menu, press Analysis Setup.



Setting Up Spectral Transmittance Analysis Parameters

ST Analysis Calibration		
Global analysis parameters		
Channel definition:	ITU 25 GHz	-
Nominal wavelength:	Auto	
Channel distance:	25.000	GHz
Channel range:	12.000	GHz
Bandwidth 1 at:	1.00	dB
Bandwidth 2 at:	3.00	dB
Input wavelength offset:	0.000	nm
Input power offset:	0.00	dB ≈100.0% Edit %
Output wavelength offset:	0.000	nm
Output power offset:	0.00	dB ≈100.0% Edit %
		Restore Defaults
Import from Trace		OK Cancel

3. From any tab, press **Import from Trace**.

4. Press **OK** to confirm the changes.

Setting Up Spectral Transmittance Analysis Parameters

Defining ST Analysis Settings

The global analysis parameters for spectral transmittance acquisitions affect the calculation of the results.

Note: When you change the analysis setup parameters, the new settings are active as soon as you confirm your choice. The current trace is re-analyzed, and the analysis setup parameters will be applied to the ST results for the following acquisitions.

To define ST analysis parameters:

1. From the Main Menu, press Analysis Setup.

ST Graph ST Results		
20 Spectral Transmittance measurement instructions		Start
 I - Select the acquisition parameters 2 - Select Input button in Acquisition tab 	R	🖻 🖬 🗙
3 - Start an acquisition 4 - Select Output button in Acquisition tab -20 - 5 - Start an acquisition	Sur	Open Save Fav. Main Menu
6- Save results and traces to file		File 🕨
	2	Swap Traces
-60 -	$\textcircled{1}^{\ddagger}$	Preferences
-80-		Analysis Setup
-100	-	Mode 🕨
Acquisition Results Trace Info.		
Acquisition Type: Single Count: 1 Input Output Nulling		
Wavelength range Start: 1529.000 nm Stop: 1566.000 nm		
O E S C L U		

Setting Up Spectral Transmittance Analysis Parameters

2. Select the ST Analysis tab.

ST Analysis Calibration			
Global analysis parameters			
Channel definition:	ITU 25 GHz	-	
Nominal wavelength:	Auto		
Channel distance:	25.000	GHz	
Channel range:	12.000	GHz	
Bandwidth 1 at:	1.00	dB	
Bandwidth 2 at:	3.00	dB	
Input wavelength offset:	0.000	nm	
Input power offset:	0.00	dB ≈100.0%	Edit %
Output wavelength offset:	0.000	nm	
Output power offset:	0.00	dB ≈100.0%	Edit %
	[Restore Defa	aults
Import from Trace		ОК	Cancel

Setting Up Spectral Transmittance Analysis Parameters

3. Under **Global analysis parameters**, define the following parameters as needed:

ST Analysis Calibration			
Global analysis parameters			
Channel definition:	ITU 25 GHz	•	
Nominal wavelength:	Auto		
Channel distance:	25.000	GHz	
Channel range:	12.000	GHz	
Bandwidth 1 at:	1.00	dB	
Bandwidth 2 at:	3.00	dB	
Input wavelength offset:	0.000	nm	
Input power offset:	0.00	dB ≈100.0% E	dit %
Output wavelength offset:	0.000	nm	
Output power offset:	0.00	dB ≈100.0% E	dit %
		Restore Defaul	lts
Import from Trac	e	ОК	Cancel

 Channel definition: indicates the limit inside which the power values will be considered in the channel.

Centred on max peak: Channel is centered on the lowest insertion loss peak.

ITU Grid: Select the nearest ITU channel from the peak with lowest insertion loss.

CWDM: Select the nearest CWDM channel from the peak with lowest insertion loss.

Custom: Channel is centered on value specified by the user.

Nominal wavelength or frequency (nm or Thz): indicates a single value that represent the channels center wavelength (in nm) or frequency (in THz). This field is editable only when Channel definition is selected as Custom. Setting Up Spectral Transmittance Analysis Parameters

- Channel distance (GHz or nm): indicates distance between the channels. The value of channel distance will be set depending on the selection made for the channel definition option. The channel distance box will be enabled only when the channel center wavelength option is set to custom.
- Channel range (GHz or nm): indicates the limit inside which the power values will be considered in the channel. Integrated power is calculated on channel width.
- Bandwidth 1 at (dB): Set the power level used, relative to the channel peak power, to compute the bandwidth.
- Bandwidth 2 at (dB): Set the power level used, relative to the channel peak power, to compute the bandwidth.
- Input wavelength offset (nm): indicates the offset value applied on the input wavelength. This does not replace a calibration performed at EXFO, but it can help you temporarily sharpen the specifications if you have determined that, for example, your modules are used beyond the normal allowed use. Entering a value in THz is not possible. When an offset is applied, it is indicated at the bottom of the graph (λ).
- ➤ Input power offset (dB): indicates the offset value applied on the input power. This does not replace a calibration performed at EXFO, but it can help you achieve the specifications if you have determined that, for example, your modules are used beyond the normal allowed use. When an offset is applied, it is indicated at the bottom of the graph (P ←).

To edit the power offset value as a tap percentage, press the **Edit %** button.



Setting Up Spectral Transmittance Analysis Parameters

The percentage value entered in **Edit percentage** will be converted to a corresponding value in dB.

- Output wavelength offset (nm): indicates the offset value applied on the output wavelength. This does not replace a calibration performed at EXFO, but it can help you temporarily sharpen the specifications if you have determined that, for example, your modules are used beyond the normal allowed use. Entering a value in THz is not possible. When an offset is applied, it is indicated at the bottom of the graph (λ <>>)
- ➤ Output power offset (dB): indicates the offset value applied on the output power. This does not replace a calibration performed at EXFO, but it can help you achieve the specifications if you have determined that, for example, your modules are used beyond the normal allowed use. When an offset is applied, it is indicated at the bottom of the graph (P ←).

To edit the power offset value as a tap percentage, press the **Edit %** button.

ower Offset	
Edit percentage:	
100 %	≈0 dB
ОК	Cancel

The percentage value entered in **Edit percentage** will be converted to a corresponding value in dB.

4. Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Setting Up Acquisition Parameters

Setting Up Acquisition Parameters

Before performing your test, you must set the acquisition type and parameters.

There are three types of acquisitions in Spectral Transmittance mode: single, averaging and real-time.

- Single: Spectral measurement is performed once. The results are displayed according to this measurement.
- Averaging: Spectral measurements are performed based on the number of scans that you have entered for this parameter. The trace will be displayed after each acquisition and averaged with the previous traces.
- Real-Time: In real-time acquisition, spectral measurements are performed continuously until you press Stop. No averaging is done for spectral measurements. The graph and results are refreshed after each acquisition.

Before performing measurements on an optical spectrum, you must select the wavelength/frequency range to use. You can perform the scan on the full range, on spectral bands, or select a custom range.

- **Note:** The shorter the wavelength or frequency range, the faster the acquisition.
- **Note:** The Acquisition tab is not available in offline mode.

Setting Up Acquisition Parameters

To set parameters in the Acquisition tab:

1. From the main window, select the **Acquisition** tab.

ST G	raph	ST Results		
1	20	Spectral Transmittance measurement instructions		Start
	0	1 - Select the acquisition parameters 2 - Select Input button in Acquisition tab 3 - Start an acquisition	2	Open Save Fav.
	-20	4- Select Output button in Acquisition tab	< M	Main Menu
шар	-40		2	File Swap Traces
Ψ	-60		on Al	Preferences
	-80			Analysis Setup
	-100	-	Ψ.	Mode 🕨
Acqu	-	250 1300 1350 1400 1450 1500 1550 1600 nm		
(···	IBILIO		_	
Type		Single Count: 1 Input Output Nulling		
		Start: 1529.000 nm Stop: 1566.000 nm		
		O E S C L U		0 0 0

2. Select the acquisition type.

Acquisition Results	Trace Info.	Û	
Acquisition Type: Single	Count:	1 Input Output Nulling	
Wavelength range	Start: 1529.000 nm	Stop: 1566.000 nm	
0	E	S C L U	0 0 0

Setting Up Acquisition Parameters

- **3.** If you are performing an averaging type acquisition, enter the number of scans the unit will perform.
- **Note:** You cannot modify the number of scans count value if you are performing a single or real-time acquisition.
 - **4.** Press **Input** or **Output** to specify which position to use to store the next acquisition.

	Trace Info.			⊻	
Acquisition Type: Single	Count:		Output	tulling	
Wavelength range	Start: 1529.000 nm	Stop: 1566.000 nm	n		
[

5. Select the wavelength range for your acquisition.

Acquisition Results Trace	Info.			(J.)	
Acquisition Type: Single	Count:	1 Input	Output	Nulling	
Vravelength range Star	t: 1529.000 nm	Stop: 1566.000	nm		
0	E	s c		U	000

You can select the wavelength range by entering the start and stop values or by selecting a range on the double slider.

To select the wavelength range using the double slider, move the left and right handles on the double slider or simply click on any band.

Note: You can select more than one adjoining ranges to include in your range, for example, S + C.

Setting Up Acquisition Parameters

The wavelength range covered within these bands of the spectra are listed below.

- ▶ O band (original): 1255 to 1365 nm
- ► E band (extended): 1355 to 1465 nm
- ► S band (short wavelengths): 1455 to 1535 nm
- ► C band (conventional "erbium window"): 1525 to 1570 nm
- ► L band (long wavelengths): 1560 to 1630 nm
- ► U band (ultralong wavelengths): 1620 to 1650 nm.

10 Setting Up the Instrument in EDFA Mode

Before performing a spectral analysis in the EDFA mode, you must set up your OSA module and the test application with the appropriate parameters, as explained in this chapter.

Select the EDFA test mode as explained in *Selecting a Test Mode* on page 20 before setting up the EDFA test parameters.

- The *preferences* are the result displayed in the graph and tables, as well as the job information and related comments saved with each file.
- The analysis parameters include the channel list details, and allows you to configure global analysis parameters.
- The *acquisition parameters* include the type of measurement you want to perform and the wavelength range.

See *Defining Preferences* on page 201, *Setting Up EDFA Analysis Parameters* on page 215 and *Setting Up Acquisition Parameters* on page 232 for more details. You can set up your unit in different manners depending on your testing needs.

- ➤ The preferred way is to use the complete analysis setup parameters and complete the information in all tables, as explained in *Setting Up EDFA Analysis Parameters* on page 215. This setup will be used for the next acquisition.
- ➤ The most efficient way to setup the instrument is to use one of the favorites configurations, uploading a pre-customized acquisition and analysis setup configuration. The operator in the field only has to press the the setup button, select the appropriate configuration and press Start. As an example, a pre-customized configuration could be: "32 channels DWDM 50GHz"; "Toronto-Montreal CWDM" or "Vendor ABC DWDM ROADM 40Gb". This is explained in *Managing Favorites* on page 250.
- ➤ You can also import the setup from the current trace. This method will take the data and channel information from the current trace and apply them in the corresponding tabs. For more information, see *Setting Up EDFA Analysis Parameters* on page 215.

Defining Preferences

The preferences window allows you to set general information and comments on trace, set display parameters and customize the EDFA results table.

Note: Only the Display and EDFA tabs are available in offline mode.

Defining Trace Information

The trace information relates to the description of the job to be done, cable and job IDs, and any relevant information about what is being tested.

To enter general information:

1. From the Main Menu, press Preferences.



2. Select the **General** tab.

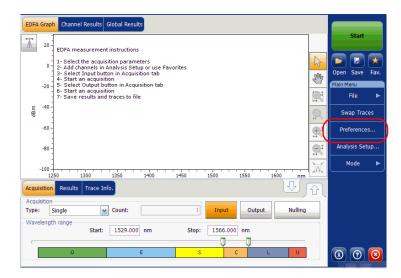
General Information	Comments	Display	EDFA Results	File Name	
General Job ID:	You	r job			
Cable ID:	123	444			
Fiber ID:					
Customer:					
Company:	You	r company			
Operator:	You				
Maintenance reason:					
				(Clear
					1
0				ОК	Cancel

- **3.** Define the general parameters as needed.
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Clear** to clear all the changes made in the **General** tab.

To enter link and location information:

1. From the Main Menu, press Preferences.



2. Select the **Information** tab.

General Information	Comments	Display	EDFA Results	File Name	
- System and link informa	ation				
Link ID prefix:					
Starting value:			2		
	×	Auto incre	ment		
Orientation:	Sou	thbound	~		
System:					
Location information					
Network element:	Tra	nsmitter	~		
Test point:	Inp	ut	~		
Description:					
				Restore Defaul	ts
2				ОК	Cance

Setting Up the Instrument in EDFA Mode

Defining Preferences

- **3.** Under **System and link information**, define the following parameters as needed:
 - ► Link ID prefix: prefix value for the link ID. You can enter any alphanumeric value.
 - > Starting value: suffix increment starting value for the link ID.

This value is incremented each time a new file is saved provided the **Auto Increment** option is selected.

IMPORTANT

When the Auto Increment option is not selected, while saving the trace file, you have to manually change the file name, else the application will overwrite the previously saved files every time you save a new trace.

- > Orientation: orientation of the link.
- > System: information about the system under test.
- **4.** Under **Location Information**, define the following parameters as needed:
 - > Network element: type of network element.
 - > Test point: where the test is performed on the link
 - > Description: Enter the description of location if required.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

To enter comments:

1. From the Main Menu, press Preferences.



2. Select the **Comments** tab.

General	Information	Comments	Display	EDFA Results	File Name	
Your com	ments here.					_
L						Clear
?					ок	Cancel

- **3.** Enter your comments for the current trace.
- **4.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Clear** to clear all the changes made in the **Comments** tab.

Defining Display Parameters

The application allows you to set display settings for the acquisition trace. You can set the spectral unit for the trace and the results table. You can also select the label that should appear on the peaks of the trace.

To define display parameters:

1. From the Main Menu, press Preferences.

EDFA Graph Channel Results Global Results		
20 EDFA measurement instructions		Start
1- Select the acquisition parameters 0 - 2- Add channels in Analysis Setup or use Favorites	6	
3- Select Input button in Acquisition tab 4- Start an acquisition	Sm	Open Save Fav.
6- Start an acquisition 7- Save results and traces to file		File ►
E -40 - 8 :		Swap Traces
-60-	⊕ ‡	Preferences
- 80 -	<u>e</u> t	Analysis Setup
-100)a(Mode 🕨
1250 1300 1350 1400 1450 1500 1550 1600 nm Acquisition Results Trace Info. Image: Contract	<u>[</u> 값	
Acquisition Type: Single Count: 1 Input Output Nulling		
- Wavelength range Start: 1529.000 nm Stop: 1566.000 nm		
0 E S C COLLOGO U		0 0 0

2. Select the **Display** tab.

General	Information	Comment	s Display EDFA	Results	File Name	
General			·			
Spectral unit:		nm	~			
Label on peak in graph:		Channel number	[*		
Empty results channel:		Hide	•			
Horizontal markers:		Show		*		
Graph col	or scheme:		White background	I (~	
					Restore Defaul	ts
0					ОК	Cancel

3. Select the spectral unit you want to work with, either nm or THz.

General Information Comment	Display EDFA Results	File Name			
Seneral Spectral unit:	nm	-			
Label on peak in graph:	Channel number				
Empty results channel:	Hide				
Horizontal markers:	Show				
Graph color scheme:	White background	~			
		Restore Defaul	ts		
0		ОК	Cancel		

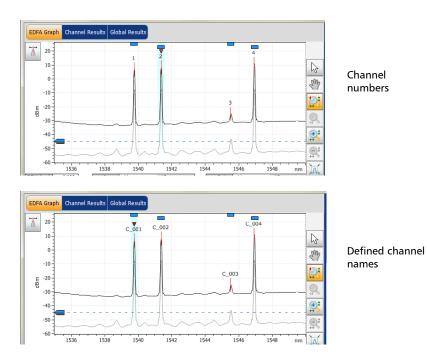
4. Select the label that will appear on the peaks in the graph, either the channel name, its number, or nothing.

General Information Comment	s Display EDFA Results	File Name		
General Spectral unit:	nm	~		
Label on peak in graph:	Channel number			
Empty results channel:	Hide 🗸			
Horizontal markers:	Show			
Graph color scheme:	Vhite background 🔽			
		Restore Defaul	ts	
0		ОК	Cancel	

Setting Up the Instrument in EDFA Mode

Defining Preferences

Note: The channel name and channel number cannot be shown at the same time.



5. Select whether you want to display the empty channels from the channel list in the **Results** tab.

General Information Comment	s Display EDFA Results	File Name	
General Spectral unit:	nm	1	
Label on peak in graph:	Channel number	•	
Empty results channel:	Hide		
Horizontal markers:	Show	•	
Graph color scheme:	White background	•	
		Restore Defaul	ts
0		ОК	Cancel

6. Select whether you want to show the horizontal markers or the integrated power and the Δ trace in the marker toolbar.

General Information Comment	s Display EDFA Resul	ts File Name	
General Spectral unit:	nm	~	
Label on peak in graph:	Channel number	v	
Empty results channel:	Hide	~	
Horizontal markers:	Show	v)	
Graph color scheme:	White background	~	
		Restore Defaul	ts
0		ОК	Cancel

7. Select the background color scheme for the graph as desired.

General Information Commen	ts Display EDFA Results File Name
General Spectral unit:	nm
Label on peak in graph:	Channel number
Empty results channel:	Hide
Horizontal markers:	Show
Graph color scheme:	White background
	Restore Defaults
@	OK Cancel

8. Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Customizing EDFA Results Table

It is possible to select which results you would like to be displayed in the **Results** tab of your EDFA tests.

To customize the results table:

1. From the **Main Menu**, press **Preferences**.

EDFA Graph Channel Results Global Results		
20 EDFA measurement instructions 0 1. Select the acquisition parameters 3. Select Input button in Acquisition tab 4. Start an acquisition 5. Select Output button in Acquisition tab 5. Select Output button in Acquisition 7. Save results and traces to file 6 -80		Start Open Save Fav. Main Menu File File Swap Traces Preferences Analysis Setup Mode
-100)ať	Mode F
Acquisition Results Trace Info.	ि	
Acquisition Type: Single Count: 1 Input Output Nulling		
Wavelength range Start: 1529.000 nm Stop: 1566.000 nm		
		0 0 0

2. Select the EDFA Results tab.

Ger	neral	Information	Comments	Display	EDFA Resu	ts File Name	
EDF	A Res	ults column pr	esence and (ordering			
	Colur	mn Name					
	Name						
×	λ						
×	Input	t Signal Power					
×	Outp	ut Signal Pow	er				
×	S%						
×	PASE						
×	PSSE				_		
×	Gain				_		
×	Noise	Figure			_		
×	Gain	- Avg. Gain					
						Restore Defa	ults
?						ок	Cancel

- *3.* Select which parameters you want to display in the **Results** tab from the list of available choices:
 - ► Name: name of channel.
 - Center wavelength/frequency: spectral center-of-mass for the peak in that channel.
 - Input Signal Power: signal power for the selected channel (excludes noise).
 - Output Signal Power: signal power for the selected channel (excludes noise).
 - ► S %: current output power according to the measured output power (Output Signal Power / [Output Signal Power + PASE]).
 - > PASE: power of the spontaneous emission amplified by EDFA.
 - > PSSE: power of the spontaneous emission of the source.
 - Gain: gain (Output Signal Power Input Signal Power) for the selected channel.

- Noise Figure: EDFA's noise figure measured for the selected channel.
- Gain Avg. Gain: selected channel gain minus the average of all channel gains.
- **4.** Press the up or down arrows to change the order in which the columns will appear in the **Results** tab.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

Setting Up EDFA Analysis Parameters

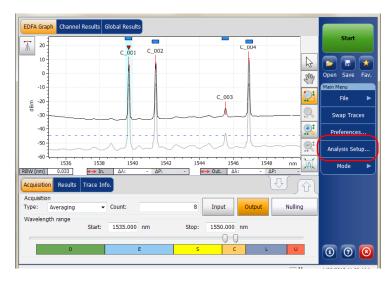
This section presents the various analysis settings for the application, particularly the channel list and settings. You can set the channel list, channel parameters, manage favorite configurations and perform user calibration.

Note: When you change the analysis setup parameters, the new settings are active as soon as you confirm your choice. The current trace is re-analyzed, and the analysis setup parameters will be applied to the global results and channel results for the following acquisitions.

You can either set each parameter individually, or use parameters from the current trace and import them.

To import the parameters from the current trace:

- **1.** Make sure that you have a trace on-screen.
- 2. From the Main Menu, press Analysis Setup.



General Channels Favorites	Calibration		
Default channel settings			
X Activate default channel			
Channel width:	50.0 GHz -	Snap to ITU	grid
Global analysis parameters			
Peak detection level:	-45.00	dBm	
RBW for OSNR:	0.100 -	nm	
Input wavelength offset:	0.000	nm	
Input power offset:	0.00	dB ≈100.0%	Edit %
Output wavelength offset:	0.000	nm	
Output power offset:	0.00	dB ≈100.0%	Edit %
		Restore Defau	lts
Import from	Trace	ОК	Cancel

3. From any tab, press **Import from Trace**.

4. Press **OK** to confirm the changes.

Defining General Settings

The general analysis parameters for EDFA acquisitions affect the calculation of the results. Any change you make to the settings affect future traces, or you can apply them to the active trace when reanalyzing it.

IMPORTANT

In the General tab, you can set the default channel parameters. Any channel found during an acquisition that is not defined in the channel list will be analyzed according to the default channel settings.

To define general settings:

1. From the Main Menu, press Analysis Setup.



2. Select the **General** tab.

General hannels Favorites (Calibration			
Default channel settings Activate default channel				
Channel width:	50.	GHz 👻	Snap to ITU	grid
Global analysis parameters				
Peak detection level:		-45.00	dBm	
RBW for OSNR:	0.100	-	nm	
Input wavelength offset:		0.000	nm	
Input power offset:		0.00	dB ≈100.0%	Edit %
Output wavelength offset:		0.000	nm	
Output power offset:		0.00	dB ≈100.0%	Edit %
			Restore Defau	lts
Import from	Trace		ОК	Cancel

Setting Up the Instrument in EDFA Mode

Setting Up EDFA Analysis Parameters

3. Under **Default channel settings**, define the following parameters as needed:

General Channels Favorites C	alibration	
Default channel settings		
X Activate default channel		
Channel width:	50.0 GHz -	Snap to ITU grid
Global analysis parameters		
Peak detection level:	-45.00	dBm
RBW for OSNR:	0.100 -	nm
Input wavelength offset:	0.000	nm
Input power offset:	0.00	dB ≈100.0% Edit %
Output wavelength offset:	0.000	nm
Output power offset:	0.00	dB ≈100.0% Edit %
		Restore Defaults
Import from 1	Trace	OK Cancel

Clear the Activate default channel selection, to use the currently defined channel for analysis. This reduces the analysis time by eliminating the peak detection over the complete spectral range. The peaks outside the defined channel list will not be analyzed.

 Channel width (GHz or nm): indicates the limit inside which the power values will be considered in the channel.

For default channels, the channel width that sets the limits of the channel, should be the same as the channel distance or smaller (channel distance is defined while creating a channel list). If the channel width is not compatible with the channel spacing, either a single peak may be found for two distinct channels and two analysis would be performed and displayed for that peak, or, it is possible that two peaks may be found within the same channel and be considered as one multi-peak signal. With this result, you can use markers to find the spacing between adjacent channels or to find the channel width.

- Snap to ITU Grid: When selected, each detected peak will be defined by the nearest ITU channel. The ITU grid is based on the selected channel width.
- **4.** Under **Global analysis parameters**, define the following parameters as needed:

General Channels Favorites C	alibration	
Default channel settings Activate default channel	_	
Channel width:	50.0 GHz 👻	Snap to ITU grid
Global analysis parameters		
Peak detection level:	-45.00	dBm
RBW for OSNR:	0.100 -	nm
Input wavelength offset:	0.000	nm
Input power offset:	0.00	dB ≈100.0% Edit %
Output wavelength offset:	0.000	nm
Output power offset:	0.00	dB ≈100.0% Edit %
		Restore Defaults
Import from 1	Trace	OK Cancel

- Peak detection level (dBm): minimum power level from where the peak can be considered as a signal.
- RBW for OSNR (nm): indicates the resolution bandwidth selected for the OSNR calculation. This parameter is generally set to 0.1 nm to allow for a common basis of comparison between different OSAs having different effective resolutions. The instrument's RBW value is written below the graph. This parameter does not actually have an effect on the acquisition, but is only a normalization factor used to provide the OSNR value in a standardized manner.
- Input wavelength offset (nm): offset value applied on the input wavelength. This does not replace a calibration performed at EXFO, but it can help you temporarily sharpen the specifications if you have determined that, for example, your modules are used beyond the normal allowed. Entering a value in THz is not possible. When an offset is applied, it is indicated at the bottom of the graph (λ <>).
- ➤ Input power offset (dB): offset value applied on the input power. This does not replace a calibration performed at EXFO, but it can help you achieve the specifications if you have determined that, for example, your modules are used beyond the normal allowed. When an offset is applied, it is indicated at the bottom of the graph (P ←).

To edit the power offset value as a tap percentage, press the **Edit %** button.

ower Offset	×
Edit percentage:	
100	% ≈ 0 dB
ОК	Cancel

The percentage value entered in **Edit percentage** will be converted to a corresponding equivalent value in dB.

- Output wavelength offset (nm): offset value applied on the output wavelength. This does not replace a calibration performed at EXFO, but it can help you temporarily sharpen the specifications if you have determined that, for example, your modules are used beyond the normal allowed. Entering a value in THz is not possible. When an offset is applied, it is indicated at the bottom of the graph (λ <>).
- ➤ Output power offset (dB): offset value applied on the output power. This does not replace a calibration performed at EXFO, but it can help you achieve the specifications if you have determined that, for example, your modules are used beyond the normal allowed. When an offset is applied, it is indicated at the bottom of the graph (P ↔).

To edit the power offset value as a tap percentage, press the **Edit %** button.

Power Offset	
Edit percentage:	
100 % ≈ 0 dB	
OK Canc	el

The percentage value entered in **Edit percentage** will be converted to a corresponding equivalent value in dB.

5. Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

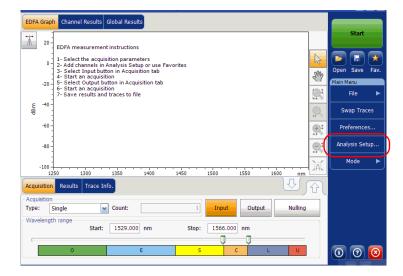
Managing Channels

Testing DWDM systems involves characterizing multiple signals in a link. The application allows you to define channels using a channel editor or quickly generate them from the current data. You can also rapidly create a list of equally spaced channels. Once a channel list is created, you can modify it as needed. You can edit the analysis parameters for one channel or multiple channels.

While creating the channel list, some channels may overlap. When the channel widths are specified in nm, two channels are considered to be overlapping when more than 1.2 GHz of frequency range is common between the two channels.

To add a channel list:

1. From the Main Menu, press Analysis Setup.



- General Channels Favorites Calibration Channel list λ (nm) Channel Width Name × C_001 1539.747 50.0 GHz C_002 1541.353 50.0 GHz 🗶 C_00 C_004 1546.926 50.0 GHz Select All Unselect All Delete Edit Selection. Add Channels.. ? Import from Trace ОК Cancel
- 2. Select the Channels tab.

3. By default, the channel list is empty. Press **Add Channels**.

Name	λ (nm)	
	77 (m)y	Channel Width
X C_001	1539.747	50.0 GHz
C_002	1541.353	50.0 GHz
X C_003	1545.503	50.0 GHz
C_004	1546.926	50.0 GHz
Select All	Unselect All	Delete

4. Enter values in the boxes as explained below:

Add channels Start range:	1528.773 nm
Stop range:	1560.606 nm
Channel center wavelength:	ITU 100 GHz
Channel distance:	100 🕑 GHz 📝
Channel width:	100 🔽 GHz 🔮
Name prefix:	
Starting value:	1
Increment value:	1
	Restore Defaults

- Start range (nm or THz): starting range of the channel list.
- Stop range (nm or Thz): ending range of the channel list.
- Channel center wavelength/frequency: spectral center-of-mass for the peak in that channel.
- **Note:** When using the custom channel center wavelength option, the first channel will be centered at the start range, and the list will be created using channel distance and channel width.
 - Channel distance (nm or GHz): distance between the channels. The value of channel distance will be set depending on the selection made for the channel center wavelength option. The channel distance box will be enabled only when the channel center wavelength option is set to custom.
 - Channel width (nm or GHz): limit inside which the power values will be considered in the channel. Integrated power is calculated on channel width.

- > Name prefix: adds prefix to the channel names.
- Starting Value: sets the increment starting value for the channel name in the channel list.
- Increment value: sets the increment value for the channel name in the channel list.
- **5.** Press **OK** to return to the **Channels** window, which now lists the added channels.
- **Note:** When new channels are added, the Use Default thresholds will be applied to the channel parameters.
- **Note:** A warning message will be displayed if any channels are overlapping, but the analysis can still be performed on overlapping channels. If any duplicate channels are added, a confirmation message will be displayed to overwrite the existing channels with the duplicate channels.
 - **6.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.
- **Note:** The application displays a message if more than 1000 channels are added. You can exit the **Analysis Setup** window only after deleting the extra channels from the channel list. You can delete the channels manually as required.

To edit the parameters of a specific channel:

1. From the Main Menu, press Analysis Setup.

EDFA Graph Channel Results Global Results		
20 EDFA measurement instructions		Start
1 - Select the acquisition parameters 2 - Add channels in Analysis Setup or use Favorites	6	Open Save Fav.
-20 5- Select Output button in Acquisition tab		Main Menu
- 7- Save results and traces to file	<u>R</u>	File ►
E -40- 왕	9	Swap Traces
-60	R	Preferences
-80 -	R	Analysis Setup
-100 1250 1300 1350 1400 1450 1500 1550 1600 nm)a(Mode 🕨
1250 1300 1350 1400 1450 1500 1550 1600 nm Acquisition Results Trace Info.	Û	
Acquisition Type: Single Count: 1 Input Output Nulling		
Wavelength range		
Start: 1529.000 nm Stop: 1566.000 nm		
ο ε ς ς ε υ		0 0 0

General Channels Favorites	Calibration		
Channel Ist Name	λ (nm)	Channel Width	٦
X C_001	1539.747	50.0 GHz	
C_002	1541.353	50.0 GHz	
X C_003	1545.503	50.0 GHz	
C_004	1546.926	50.0 GHz	
Select All	Unselect All	Delete	
	Edit Selection	Add Channels	
Import from	om Trace	OK Cano	el

2. Select the **Channels** tab.

3. Select the channel or channels to be modified in the channel list.

If you want the changes to be applied to all of your channels, press **Select All**. Channels can be selected one by one or all together. You can press **Unselect All** to clear all channel selections. To delete the selected channels, press **Delete**.

4. Press Edit Selection.

General Channels Favorites	Calibration		
Channel list			_
Name	λ (nm)	Channel Width	
X C_001	1539.747	50.0 GHz	
C_002	1541.353	50.0 GHz	
X C_003	1545.503	50.0 GHz	
C_004	1546.926	50.0 GHz	
Select All	Unselect All	Delete	
(Edit Selection	Add Channels	
Import fro	m Trace	ок с	ancel

5. Modify the settings as needed. For more information about the settings, see Managing Channels *on page 224*. If you leave a box empty, it will remain as it was before your changes.

Channel center:		1545.503 nm			
Channel name:	C_003				
Channel width:		50.0 GHz	~		
			R	lestore Defaults	

- **6.** Press **OK** to return to the **Channels** tab, which now contains the modified settings.
- 7. Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Before performing your test, you must set the acquisition type and parameters.

There are three types of acquisitions in EDFA mode: single, averaging and real-time.

- Single: Spectral measurement is performed once. The results are displayed according to this measurement.
- Averaging: Spectral measurements are performed based on the number of scans that you have entered for this parameter. The trace will be displayed after each acquisition and averaged with the previous traces.
- Real-Time: In real-time acquisition, spectral measurements are performed continuously until you press Stop. No averaging is done for spectral measurements. The graph and results are refreshed after each acquisition.

Before performing measurements on an optical spectrum, you must select the wavelength/frequency range to use. You can perform the scan on the full range, on spectral bands, or select a custom range.

Note: The shorter the wavelength or frequency range, the faster the acquisition.

To set parameters in the Acquisition tab:

- EDFA Graph Channel Results Global Results Star ₩. C_004 20 -C_001 C_002 10 2 H * 12 0 Open Save Fav SM Main Menu -10-C_003 File -20 dBm -30 Swap Traces **₽**‡ -40 Preferences... -50 Analysis Setup... -60)A(1536 1538 1540 1542 1544 1546 1548 nm Mode 0.033 🛶 Out. 🛛 Δλ: ΔP: ↔ In. Δλ: ΔP: Acquisition Results ACQUISITIO Input Output Nulling Type: Averaging - Count: 8 Wavelength range Start: 1535.000 nm Stop: 1550.000 nm 00 0 0 0 С
- **1.** From the main window, select the **Acquisition** tab.

2. Select the acquisition type.

Acquisition Results	Trace Info.	l	J J	
Acquisition Type: Averaging	- Count:	8 Input Output	Nulling	
Wavelength range	Start: 1535.000 nm	Stop: 1550.000 nm		
0	E	S C L		006

- **3.** If you are performing an averaging type acquisition, enter the number of scans the unit will perform.
- **Note:** You cannot modify the number of scans count value if you are performing a single or real-time acquisition.
 - **4.** Press **Input** or **Output** to specify which position to use to store the next acquisition.

Acquisition							
Type: Averaging	- C	ount:	8	Input	Output	Nulling	
Wavelength range							
	Start:	1535.000 nm	Stop:	1550.000	nm		
				UU	_		
		E	S	C	L	U	1 0 0
0		T					

5. Select the wavelength range for your acquisition.

Acquisition	Results Tr	ace Info.					ۍ ک	
Acquisition Type: A	veraging	- Cou	nt:	8	Input	Output	Nulling	
Wavelength	-	Start: 15	5.000 mm	Stop:	1550.000			
		_			0.0)		
	0		E	S	C	L		00

You can select the wavelength range by entering the start and stop values or by selecting a range on the double slider.

To select the wavelength range using the double slider, move the left and right handles on the double slider or simply click on any band.

Note: You can select more than one adjoining ranges to include in your range, for example, S + C.

The wavelength range covered within these bands of the spectra are listed below.

- ► O band (original): 1255 to 1365 nm
- ► E band (extended): 1355 to 1465 nm
- ► S band (short wavelengths): 1455 to 1535 nm
- ► C band (conventional "erbium window"): 1525 to 1570 nm
- ► L band (long wavelengths): 1560 to 1630 nm
- ▶ U band (ultralong wavelengths): 1620 to 1650 nm.

11 Starting a Measurement

Before starting a measurement you must select and configure a test mode. You will find the instructions to select a test mode in *Selecting a Test Mode* on page 20. For instructions on configuring various test modes, see their respective sections.

Note: You cannot start a measurement in offline mode.

To start the measurement:

From the main window, Press **Start**. The button will turn into a **Stop** button.

Graph Channel Results Global Results	(
20 WDM measurement instructions	Ш,	Start
1 - Select the acquisition parameters 2 - Add channels in Analysis Setup or use Favorites	6	
3- Start an acquisition -20 4- Save results and trace to file	S.	Open Save Fav. Main Menu
e 40		File 🕨
원 -60 -		Discover
-80 -		Preferences
		Analysis Setup
-100	JA(Mode 🕨
Acquisition Results Trace Info.	Û	
Acquisition Type: Single Count: 1 Nulling		
Wavelength range Start: 1526.000 nm Stop: 1567.000 nm		
O E S C L U		0 0 0

You are notified that the acquisition is in progress in the status bar.

When the acquisition is complete, the corresponding trace or traces, plus result data, trace information and pass-fail statuses, if activated, appear.

12 Managing Files and Test Configurations

Using the Discover Feature

The Discover feature allows you to start a measurement procedure to automatically build an analysis setup (scan range, channel list, analysis parameters, etc.) based on the signal being detected on the input port of the module.

Note: The Discover features is available on the WDM and Drift test modes only.

The procedure starts with a full range single scan (1250 nm to 1650 nm) to determine signal spectral range. It is followed by a second scan to establish the analysis parameters by locating the various peaks from the incoming signal.

When the discover process is successful, the application displays the results and graph for the detected channels and the newly discovered analysis parameters are applied automatically to the analysis setup.

Note: If no signal is detected with the first scan, then the graph shows the full range scan and ends the discover procedure. The application analysis parameters remain unchanged.

Using the Discover Feature

Discover analysis parameters are established as follows:

- The acquisition spectral range is set at 5 nm before the first detected signal peak, and 5 nm after the last detected signal peak (respecting spectral range limits).
- A channel list is created based on detected signal peaks; default settings are applied for all channel parameters.
- ➤ The center wavelength of each channel is aligned with an ITU grid (200, 100, 50 or 25 GHz for DWDM).
- ➤ The channel width is determined using the overlap criteria; if two channels overlap by more than 0.001 nm or 0.001 GHz, then their widths are reduced to the lower width. If the width of two channels is at 25 GHz and they still overlap, then the width is not reduced and the application considers it as a multi-peak signal (like recent modulation formats for 10 Gb/s or 40 Gb/s) and sets the width of the channel to 50 GHz.
- **Note:** One of the limitations of using the Discover feature is that the channels are discovered based on the ITU-Grid. All detected peaks will be aligned with an ITU-channel; the channel width and distance are computed and fit in one of the ITU grids (25, 50, 100 or 200 GHz). If your channel is not based on the ITU grid, the results may not be correct. In this case, you can use the default channel definition or create a new channel list.

Using the Discover Feature

To start an automatic setup measurement:

Note: You cannot do a setup measurement in offline mode.

From the **Main Menu**, press **Discover**. The **Start** button turns into a **Stop** button and the first scan of the discover starts.

Graph Channel Results Global Results		
WDM measurement instructions	<u>}</u>	Start
1 - Select the acquisition parameters 2 - Add channels in Analysis Setup or use Favorites	R	
-20 -20 -20	SM	Open Save Fav. Main Menu
е е е		File 🕨
원 - -60 -	11	Discover
-80 -		Preferences
		Analysis Setup
-100	,A	Mode 🕨
Acquisition Results Trace Info.	Û	
Acquisition Type: Single Count: 1 Nulling		
Wavelength range		
Start: 1526.000 nm Stop: 1567.000 nm		
O E S C L U		
	_	

Note: If you already have an active trace on screen that was modified, you will be prompted to save it. Any reference trace will be cleared.

You are notified that the discover acquisition is in progress in the status bar.

When the automatic setup measurement is complete, you can start using these newly detected parameters. Simply press **Start** to perform another measurement with the newly found settings.

Managing Measurement Files

The application allows you to manage the measurement files for all test modes. You can save files for future reference, open files to continue a test, or clear them to make room on your unit.

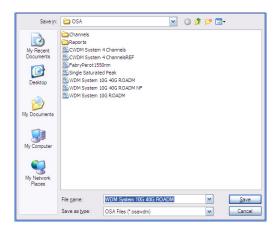
Note: You can also open files from one type of test into another type of test (for example, open a WDM trace while in EDFA test mode) for specific test needs, see Opening Files in Other Test Modes on page 246 for more information.

To save files:

1. From the Main Menu, Press File, and then press Save As.

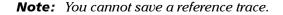
OR

From the main window, press 🗾.



- **2.** If desired, change the location and file name.
- 3. Press Save to save the trace, else press Cancel to exit the window.

Note: Once a trace is overwritten, you cannot access it anymore.



Managing Measurement Files

To open a file:

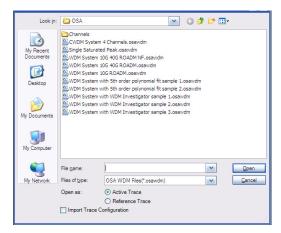
1. From the Main Menu, Press File, and then press Open.

OR

From the main window, press



2. If you had already acquired (but not saved) a trace, a warning window appears, asking you if you want to save the current trace. Press Yes to save the trace. Once the trace is saved, you can open a new trace. Press **No** to display the new trace without saving the previously acquired one. Press Cancel to return to the previous window.



Managing Files and Test Configurations

Managing Measurement Files

- **3.** Scroll through the list and select a trace to open.
- 4. Select the trace type the file will be loaded into:
 - ➤ In WDM mode, two choices are available: Active Trace and Reference Trace.
 - ► In Spectral Transmittance and EDFA modes, when opening an OSA WDM file, two choices are available: Input Trace and Output Trace.

Note: This option is not available in Drift, DFB and FP modes.

If you are in WDM, Drift, EDFA or ST modes, you can select whether you want to also import the trace configuration and overwrite the current analysis setup and acquisition context at the same time that you open the file. The file type must be the same for the configuration importation to be valid. If you have selected to open a reference trace, the importation is done automatically.

- **Note:** If you open an active trace and a reference trace is already present, the current analysis setup will be applied to the active trace. If you open a reference trace its analysis setup will replace the current analysis setup.
 - **5.** Press **Open** to open the file. The trace appears in the **Graph** tab. All the values in the main window will also be updated from the file.

Managing Measurement Files

To clear a file:

- 1. From the Main Menu, Press File.
- 2. Press New.



- **3.** If you had already acquired (but not saved) a trace, a warning window appears, asking you if you want to save the current trace. Press **Yes** to save the trace. Once the trace is saved, you can make room for a new trace. Press **No** to create a new trace without saving the previously acquired one. Press **Cancel** to return to the previous window.
- Note: In WDM mode, any reference trace will be cleared at this point.

Opening Files in Other Test Modes

Sometimes, you will need to open a file of a specific test mode while being in a different test mode. Depending on the type of file and the mode you selected, your unit will react differently.

Opening Other Test Mode Files in WDM Mode

Your application allows you to open different file types in WDM mode.

While loading a spectral transmittance (.osast) file, the application will re-analyze the newly imported data using the current WDM analysis setup.

While loading a legacy (.osw /.osm) file, the application will import only the raw trace data and acquisition conditions (date, acquisition type, averaging count and wavelength range). All results will be re-analyzed using the current WDM analysis setup.

While loading an EDFA (.osaedfa) file, the application will re-analyze the newly imported data using a temporary setup built from the retrieved channel list, retrieved default channel settings and blanks filled using the current WDM analysis setup.

While loading a spectral transmittance or EDFA file, the application imports trace data as follows:

- If an Input trace is present in the file, it is imported as the WDM reference trace.
- If an Output trace is present in the file, it is imported as the WDM active trace.

Opening Other Test Mode Files in DFB Mode

Your application allows you to open WDM file type in DFB mode.

While loading a WDM (.osawdm) file, the application will re-analyze the newly imported data using the DFB analysis setup and imports the following data from the selected trace:

- Raw trace data
- ► Trace information
- ➤ Trace identification

Opening Other Test Mode Files in FP Mode

Your application allows you to open WDM file type in FP mode.

While loading a WDM (.osawdm) file in the FP mode, the application will re-analyze the newly imported data using the FP analysis setup and imports the following data from the selected trace:

- ► Raw trace data
- ► Trace information
- ➤ Trace identification

Opening Other Test Mode Files in ST Mode

Your application allows you to open WDM file type in spectral transmittance mode.

While loading a WDM (.osawdm) file, the application behaves as if a new acquisition is requested. This means that the application does not change the modified state of the current measurement while loading a WDM file.

Before loading a WDM file, the application allows you to select in which trace you want to import the WDM file. Select **Input Trace**, or **Output Trace** as required. Once you have selected the file, the application imports the following data in the selected trace.

- Raw trace data
- ➤ Trace information
- ► Trace identification

Opening Other Test Mode Files in EDFA Mode

Your application allows you to open WDM file type in EDFA mode.

While loading a WDM (.osawdm) file, the application behaves as if a new acquisition is requested. This means that the application does not change the modified state of the current measurement while loading a WDM file.

Before loading a WDM file, the application allows you to select in which trace you want to import the WDM file. Select **Input Trace**, or **Output Trace** as required. Once you have selected the file, the application imports the following data in the selected trace.

- ► Raw trace data
- ► Trace information
- ► Trace identification

Managing Favorites

Favorites are configuration files that contain all of the parameters from the **Analysis Setup** tab and **Acquisition** tab. When you often use the same settings, you can save them as a favorite, then recall them for future acquisitions.

Note: The Favorites feature is available for the WDM, Drift and EDFA test modes.

To load a test configuration:

1. From the Main Menu, press Analysis Setup.

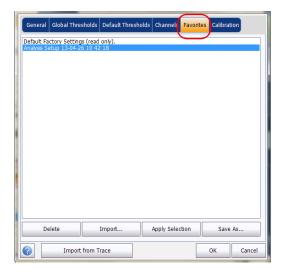
OR

From the main window, press 🔀

Graph Channel Results Global Results		
WDM measurement instructions	<u>].</u>	Start
1 - Select the acquisition parameters 2 - Add channels in Analysis Setup or use Favorites	6	
3- Start an acquisition -20 - 4- Save results and trace to file	SW)	Open Save Fav.
		File 🕨
토 -40 - 용 - - 60 -	51	Discover
		Preferences
-80 -	₽.	Analysis Setup
-100	, AK	Mode 🕨
Acquisition Results Trace Info.	Û	
Acquisition Type: Single Count: 1 Nulling		
Wavelength range Start: 1526.000 nm Stop: 1567.000 nm		
0 E S C C Land U		0 0 0

Managing Favorites

2. Select the Favorites tab.



Managing Files and Test Configurations

3. To apply the settings from a favorite file to the current analysis setup, select a file from the favorites list and press Apply Selection. This button will be enabled only when a file is selected from the favorites list. When you press Apply Selection, the contents of the file are loaded in the other tabs of this window.

General	Global Threshol	ds Default Thre	sholds	Channels	Favorites	Calibration	
Default Fa Analysis S	ictory Settings (re etup 13-04-26 10	ead only). 142-18					
			6		_		
D	elete	Import		Apply Selec	tion	Save As.	
?	Import fror	n Trace				ок	Cancel

- **4.** Press **OK** to proceed with the loaded configuration and close the window, or press **Cancel** to exit without saving.
- **Note:** Pressing **OK** automatically starts the reanalysis process if a measurement file was already present.

Managing Favorites

To save a test configuration:

1. From the Main Menu, press Analysis Setup.

OR

From the main window, press 🕢.

Graph	Channel Results Global Results	
™ 2	WDM measurement instructions	Start
	- 2- Add channels in Analysis Setup or use Favorites	Mr. Open Save Fav.
-2		Main Menu
ш -4 Фр	J-	File Discover
-6		Preferences
-8	-	Analysis Setup
-10	1250 1300 1350 1400 1450 1500 1550 1600 nm	Mode 🕨
Acquisiti	an Results Trace Info.	
Acquisiti Type:	Single Count: 1 Nulling	
~ Waveler	gth range Start: 1526.000 nm Stop: 1567.000 nm	
	O E S C L U	

2. Select the **Favorites** tab.

	General	Global Thre	sholds Default	Thresholds	Channers F	avorites	alibrat	ion
	Default Fa Analysis Se	ctory Setting etup 13-04-2	is (read only). 6 10 42 18					
•								
	De	lete	Import		Apply Selection	on	Save	As
	?	Import	from Trace				ОК	Cancel

3. To save an analysis setup to a file, press **Save As**. The default folder where the file will be saved is the Favorites folder. You should use this folder unless you want to transfer a copy on an external storing device such as a USB stick.

Save (n:	🚞 Favorites		💌 G 💋	i 📂 🛄 -	
My Recent Documents	40GBASE-LR4 100GBASE-LR CWDM TU 50 GHz TU 50 GHz TU 100 GHz TU 200 GHz				
My Documents					
My Computer					
	File name:	Analysis Setup		~	Save
My Network	Save as type:	osawdmsetup files (*.osaw	dmsetup)	~	Cancel

- **4.** In the **Save As** window, enter a file name and press **Save**. The file will be added to the favorites list in the **Analysis Setup Favorites** tab.
- **5.** Press **Save** to save the configuration and close the window, or press **Cancel** to exit without saving.

To import a test configuration:

1. From the Main Menu, press Analysis Setup.

OR

From the main window, press

Graph Channel Results Global Results	(
20 WDM measurement instructions	Start	
0 1- Select the acquisition parameters 2- Add channels in Analysis Setup or use Favorites		*
3- Start an acquisition -20 4- Save results and trace to file	Main Menu	av.
е 40 е	File	
	Discover	
-80	Preferences	
100	Analysis Setup	
1250 1300 1350 1400 1450 1500 1550 1600 nm	Mode	
Acquisition Results Trace Info.	Û	
Acquisition Type: Single Count: 1 Nulling		
Wavelength range Start: 1526.000 nm Stop: 1567.000 nm		
O E S C L U	$\overline{0}$	

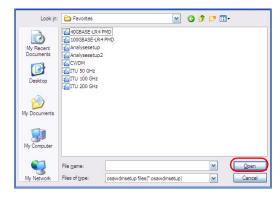
2. Select the **Favorites** tab.

General	Global Thre	sholds Default Thre	esholds	Channels	Favorite	s Calibrat	ion
Default Fa Analysis S	ctory Setting etup 13-04-2	s (read only). 5 10 42 18					
De	elete	Import		Apply Selec	tion	Save	As
?	Import	from Trace				ок	Cancel

3. Press Import to import an analysis setup from a file.

Gener	al Glob	al Thresholds	Default Thre	sholds	Channels	Favorites	Calibratio	n
Default Analysi	Factory	Settings (read 3-04-26 10 42	only). 2 18					
	Delete		Import		Apply Selec	tion	Save A	s
?		Import from T	race				ок	Cancel

From the Import window, select the file you want to import and press
 Open. The file will be added to the favorites list in the Analysis Setup –
 Favorites tab.



- **5.** Press **OK** to load the configuration and close the window, or press **Cancel** to exit without saving.
- **Note:** To load this newly imported test configuration, you must select it from the favorites list and press **Apply Selection**.

Managing Files and Test Configurations

To delete a test configuration:

1. From the Main Menu, press Analysis Setup.

OR

From the main window, press 🚺.

WDM measurement instructions 1 0 1. Seject the acquisition parameters 2. Add channels in Abonysis Setup or use Favorites 2. Add channels in Abonysis Setup or use Favorites 2. Add channels in Abonysis Setup or use Favorites 3. Setup or use Favorites 3. Setup or use Favorites 4. Save results and trace to file 60 -80 -100	Start Image: Start
	, IAL Mode ►

Managing Favorites

2. Select the **Favorites** tab.

General	Global Thres	holds Default Thre	sholds	Channels	Favorites	Calibrat	ion
Default Fa Analysis S	ctory Settings etup 13-04-26	(read only). 10 42 18					
De	lete	Import	1	Apply Selec	tion	Save	As
?	Import	from Trace				ок	Cancel

Managing Files and Test Configurations

Importing a Configuration from the Current Trace

3. To delete a configuration file from the favorites list, select it and press **Delete**. Press **Yes** to confirm your choice.

	General	Global Thresholds	Default Thresholds	Channels	Favorites	Calibration		
	Default Fa	actory Settings (read etup 13-04-26 10 4:	l only). 2 18					
								l
ſ	D	elete	Import	Apply Selec	tion	Save As.		
	?	Import from 1	Trace			ок	Cancel	

Importing a Configuration from the Current Trace

In WDM, Drift, EDFA and ST modes, you can import the analysis and channel configuration from the measurement file currently on-screen. See the corresponding test mode for details.

Using a Restore Point

When you modify the analysis setup and press **OK**, a restore point is created. This can be useful when you want to revert to the values you had prior to changing a test configuration.

You can keep up to three restore points during a working session, but they are cleared when you start a new session, or if you change the test mode.

13 Managing Results

Each test mode has its own results tabs, where you can view the trace details, channel results and global results for all measured channels.

You can use zoom options on the trace, configure markers to view the power values for specific wavelengths, and view trace information.

You can also manage trace files and generate reports for all test modes.

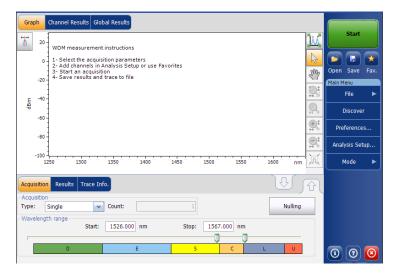
- **Note:** When a power result is flagged using an asterisk (*), it means that the detector is saturated. When the optical power on the detector is too high, the detector gets saturated and the returned value is probably incorrect.
- **Note:** When an OSNR or a noise result is flagged using a question mark (?), it means that the quality of the result is insufficient to make a valid calculation. This indication can be produced when analyzing an InBand/i-InBand measurement, or when computing noise through polynomial fit. This indication can arise in the following situations:
 - InBand/*i*-InBand averaging was made using a very few scans (1 or 2 for example). Usually produced when the operator presses the Stop button before the end of the InBand/*i*-InBand acquisition.
 - The data in the measured channel is subjected to fast polarization scrambling, or is a polarization multiplexed signal.
 - One channel might have a misfit with the current state of the polarization scrambler inside the module. This can be corrected by moving the fiber at the entrance of the module.
 - The polarization scrambler inside the module could be defective. If you suspect this option please contact EXFO technical support for a more complete diagnosis.
 - > Polynomial fit coefficient correlation is questionable.

Managing WDM Test Results

The application allows you to view and manage your WDM test results. You can view the graph of your acquisition, results for a single channel, global results and information about the trace.

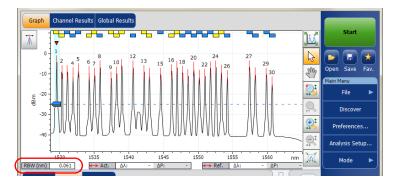
Graph Tab

The **Graph** tab allows you to view the spectrum of the active and reference traces. This graph represents the optical power against wavelength or frequency.



When the acquisition is taken (see *Starting a Measurement* on page 237 for details on how to perform a test), the active trace will be displayed in the tab with information along the following axis values:

- > X axis: wavelength in nm or frequency in THz.
- ➤ Y axis: optical power expressed in dBm, as measured in the optical resolution bandwidth (RBW) of the OSA. This reference RBW is shown at the bottom of the graph.



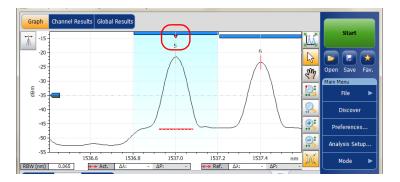
If the current active trace was previously saved, the application will display the file name of the current trace in the status bar.

The graph will display peak indicators for all the channels found by the application with a red vertical line over the peaks to indicate the peak position.

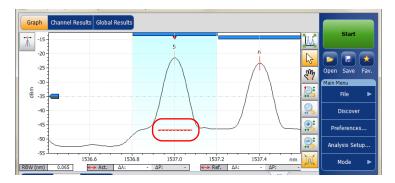
A blue horizontal bar () will be displayed on the top of a channel if it does not overlap with another channel. If the channel overlaps with another channel, the horizontal bar will be yellow ().

The selected peak indicator, a small red inverted triangle (\triangledown) points down at the top of the currently selected channel peak. In the graph zone, you can change the selected peak by clicking inside the peak limits of the desired channel. Peak selection in the graph is synchronized with the channel selection in lower tab results list; changing the selection in the graph modifies the selection in the list and vice-versa.

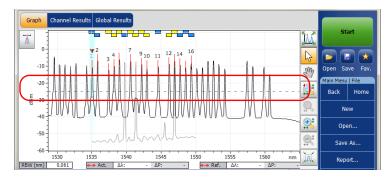
Note: This is valid only for channels in the list for which a signal is detected. If you select a channel that has no signal, no peak is selected in the graph.



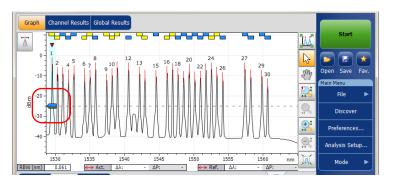
The noise level for a channel is indicated by a dotted line under the selected peak. The width of the noise level indicator is set according to the current Noise for OSNR setting. The width of the noise level indicator depends on the noise associated with the OSNR setting (from the largest to the narrowest): IEC, InB, InB nf and fit.



A dotted line across the full spectral width corresponds to the peak detection level indicator. This line indicates the minimum power level (dBm) from where a peak can be considered as a valid signal.



A peak detection level cursor is available in the graph when the **Results** tab is selected. The cursor is positioned along the Y-axis in accordance with the application's peak detection level global analysis parameter. You can move the cursor to modify the peak detection level for the current measurement.Each time the cursor is moved, the trace(s) is/are fully analyzed again using the application analysis setup.



- **Note:** If you select another tab than **Results**, the cursor disappears, but you can still see the peak detection level indicator line.
- **Note:** If there is a reference trace, it appears in gray in the graph.
- **Note:** For more information on these, see Managing Markers on page 311 and Using Zoom Controls on page 309.

Results Tab

In the **Results** tab, each channel will be represented for both the active and reference traces, with the delta between both results. Only the results for the channels within the scan range will be analyzed. The pass (②)/fail (③) verdict for thresholds are also displayed; if the verdict is fail for any parameter, its value will appear in red.

To view results:

From the main window, select the **Results** tab.

Acquisi	ruisition Results Trace Info.										
	Ch. #	λ (nm)	Power (dBm)	OSNR (dB)	Noise (dBm)	BW 3.00 dB (nm)	BW 20.00 dB (nn ^				
		1535.033	(i)-9.88		(InB nf)-30.78		0.40				
Ref.		-	-	-	-	-					
Δ		-	-	-	-	-					
Active	2	1535.832	(i)-6.04	36.15	(InB nf)-42.19	0.067	0.22				
Ref.		-	-	-	-	-					
Δ		-	-	-	-	-	-				
•				m			•				

Note: For details on filtering displayed channel results, see Defining Display Parameters on page 50

For details on each result type, see Customizing WDM Results Table on page 57.

Channel Results Tab

The application allows you to view the complete information about the parameters measured for the selected channel. This is also where the pass/fail verdict for thresholds are displayed. If the verdict is fail for any parameter, its value will appear in red. If the verdict is pass, its value will appear in green.

To view channel results:

1. From the main window, select Channel Results tab.

Channel number			3 4	1			Start	
Channel name			C 003					
 Channel Result 	lts		0_000					
Center waveleng			1534.262 nm					
Wavelength devi			0.000 nm				Open Save	Fai
Signal power			(i)-17.69 dBm				Main Menu	
Noise			nf)-49.00 dBm				File	
OSNR		(110	31.30 dB				rile	
Bandwidth 3.00 (B		0.066 nm				Discove	er
Bandwidth 20.00	dB		0.198 nm					
ENBW			0.065 nm				Preferenc	es
 Channel Anal 	sis Parameters							
Channel center			1534.262 nm				Analysis Se	etup
Channel width			50.0 GHz					
Signal power cale	ulation	In	tegrated signal 👻				Mode	•
Acquisition Res	ults Trace Info.	Ì			Ŷ			
Ch. # λ (nm)	Power (dBm)	OSNR (dB)	Noise (dBm)	BW 3.00 dB (nm)	BW 20.00 dB (nm)	~		
1 1531.1	7 (i)-15.72	32.52	(InB nf)-48.23	0.066	0.203	E		
2 1532.60		30.32	(InB nf)-48.76	0.066	0.199			
3 1534.20		31.30	(InB nf)-49.00	0.066	0.198			
4 1535.8		30.61	(InB nf)-48.94	0.066	0.199			
5 1537.0		25.21	(InB nf)-46.75	0.060	0.172			
6 1537.4	(i)-23.22	23.41	(InB nf)-46.62	0.063	0.186		1 7	×

Channe	Inumber			3 -	·]			Star	t
Channe	l name			C_003					
🔺 Cha	nnel Results								٦.
Center v	wavelength			1534.262 nm					ЛС
Waveler	ngth deviatio	on		0.000 nm				Open Save	e Fai
Signal p	ower			(i)-17.69 dBm				Main Menu	
Noise			(InB	nf)-49.00 dBm				File	
OSNR				31.30 dB					
Bandwid	dth 3.00 dB			0.066 nm				Discov	er
Bandwid	dth 20.00 dE	1		0.198 nm					
ENBW				0.065 nm				Preferen	ces
🔺 Cha	nnel Analysi:	s Parameters							
Channe	l center			1534.262 nm				Analysis S	etup
Channe	l width			50.0 GHz					
Signal p	ower calculation	ation	Int	tegrated signal 🖣	-			Mode	•
Acquisit	tion Result	s Trace Info.				Û	M		
Ch. #	λ (nm)	Power (dBm)	OSNR (dB)	Noise (dBm)	BW 3.00 dB (nm)	BW 20.00 dB (nm)	*		
1	1531.117	(i)-15.72	32.52	(InB nf)-48.23		0.203	=		
2	1532.664	(i)-18.44	30.32	(InB nf)-48.76		0.199			
	1534.262	(i)-17.69	31.30	(InB nf)-49.00		0.198			
	1535.818	(i)-18.33	30.61	(InB nf)-48.94	0.066	0.199			
4									
4 5 6	1537.002 1537.402	(i)-21.54 (i)-23.22	25.21 23.41	(InB nf)-46.75 (InB nf)-46.62		0.172		a 0	

2. Select a row from the **Results** tab to view the results for this channel.

- **Note:** Values displayed in the **Channel Result** tabs are those of the active trace only.
- **Note:** For details on each result type, see Customizing WDM Results Table on page 57 and Defining General Settings on page 62.
- **Note:** The wavelength/frequency deviation is the difference between the channel center wavelength/frequency and the measured signal center wavelength/frequency.

Global Results Tab

The application allows you to view the global results of the current measurement. The pass/fail verdict for thresholds are displayed in the **Global Results** tab. If the verdict is fail for any parameter, its value appears in red. If the verdict is pass, its value appears in green.

To view global results:

From the main window, select the Global Results tab.

 Global Results 		Pass/fail status	Start
Channel count	38		
Empty channel count	0	Not Active	
Average signal power	-18.67 dBm	-	
Signal power flatness	7.50 dB		Open Save Fav.
Average OSNR	28.24 dB		Main Menu
OSNR flatness	9.11 dB		File 🕨
Total power in scan range	-2.73 dBm		
 Global Analysis Parameters 			Discover
Peak detection level	-35.00 dBm		
RBW for OSNR	0.065 nm		Preferences
Wavelength offset	0.000 nm		
Power offset	0.00 dB		Analysis Setup
Bandwidth at	20.00 dB		Mode 🕨

Results and analysis parameters global to all channels will be displayed. For more information on each item, see *Defining Global Thresholds* on page 70 and *Defining General Settings* on page 62.

In addition, you can view the global pass/fail status, provided the thresholds are activated in the **Global Result Thresholds** tab in the **Analysis Setup** window. If the thresholds are enabled, the **Pass/Fail status** pane will display a Pass or Fail status based on the global results, or **Not Active** if the thresholds are disabled.

Note: Values displayed in the **Global Results** tab are indicated for the active trace only.

WDM Investigator Tab

The WDM Investigator tab presents information allowing you to do massive network prevention and maintenance. With the WDM Investigator dashboard, an OSA can identify several types of impairments on a per-channel basis, which gives visibility into a WDM network. In addition, the WDM Investigator dashboard provides useful information on the channel characteristics.

Note: If your measurement file contains diagnostic information, the latter will be stored in the file when you save it. It will be possible to view the diagnostic information later with the OSA application (the WDM Investigator (Inv) option is not required to view the stored file).You can also view the same information with the offline application

Channel diagnostics and the WDM Investigator tab are only available for the active trace, if the two conditions below are met:

- ► The measurement under analysis was performed on an OSA module onto which the WDM Investigator (Inv) software option is activated.
- Diagnostics are computed only for channels analyzed with the i-InBand noise for OSNR.

To view the WDM Investigator diagnostics:

From the main window, select the **WDM Investigator** tab.

Graph	Channel	Results Global	Results WD	M Investigator)				
A Char	nel Character	istics						Start	
PolMux S	ignal		0000	00000	000000	000000			
Carved N	loise		0000	00000	000000	000000			
🔺 Impa	irments								-
PMD Puls	se Spreading		0000	00000	000000	0000000		Open Save	Fav.
Interchan	nel Crosstalk		0000	00000	000000	0000000		Main Menu	
Nonlinea	r Depolarizatio	on	0000	00000	00000	000000		File	•
Carrier L	eakage		000	00000	00000	000000			
								Discove	r
			1546.801 1547.929 1549.075	1551.349 1551.349 1552.483 1553.641 1553.641	1555.929 1557.083 1558.245 1558.245 1560.546 1560.546	1562.876 1564.036 1565.192 1566.370 1567.544 1567.544 1568.710			
			154 154	156 156 156 156 156	155 155 155 156 156 157	156 156 156 156 156 156 156 156 156 156		Preference	s
								Analysis Set	up
								Mode	►
Acquisi	tion Result	s Trace Info.)			Û	<u>کر</u>		
Ch. #	λ (nm)	Power (dBm)	OSNR (dB)	Noise (dBm)	BW 3.00 dB (nm)	BW 20.00 dB (nm)	^		
1	1546.802	(i)-41.81	27.96	(InB)-69.77	0.044	0.297			
2	1547.929	(i)-40.22	29.57	(InB)-69.79	0.041	0.237	=		
3	1549.076	(i)-38.66	31.01	(InB)-69.67	0.038	0.188			
4	1550.216	(i)-36.83	32.85	(InB)-69.68	0.034	0.145			
5	1551.348	(i)-34.25	35.44	(InB)-69.69	0.031	0.107			
6	1552.484	(i)-30.79	38.62	(InB)-69.41	0.030	0.091			
7	1553.642	(i)-24.78	44.78	(InB)-69.56	0.029	0.082	~		-

As you change the channel selection in the WDM Investigator tab, the selected row in the Results tab list will move accordingly to indicate the corresponding channel analysis results.

The WDM Investigator diagnostics are divided into two types: channel characteristics (informative) and impairments (qualitative). Both the channel characteristics and the impairment identification help to pinpoint the exact failure affecting a channel, which reduce test time and help prevent future failures.

There are two channel characteristic types:

Pol-Mux signal: This specific kind of channel characteristic determines if the signal is polarization multiplexed. Pol-Mux signals appear unpolarized (minimal polarization extinction) at the end of an i-InBand acquisition.

Note: When a signal is identified as Pol-Mux, no further diagnostics are provided.

Note: This information is available for polarized signals only.

 Carved noise: When the ASE noise is filtered so that the noise level affecting the peak at the center is higher than the noise level at either channel edge, this usually indicates the presence of filters/ROADMs on the link.

Four levels of information are given for channel characteristics diagnostics.

Symbol	Meaning
0	Not present
ଓ	Present
-	Inconclusive
No symbol (blank)	Not analyzed (empty channel)

Impairment diagnostics check for the presence of several types of impairments and give an assessment of their severity. There are four impairment types:

➤ PMD Pulse Spreading: This impairment shows the presence of Polarization Mode Dispersion (PMD) in a channel. When PMD is present on the path of the signal, depending on the polarization axis of the signal injected, the signal may suffer from pulse spreading which, in turn, leads to polarization dependent spectral deformations. These deformations can be analyzed to determine how much polarization pulse broadening the signal has experienced during the measurement. Managing WDM Test Results

- Interchannel Crosstalk: In densely-filled channel plans, neighboring channels may have a non-negligible portion of their spectrum that extends within the channel bandpass of a given signal.
- Non Linear Depolarization: Fast changing power levels in multichannel systems (10 G and 40 G) may induced local polarization dependent changes in the refraction index of the fiber. This, sometimes, leads to inter-channel nonlinear effects (for example cross-phase modulation) which, in turn, lead to partial depolarization of neighboring channels.
- Carrier leakage: In a phase-modulated transmission, a CW carrier wave is modulated using external modulators which are generally polarization dependent. When the CW source polarization axis is not optimally aligned with the modulator, a portion of the CW signal passes through unmodulated and gets transmitted as such along the path. When this CW residual signal is present, it may be detected as carrier leakage using advanced polarization analysis to provide a useful diagnostic.

The symbols that are used to illustrate the diagnostics are the same, regardless of the type of impairment. The global diagnostic status is shown in the status bar at the bottom of the window according to the severity displayed in the table below. The most severe status takes precedence over the others for all tested channels. Five statuses are provided for impairments diagnostics. The symbols are presented from the most severe to the least severe.

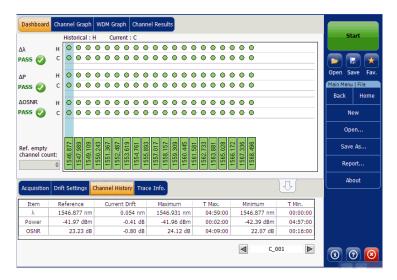
Symbol	Meaning
8	Risk
<u>^</u>	Warning
-	Inconclusive
 Image: A start of the start of	ОК
No symbol (blank)	Not analyzed (empty channel)

Managing Drift Test Results

The application allows you to view and manage your drift test results. You can view the dashboard, channel graph and WDM graph of your drift acquisition, channel history results for a single channel and information about the trace.

Dashboard Tab

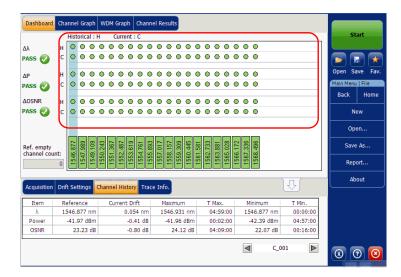
The dashboard allows you to view at-a-glance the pass/fail status of each parameter for each channel that is measured during a drift measurement. When there is no measurement, the dashboard is blank.



You can select a channel directly from the dashboard or from the **Channel History** tab. For each channel, the dashboard displays the pass/fail status for each of the following parameters:

- ► Central wavelength/frequency
- ➤ Signal power
- ► OSNR

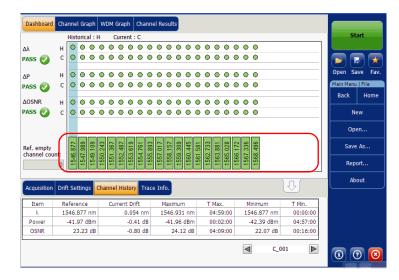
Both the current pass/fail status (last completed acquisition) and the historical pass/fail status are displayed in the dashboard. The historical pass/fail status will be set to Fail as soon as one occurrence of fail has occurred in the past or in the current acquisition.



The dashboard shows a global status (all channels) for each parameter. This global status is set to Fail if at least one channel has a failed historical status for that given parameter, otherwise the global status is set to Pass.

Dashboard	Cha	anne	l Gra	aph	w	DM (Grap	h	Cha	anne	l Re	sult	s																	
		Hist	orica	al : I	н	C	Curre	nt :	С																				Start	
Δλ	н	0	۲	$^{\circ}$	0	0	$^{\circ}$	0	٥	0	0	0	0	0	0	0	$^{\circ}$	0	0	0	٥									
PASS 🌍	с	0	٥	•	•	•	0	•	•	•	•	•	•	•	•	•	٥	•	•	•	۲									*
ΔΡ	н	0	0	0	0	0	$^{\circ}$	0	0	0	0	0	0	0	0	0	0	0	0	0	0					-	0	pen	Save	Fav.
PASS	с	0	۰	0	0	0	$^{\circ}$	0	0	0	0	$^{\circ}$	$^{\circ}$	0	0	0	$^{\circ}$	0	0	0	•					-	M	ain M	enu F	ile
ΔOSNR	н	0	•	0	0	0	0	0	0	0	0	0	0	0	•	0	0	0	0	•	•					-		Back		Home
PASS 📀	с	•	۰	0	0	0	0	0	0	•	0	0	•	0	0	0	0	0	•	•	٥								New	
\square																												(Open.	
Ref. empty channel cou	int:	5.877	7.989	9.109	0.243		2.487	553.619	1.761	5.893	7.017	3.157	9.309	0.445	.581	2.733	563.881	565.028	5.172	1.336	3.496							Sa	ive As	
	0	1546.1	1547.	1549.	1550.	1551.	1552.4	1550	1554.	1555.1	1557.	1558.	1559.	1560.	1561	1562.	1560	1565	1566.1	1567	1568.							R	eport.	
Acquisition	Drif	t Se	tting				l His			race	Inf	ю.											ŀ	IJ					About	
Item	Re	efere	ence		_	Cur	rrent	t Dri	Ĥ		N	laxi	mun	n	-	т	Max		1	М	inimu	m		ТМ	in.	1				
λ	15	546.	877	nm					4 ni	m	1	546	.93	1 nr	n	()4:5	9:00		15	46.87	77 nm	1	00:	00:00	1				
Power		-41.	97 d	iBm				-0.4	1 1 d	в		-41	.96	dBr	n	(0:0	2:00)	-	42.39) dBm	1	04:	57:00		Γ			
OSNR		2	3.23	dB				-0.8	30 d	в		2	4.1	2 d	В	(04:0	9:00			22.	07 dB		00:	16:00		Γ			
																				4]	C_	001				0	•	0	8

The dashboard displays a channel status (all parameters) for a given channel. This channel status is set to Fail as soon as one of the parameters has a failed historical status for that given channel, otherwise the channel status is set to Pass.



Channel Graph Tab

The **Channel Graph** tab displays three different graphs for the selected channel. You can select which graphs you want to display from the **Drift Results** tab in the **Preferences** Window. The three graphs are X-Y plots of:

- Spectral position (center of mass of wavelength or frequency) of the channel over time
- ► Signal power of the channel over time
- ► OSNR of the channel over time

Dashboard Channel Graph WDM Graph Channel Results			
nm <u>C_001</u> λ	R	St	art
1547.2			2
1546.8 1546.6		Open Sa	-
1546.4 3		Main Menu	
-35	₽ ‡	Back	Home
-40	<u>e</u>	N	ew
-50	÷,	00	en
dB OSNR			
30		Save	As
		Rep	ort
00:00:00 00:50:00 01:40:00 02:30:00 03:20:00 04:10:00			
Acquisition Drift Settings Channel History Trace Info.		Ab	out
Acquisition			
Type: Single Count: 1 Trial Scan Nulling			
Wavelength range			
Start: 1250.000 nm Stop: 1650.000 nm			
	ŕ	-	
O E S C L U			

Channel History Tab

The channel history table shows channel results for the active trace. The result is displayed for the selected channel only. The pass/fail verdict for thresholds are also displayed in the results table. If the verdict is fail for any parameter, its value will appear in red.

The application displays the progress of the measurement in the status bar, while the acquisition is taken. The Elapsed time and Expected duration for the measurement to stop is displayed in the **Channel History** tab.

Item	Reference	Current Drift	Maximum	T Max.	Minimum	T Min.
λ	1531.446 nm	-0.002 nm	1531.446 nm	00:00:00	1531.444 nm	00:00:40
Power	-39.70 dBm	-0.06 dB	-39.70 dBm	00:00:00	-39.76 dBm	00:00:40
OSNR	5.86 dB	0.02 dB	5.90 dB	00:00:30	5.81 dB	00:00:20

To view channel history results:

(

From the main window, select the Channel History tab.

Item	Reference	Current Drift	Maximum	T Max.	Minimum	T Min.	
λ	1546.877 nm	0.054 nm	1546.931 nm	04:59:00	1546.877 nm	00:00:00	
Power	-41.97 dBm	-0.41 dB	-41.96 dBm	00:02:00	-42.39 dBm	04:57:00	
OSNR	23.23 dB	-0.80 dB	24.12 dB	04:09:00	22.07 dB	00:16:00	

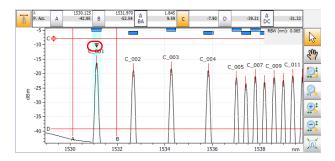
Results for the following parameters related to the selected channel are displayed in the **Channel History** table:

- Spectral position (center of mass of wavelength or frequency) of the channel against time (nm or THz)
- ► Signal power of the channel against time (dBM)
- > OSNR of the channel against time (dB)

For each of the above parameters, the following results are displayed:

- Reference: channel reference values for the current drift acquired during the initial acquisition.
- Current Drift: current drift values, that is, the current deviation from the channel's reference for the drift's latest acquisition.
- > Maximum: maximum values reached during the drift.
- T Max.: time of the drift at which the channel was at its maximum value. Displayed time is relative to the time at the start of the drift measurement.
- > Minimum: minimum values reached during the drift.
- T Min.: time of the drift at which the channel was at its minimum value.
 Displayed time is relative to the time at the start of the drift measurement.

A small red marker ($\mathbf{\nabla}$) will point down at the peak in the **WDM Graph** tab when you select a channel in the **Channel History** tab. The red marker will move accordingly to indicate the corresponding peak on the graph, with a focus on the selected channel.



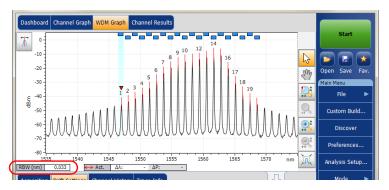
WDM Graph Tab

The **WDM Graph** tab allows you to view the spectrum of the active trace for the last WDM acquisition in your drift measurement. This graph represents the optical power versus wavelength or frequency.

Dashboard Channel Graph WDM Graph Channel Results Image: Channel Graph 20 Drift measurement instructions 0 1- Select the acquisition and Drift parameters 2-20 2-4d channels in Analysis Setup or use Favorites 2-20 4-5 start a Drift measurement 0 -500 -60 -60 -100 -100 1250 1300 1350 1400 1450 1500 1550 1600	Start Open Save Fav. Main Menu File Custom Build Discover Preferences Main Setup
Acquisition Drift Settings Channel History Trace Info.	Mode 🕨
Acquisition Type: Single Count: 1 Trial Scan Nullin	ing
Wavelength range Start: 1535.000 nm Stop: 1575.000 nm	
	. 0 0 0

When the acquisition is taken (see *Starting a Measurement* on page 237 for details on how to perform a test), the active trace will be displayed in the tab with information along the following axis values:

- > X axis: wavelength in nm or frequency in THz.
- ➤ Y axis: optical power expressed in dBm, as measured in the optical resolution bandwidth (RBW) of the OSA. This reference RBW is shown at the bottom of the graph.



The graph will display peak indicators for all the channels found by the application with a red vertical line over the peaks to indicate the peak position.

A blue horizontal bar () will be displayed on the top of a channel if it does not overlap with another channel. If the channel overlaps with another channel, the horizontal bar will be yellow ().

Channel Results Tab

When you select a channel in the **Channel History** tab, the **Channel Results** tab will show complete information about the parameters measured for the selected channel. The pass/fail verdict for thresholds are also displayed in the **Channel Results** tab. If the verdict is fail for any parameter, its value appears in red. If the verdict is pass, its value appears in green.

To view channel results:

1. From the main window, select Channel Results tab.

Dashboard Channel Graph WDM	Graph Channel Results			
Channel number		*		Start
Channel name	C_001			
 Channel Results 				
Center wavelength	1546.931 nm	E		
Signal power	(i)-42.39 dBm			Open Save Fav.
OSNR	22.43 dB			Main Menu
Noise	(IEC)-64.81 dBm			File 🕨
Bandwidth 3.00 dB	0.053 nm			
Bandwidth 20.00 dB	0.352 nm			Custom Build
ENBW	0.033 nm			
 Global Results 				Discover
Ref. empty channel count	0			
 Global Analysis Parameters 				Preferences
Peak detection level	-60.00 dBm			
RBW for OSNR	0.100 nm	-		Analysis Setup
Acquisition Drift Settings Channel	History Trace Info.		Û	Mode 🕨
Acquisition type: Single		*		
Number of scans: 1				
Spectral range start: 1535.0	00 nm	Ξ		
Spectral range stop: 1575.0				
User calibration: Factory				
Calibration date: 9/17/2				
	2009 7:55:04 AM 2009 12:55:04 PM	-	Trace Identification	00
Acquisición scop cillie. 11/12/	2009 12:00:04 PM			

2. Select a channel from the **Channel History** tab to view the channel results for the selected channel.

Item	Reference	Current Drift	Maximum	T Max.	Minimum	T Min.	
λ	1546.877 nm	0.054 nm	1546.931 nm	04:59:00	1546.877 nm	00:00:00	
Power	-41.97 dBm	-0.41 dB	-41.96 dBm	00:02:00	-42.39 dBm	04:57:00	
OSNR	23.23 dB	-0.80 dB	24.12 dB	04:09:00	22.07 dB	00:16:00	
					C_00	01	00

Note: For details on each item, see Customizing WDM Results Table on page 57 and Defining General Settings on page 62.

Managing DFB Test Results

The application allows you to view and manage your DFB test results. You can view the graph and results for your DFB laser source.

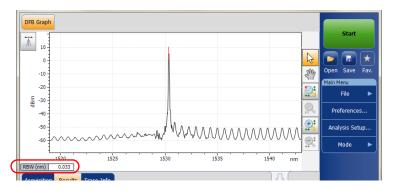
DFB Graph Tab

The **DFB Graph** tab allows you to view the spectrum of a DFB laser source. This graph represents the optical power against wavelength or frequency.

DFB Graph			
20	DFB measurement instructions		Start
0 -	1- Select the acquisition parameters 2- Start an acquisition	6	🖻 🖪 ★
-20 -	3- Save results and trace to file	Sm	Open Save Fav. Main Menu
			File 🕨
는 -40 · 말			Preferences
-60 -		₽ ‡	Analysis Setup
-80 -		R	Mode 🕨
-100 -	50 1300 1350 1400 1450 1500 1550 1600 nm		
Acquisition	Results Trace Info.		
L L	Single Count: 1		
- Wavelengt	h range Start: 1529.000 nm Stop: 1566.000 nm		
	O E S C C C C C C C C C C C C C C C C C C		0 0 0

When the acquisition is taken (see *Starting a Measurement* on page 237 for details on how to perform a test), the active trace will be displayed in the tab with information along the following axis values:

- > X axis: wavelength in nm or frequency in THz.
- ➤ Y axis: optical power expressed in dBm, as measured in the optical resolution bandwidth (RBW) of the OSA. This reference RBW is shown at the bottom of the graph.



If the current trace was previously saved, the graph will display the file name of the current trace in the status bar.

Results Tab

You can view the analysis of the DFB laser source from the **Results** tab.

To view results:

From the main window, select the **Results** tab.

Center wavelength:	1530.331 nm	Worst case SMSR:	51.45 dB	
Peak power:	5.15 dBm	Worst case SMSR position:	1530.895 nm	
Bandwidth at 3.00 dB:	0.031 nm	Left stopband:	0.443 nm	
Bandwidth at 20.00 dB:		Right stopband:	0.564 nm	
Left SMSR:	59.36 dB	Central offset:	-0.060 nm	_
Right SMSR:	51.45 dB	Fabry-Perot mode spacing:	0.675 nm 🕢 🕐	

The following information related to the DFB measurement is displayed in the **Results** table:

- > Center wavelength/frequency: spectral center-of-mass for the peak.
- > Peak power (dBm): peak signal power.
- Bandwidth 3.00 dB: bandwidth measured by taking the width of a signal at 50 % linear power of the peak or -3 dB from the peak.
- Bandwidth 20.00 dB: bandwidth measured by taking the width of a signal at 1 % linear power of the peak or -20 dB from the peak.
- Left SMSR: Left side-mode suppression ratio. It is the power difference between the main mode and the most powerful outstanding side-mode on the left.
- Right SMSR: Right side-mode suppression ratio. It is the power difference between the main mode and the most powerful outstanding side-mode on the right.

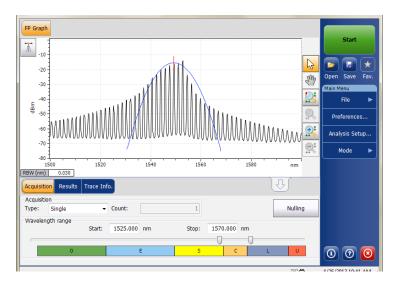
- Worst case SMSR: power difference between the main mode and the side-mode with the highest power.
- ► Worst case SMSR position: spectral position of the worst SMSR.
- ► Left stopband: spectral position difference between the main mode and the closest side-mode on the left.
- Right stopband: spectral position difference between the main mode and the closest side-mode on the right.
- Central offset: spectral position of the main mode minus the mean of the spectral positions of the first adjacent left and right side-modes.
- ► Fabry-Perot mode spacing: average estimated spectral spacing between adjacent Fabry-Perot modes of the DFB.

Managing FP Test Results

The application allows you to view and manage your FP test results. You can view the graph and results for your FP laser source.

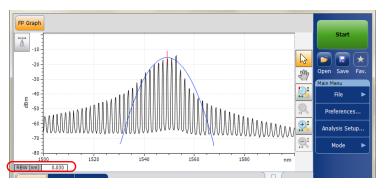
FP Graph Tab

The **FP Graph** tab allows you to view the spectrum of a FP laser source. This graph represents the optical power against wavelength or frequency.



When the acquisition is taken (see *Starting a Measurement* on page 237 for details on how to perform a test), the active trace will be displayed in the tab with information along the following axis values:

- > X axis: wavelength in nm or frequency in THz.
- ➤ Y axis: optical power expressed in dBm, as measured in the optical resolution bandwidth (RBW) of the OSA. This reference RBW is shown at the bottom of the graph.



If the current trace was previously saved, the graph will display the file name of the current trace in the status bar.

Results Tab

You can view the analysis of the FP laser source from the **Results** tab.

To view results:

From the main window, select the **Results** tab.

Center wavelength:	1549.177 nm	Peak mode power:	-14.03 dBm	
RMS width:	3.563 nm	Peak mode wavelength:	1552.641 nm	
FWHM:	3.264 nm	MTSM at 10.00 dB:	7.651 nm	
Gaussian fit error factor:	0.16	Fit width at 3.00 dB:	8.375 nm	
Total power:	-1.20 dBm	Fit width at 20.00 dB:	21.624 nm	
Power (detected modes):	-1.26 dBm	Mode spacing:	1.749 nm 🕢 🕜	

The following information related to the FP measurement is displayed in the **Results** table:

- > Center wavelength/frequency: spectral center-of-mass for the peak.
- > RMS width: indicates the second moment of the spectral distribution.
- ► FWHM: indicates the full width at the half-maximum position.
- Gaussian fit error factor: indicates the normalized RMS error factor in the Gaussian fit.
- ► Total power (dBm): indicates the integrated power of the acquisition window.
- Power (detected modes) (dBm): indicates the integrated power from the starting point of the first mode to the ending point of the last mode.
- Peak mode power (dBm): indicates the power of the peak mode of the Fabry-Perot laser.

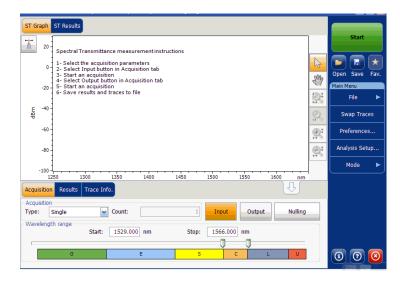
- Peak mode wavelength/frequency: indicates the wavelength/frequency of the peak mode of the Fabry-Perot laser.
- MTSM at 10.00 dB: indicates the maximum wavelength difference between the peak power mode and the last mode with amplitude that is one tenth (10 dB down) of the peak mode amplitude.
- ➤ Fit width at 3.00 dB: indicates the spectral width of the Gaussian fit at 3 dB.
- ► Fit width at 20.00 dB: indicates the spectral width of the Gaussian fit at 20 dB.
- Mode spacing: average estimated spectral spacing between adjacent Fabry-Perot modes of the FP.

Managing Spectral Transmittance Test Results

The application allows you to view and manage your spectral transmittance test results. You can view the graph of your acquisition, results for a single channel, global results and information about the trace.

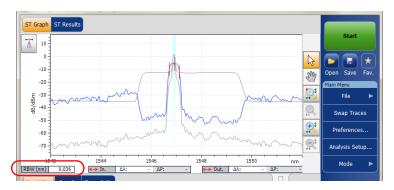
ST Graph Tab

The **ST Graph** tab allows you to view the spectrum of the input trace, the output trace and the calculated ST trace. This graph represents the optical power against wavelength or frequency.



When the acquisition is taken (see *Starting a Measurement* on page 237 for details on how to perform a test), the active trace will be displayed in the tab with information along the following axis values:

- > X axis: wavelength in nm or frequency in THz.
- ➤ Y axis: optical power expressed in dBm, as measured in the optical resolution bandwidth (RBW) of the OSA. This reference RBW is shown at the bottom of the graph.



If the current trace was previously saved, the graph will display the file name of the current trace in the status bar.

Results Tab

The results table shows the spectral transmittance results for the active trace. Results for only the channels within the scan range will be displayed.

To view results:

From the main window, select the **Results** tab.

Acquisition Results Trace Info.			(Th	
Nominal center wavelength:	1546.917 nm	Bandwidth 1.00 dB:	0.268 nm	
Offset to nominal wavelength:	-0.016 nm	Bandwidth 3.00 dB:	0.321 nm	
Insertion loss min.:	5.63 dB	Adjacent channel isolation:	-5.60 dB	
Insertion loss max.:	5.76 dB			
				000

The following results related to the channels are displayed:

- Nominal center wavelength or frequency: single value representing the channels center wavelength (in nm) or frequency (in THz).
- Offset to nominal wavelength or frequency: offset value applied to the nominal wavelength (nm) or frequency (THz).
- Insertion loss min: minimum difference between a reference power level and the measured power level (in dB).
- Insertion loss max: maximum difference between a reference power level and the measured power level (in dB).
- Bandwidth x at (dB): bandwidth measured by taking the width of a signal at x dB from the peak.
- Bandwidth y at (dB): bandwidth measured by taking the width of a signal at y dB from the peak.
- Adjacent channel isolation: isolation (in dB) taken at the channel distance on the left or right of the nominal wavelength. The worst value between the left and right isolation is kept.

ST Results Tab

The **ST Results** tab will show complete information about the spectral transmittance parameters and the global analysis parameters.

To view ST results:

From the main window, select **ST Results** tab.

ST Graph ST Results					Start
 Global Results 			×		Start
Nominal center wavelength	1546.91	7 nm			
Offset to nominal wavelength	-0.01	6 nm			
Insertion loss min.	5.6	i3 dB			
Insertion loss max.	5.3	'6 dB			Open Save Fav.
Bandwidth 1.00 dB	0.26	8 nm			Main Menu
Bandwidth 3.00 dB	0.32	1 nm	=		File 🕨
Adjacent channel isolation	-5.6	60 dB			
 Global Analysis Parameters 					Swap Traces
Channel definition	ITU 25	GHz			
Channel distance	25.0	GHz			Preferences
Channel range	12.0	GHz			
Input wavelength offset	0.00	0 nm .			Analysis Setup
Input power offset	0.0	00 dB			
Output wavelength offset	0.00	0 nm	*		Mode 🕨
Acquisition Results Trace Info.				Û	
Nominal center wavelength:	1546.917 nm	Band	lwidth 1.00 dB:	0.268 nm	
Offset to nominal wavelength:	-0.016 nm	Band	lwidth 3.00 dB:	0.321 nm	
Insertion loss min.:	5.63 dB	Adja	cent channel isolation:	-5.60 dB	
Insertion loss max.:	5.76 dB				0 0 0

Note: For details on each item, see Results Tab on page 297 and Defining ST Analysis Settings on page 190.

Swapping Spectral Transmittance Traces

The Swap Trace feature allows you to swap spectral transmittance input and output traces. With this feature, the input trace is replaced with the output trace and vice versa. All results are recalculated.

Note: The swap trace feature will not be available if there are no traces in the application.

To swap spectral transmittance traces:



From the Main Menu, press Swap Traces.

All the parameters in the application will be updated according to the modified traces.

Managing EDFA Test Results

The application allows you to view and manage your EDFA test results. You can view the graph of your acquisition, results for a single channel, global results and information about the trace.

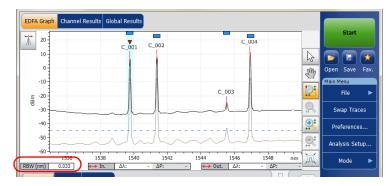
EDFA Graph Tab

The **EDFA Graph** tab allows you to view the spectrum of the input trace and the output trace. This graph represents the optical power against wavelength or frequency.



When the acquisition is taken (see *Starting a Measurement* on page 237 for details on how to perform a test), the trace will be displayed in the **EDFA Graph** tab with information along the following axis values:

- > X axis: wavelength in nm or frequency in THz
- ➤ Y axis: optical power expressed in dBm, as measured in the optical resolution bandwidth (RBW) of the OSA. This reference RBW is shown in the graph.



If the current trace was previously saved, the graph will display the file name of the current trace in the status bar.

The graph will display peak indicators for all the channels found by the application with a red vertical line over the peaks to indicate the peak position.

Results Tab

The results table shows channel results for both the input or output traces. The results for only the channels within the scan range will be displayed.

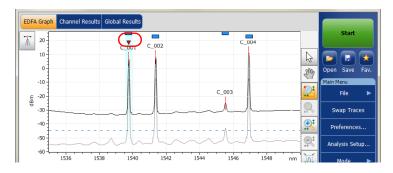
To view results:

From the main window, select the **Results** tab.

Acquisi	tion Resul	ts Trace Info.			l	لك لك	·J	
Ch. #	λ (nm)	Input Signal Power (dBm)	Output Signal Power (dBm)	S%	PASE (dBm)	PSSE (dBm)	G	
1	1539.747	(p)-7.75	(p)6.79	99.97	-28.43	-49.16		
	1541.355	(p)-7.18	(p)8.24	99.98	-27.79	-48.80		
3	1545.509	(p)-43.75	(p)-26.27	50.07	-26.28	-47.93		
4	1546.921	(p)-7.12	(p)10.73	99.98	-26.07	-47.77		
•							4	0 0 0

For information on each item, see *Customizing EDFA Results Table* on page 213.

A small red marker (\triangledown) will point down at the peak in the **EDFA Graph** tab when you select a row in the **Results** tab. The red marker will move accordingly to indicate the corresponding peak on the graph, with a focus on the selected channel.



Channel Results Tab

When you select a row from the **Results** tab, the **Channel Results** tab will show complete information about the parameters measured for the selected channel.

To view channel results:

1. From the main window, select Channel Results tab.

EDFA G	Inumber	nel Results Glob		1	*]					Start
Channe	Iname			C_001							
🔺 Cha	innel Result	5									
Center	wavelength			1539.747 nm							
Input s	ignal power			(p)-7.75 dBm							Open Save Fa
Output	signal powe	r		(p)6.79 dBm							Main Menu
Noise f	igure			13.71							File
S%				99.97 %	Ε						
PASE				-28.43 dBm							Swap Traces
PSSE				-49.16 dBm							
Gain				14.54 dB							Preferences
Gain - a	average gair	1		-1.99 dB							
🔺 Cha	innel Analys	s Parameters									Analysis Setup
Channe	l center			1539.747 nm							
Channe	l width			50.0 GHz	-						Mode I
Acquisi	tion Resul	ts Trace Info.						J	Ð Jû	Ĵ	
Ch. #	λ (nm)	Input Signal Pov	ver (dBm)	Output Signal P	ow	er (dBm)	S%	PASE (dBm)	PSSE (dBm)	G	
1	1539.747		(p)-7.75			(p)6.79		-28.43			
2	1541.355		(p)-7.18			(p)8.24		-27.79			
3	1545.509		(p)-43.75			p)-26.27		-26.28	-47.93		
4	1546.921		(p)-7.12			(p)10.73	99.98	-26.07	-47.77		
											00
							_			E.	0 0 0

2. Select a row from the **Results** tab to view the channel results for the selected channel.

	el center		1539.747 nm					Mode	•
Channe	el width		50.0 GHz +						
Acquisi	ition Resul	ts Trace Info.			l	री रि			
Ch. #	λ (nm)	Input Signal Power (dBm)	Output Signal Power (dBm)	S%	PASE (dBm)	PSSE (dBm)			
1	1539.747	(p)-7.75	(p)6.79	99.97	-28.43	-49.16			
2	1541.355	(p)-7.18	(p)8.24	99.98	-27.79	-48.80			
3	1545.509	(p)-43.75	(p)-26.27	50.07	-26.28	-47.93			
4	1546.921	(p)-7.12	(p)10.73	99.98	-26.07	-47.77			
٠						•	0	0	8

For details on each item, see Customizing EDFA Results Table on page 213.

Global Results Tab

The application allows you to view the global results of the current measurement.

To view global results:

From the main window, select the **Global Results** tab.

 Global Results 		*
Input average signal power	-8.59 dBm	
Input signal power flatness	36.63 dB	
Output average signal power	7.65 dBm	
Output signal power flatness	37.00 dB	
Gain flatness	3.30 dB	
Average gain	16.54 dB	-
Gain slope (tilt)	0.47 dB/nm	
 Global Analysis Parameters 		
Peak detection level	-45.00 dBm	
RBW for OSNR	0.100 nm	
Input wavelength offset	0.000 nm	
Input power offset	0.00 dB	
Output wavelength offset	0.000 nm	
Output power offset	0.00 dB	Ŧ

Results for the following parameters for all the channels will be displayed:

- Input average signal power: sum of the signal powers of all the peaks detected in the current acquisition, divided by the total number of peaks.
- Input signal power flatness: difference between the maximum and minimum signal power values of the detected peaks, in dB.
- Output average signal power: sum of the signal powers of all the peaks detected in the current acquisition, divided by the total number of peaks.
- Output signal power flatness: difference between the maximum and minimum signal power values of the detected peaks, in dB.
- Gain flatness: difference between the maximum and minimum gain values of the detected channels, in dB.

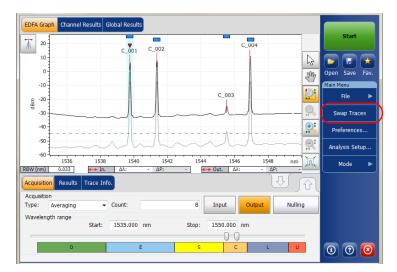
- Average gain: sum of the gain of all detected channels in the current measurement, divided by the total number of channels.
- Gain slope (tilt): slope of the linear fit on the gain values of the detected channels.

Swapping EDFA Traces

The Swap Trace feature allows you to swap EDFA input and output traces. With this feature, the input trace is replaced with the output trace and vice versa. All results are recalculated.

Note: Swap Trace feature will not be available if there are no traces in the application.

To swap EDFA traces:



From the Main Menu, press Swap Traces.

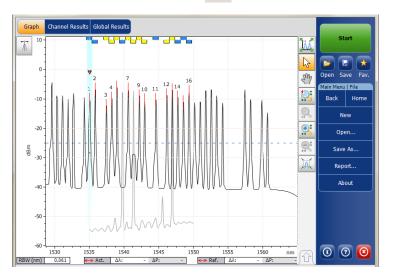
All the parameters in the application will be updated according to the modified traces.

Adjusting the Display Size

Your application allows you to toggle the view of your main window. You can change the view of the upper and lower tabs from the normal view to 100 % upper tabs or 100 % lower tabs view.

To adjust the display size:

For 100 % upper tabs view, press $\left| \bigcirc \right|$



Ch.#	λ (nm)	Power (dBm)	OCND (dp)	Noise (dBm)	DM/ 2,00, dB (om)	BW 20.00 dB (nm)	A) (nm) (1	Start
1	1529.579	(i)-4.50	20.53	(InB nf)-25.02	0.057	0,187	0.000		
2	1530.341	(i)-8.91	29.52	(InB nf)-38.43	0.060	0.159	0.000		
3	1531.113	(i)-9.07	23.06	(InB nf)-32.12	0.057	0.170	0.000		
4	1531.925	(i)-10.29	19.68	(InB nf)-29.97	0.058	0.268	0.000		Open Save F
5	1532.704	(i)-8.13	32.65	(InB nf)-40.78	0.059	0.160	0.000		Main Menu
6	1534.260	(i)-9.78	22.14	(InB nf)-31.91	0.055	0.168	0.000		
7	1535.033	(i)-9.89	17.97	(InB nf)-27.86	0.065	0.406	0.000		File
8	1535.832	(i)-6.04	34.35	(InB nf)-40.38	0.067	0.220	0.000		
9	1537.432	(i)-11.91	26.46	(InB nf)-38.36	0.062	0.201	0.000		Discover
10	1538.209	(i)-9.80	16.06	(InB nf)-25.87	0.061	0.483	0.000		
11	1538.967	(i)-6.10	24.13	(InB nf)-30.23	0.058	0.169	0.000	-	Preferences
12	1540.574	(i)-6.57	21.05	(InB nf)-27.62	0.062	0.198	0.000		
13	1542.172	(i)-9.20	21.05	(InB nf)-30.25	0.056	0.191	0.000		Analysis Setup
14	1542.932	(i)-10.34	20.34	(InB nf)-30.68	0.060	0.243	0.000		
15	1544.576	(i)-10.00	19.24	(InB nf)-29.24	0.062	0.381	0.000		Mode
16	1546.158	(i)-8.20	30.84	(InB nf)-39.04	0.063	0.214	0.000		
17	1546.924	(i)-6.92	33.81	(InB nf)-40.74	0.059	0.163	0.000		
18	1547.730	(i)-9.09	30.28	(InB nf)-39.37	0.061	0.217	0.000		
19	1548.532	(i)-10.70	20.94	(InB nf)-31.64	0.062	0.277	0.000		
20	1549.333	(i)-6.79	34.12	(InB nf)-40.91	0.067	0.217	0.000		
21	1550.132	(i)-10.73	20.33	(InB nf)-31.06	0.065	0.353	0.000		
22	1550.948	(i)-10.56	21.17	(InB nf)-31.73	0.062	0.280	0.000	-	
23	1551.742	(i)-6.67	34.30	(InB nf)-40.97	0.063	0.208	0.000		
24	1552.536	(i)-6.21	34.40	(InB nf)-40.60	0.064	0.215	0.000		
25	1553.309	(i)-8.91	24.03	(InB nf)-32.94	0.058	0.171	0.000		
26	1554.169	(i)-11.45	27.90	(InB nf)-39.35	0.058	0.163	0.000	1	1 1 1

For 100 % lower tabs view, press

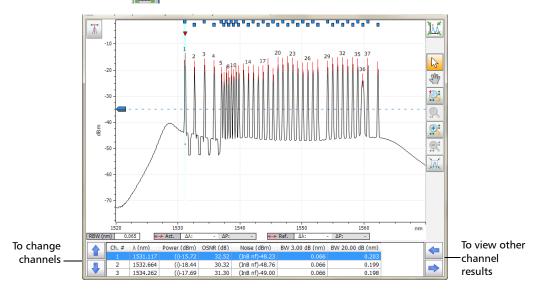
Viewing WDM Graph in Full-Screen Mode

The full-screen mode allows you to see the WDM graph, including the markers, using the whole screen of your unit. It also displays three lines of results.

If you have only an active trace, the results show three channels. If you have an active trace and a reference channel, you will see the results for one channel.

To display the trace in full-screen mode:

Use the **weight** button located on the upper right-hand section of the graph.



Using Zoom Controls

Use the zoom controls to change the scale of the trace display.

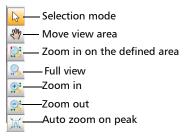
You can zoom in on or out of the graph using the corresponding buttons or let the application automatically adjust the zoom on the currently selected peak from the results table.

You can quickly zoom in on or out of a selected peak.

You can also return to the original graph value.

The application provides an automatic zoom on peak feature. When this feature is activated and you press on a row in the peak results grid, the graph will zoom and tab to show that peak covering 33 % of the graph canvas. By default, this option is deactivated.

Note: You cannot select channels on the graph when the markers are displayed.



Note: You can only move the markers with the button.

To view specific portions of the graph:

- You can define which portion of the graph will be visible by pressing
 and dragging the graph with the stylus or your finger.
- ➤ You can also zoom in on a specific area by pressing and defining the zoom area with the stylus or your finger (a rectangle with dotted lines will appear to help you define the area). Once you release the stylus, the application automatically zooms in on the graph.

To automatically zoom in on the selected peak:

Select the peak on the graph or in the table results and press 📈

To revert to the complete graph view:

Press 🔍.

Managing Markers

You can use markers to perform manual measurements and verification directly on the trace. All test modes feature two vertical markers and two horizontal markers. The vertical markers are used to indicate the power level on the trace at the wavelength or frequency it is positioned, and the horizontal markers are used for indicating power at the level they are. You can measure actual power and wavelength values of any point on the trace using the vertical markers.

Note: Horizontal markers will be displayed only if the markers are activated in the **Preferences** tab of the related test mode.

Each marker is identified by a letter: A and B are for vertical markers, and C and D for horizontal markers.

The application allows you to fix the distance between the markers. When this feature is activated, while moving any one marker, both markers will move at the same rate and distance.

Markers A and B in the marker toolbar act as toggle buttons to enable selection. When a marker is activated, the color of the button changes to orange and the selected marker displays a double arrow at the base of the marker in the graph tab, which means that the marker can be moved.

At this point, if you select the other vertical marker in the graph tab, the selection of the toggle switches to this marker. However, if you select the other marker button from the marker toolbar, both markers will be selected and the distance between both will be locked.

- **Note:** If you select a vertical marker while the horizontal markers are active, the selection will toggle to the other type of marker and vice versa.
- **Note:** If you zoom into the graph, or pan within it, the markers remain in their set positions.

You can also use the automated marker positioning to place the markers around a specific channel peak. The positions are set from the results grid, according to the following by default:

- A: set at the peak wavelength "λ Peak(nm)" or frequency "f peak(Thz)".
- B: set at the wavelength/frequency which corresponds to a 3 dB drop from the peak maximum power (Signal power "p" without subtracting the noise).
- > C: set at the peak power (λ Peak).
- ► D: set at 3 dB below marker C.

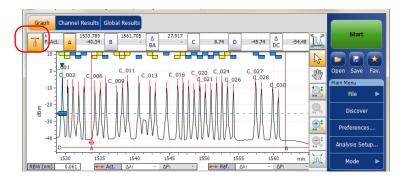
If you move one of the markers, these new settings are kept for the next use of the automated markers until you reset them or select another zoom feature.

If the channel you select does not display a signal, the markers remain in the position that they were before.

In the case of the WDM and Drift modes, the markers are placed on the active trace. In the case of EDFA testing, the markers will be on the output trace.

To display the marker toolbar:

Press the T button on the top left-hand corner of the display.

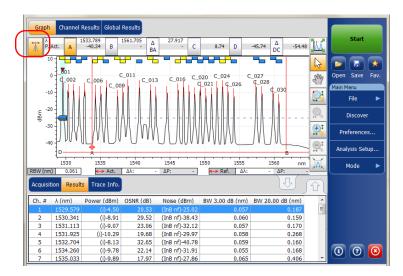


To display the automated markers:

Press the $\boxed{}$ button. The focus will be done on the currently selected channel in the **Results** tab.

To manually enter a marker position value:

 If you have not done so already, press the button on the top left-hand corner of the display to make the marker toolbar appear.



2. Set the marker by entering precise values in the box corresponding to it or by dragging it on-screen.

As markers A and B appear on the graph, the following values will be displayed in the marker toolbar.

- power values corresponding to the wavelength position of both markers (in the case of WDM, the active and reference values are displayed; in the case of spectral transmittance and EDFA, the input and output values are displayed).
- > wavelength or frequency difference between the markers (A-B)
- > power difference in dB between the markers

- integrated power between the markers in dBm (when horizontal markers are hidden)
- ➤ for WDM, spectral transmittance and EDFA modes, power difference between the traces (active against reference or input against output) for both markers in dB (when horizontal markers are hidden).

As markers C and D appear on the graph, the power difference between the markers (C-D) related to the horizontal markers will be displayed in the marker toolbar.

You can also move the markers directly on the graph tab. Drag the marker to the desired area in the display. You will notice that the corresponding box in the marker toolbar changes according to the marker's position. If you want to set a precise value for the marker, simply enter it in the box.

- **Note:** After using the zoom tools in the graph tab, you can only move the markers again on the graph after deactivating the zoom. Pressing the arrow in the zoom tools section will deactivate the zoom function.
- **Note:** Markers A and B cannot cross. Displacing a marker over the second one will cause both markers to move together.

Managing Trace Information

After acquiring a trace, you might want to view details about the acquisition. The **Trace Info.** tab shows information related to acquisition parameters and conditions. You can also edit information about the tested fiber and job or add comments. This information is saved along with the trace.

- **Note:** Trace information is available for both active and reference traces, but you can edit only the trace information pertaining to the active trace.
- **Note:** If you want to apply the settings of the **Trace Identification** window to the **Preferences** tab, select the **Use as template** option and press **OK**.

To view trace information parameters:

From the main window, select the Trace Info. tab.
 Acquisition Drift Settings Channel Histor (Trace Info.)

Acquisition Drift Settings	Channel History Trace Info.		Mode 🕨
Acquisition type:	Single	A	
Number of scans:	1		
Spectral range start:	1535.000 nm	E	
Spectral range stop:	1575.000 nm		
User calibration:	Factory		
Calibration date:	9/17/2009		
Acquisition start time:	11/12/2009 7:55:04 AM		
Acquisition stop time:	11/12/2009 12:55:04 PM	Trace Identification	

2. For some test types (WDM if there is a reference trace, spectral transmittance and EDFA), select which trace you want to view.

Acquisition type:	Single	-	Show:	Input Trace	- I
Number of scans:	1				
Spectral range start:	1542.000 nm	E			
Spectral range stop:	1552.000 nm				
User calibration:	Factory				
Calibration date:	5/22/2009				
Acquisition start time:	6/18/2009 11:56:56 AM				
Acquisition stop time:	6/18/2009 11:58:40 AM	*		Frace Identification	

To edit general information:

- 1. From the main window, select the **Trace Info.** tab.
- 2. Press Trace Identification.

race Info.			Û		
Single		Show:	Input Trace	•	
1					
1542.000 nm	=				
1552.000 nm					
Factory					
5/22/2009					
6/18/2009 11:56:56 AM					
6/18/2009 11:58:40 AM	-	T	race Identification		
	race Info.) Single 1 1542.000 nm 1552.000 nm Factory 5/22/2009 6/18/2009 11:56:56 AM	Single 1 1542.000 nm E 1552.000 nm Factory 5/22/2009 6/18/2009 11:56:56 AM	Single Annual Show: 1 1542.000 nm E 1552.000 nm Factory 5/22/2009 6/18/2009 6/18/2009 1:56:56 AM	Single Input Trace 1 142.000 nm 1552.000 nm Factory 5/22/2009 6/18/2009 11:56:56 AM	single ↑ 1 1 1542.000 nm E 1552.000 nm Factory 5/22/2009 6/18/2009 6/18/2009 11:56:56 AM Tage Identification

Note: Trace identification is not available for the WDM reference trace.

3. Select the **General** tab.

General Information Com	ments
Job ID:	JOB-123
Cable ID:	CB_0003
Fiber ID:	
Customer:	Customer
Company:	EXFO
Operator:	
Maintenance reason:	
	Clear
Use as temp	late OK Cancel

- **4.** Edit the general information as required.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press Clear to clear all the changes made in the General tab.

To edit trace information:

- 1. From the main window, select the **Trace Info.** tab.
- 2. Press Trace Identification.

Acquisition Results T	race Info.		Ŷ		
Acquisition type:	Single	▲ Shov	v: Input Trace	-	
Number of scans:	1				
Spectral range start:	1542.000 nm	=			
Spectral range stop:	1552.000 nm				
User calibration:	Factory				
Calibration date:	5/22/2009				_
Acquisition start time:	6/18/2009 11:56:56 AM				
Acquisition stop time:	6/18/2009 11:58:40 AM	-	Trace Identification		
				4/26/2012 10	24 0.04

3. Select the **Information** tab.

Genera Information Con System and link information – Link ID:	nments)
Orientation:	Northbound	ł	~
System:			~ ~
Location information			
Network element:	Transmitte	r	×
Test point:	Input	~	
Description:			
		Restore Defau	ılts
🕜 📃 Use as temp	plate	ОК	Cancel

- **4.** Edit the information as required.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press **Restore Defaults** to remove all the changes and apply the default values.

To edit comments:

- 1. From the main window, select the **Trace Info.** tab.
- 2. Press Trace Identification.

Acquisition Results T	ace Info.		Û	
Acquisition type:	Single	 Show: 	Input Trace	•
Number of scans:	1			
Spectral range start:	1542.000 nm	=		
Spectral range stop:	1552.000 nm			
User calibration:	Factory			
Calibration date:	5/22/2009			
Acquisition start time:	6/18/2009 11:56:56 AM			
Acquisition stop time:	6/18/2009 11:58:40 AM	-	Trace Identification	

3. Select the **Comments** tab.

General	Information Comments		
Sample OS	5A trace showing a single saturated	peak.	
		(lear
0	Use as template	ОК	Cancel

- 4. Edit comments in the Comments window for the current trace.
- **5.** Press **OK** to save the changes and close the window, or press **Cancel** to exit without saving.

Press Clear to clear all the changes made in the Comments tab.

Generating Reports

After performing any acquisition, you can generate a report for the current acquisition and save it in .html, PDF or .txt format depending on the supported file type for your test mode. The report file will include trace information, acquisition conditions and other results and details specific to each test mode.

- **Note:** Empty channels that are shown on screen are included in the report files.
- **Note:** The .txt format report type is only available for the WDM and Drift modes.

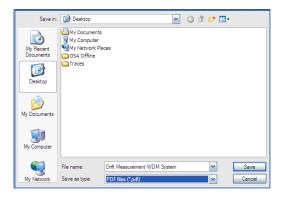
To generate a report:

- 1. From the Main Menu, select File.
- **2.** Press **Report**.



3. In the **Save As** window, enter a file name.

4. From the Save as type list, select the format for your report.



5. Press **Save**. The report will be added to the **Reports** folder. You can change the location where you want to save the report as desired.

14 Maintenance

To help ensure long, trouble-free operation:

- Always inspect fiber-optic connectors before using them and clean them if necessary.
- ► Keep the unit free of dust.
- Clean the unit casing and front panel with a cloth slightly dampened with water.
- Store unit at room temperature in a clean and dry area. Keep the unit out of direct sunlight.
- > Avoid high humidity or significant temperature fluctuations.
- > Avoid unnecessary shocks and vibrations.
- If any liquids are spilled on or into the unit, turn off the power immediately, disconnect from any external power source, remove the batteries and let the unit dry completely.



WARNING

The use of controls, adjustments and procedures other than those specified herein may result in exposure to hazardous situations or impair the protection provided by this unit.

Cleaning EUI Connectors

Regular cleaning of EUI connectors will help maintain optimum performance. There is no need to disassemble the unit.



IMPORTANT

If any damage occurs to internal connectors, the module casing will have to be opened and a new calibration will be required.

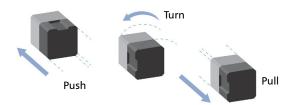


WARNING

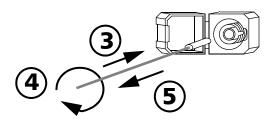
Looking into the optical connector while the light source is active WILL result in permanent eye damage. EXFO strongly recommends to TURN OFF the unit before proceeding with the cleaning procedure.

To clean EUI connectors:

1. Remove the EUI from the instrument to expose the connector baseplate and ferrule.



- **2.** Moisten a 2.5 mm cleaning tip with *one drop* of isopropyl alcohol (alcohol may leave traces if used abundantly).
- **3.** Slowly insert the cleaning tip into the EUI adapter until it comes out on the other side (a slow clockwise rotating movement may help).



- **4.** Gently turn the cleaning tip one full turn, then continue to turn as you withdraw it.
- 5. Repeat steps 3 to 4 with a dry cleaning tip.

Note: Make sure you don't touch the soft end of the cleaning tip.

6. Clean the ferrule in the connector port as follows:

6a. Deposit one drop of isopropyl alcohol on a lint-free wiping cloth.



IMPORTANT

Isopropyl alcohol may leave residues if used abundantly or left to evaporate (about 10 seconds).

Avoid contact between the tip of the bottle and the wiping cloth, and dry the surface quickly.

- **6b.** Gently wipe the connector and ferrule.
- **6c.** With a dry lint-free wiping cloth, gently wipe the same surfaces to ensure that the connector and ferrule are perfectly dry.
- **6d.** Verify connector surface with a portable fiber-optic microscope (for example, EXFO's FOMS) or fiber inspection probe (for example, EXFO's FIP).
- 7. Put the EUI back onto the instrument (push and turn clockwise).
- **8.** Throw out cleaning tips and wiping cloths after one use.

Recalibrating the Unit

EXFO manufacturing and service center calibrations are based on the ISO/IEC 17025 standard (*General Requirements for the Competence of Testing and Calibration Laboratories*). This standard states that calibration documents must not contain a calibration interval and that the user is responsible for determining the re-calibration date according to the actual use of the instrument.

The validity of specifications depends on operating conditions. For example, the calibration validity period can be longer or shorter depending on the intensity of use, environmental conditions and unit maintenance, as well as the specific requirements for your application. All of these elements must be taken into consideration when determining the appropriate calibration interval of this particular EXFO unit.

Under normal use, the recommended interval for your FTB-5240S/S-P Optical Spectrum Analyzer is: one year.

For newly delivered units, EXFO has determined that the storage of this product for up to six months between calibration and shipment does not affect its performance (EXFO Policy PL-03).

To help you with calibration follow-up, EXFO provides a special calibration label that complies with the ISO/IEC 17025 standard and indicates the unit calibration date and provides space to indicate the due date. Unless you have already established a specific calibration interval based on your own empirical data and requirements, EXFO would recommend that the next calibration date be established according to the following equation:

Next calibration date = Date of first usage (if less than six months after the calibration date) + Recommended calibration period (one year)

To ensure that your unit conforms to the published specifications, calibration may be carried out at an EXFO service center or, depending on the product, at one of EXFO's certified service centers. Calibrations at EXFO are performed using standards traceable to national metrology institutes.

Note: You may have purchased a FlexCare plan that covers calibrations. See the Service and Repairs section of this user documentation for more information on how to contact the service centers and to see if your plan qualifies.

Recycling and Disposal (Applies to European Union Only)

For complete recycling/disposal information as per European Directive WEEE 2012/19/UE, visit the EXFO Web site at www.exfo.com/recycle.

15 Troubleshooting

Viewing Online Documentation

An online version of the FTB-5240S/S-P Optical Spectrum Analyzer user guide is available at all times from the application.

Note: You will also find a printable PDF version on your installation DVD.

To access online help:

At the bottom of the **Main Menu**, tap **O**.

Acquisition	Drift Set	tings Char	nnel History	Trace Info.		(fr	Mode	►
Delay:	0	Second	-	Drift file name:	1529-1566_Single_1			
Sampling:	1	Minute	•	Drift file folder location				
Duration:	5	Hour	•	C:\Users\isasau1\Docun	nents\OSA\			
				Historical traces:	Don't keep any traces	•		
								W
						×⇔	4/26/2013 11:0	07 AM 🔡

Contacting the Technical Support Group

To obtain after-sales service or technical support for this product, contact EXFO at one of the following numbers. The Technical Support Group is available to take your calls from Monday to Friday, 8:00 a.m. to 7:00 p.m. (Eastern Time in North America).

Technical Support Group

400 Godin Avenue Quebec (Quebec) G1M 2K2 CANADA 1 866 683-0155 (USA and Canada) Tel.: 1 418 683-5498 Fax: 1 418 683-9224 support@exfo.com

For detailed information about technical support, and for a list of other worldwide locations, visit the EXFO Web site at www.exfo.com.

If you have comments or suggestions about this user documentation, you can send them to customer.feedback.manual@exfo.com.

To accelerate the process, please have information such as the name and the serial number (see the product identification label), as well as a description of your problem, close at hand.

You may also be requested to provide software and module version numbers. This information, as well as technical support contact information, can be found in the **About** window.

To view the information about the product:

From the Main Menu, press 👩.

Graph Channel Results Gi	bal Results					
20 WDM measurement 0 2- Add channels 20 3 Start an acquis 20 - Solect the acquis 3- Start an acquis - Solect the acquis -20 - Solect the acquis -50 - Solect the acquis -60 - Solect the acquis -60 - Solect the acquis -100 - Solect the acquis -1250 1300	sition parameters Analysis Setup or use Favo	rites		1600 nm	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Start Open Save Fav. Main Menu File Discover Preferences Analysis Setup Mode Mode
Acquisition Results Trace I	nfo.			U	Û	
Acquisition Type: Single	Count:			Nulling		
- Wavelength range Start:	1526.000 nm	Stop: 1567	.000 nm			
0	E	s	c	LU		000
				172	** 88%	11/7/2013 10:33 AM

Transportation

Maintain a temperature range within specifications when transporting the unit. Transportation damage can occur from improper handling. The following steps are recommended to minimize the possibility of damage:

- > Pack the unit in its original packing material when shipping.
- > Avoid high humidity or large temperature fluctuations.
- ► Keep the unit out of direct sunlight.
- > Avoid unnecessary shocks and vibrations.

IMPORTANT

Keep this information close at hand, as it contains important details about your product.



CAUTION

- Always use the GP-10-055 case when transporting the FTB-5240S module. EXFO does not recommend transporting the modules in a platform and/or in a case other than the one designed for your specific module.
- ► Handle the case with care when transporting the module.
- Please follow these guidelines. Modules damaged from rough handling during transport or shipment are not covered by any EXFO warranty.



The following image show the GP-10-055 case with the module inside.

16 Warranty

General Information

EXFO Inc. (EXFO) warrants this equipment against defects in material and workmanship for a period of one year from the date of original shipment. EXFO also warrants that this equipment will meet applicable specifications under normal use.

During the warranty period, EXFO will, at its discretion, repair, replace, or issue credit for any defective product, as well as verify and adjust the product free of charge should the equipment need to be repaired or if the original calibration is erroneous. If the equipment is sent back for verification of calibration during the warranty period and found to meet all published specifications, EXFO will charge standard calibration fees.



IMPORTANT

The warranty can become null and void if:

- unit has been tampered with, repaired, or worked upon by unauthorized individuals or non-EXFO personnel.
- warranty sticker has been removed.
- case screws, other than those specified in this guide, have been removed.
- > case has been opened, other than as explained in this guide.
- > unit serial number has been altered, erased, or removed.
- > unit has been misused, neglected, or damaged by accident.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL EXFO BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Liability

EXFO shall not be liable for damages resulting from the use of the product, nor shall be responsible for any failure in the performance of other items to which the product is connected or the operation of any system of which the product may be a part.

EXFO shall not be liable for damages resulting from improper usage or unauthorized modification of the product, its accompanying accessories and software.

Exclusions

EXFO reserves the right to make changes in the design or construction of any of its products at any time without incurring obligation to make any changes whatsoever on units purchased. Accessories, including but not limited to fuses, pilot lamps, batteries and universal interfaces (EUI) used with EXFO products are not covered by this warranty.

This warranty excludes failure resulting from: improper use or installation, normal wear and tear, accident, abuse, neglect, fire, water, lightning or other acts of nature, causes external to the product or other factors beyond the control of EXFO.

IMPORTANT

In the case of products equipped with optical connectors, EXFO will charge a fee for replacing connectors that were damaged due to misuse or bad cleaning.

Certification

EXFO certifies that this equipment met its published specifications at the time of shipment from the factory.

Service and Repairs

EXFO commits to providing product service and repair for five years following the date of purchase.

To send any equipment for service or repair:

- **1.** Call one of EXFO's authorized service centers (see *EXFO Service Centers Worldwide* on page 337). Support personnel will determine if the equipment requires service, repair, or calibration.
- **2.** If equipment must be returned to EXFO or an authorized service center, support personnel will issue a Return Merchandise Authorization (RMA) number and provide an address for return.
- 3. If possible, back up your data before sending the unit for repair.
- **4.** Pack the equipment in its original shipping material. Be sure to include a statement or report fully detailing the defect and the conditions under which it was observed.
- **5.** Return the equipment, prepaid, to the address given to you by support personnel. Be sure to write the RMA number on the shipping slip. *EXFO will refuse and return any package that does not bear an RMA number.*

Note: A test setup fee will apply to any returned unit that, after test, is found to meet the applicable specifications.

After repair, the equipment will be returned with a repair report. If the equipment is not under warranty, you will be invoiced for the cost appearing on this report. EXFO will pay return-to-customer shipping costs for equipment under warranty. Shipping insurance is at your expense.

Routine recalibration is not included in any of the warranty plans. Since calibrations/verifications are not covered by the basic or extended warranties, you may elect to purchase FlexCare Calibration/Verification Packages for a definite period of time. Contact an authorized service center (see *EXFO Service Centers Worldwide* on page 337).

EXFO Service Centers Worldwide

If your product requires servicing, contact your nearest authorized service center.

EXFO Headquarters Service Center

400 Godin Avenue Quebec (Quebec) G1M 2K2 CANADA 1 866 683-0155 (USA and Canada) Tel.: 1 418 683-5498 Fax: 1 418 683-9224 support@exfo.com

EXFO Europe Service Center

Winchester House, School Lane
Chandlers Ford, Hampshire S053 4DGTel.: +44 2380 246800
Fax: +44 2380 246801
support.europe@exfo.com

EXFO Telecom Equipment

(Shenzhen) Ltd. 3rd Floor, Building 10, Yu Sheng Industrial Park (Gu Shu Crossing), No. 467, National Highway 107, Xixiang, Bao An District, Shenzhen, China, 518126

Tel: +86 (755) 2955 3100 Fax: +86 (755) 2955 3101 support.asia@exfo.com

A

Technical Specifications

IMPORTANT

The following technical specifications can change without notice. The information presented in this section is provided as a reference only. To obtain this product's most recent technical specifications, visit the EXFO Web site at www.exfo.com.

SPECTRAL MEASUREMENT		
	FTB-5240S and FTB-5240S-P	FTB-5240BP
Wavelength range (nm)	1250 to 1650	1250 to 1650
Wavelength uncertainty (nm) $^{\rm b}$	±0.05 ±0.01 ^{c, d}	±0.03 ±0.01 ^{c, d}
Reference	Internal °	Internal
Resolution bandwidth (FWHM) (nm) ^f	0.065 ^{b, d}	0.033 ^{b, d}
Wavelength linearity (nm)	±0.01 ^{b, d}	±0.01 ^{b, d}
Wavelength repeatability 2σ (nm)	±0.003 ⁹	±0.002°

POWER MEASUREMENT			
	FTB-5240S and FTB-5240S-P	FTB-5240BP	HPW Option
Dynamic range (dBm) (per channel) ^b	-80 ^h to +18	-80 ^h to +18	-70 ^h to +23
Maximum total safe power (dBm)	+23	+23	+29
Absolute power uncertainty (dB)	±0.5	±0.5	±0.5
Power repeatability 2o (dB) d, g	±0.05	±0.04	±0.05

OPTICAL MEASUREMENT			
	FTB-5240S and FTB-5240S-P	FTB-5240BP	HPW Option
Optical rejection ratio at 1550 nm (dB) at 0.2 nm (25 GHz) at 0.4 nm (50 GHz)	35 (40 typical) 45 (50 typical)	45 (50 typical) 50 (55 typical)	35 (40 typical) 45 (50 typical)
Channel spacing	25 to 200 GHz CWDM	12.5 to 200 GHz CWDM	25 to 200 GHz CWDM
PDL at 1550 nm (dB)	±0.08 ^d	±0.06 d	
ORL (dB)	≥40	≥40	
Measurement time (s) ^{d,j} (includes scanning, analysis and display)	<1 (with the FTB-500 Platform)	<1 (with the FTB-500 Platform)	

Technical Specifications

IN-BAND OSNR MEASUREMENT d, k

	FTB-5240S-P only	FTB-5240BP
OSNR dynamic range (dB)	>35'	>35'
OSNR measurement uncertainty (dB)	±0.5 ^m	±0.5 ^m
Repeatability (dB)	±0.2 ⁿ	±0.2 °
Data signals	Up to 100 Gbit/s °	Up to 100 Gbit/s°
Measurement time (s) ^{d,j} (includes scanning, analysis and display)	<6 (eight scans)	<6 (eight scans)
Analysis modes	WDM, EDFA, drift, spectral transmittance, DFB, BP	WDM, EDFA, drift, spectral transmittance, DFB

Notes

- a. All specifications are for a temperature of 23 °C ± 2 °C with an FC/UPC connector unless otherwise specified, after warm-up.
- b. From 1520 to 1610 nm.
- c. After user calibration in the same test session within 10 nm from each calibration point.
- d. Typical.
- e. Integrated and wavelength-independent self-adjustment.
- f. Full width at half maximum.
- g. Over one minute in continuous acquisition mode.
- h. With averaging.
- i. At 1550 nm, -10 dBm input.
- j. 45 nm span, full resolution, 20 peak analysis.
- k. In-band OSNR measurement performed with 64 scans.
- I. For an optical noise level of > -60 dBm.
- m. 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.
- n. Repeatability specification is valid for OSNR \leq 25 dB.
- o. Except for pol-mux and fast polarization scrambled signals.

GENERAL SPECIFI	CATIONS		
Temperature	operating storage	0 °C to 40 °C (32 °F to 104 °F) −20 °C to 50 °C (−4 °F to 120 °F)	
Relative humidity		0 % to 95 % noncondensing	
Battery life (hours)		5 (with the FTB-500 Platform)	
Connectors		EI (EXFO UPC Universal Interface) EA (EXFO APC Universal Interface)	
Size (H x W x D)	FTB-5240S module FTB-5240BP module	96 mm x 51 mm x 260 mm (3 ¾ in x 2 in x 10 ¼ in) 96 mm x 76 mm x 260 mm (3 ¾ in x 3 in x 10 ¼ in)	
Weight	FTB-5240S module FTB-5240BP module	1. 5 kg (3.3 lb) 1.7 kg (3.8 lb)	

SELECTION GUIDE				
OSA Module	CWDM	DWDM (100 GHz spacing)	DWDM (50 GHz spacing)	ROADM + 40 Gbit/s network
FTB-5240S	х	Х	Х	
FTB-5240S-P	х	х	х	Х
FTB-5240BP	Х	Х	Х	x

Formulas Used with Your Optical Spectrum Analyzer

The following formulas are used in the various tests available with your OSA module.

EDFA Noise Figure Calculation

The EDFA noise figure is calculated using the following equation:

EDFA noise figure =
$$\frac{P_{ASE} - GP_{SSE}}{GhvB} + \frac{1}{G}$$

Where

B

P_{ASE} is the power of the spontaneous emission amplified by the EDFA,

P_{SSE} is the power of the spontaneous emission of the source,

G is the gain at this channel's wavelength,

h is Plank's constant (6,6256 x 10^{-34} J · s),

 \boldsymbol{v} is the frequency of the channel, and

B is the noise equivalent bandwidth, as calibrated at this channel's wavelength.

Central Wavelength Calculation (Spectral Transmittance)

Central Wavelength Calculation (Spectral Transmittance)

The central wavelength is calculated using the following equation:

$$a = \frac{\lambda_{\rm R} + \lambda_{\rm L}}{2}$$

Where

a is the central wavelength,

 λ_R is the wavelength on the right at which the power is 3 dB below the power at the nominal wavelength, and

 λ_L is the wavelength on the left at which the power is 3 dB below the power at the nominal wavelength.

Bandwidth Calculation (Spectral Transmittance)

Bandwidth Calculation (Spectral Transmittance)

Bandwidth is calculated using the following equation:

$$b = 2*Min\{(\lambda_N - \lambda_{XdBLeft}), (\lambda_{XdBRight} - \lambda_N)\}$$

Where

b is the bandwidth at X dB,

 λ_N is the nominal wavelength,

- $\lambda_{XdBLeft}$ is the wavelength on the left at which the power is X dB below the power at the nominal wavelength.
- $\lambda_{XdbRight}$ is the wavelength on the right at which the power is X dB below the power at the nominal wavelength.

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NOTICE

通告

CHINESE REGULATION ON RESTRICTION OF HAZARDOUS SUBSTANCES 中国关于危害物质限制的规定

NAMES AND CONTENTS OF THE TOXIC OR HAZARDOUS SUBSTANCES OR ELEMENTS CONTAINED IN THIS EXFO PRODUCT 包含在本 **EXFO** 产品中的有毒有害物质或元素的名称和含量

Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006

O 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的 限量要求以下。

Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006

表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。

	Toxic or hazardous Substances and Elements 有毒有害物质和元素					
Part Name 部件名称	Lead 铅 (Pb)	Mercury 汞 (Hg)	-		Polybrominated biphenyls 多溴联苯 (PBB)	Polybrominated diphenyl ethers 多溴二苯醚 (PBDE)
Enclosure 外売	0	0	0	0	0	О
Electronic and electrical sub-assembly	Х	0	Х	0	Х	Х
电子和电子组件						
Optical sub-assembly ^a	Х	0	0	0	0	0
光学组件 ^a						
Mechanical sub-assembly ^a	0	0	0	О	0	О
机械组件 ^a						

a. If applicable.

如果适用。

MARKING REQUIREMENTS 标注要求

Product	Environmental protection use period (years)	Logo
产品	环境保护使用期限(年)	标志
This Exfo product 本 EXFO 产品	10	
Battery ^a 电池 ^a	5	5

a. If applicable. 如果适用。

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