OSA20 – Optical fiber amplifier (OFA) mode

EXFO

# OSA20 – Optical fiber amplifier (OFA) mode

Introduction

Optical amplifiers generate noise, known as amplified spontaneous emission (ASE), which is injected into the network. ASE is considered the main cause of errors in data transfer.

EXFO's OSA20 is equipped with a mode to analyze optical amplifiers. This quick reference guide walks you through the optical fiber amplifier or OFA mode step by step.

Launching the OFA mode

Select the OFA mode in the main menu:
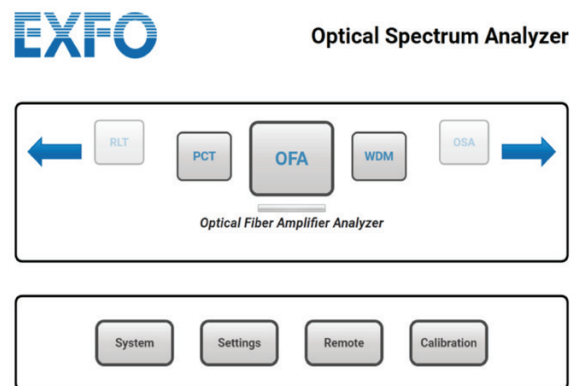
Scan settings and analysis setup

It is recommended to define the scan settings (e.g., wavelength range, sensitivity) and analysis setup before running a test.
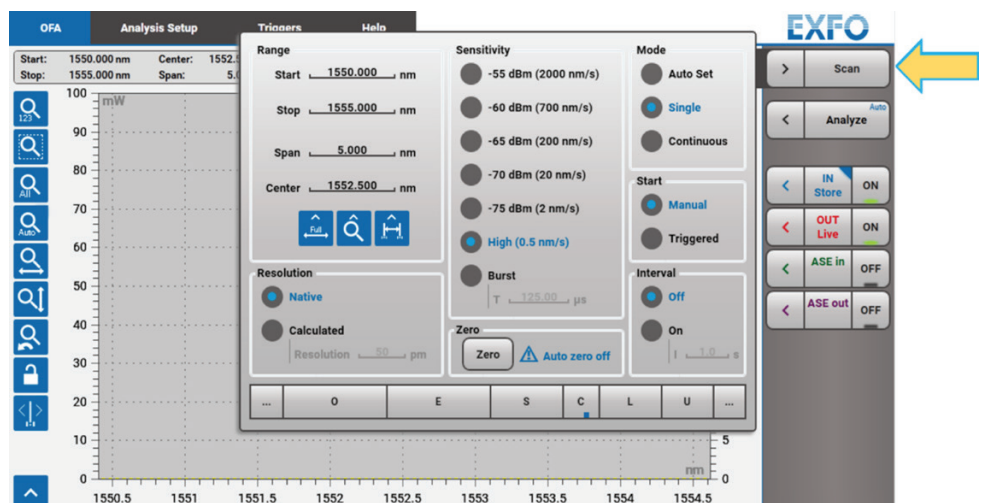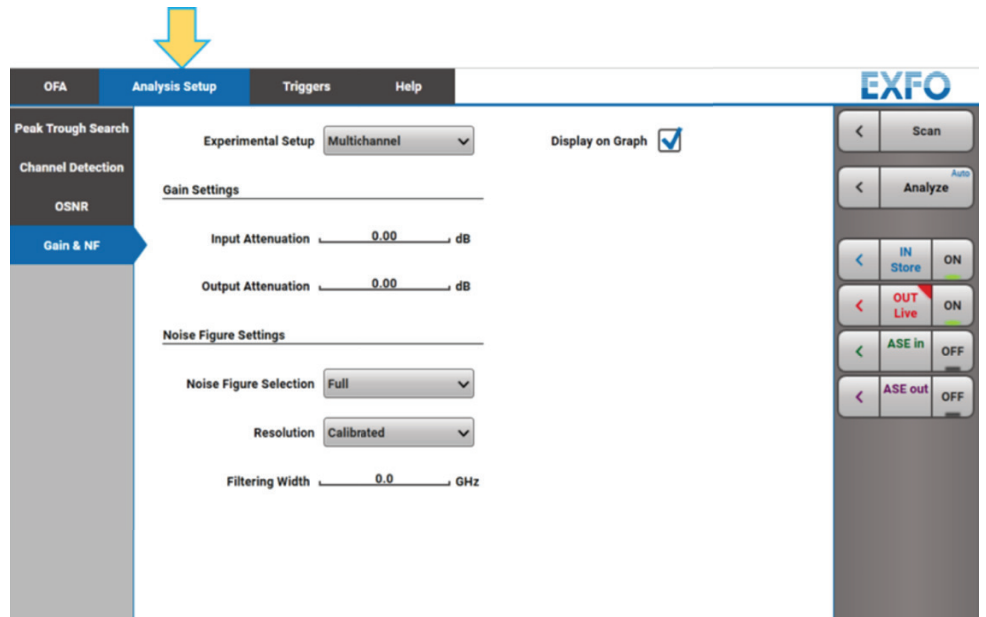

Figure 1. Scan settings menu.
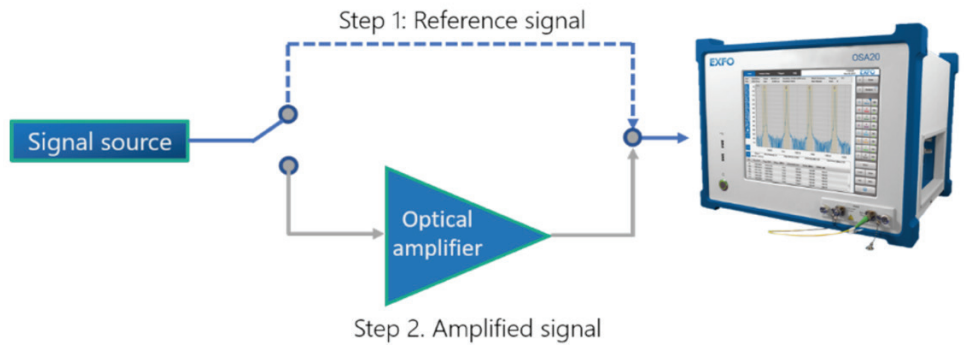
Figure 2. Analysis setup menu.

Figure 3. Typical setup for using the OFA mode in OSA20.

The OFA mode involves two steps in the analysis of an optical amplifier (see figure above). In the current example, a multichannel WDM signal is amplified and analyzed.

Test and analysis of optical amplifiers

The measurement starts by acquiring the reference trace, which corresponds to the non-amplified signal. In the right-hand side menu of the GUI, the "*In*" trace is recorded as "*Live*" and it is displayed by clicking the button "*On*", as shown below.
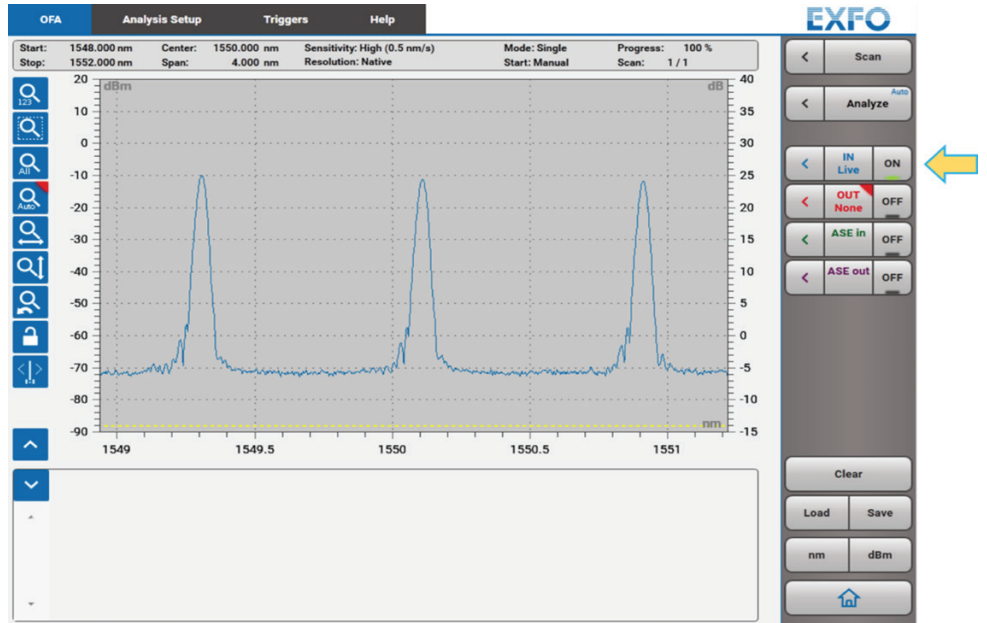

Figure 4. Measuring the non-amplified signal.

After the acquisition, the reference trace is "Stored" to proceed to the next measurement.

Figure 5. Storing the non-amplified signal.

4

Then, a second scan is performed to record the spectrum when the amplifier is turned on.
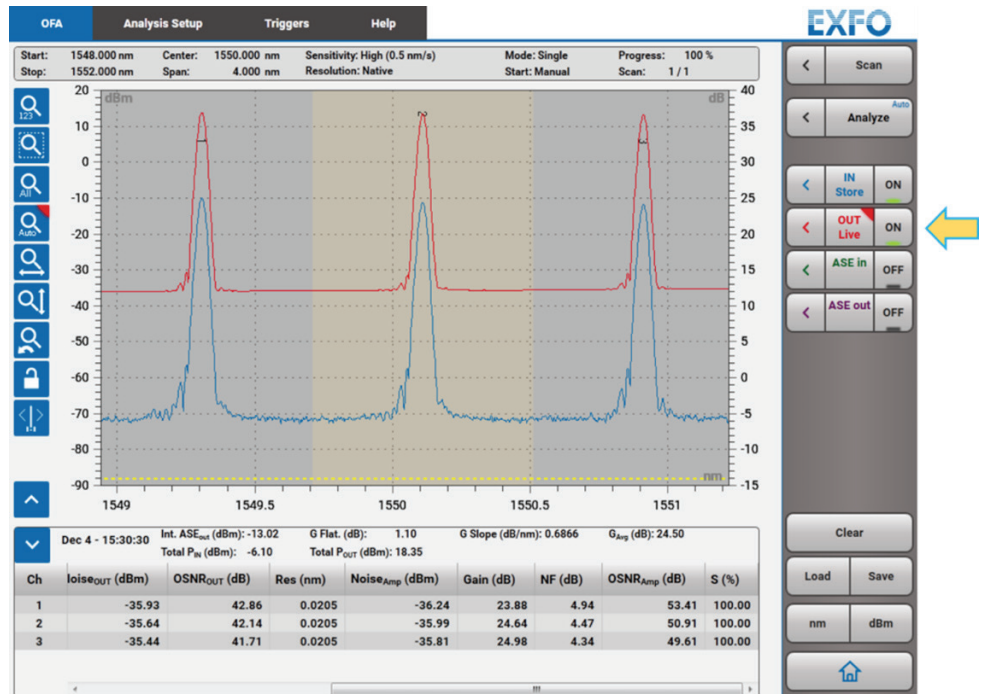

Figure 6. Measuring the amplified signal.

The results are immediately calculated and displayed in the chart below the plot, as can be seen in Figure 6. The key parameters in this analysis are gain, OSNR and noise (quality of the amplification). Moreover, the gain and noise of each channel can be plotted in the graph and their values are associated to the right-hand axis (Figure 7).
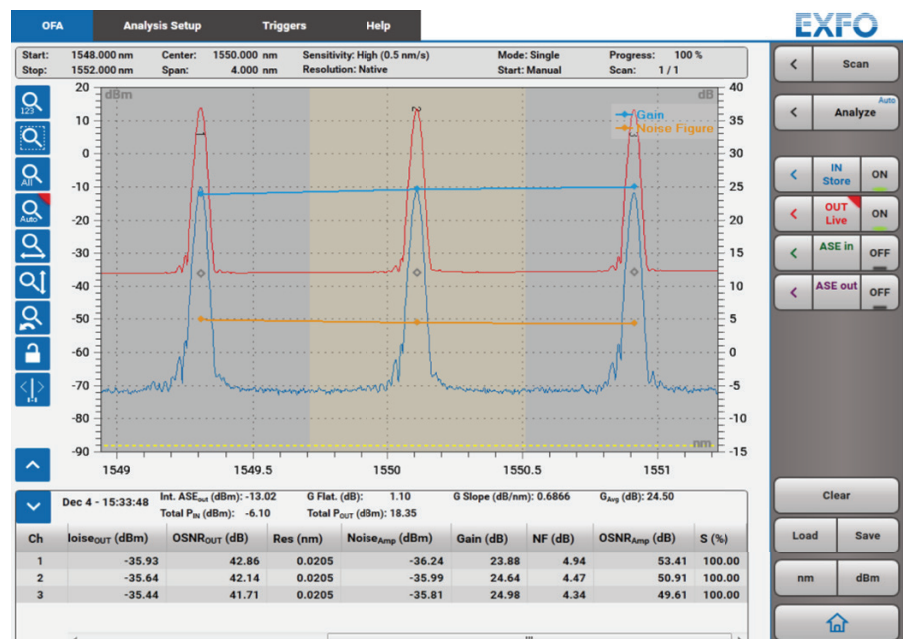

Figure 7. Displaying noise and gain results.

Finally, in Figure 8, we can calculate the noise level "*ASE in*" and "*ASE out*", representing the ASE of the non-amplified and the amplified signal, respectively.
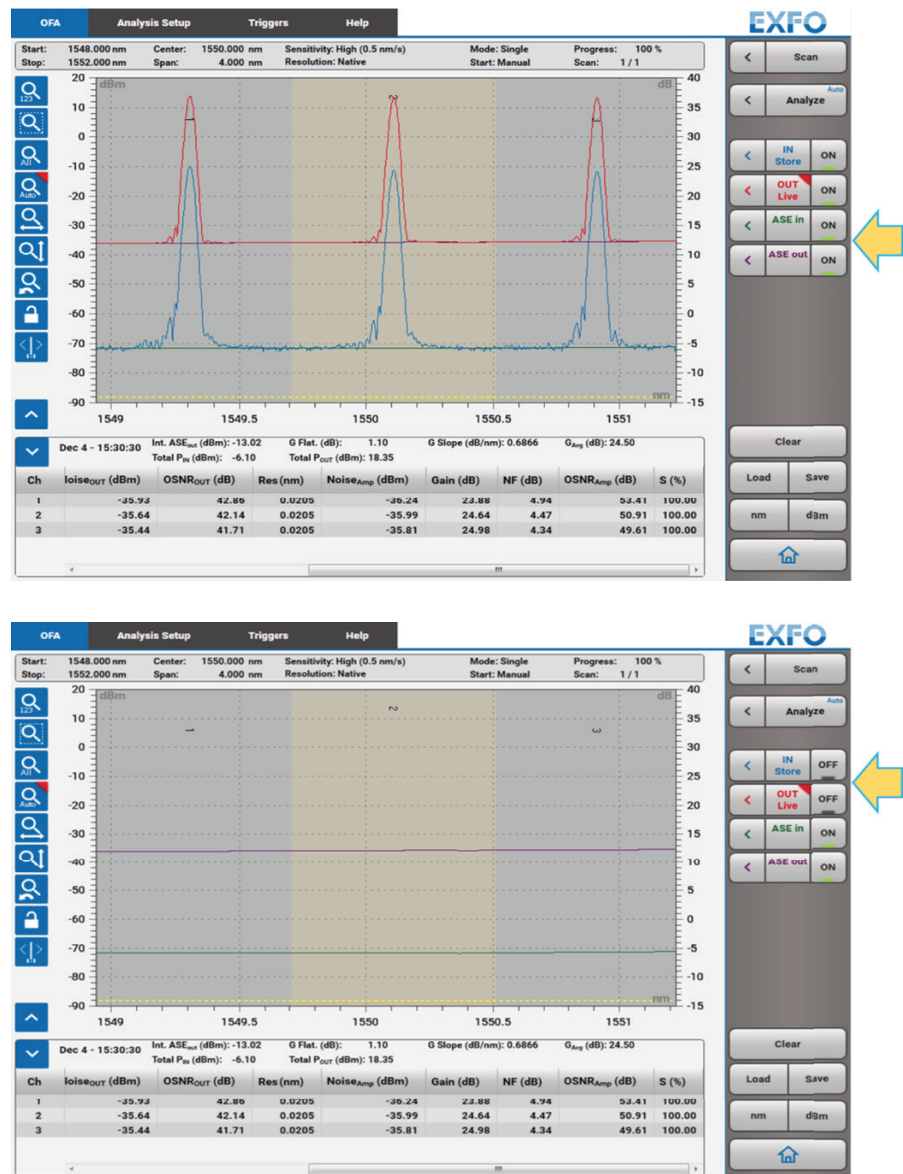

Figure 8. Displaying the ASE level for the signal before and after the amplification.

SUMMARY

The OSA20 is a powerful tool for the advanced analysis of optical amplifiers through its **OFA mode**. This document shows how straightforward it is to take the measurement. Please bear in mind, however, that the example given represents a typical application. Please read the User manual for further details about the scan settings and analysis setup.

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OSA20 – Passive component testing (PCT) mode

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# OSA20 – Passive component testing (PCT) mode

Introduction

The reliability and proper functioning of optical networks can be guaranteed by characterizing the passive components in their topology. This type of measurements has, therefore, become a day-to-day practice in laboratory and manufacturing environments. Moreover, this is a growing trend with the incorporation of photonic integrated circuits (PIC) in transceivers, modulators, filters, MUX, sensors and so forth.

Among the different methods to assess the insertion loss of passive components, one of the most straightforward but efficient solution is to test with an optical spectrum analyzer (OSA). The advantages and limitations of this technique have been widely detailed in EXFO's application note entitled "Assessing passive components using a CT440 or an OSA20".

The OSA20's **passive component testing mode or PCT mode** enables the measurement and calculation of the transfer function in passive components. This quick reference guide outlines the measurement step by step.

Launching PCT mode

The PCT mode is launched from the main menu as follows:
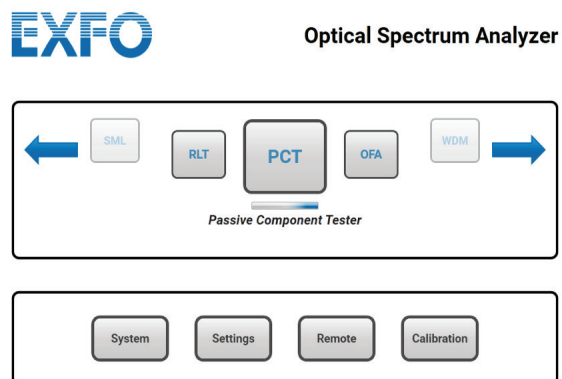
Scan settings and analysis setup

It is recommended to define the scan settings (e.g., wavelength range, sensitivity) and analysis setup before running a test.
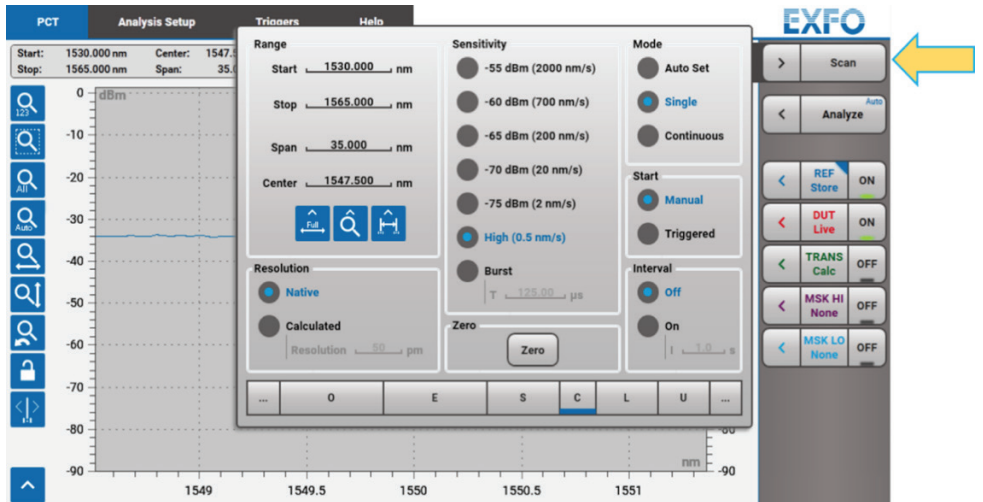

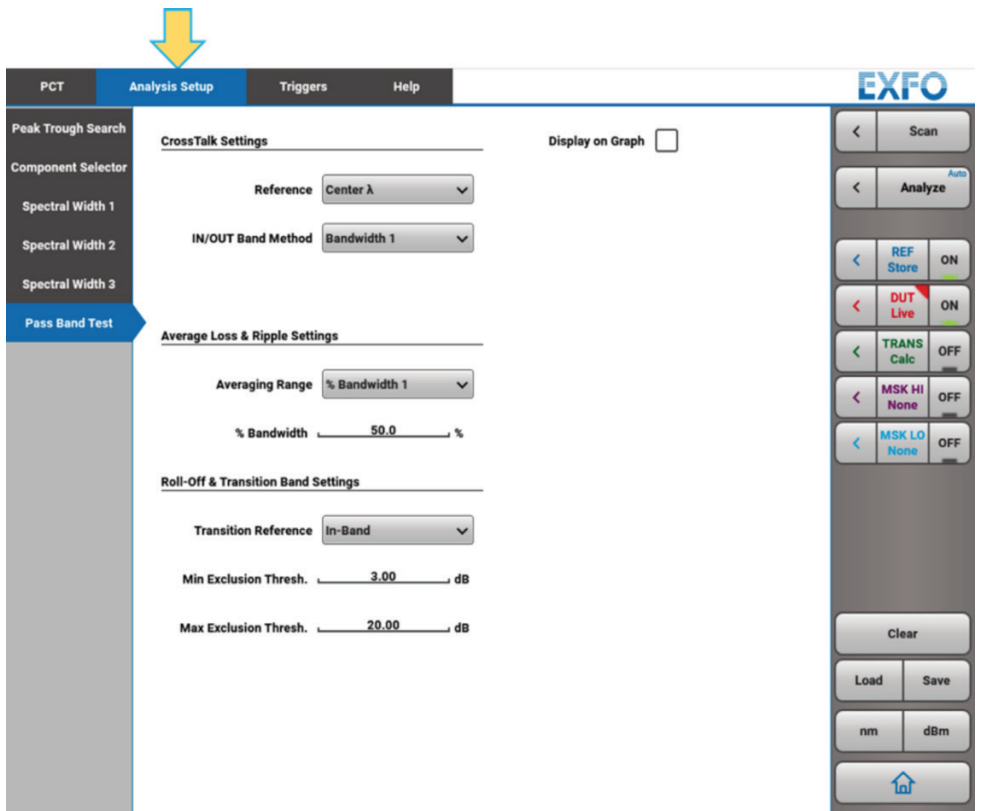*Figure 1. Scan settings menu.*

Figure 2. Analysis setup menu.

The PCT mode involves two steps in the characterization of a passive component (see figure below). In the current example, the device under test (DUT) is given by a bandpass filter for which the insertion loss is measured and analyzed.
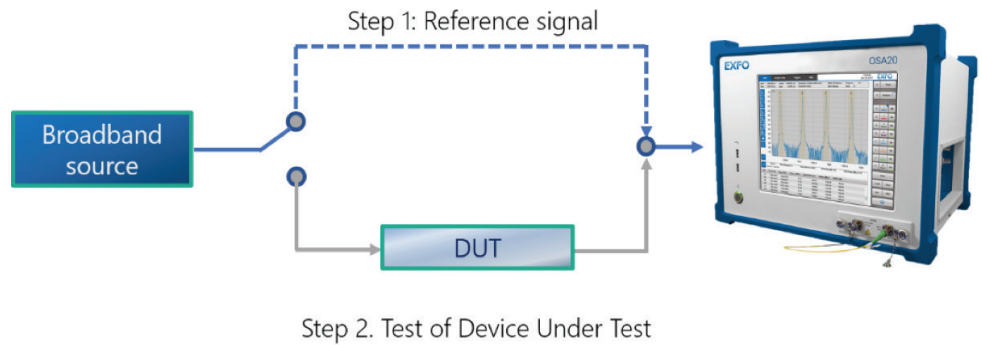
Figure 3. Typical setup for using the PCT mode in OSA20.

Test and analysis of passive components

The measurement starts by acquiring the reference trace, which corresponds to the signal coming from the broadband source. So, on the right-hand side menu of the GUI, the "*In*" trace is recorded as "*Live*" and is displayed by clicking the button "*ON*", as shown below:
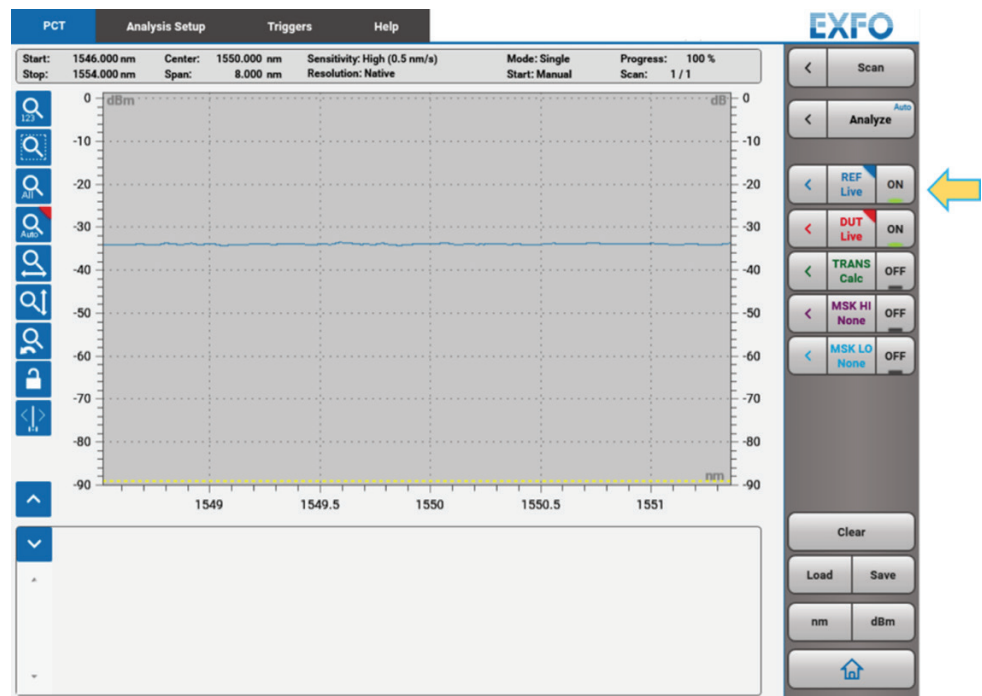

Figure 4. Measuring the reference signal (light source).

4

After the acquisition, the reference trace is "*Stored*" to proceed to the next measurement.

Figure 5. Storing the reference signal.

A second scan is then performed to record the spectrum when the DUT is connected to the initial setup.
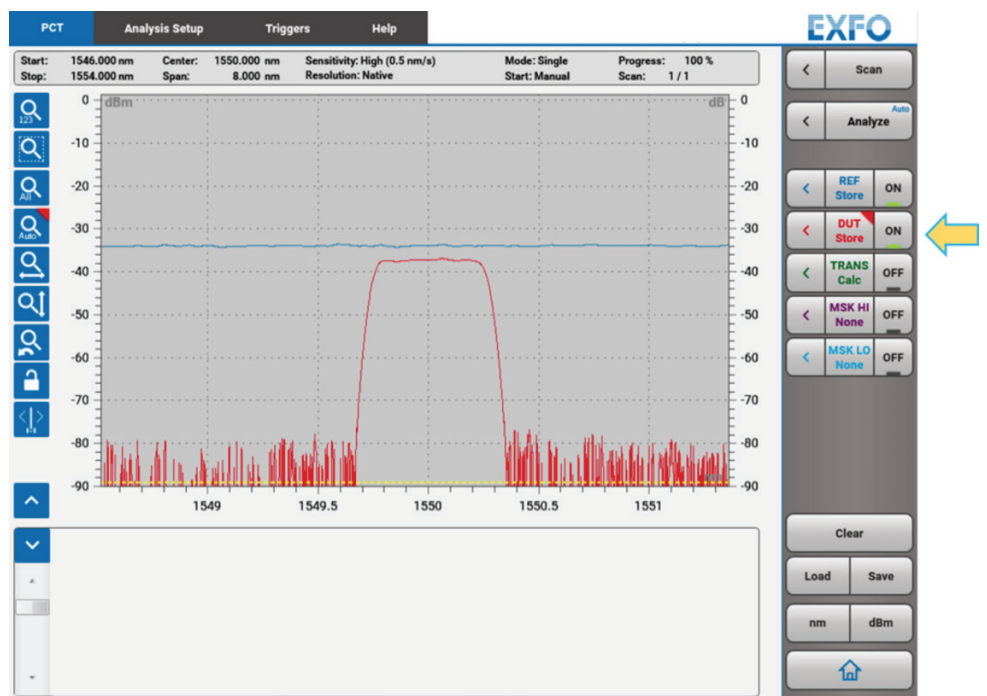

Figure 6. Scanning when the DUT is present in the experimental setup.

The transfer function of DUT, given by the difference of the reference signal (*REF Store*) and the spectrum of the DUT (*DUT Store*), is calculated by enabling the "*TRANS Calc*". The analysis results are immediately displayed in the chart under the plot, as can be seen in the following figure.

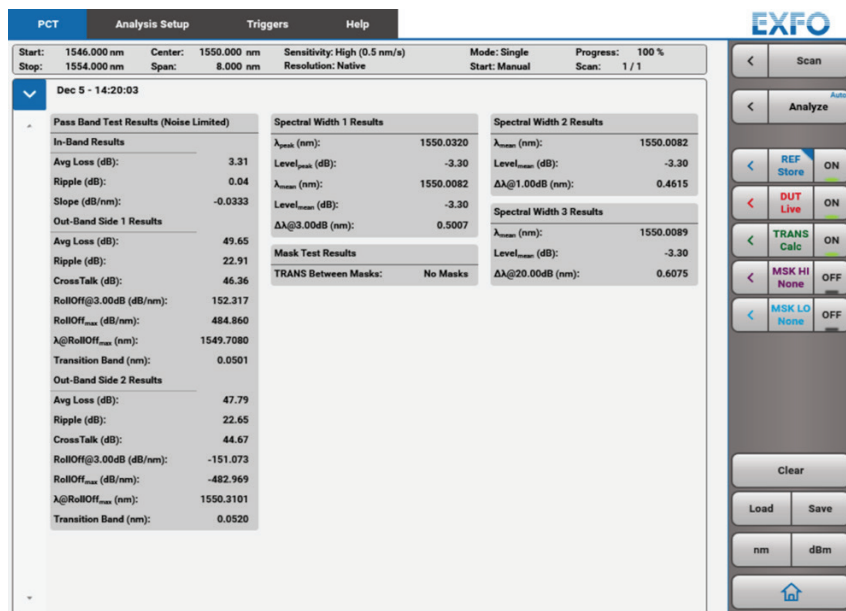*Figure 7. Displaying the transfer function (green trace).*

Figure 8. Maximizing the analysis results chart.

SUMMARY

The OSA20's **PCT mode** tests passive components with elegance and simplicity. This document shows how straightforward it is to take the measurement. Please bear in mind, however, that the example given here represents the typical application. It is highly recommended to read the User manual for further details concerning the scan settings and analysis setup.

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OSA20 – On-Off Method for OSNR measurement

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OSA20 – On-Off Method for OSNR measurement

Introduction

The On-Off Method in OSA20 is a tool designed for Pol-Mux optical signal-to-noise ratio (OSNR) measurement, suitable for the installation and turn-up of WDM networks. This method provides accurate amplified spontaneous emission (ASE) OSNR measurements relying on the comparison of optical spectra—the first measurement with all channels turned on and the second with the channel of interest turned off. The On-Off Method can be applied to signals presenting an inter-channel spacing that is wide enough to determine and extract the noise level information. Additionally, an essential requirement is the availability to activate and disable the emission of each WDM channel.
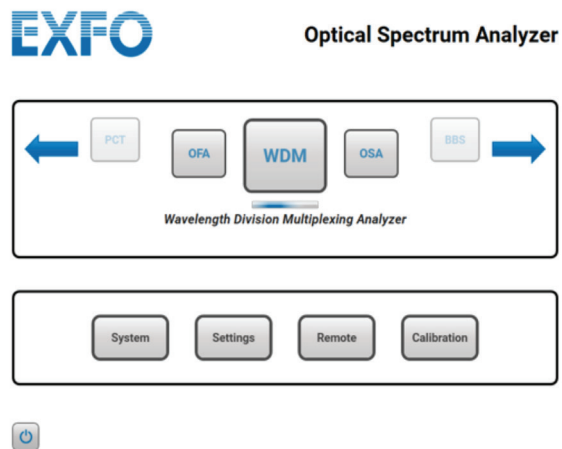
This document is a step-by-step guide to perform an OSNR measurements using the On-Off Method.

Launching the WDM Mode

Select the WDM Mode[1] in the main menu:

The On-Off Method is a tool designed for Pol-Mux OSNR measurements during the installation and turn-up of WDM networks.

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1. The On-Off Method is also available in the RLT Mode to analyze recirculating loop transmissions. For more information, please consult the application note entitled "Testing fiber-optic recirculating loop transmission using the OSA20."

Scan and Analysis Setup settings

First, we recommend you define the scan settings (e.g., wavelength/frequency range, sensitivity, etc.) before running any test:
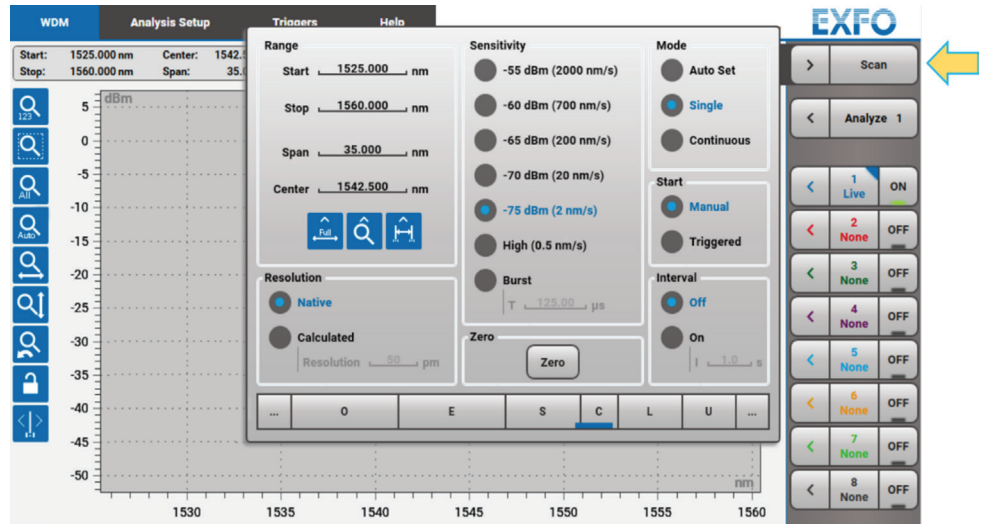

Figure 1. Scan Settings menu.

The Analysis Setup settings can then be modified:

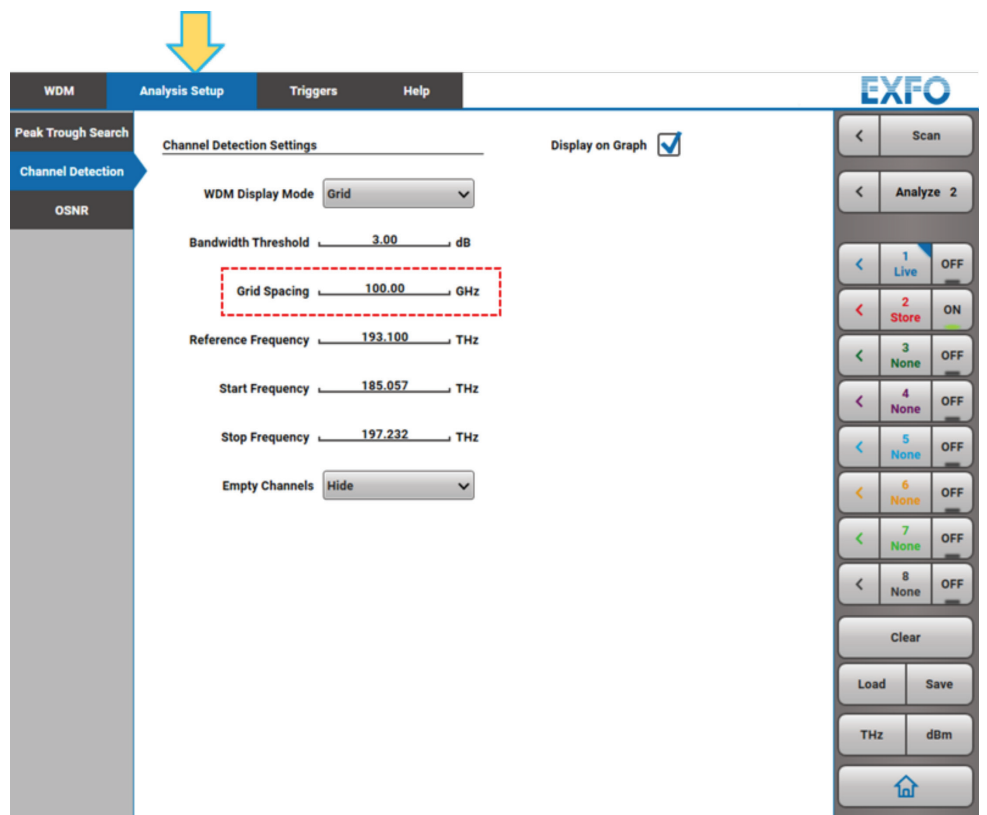The Channel Detection must be customized according to the WDM signal under test.

Figure 2. Channel Detection settings.

> To apply the On-Off Method, an essential requirement is the availability to activate and disable the emission of each WDM channel.

Did you know?

The wavelength range can be defined in the Scan menu by selecting the ITU band selection bar, which is displayed at the bottom of the menu window.

The OSNR tab allows you to select the On-Off Method in the Noise Point Selection menu. The On-Off Integration Range value must be identical to the Grid Spacing value selected in the Channel Detection tab.
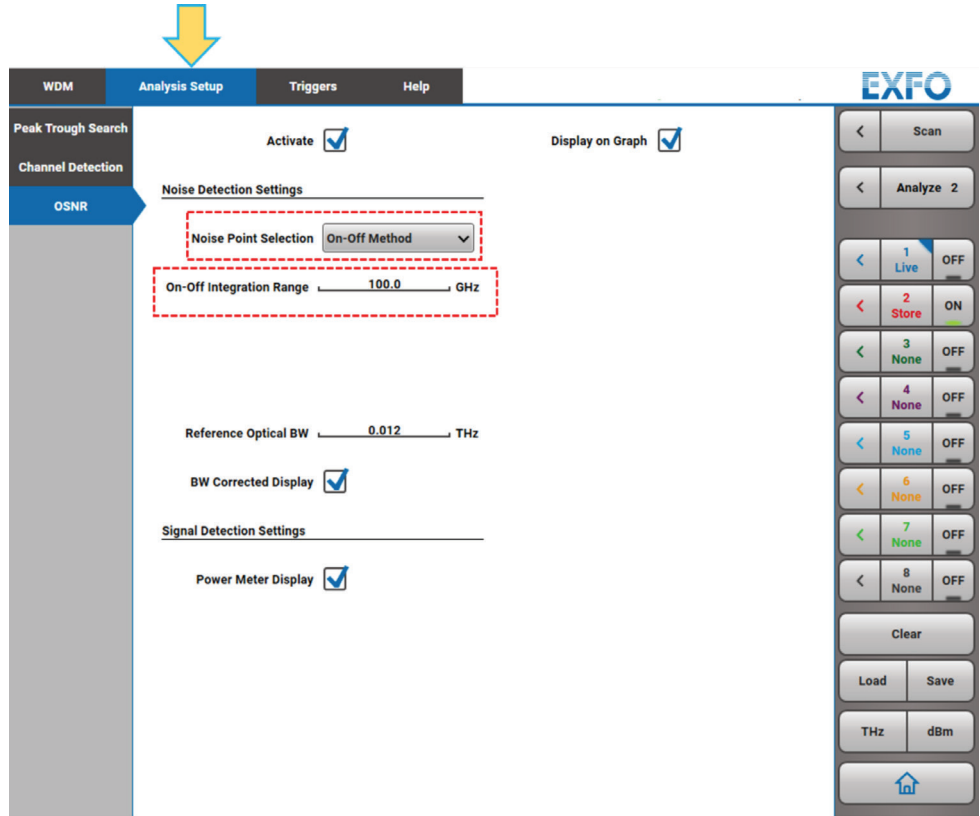

Figure 3. OSNR settings.

Testing and calculation of OSNR using the On-Off Method

The On-Off Method compares two optical spectra. The initial measurement is the acquisition of the WDM signal when all the channels are turned on. In the menu bar to the right of the GUI, trace 1 is recorded as "Live" and it is displayed by clicking the "ON" button as shown in Figure 4:
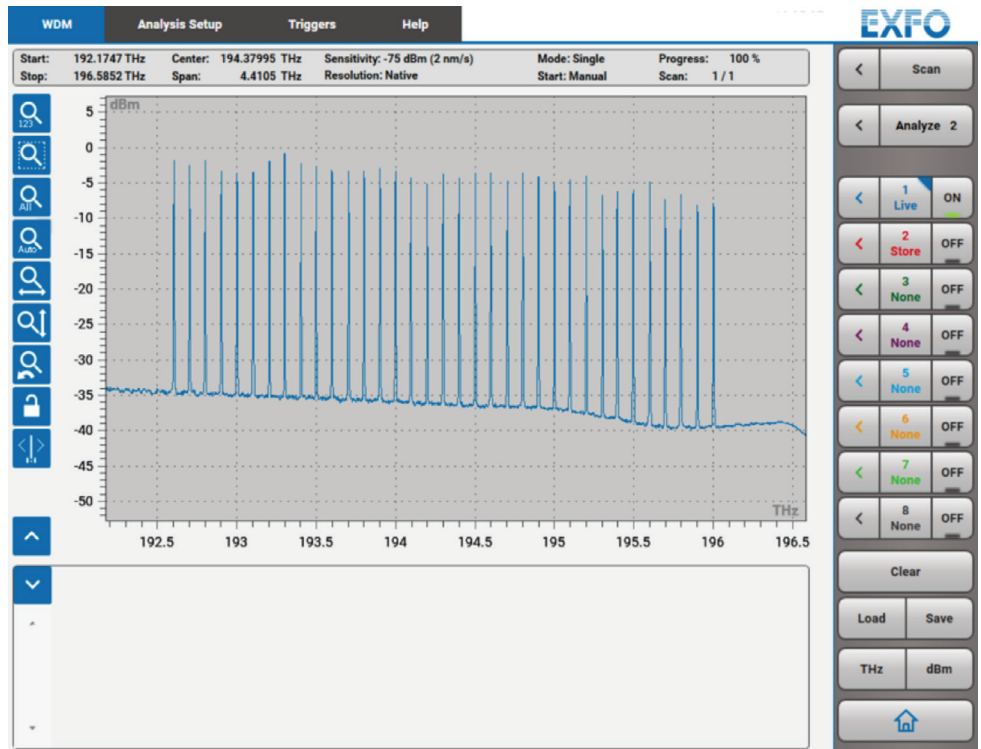

Figure 4. Measuring the WDM signal with all the channels turned on.

After the acquisition, the reference trace that has been just recorded is "Stored" to proceed to the next measurement.

Figure 5. Storing the trace with all the channels on.

Did you know?

The user manual can be consulted directly on the OSA20 by selecting the Help tab at the top of the GUI.

Then, the WDM channel for which the OSNR will be calculated is turned off. A second scan is performed afterwards to measure the spectrum and to analyze the trace.
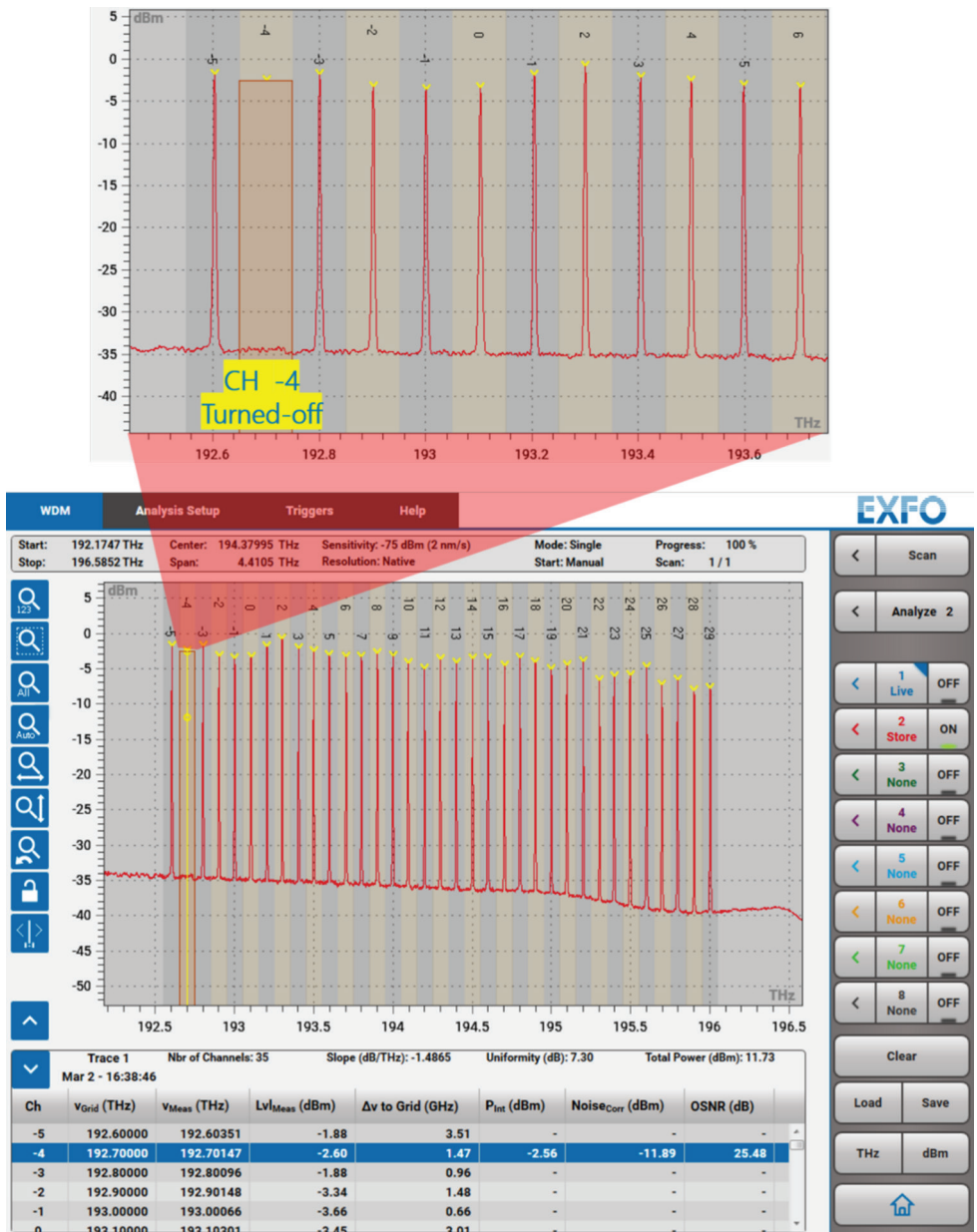

Figure 6. Calculation of OSNR using the On-Off Method.

The OSNR value is immediately calculated and displayed on the results table below the plot, as can be seen in Figure 6.

The OSNR value of the rest of the channels can be calculated one by one, by repeating the procedure described above.

For further information, please consult the OSA20 user manual.