CT440/CT440-PDL

OPTICAL COMPONENT TESTER

Compact tester for fast and accurate characterization of passive optical components (MUX/DEMUX, filters, splitters, etc.) and modules (ROADM, WSS). Covers the spectral range from 1240 to 1680 nm for measurements over the full telecom band. With the PDL option, simultaneously measure insertion loss and polarization dependent loss.

SPEC SHEET

KEY FEATURES

- Fast transfer function measurement
- Wavelength range: 1240 - 1680 nm (SMF model)
- PM and PDL options
- Wavelength resolution: 1 to 250 pm
- Wavelength accuracy: ±5 pm
- Dynamic range: 65 dB in a single sweep
- Combines up to four tunable lasers (SMF type)
- Four internal detectors, expandable with synchronization
- 19-in rack compatible with 1U format

FAST INSERTION LOSS MEASUREMENT

The CT440 features a unique combination of high-speed electronics and optical interferometry. The four integrated detectors allow for the simultaneous measurement of four channels with a 65 dB dynamic range in a single laser sweep. Moreover, ±5 pm wavelength accuracy is achieved at any sweep velocity, so there is no compromise between measurement speed and accuracy.

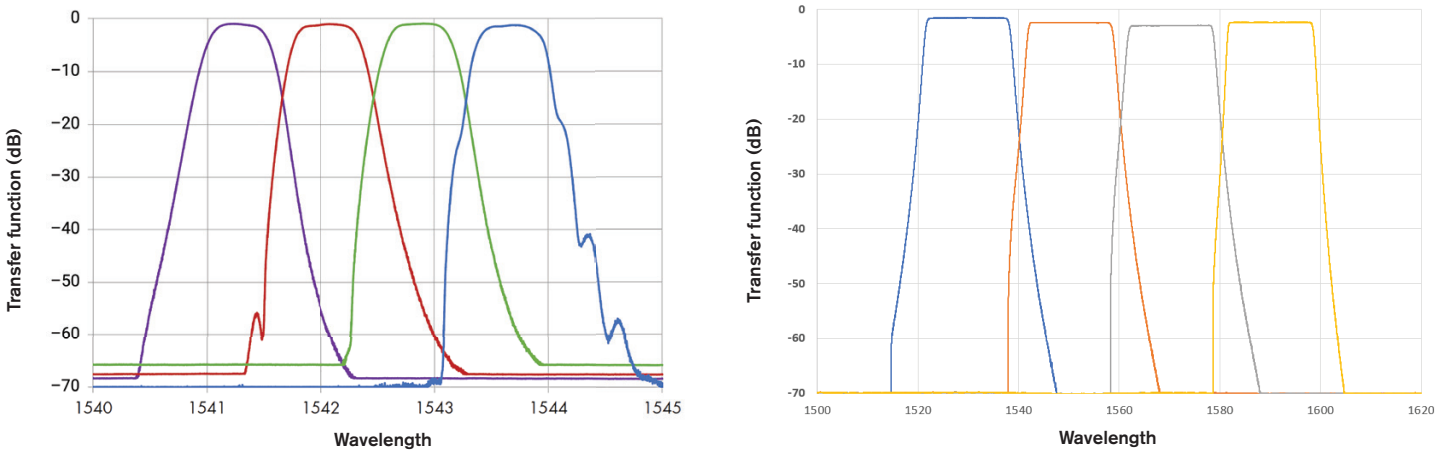

Figure 1. DWDM (left) and CWDM (right) filter measurement in a single sweep

ACCURATE INSERTION LOSS MEASUREMENT

The CT440 integrates a monitoring photodetector to compensate for any power fluctuation coming from the laser source during the sweep. Sampling resolution can be chosen between 1 and 250 pm independently of the laser sweep speed. In addition to the ±5 pm wavelength accuracy, the built-in wavemeter relaxes the requirements for the tunable laser source (TLS) to bring down the system cost without affecting measurement performance. The CT440 provides all the features you need for accurate measurements in a single box when interfaced with a TLS and a PC.

FULL-BAND READY

The CT440 (SMF model) can operate between 1240 and 1680 nm and is fully compatible with EXFO's T100S-HP series of tunable lasers. For example, combine the T100S-HP-O+, T100S-HP-ES and T100S-HP-CLU with a CT440 SMF model for full-band testing. When several TLSs are used, the CT440 can automatically switch between the lasers to allow for seamless full-band measurements. The single connection to the DUT means no external switch is required.

PM OPTION

The CT440-PM can test insertion loss of polarization-sensitive components (e.g., MZ modulator), where a polarization maintaining fiber is needed between the TLS input and output ports. Two models cover either the O-band (1260 nm to 1360 nm) with a PM13 fiber type or the SCL-band (1440 nm to 1640 nm) with a PM15 fiber type. As a result, those models require polarization-maintaining tunable lasers, such as the T100S-HP-O-M or T100S-HP-SCL-M, respectively.

PDL OPTION

The CT440-PDL integrates a polarization state generator that allows for spectral characterization of both insertion loss and polarization dependent loss (based on the Mueller matrix method) using successive polarization-controlled sweeps. Two models cover either the O-band (1260 nm to 1360 nm) with a PM13 fibre type or the SCL-band (1440 nm to 1640 nm) with a PM15 fibre type. As a result, these models require polarization-maintaining tunable lasers, such as T100S-HP-O-M or T100S-HP-SCL-M, respectively.

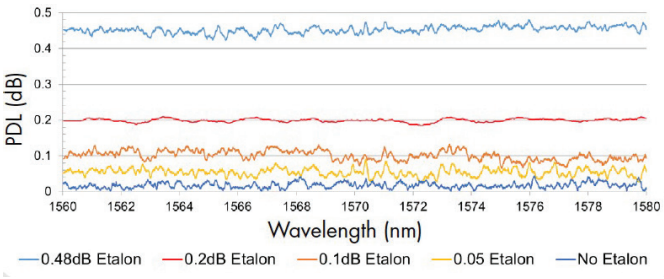

Figure 2. Four PDL etalons measured at 10 pm resolution

Figure 3. CT440-PDL model

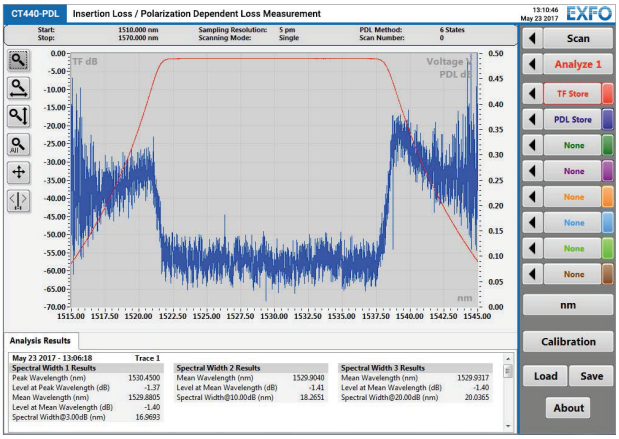

Figure 4. IL and PDL measurement on a CWDM filter

ADDITIONAL FEATURES

Heterodyne detection of laser line (SMF models with ≥2 TLS inputs)

A signal under test (SUT) can be connected to the TLS input n°2. As the laser sweeps across the wavelength range, interference patterns will be generated and detected by the CT440 when it crosses the SUT wavelengths. As such, the CT440 can be used as a multiwavelength meter.

System recalibration using a known reference laser or a fibre-coupled gas cell

For experiments where absolute wavelength referencing is paramount, the CT440 can be used with the wavelength reference material accessories. The wavelength reference material contains either hydrogen fluoride or hydrogen cyanide reference cells exhibiting absorption lines in the O-band and C-band respectively for excellent absolute wavelength accuracy.

Control software with built-in analysis functions

Intuitive and comprehensive GUI for easy laser management, reference and scan configurations and filter analysis.

Full remote control

Thanks to the DLL and the example software code provided with the CT440, component testing can be readily integrated into complex remote control programs.

Optimized form-factor

The CT440 comes in a new rack-mountable format (1U in height), ideal for laboratories with limited space.

Figure 5. Rack-mountable solution for both (top) CT440 and (bottom) CT440-PDL

SPECIFICATIONS

			SMF	PM13	PM15	PDL-O	PDL-SCL
Wavelength	Operating wavelength range (nm)		1240 to 1680	1260 to 1360	1440 to 1640	1260 to 1360	1440 to 1640
	Wavelength accuracy	Absolute (pm) [a, b]	±5				
		Relative (pm) [a]	±1			±5	
Optical ports (front panel)	TLS inputs and outputs	Number of input ports	1 to 4	1 (PM13)	1 (PM15)	1 (PM13)	1 (PM15)
		Number of output ports	1	1 (PM13)	1 (PM15)	1 (SMF)	
		Connector type	FC/APC narrow key				
		Polarization extinction ration (PER)	N/A	≥20 dB		≥18 dB (recommended)	
	Detector array	Number of detector ports	1, 2 or 4				
		Connector type	FC/PC wide key				
Electrical ports (rear panel)	Trigger out (5 V TTL)		Swept measurement external synchronization (pulse train generated at native sampling resolution)				
	Trigger in (5 V TTL)		Triggered measurement without laser sweep control (measurement is taken when TTL level = high)				
	Analog voltage in (0-5 V high impedance)		Voltage level sampling from an external device (sampling resolution of 1.3 mV)				
Optical power	Power range	On TLS input (dBm)	0 to 10				
		On detector ports (dBm)	−60 to 7				
	Transfer function	Accuracy (dB) [c, d]	±0.2				
		Sampling resolution (dB)	0.02				
		Dynamic range [d, e]	65 dB typical for 1 or 2 TLS inputs 60 dB typical for 3 or 4 TLS inputs	65 dB typical			
	Polarization-dependent loss	Accuracy (dB) [f]	N/A			±0.05 + 4% PDL	
		Measurement range [g]	N/A			0 to 20	
		Repeatability	N/A			±0.05	
Sampling characteristics	Resolution (pm)		1 to 250			5 to 250	
	Native sampling resolution		N x 100 ±10 MHz (N=1 to 250)				
	Compatible sweep speed of TLS (nm/s)		From 10 to 100				
Data handling	Interface with PC / Data rate		USB-B 2.0 / 4 MBaud				
	Maximum number of transfer function data points per TLS per detector as a function of number of activated detectors by software [h]		260,000 for 1 detector 219,500 for 2 detectors 164,400 for 3 detectors 131,100 for 4 detectors 110,500 for 5 detectors				
Environment	Operating temperature range / Relative humidity		15 °C to 30 °C (59 °F to 86 °F) / < 80 % (non condensing)				
	Storage temperature range		−10 °C to 60 °C (14 °F to 140 °F)				
	Power supply		AC 100 V to 240 V (50 Hz to 60 Hz)				
	Dimensions (W x H x D)		440 mm x 50 mm x 375 mm (17.3 in x 2 in x 14.8 in), including rackmounting brackets				
	Weight		Between 3.5 kg and 3.9 kg (7.7 lb to 8.6 lb), depending on model.				

MEASUREMENT SETUP

Tunable laser source (TLS)	
Remote control	GPIB
Output power	See CT440 specifications above
Sweep speed	See CT440 specifications above
Mode hops	No mode hop is best but the instrument is able to detect and still operates with a few mode hops
PC	
Operating system	From Windows 7 to Windows 10
Interfaces	USB-A 2.0 port to CT440 and GPIB interface card to TLS

Notes

a. For a TLS sweep > 5 nm at sampling resolution of 5 pm for PDL-O and PDL-SCL and 1 pm otherwise, excluding the acceleration and deceleration part of the TLS sweep.
b. After wavelength referencing.
c. For incident power on detectors > −30 dBm. Accuracy: ± 0.5 dB for power between −30 dBm and −60 dBm.
d. 1260 nm to 1640 nm.
e. If laser output power = 10 mW (dynamic range is proportional to laser output power).
f. For incident power on detectors > −30 dBm and determined from a 6-states measurement at 5 pm resolution.
g. Stable testing conditions, 6-states recommended for high PDL.
h. Selected frequency range of the laser divided by the native sampling resolution.

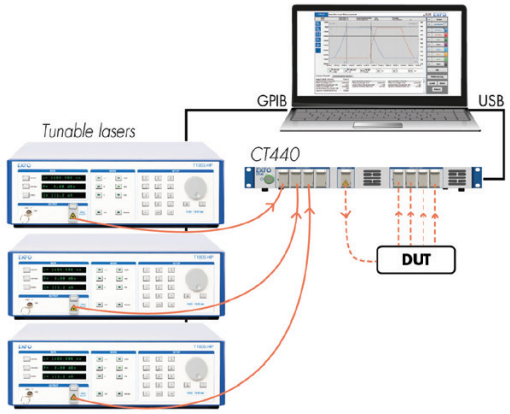

Figure 6. Typical configuration for full band characterization

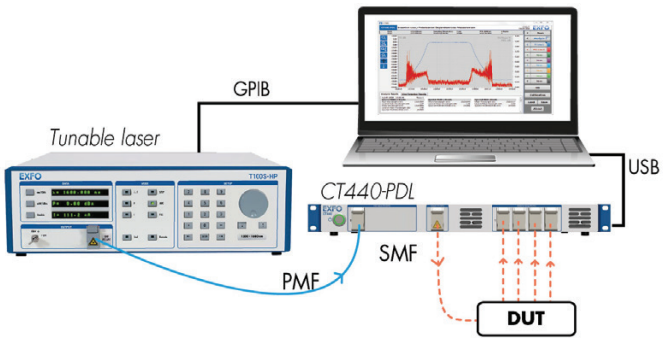

Figure 7. PDL measurement using the CT440-PDL

ORDERING INFORMATION

CT440-XX-XX-XX-XX-XX

PDL option
00 = Without PDL option
PDL = With PDL option

Number of laser inputs
1 = 1 laser input
2 = 2 laser inputs
3 = 3 laser inputs
4 = 4 laser inputs

Example: CT440-00-2-4-F-58

Connector
58 = FC/APC narrow key

Wavelength range and TLS input fiber type
F = 1240 nm to 1680 nm, SMF28 singlemode fiber [a]
SCL = 1440 nm to 1640 nm, PM15 polarization maintaining fiber [b]
O = 1260 nm to 1360 nm, PM13 polarization maintaining fiber [b]

Number of detectors
1 = 1 detector
2 = 2 detectors
4 = 4 detectors

WLRM-NS270X

Spectral reference range
1 = C-band
2 = O-band

Example: WLRM-NS2701

Notes

a. Only available only for models without PDL.

b. Only available with 1 laser input.

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  Printed in Canada 19/07