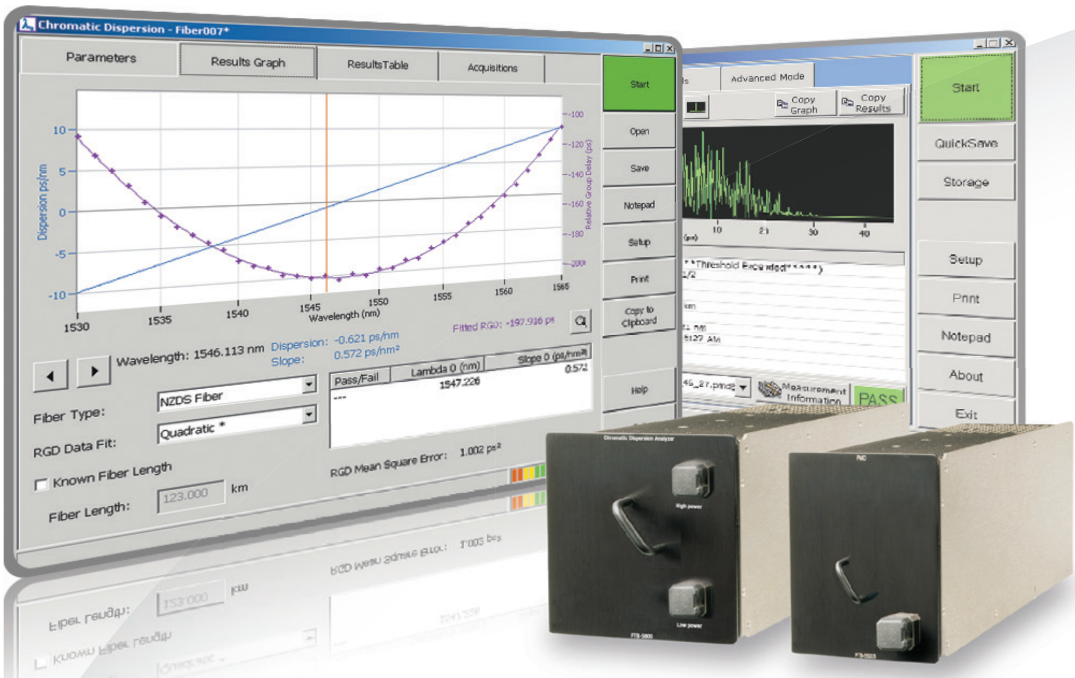
# FTB-5500B/FTB-5800

## PMD AND CD ANALYZERS





* *Protected by US patent 7,227,645 and equivalents in several other countries.*
** *Protected by US patent 6,429,929 and foreign equivalents.*

SPEC SHEET

**Delivers fast and reliable performance in a field-ready unit for all chromatic and polarization dispersion testing needs, from verifying the capacity of legacy fiber to upgrading a network to a given rate.**

## KEY FEATURES

### Polarization Mode Dispersion Analyzer—FTB-5500B

- Less than five-second testing time for any PMD range
- No autocorrelation peak, for enhanced accuracy
- NIST traceable
- Compliant with TIA-FOTP-124A standard
- Patented design*: Test through EDFAs
- 100 Gbit/s-ready
- Based on the General Interferometric Technique (GINTY)

### Chromatic Dispersion Analyzer—FTB-5800**

- Complete CD characterization
- Highly accurate phase-shift method
- No communication between source and receiver
- Compliant with IEC 60793-1-42 and TIA-FOTP-169 standards
- Patented design: Test through EDFAs
- 100 Gbit/s-ready

## PLATFORM COMPATIBILITY

**Platform**
FTB-500

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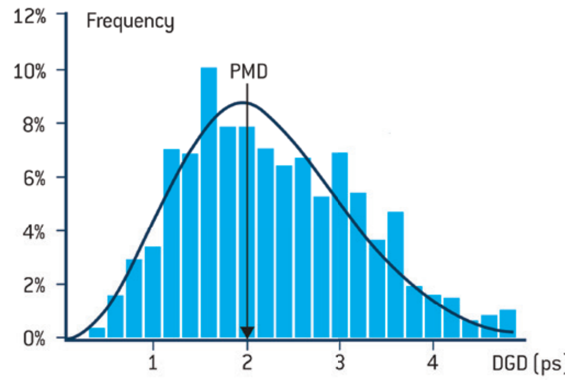
## PMD TESTING STILL CRITICAL IN COHERENT 40G/100G/200G NETWORKS

One of the promises of coherent systems is that they can handle very high levels of polarization mode dispersion (PMD), but is that really the case? Each wavelength has a different instantaneous PMD (referred to as differential group delay or DGD) that is uncorrelated with the next wavelength and changes over time. The average of all these DGDs at individual wavelengths is what we call PMD. Coherent systems feature digital signal processing (DSP) technology that tracks and compensates in real-time for the variations in DGD on a per-wavelength basis. However, DSPs can compensate for a limited range of DGD, and they have a limited reaction time to changes in DGD. Since DGD changes over time, very high DGD values can occur, and may therefore exceed the compensation range of the DSP. Similarly, DGD sometimes changes very rapidly, and even faster than the DSP is able to track, leading to loss of PMD compensation. It can also be sudden changes in state of polarization that lead to a complete loss of signal. When that happens, the DSP tries to resynchronize and rediscover the level of PMD that needs to be compensated for. While it usually does this very quickly, many bits will have gone by uncompensated for, potentially generating a lot of errors in the process.




*Even with low PMD, high DGD values can occur and lead to PMD compensation failure*

There are more chances of exceeding PMD tolerance range if the PMD of the fiber is high. As such, it is imperative to test PMD of coherent systems with an instrument like the FTB-5500B to avoid network failures. In particular, aerial sections, bridge sections, in addition to the sections following these areas, are sections very prone to exhibit high PMD.

In addition, PMD testing is also required in coherent systems because system vendors often ask service providers to supply the fiber PMD value before deploying a new coherent network.

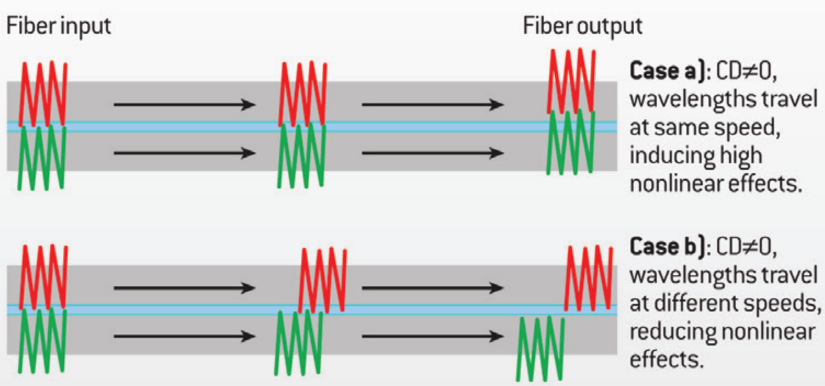
## CHROMATIC DISPERSION TESTING IN COHERENT 40G/100G/200G NETWORKS

Although coherent systems feature chromatic dispersion (CD) compensation, CD testing is still needed in coherent systems for two main reasons:

› Because system vendors use CD values in their network design tools

› To reduce nonlinear effects

Nonlinear effects are a family of optical phenomena common in coherent networks that can be potentially harmful to the system performance. Indeed, nonlinear effects can add so-called nonlinear noise to the system, which might result in increased BER. A common way to reduce the impact of some nonlinear effects, in particular cross-phase modulation and self-phase modulation, is to ensure that the CD is non-zero in the DWDM spectral range, because the greater the CD, the lower the nonlinear effects. Accordingly, CD testing in coherent systems, with a device like the FTB-5800, is useful to make sure that coherent channels propagate at wavelengths where the CD is not too close to zero.

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## COMBINING CD AND PMD FOR PRECISE LINK CHARACTERIZATION

Designed for ultra-longhaul and 40/100 Gbit/s (and higher) applications, EXFO's FTB-5500B PMD and FTB-5800 CD analyzer combo provides you with the speed, accuracy and high performance you need to ensure high-quality network services. Housed in the expert FTB-500 platform, the FTB-5500B and FTB-5800 test modules survive splashes, knocks and drops—ideal for CO and field conditions.


*EXFO's CD and PMD analyzers housed in the FTB-500 platform*

*FTB-5500B PMD Analyzer*

*FTB-5800 CD Analyzer*

## MEASURING POLARIZATION MODE DISPERSION THE FAST WAY

Polarization mode dispersion (PMD) represents a significant danger to both legacy and newly deployed networks because high PMD can induce bit error rate (BER). EXFO's FTB-5500B PMD Analyzer helps you get ahead in the field. Whether you need to verify the capacity of legacy fiber or upgrade a network to any speed, the modular FTB-5500B is fast, reliable and ready to go.

| KEY FEATURES | | KEY BENEFITS |
|---|---|---|
| Five-second testing time | > | Test more fiber, faster |
| No autocorrelation peak | > | High accuracy |
| Testing through EDFAs | > | Reduce test cost |
| Suitable for all networks | > | Future-proof: 100 Gbit/s-ready, designed for longhaul and ultra-longhaul networks |

## CHARACTERIZING CHROMATIC DISPERSION IN THE FIELD

Chromatic dispersion (CD) causes pulse broadening and can have a very negative impact on transmission performance by increasing the BER. EXFO's FTB-5800 CD Analyzer offers high performance in a field-ready unit for all chromatic dispersion testing situations.

| KEY FEATURES | | KEY BENEFITS |
|---|---|---|
| Personalized data management | > | Generate clear, customized reports |
| Phase-shift method | > | High accuracy |
| Testing through EDFAs | > | Reduce test cost |
| Suitable for all networks | > | Future-proof: 100 Gbit/s-ready, designed for longhaul, ultra-longhaul and WDM networks |

## SECOND-ORDER PMD

Particularly important in multichannel transmission, especially as rates climb to 40/100 Gbit/s and higher, second-order PMD is derived from the measured PMD value. EXFO's software provides second-order PMD delay and coefficient values for telecom fibers. These values allow you to characterize fibers and cables more precisely than simple PMD, and to better control the transmission quality of high-speed systems.

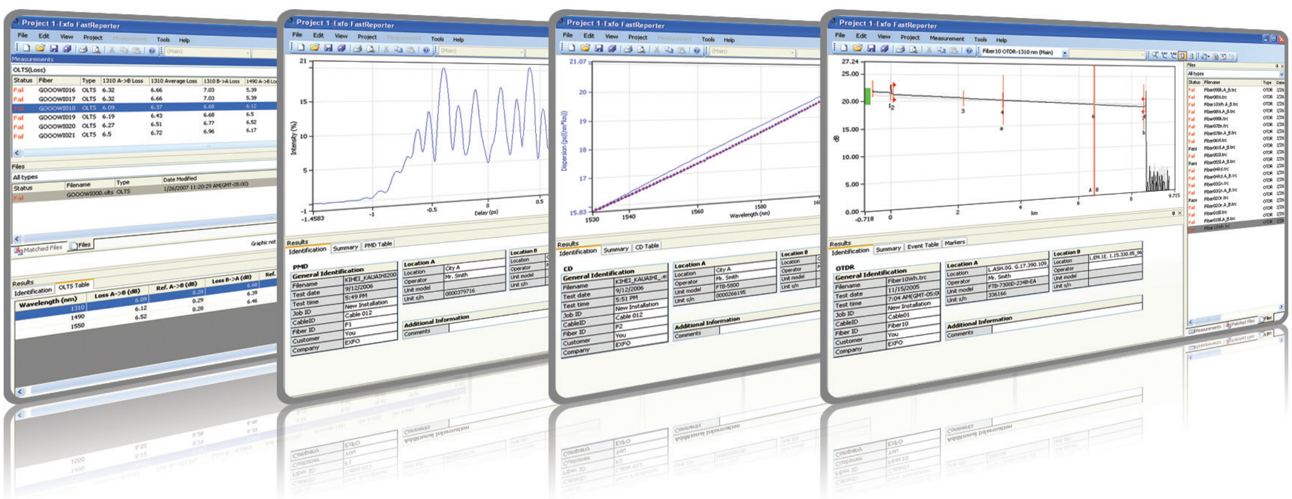
## ADDITIONAL PMD AND CD COMBO ADVANTAGES

### The Ultra-Longhaul Advantage

It's possible to test whole links as opposed to just sections, resulting in reduced manipulation, error and testing time. Because filtering is done at the receiver end and not at the source, transmission through one-way devices such as isolators and EDFAs is possible. Tests have been performed through as many as 250 cascaded amplifiers over a link length of more than 12 000 km.

### The FLS-5800 CD/PMD Analyzer Source Advantage

A single light source, the FLS-5800 CD/PMD Analyzer Source, can help you characterize CD and PMD—reducing testing time and minimizing the potential for human error.



### Fast-Track Data Post-Processing with FastReporter Software

The optional FastReporter software package provides you with the post-processing tools and functionalities you need to optimize your test cycles, whatever the application. Designed for off-line analysis of field-acquired data, FastReporter offers a truly intuitive graphical user interface, which contributes to boost productivity.

### Flexible Reporting

Choose from various report templates, including PMD, CD and fiber characterization. Generate comprehensive cable reports in PDF, Excel or HTML format.

# FTB-5500B PMD ANALYZER

## SPECIFICATIONS

| | |
|---|---|
| Wavelength range (nm) | 1260 to 1675 (O to U band) |
| Measurement range (ps) | 0 to 115 |
| Sensitivity [a] (dBm) | −45 |
| Measuring time (s) | 4.5 (for any PMD value) |
| Absolute uncertainty (strong mode coupling) [b] (ps) | ± (0.020 + 2 % of PMD) |
| Allows measurement through EDFA | Yes (above 120 EDFAs) |

**Notes**

a. Typical, for C band. May be increased with averaging. With the FLS-5800, the typical dynamic range is 47 dB.

b. For C band, assuming averaging over all states of polarization.

## GENERAL SPECIFICATIONS

| | | |
|---|---|---|
| Temperature | | |
| operating | 0 °C to 40 °C | (32 °F to 104 °F) |
| storage | −40 °C to 70 °C | (−40 °F to 158 °F) |
| Relative humidity | 0 % to 93 % noncondensing | |
| Size (H x W x D) (module only) | 9.6 cm x 7.6 cm x 26.0 cm | (3 3/4 in x 3 in x 10 1/4 in) |
| Weight (module only) | 1.5 kg | (3.4 lb) |

# FTB-5800 CD ANALYZER

## SPECIFICATIONS [a]

| | | | |
|---|---|---|---|
| Wavelength range (nm) | 1530 to 1625<br>1200 to 1700 [b] | | |
| Wavelength step (nm)<br>Minimum | 0.1 | | |
| Measurement points<br>Maximum | 950, user-definable | | |
| Dynamic range [c] (dB) | 42 | | |
| Wavelength uncertainty [d] (accuracy) (nm) | 0.1 | | |
| Dispersion uncertainty [d] (accuracy) (ps/nm) | | | |
| 20 km of G.652 | 1.6 | | |
| 120 km of G.652 | 3.1 | | |
| 20 km of G.655 | 1.9 (guaranteed) | | |
| | **20 km** | **80 km** | **120 km** |
| Dispersion repeatability [d] (ps/nm) | 0.04 | 0.2 | 1.1 |
| Zero-dispersion wavelength $\lambda_0$ repeatability [d] (nm) | 0.1 | 0.14 | 0.8 |
| Dispersion slope repeatability $\lambda_0$ [d] (%) | 0.03 | 0.05 | 0.25 |
| Minimum fiber length (km) | < 1 | | |
| Maximum fiber length [e] (km) | > 5400 | | |
| Measurement time per point [e] (s)<br>Minimum | < 1 | | |

## GENERAL SPECIFICATIONS

| | | |
|---|---|---|
| Temperature | | |
| operating | 0 °C to 40 °C | (32 °F to 104 °F) |
| storage | −20 °C to 50 °C | (−4 °F to 122 °F) |
| Relative humidity | 0 % to 90 % noncondensing | |
| Size (H x W x D) (module only) | 9.6 cm x 10 cm x 26.0 cm | (3 3/4 in x 4 in x 10 1/4 in) |
| Weight (module only) | 2 kg | (4.5 lb) |

**Notes**

a. All specifications are typical with four seconds averaging time per point (where applicable), at a temperature of 23 °C ± 1 °C, with FC connectors and after warmup time.

b. Displayed range. Values may be extrapolated.

c. Dynamic range is defined as the difference between the strongest signal and the weakest detectable by the receiver. Extra averaging may be required.
Uncertainty (accuracy) is not guaranteed at the limits of range.

d. C+L band.

e. Including EDFAs.

f. Additional gain setting time may be required prior to the first point of each band.

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## ORDERING INFORMATION

### PMD Analyzer

**FTB-5500B-XX**

**Connector** *
EI-EUI-28 = UPC/DIN 47256
EI-EUI-76 = UPC/HMS-10/AG
EI-EUI-89 = UPC/FC narrow key
EI-EUI-90 = UPC/ST
EI-EUI-91 = UPC/SC
EI-EUI-95 = UPC/E-2000
EA-EUI-28 = APC/DIN 47256
EA-EUI-89 = APC/FC narrow key
EA-EUI-91 = APC/SC
EA-EUI-95 = APC/E-2000

Example: FTB-5500B-EI-EUI-89

### CD Analyzer

**FTB-5800-XX**

**Connector**
EI-EUI-28 = UPC/DIN 47256
EI-EUI-76 = UPC/HMS-10/AG
EI-EUI-89 = UPC/FC narrow key
EI-EUI-90 = UPC/ST
EI-EUI-91 = UPC/SC
EI-EUI-95 = UPC/E-2000
EA-EUI-28 = APC/DIN 47256
EA-EUI-89 = APC/FC narrow key
EA-EUI-91 = APC/SC
EA-EUI-95 = APC/E-2000

Example: FTB-5800-EI-EUI-89

### CD/PMD Analyzer Source

**FLS-5834A-XX**

**Model**
FLS-5834A = 1550 nm and 1625 nm

**Connector**
EI-EUI-28 = UPC/DIN 47256
EI-EUI-76 = UPC/HMS-10/AG (EI only)
EI-EUI-89 = UPC/FC narrow key
EI-EUI-90 = UPC/ST (EI only)
EI-EUI-91 = UPC/SC
EI-EUI-95 = UPC/E-2000
EA-EUI-28 = APC/DIN 47256
EA-EUI-89 = APC/FC narrow key
EA-EUI-91 = APC/SC
EA-EUI-95 = APC/E-2000

Example: FLS-5834A-EI-EUI-89

### Polarized Light Source (PMD testing only)

**FLS-110-XXP-XX**

**Model**
FLS-110-02P = 1310 nm LED
FLS-110-03P = 1550 nm LED

**Connector** *
58 = FC/APC narrow key
89 = FC/UPC narrow key
91 = SC/UPC
EI-EUI-28 = UPC/DIN 47256
EI-EUI-76 = UPC/HMS-10/A
EI-EUI-89 = UPC/FC narrow key
EI-EUI-90 = UPC/ST
EI-EUI-91 = UPC/SC
EI-EUI-95 = UPC/E-2000
EA-EUI-28 = APC/DIN 47256
EA-EUI-89 = APC/FC narrow key
EA-EUI-91 = APC/SC
EA-EUI-95 = APC/E-2000

Example: FLS-110-02P-EI-EUI-89

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

## SAFETY

| | | |
|---|---|---|
| FLS-110 | This product complies with 21 CFR 1040.10 and 1040.11, and with IEC 60825-1:1993+A1:1997. | CLASS 1 LED PRODUCT |
| FLS-5834A | IEC 60825-1:2001 | CLASS 1M LED PRODUCT |



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