

# PMD Analyzer

## FTB-5500



Complete PMD characterization

High dynamic range: > 55 dB

Extensive analysis range: 0.05 ps to 200 ps (typical)

Second-order PMD calculation



# Measuring PMD the Smart Way

PMD represents a significant danger to both legacy and newly deployed networks. And as systems of 10 Gb/s and faster develop, PMD concern and awareness continue to grow. EXFO's FTB-5500 PMD Analyzer helps you get ahead in the field of PMD testing. Whether you need to verify the capacity of legacy fiber or maintain installed fiber, the modular FTB-5500 PMD Analyzer is ready to go.

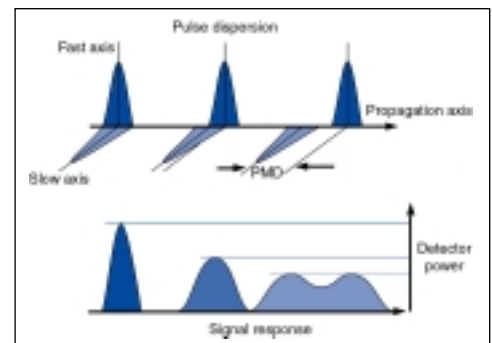


## PMD Affects System Performance

### The Dispersion Phenomenon

PMD affects system performance by spreading the pulse over the length of a fiber.

PMD is the result of birefringence, caused by asymmetry in a fiber's geometry, impurities, as well as localized stress throughout the waveguide. Birefringence produces two orthogonal axes: slow and fast. Light also has two orthogonal propagation axes, called polarization. The difference in propagation speed in the two polarization axes caused by birefringence results in temporal spreading, known as pulse dispersion, as shown in the figure to the right. With a digital signal, PMD increases the bit error rate (BER), which limits system bandwidth.



### A Major Concern for Network Planners

With the marketing of 10 Gb/s (OC-192, STM-64) and the advent of 40 Gb/s (OC-768, STM-256) ultra-high bit rates, bit spacing decreases and, more and more, PMD becomes a limiting factor of major concern to fiber and cable manufacturers. Companies specializing in cable installation, maintenance and troubleshooting also need to be concerned about PMD for a number of reasons:

- PMD is statistical in nature.
- Environmental factors such as temperature extremes or vibration can create PMD.
- Cable can be crushed, stressed or physically damaged during transportation and installation, resulting in PMD.
- Cable handling causes variations in PMD.
- Large variations in PMD values can be observed during the life cycle of a fiber.

### The Interferometric Method

The interferometric method allows field measurement of PMD, something not possible with lab-based methods such as JME or wavelength scanning. It's the fastest PMD measurement method and is almost immune to vibrations and adverse field conditions. With this method, no end-to-end communication is required. There is less equipment and human intervention as well as faster, more efficient data collection.

# Field-Proof Advanced Technology



## The FTB-400 Universal Test System Advantage

Housed in the tough, light magnesium shell and rubber-bumpered FTB-400, the FTB-5500 PMD Analyzer will survive knocks, bumps and drops. Combine up to seven single-slot field-interchangeable modules in the powerful FTB-400 Universal Test System for simultaneous support of multiple testing applications (PMD analyzer, OTDR and OLTS, among others).

## Great Measurement Range

The interferometric method handles very high as well as low PMD values. An extended range option increases the instrument's analysis from 0.05 ps to 200 ps. The measurement range of the instrument is from 0.1 ps to 115 ps, but users can obtain calculated values down to 0.05 ps and from 115 ps to 200 ps. The FTB-5500 calculates the PMD coefficient representing the PMD as a function of the link length.



Typical test setup

## High Dynamic Range

Averaging PMD over the entire source wavelength range (without filtering) preserves full power and wavelength range for PMD measurement. When used with EXFO's M2100 Broadband Light Source, a high dynamic range option increases the dynamic range to more than 55 dB, allowing the measurement of fiber spans longer than 250 km. For the output power required to measure PMD in the field, pair the FTB-5500 with EXFO's FLS-110P Optical Source.



The M2100 Light Source — high power for long-distance applications.



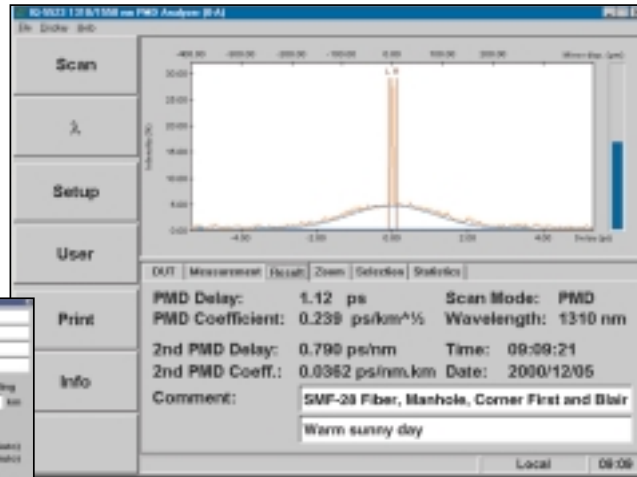
The FLS-110P Optical Source — simplicity and performance in a handheld package.

## Second-Order PMD

Second-order PMD is derived from the measured PMD value and is proportional to the number of channels. Second-order PMD is particularly important in multichannel transmission. EXFO's software provides second-order PMD delay and coefficient values. These values allow you to characterize fibers and cables more precisely than simple PMD and better control the transmission quality of both digital and analog high-bandwidth systems.

# PMD Touch and Go

Simplify testing and increase productivity in the field. EXFO's ToolBox Software Suite runs the test module applications of the FTB-400 Universal Test System. The user-friendly touchscreen and the common graphical user interface provide easy access to menus and functions.



The FTB-5500 PMD Analyzer gets the results you need.

## Simple Step-by-Step Measurements

Step-by-step instructions make testing easy and virtually error-free. Both new users and experts can obtain fast, accurate and efficient PMD measurements with minimal training. The analysis software calculates and displays a fiber's total PMD and coefficient, as well as the second-order PMD value and coefficient.

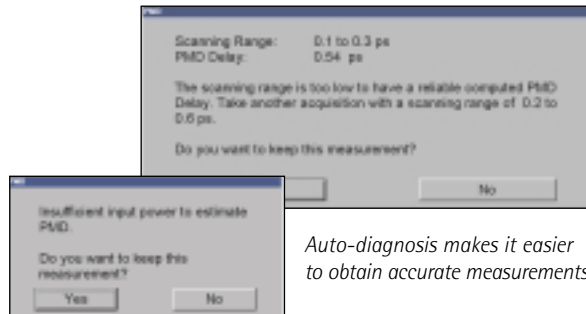
## Automated Testing Mode

Increase your productivity with automated features. The unique auto-range function scans all measurement ranges and automatically provides the PMD range best suited for measurement. This option is extremely useful when testing a fiber whose expected PMD value is unknown.

To reduce the auto-range measurement time, select the maximum Auto-Highest Range. Reduce scanning time by eliminating the higher range.

## Auto-Diagnostic Capabilities

Speed up your diagnostic testing. In default mode, the software performs an auto-diagnosis on measured PMD and supplies the user with comments and suggestions.



Auto-diagnosis makes it easier to obtain accurate measurements.

## Multiple Measurement Possibilities

Improve measurement accuracy. Average several PMD measurements taken over a long period of time with the Multiple Measurement mode. This mode also allows you to monitor PMD over an extended time.

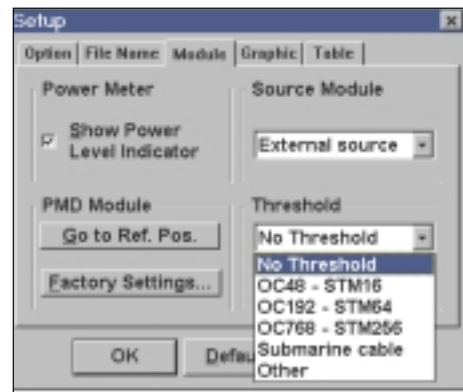
## Statistical Results Tables

View your results quickly and easily. After completing multiple tests, the FTB-5500 PMD Analyzer automatically compiles the results in a table and provides statistical results:

- Mean PMD delay and coefficient
- Standard deviation PMD delay and coefficient
- Minimum and maximum PMD delay and coefficient

## Data Management Features

Manage your data with ease. EXFO's software also includes a variety of data management features including automatic file naming and statistical and table management.



The FTB-5500 PMD Analyzer provides a threshold alarm with maximum recommended PMD values.

## Specifications (FTB-5500 PMD Analyzer)

Model	FTB-5502	FTB-5503	FTB-5523
Wavelength (nm)	1310	1550	1310/1550
Analysis range <sup>1</sup> (ps)			
standard	0.06 to 35	0.05 to 35	0.05 <sup>2</sup> to 35
extended range (ER option)	0.06 to 200	0.05 to 200	0.05 <sup>2</sup> to 200
Dynamic range <sup>3</sup> (dB)	46 (56) <sup>4</sup>	42 (56) <sup>4</sup>	34 (48) <sup>4</sup>
Measuring time <sup>6</sup> (s)	15	15	15
Accuracy <sup>5</sup> over N measurements at different polarization states		$2\sigma = 0.17 \times \sqrt{(\text{PMD}/N)} + 0.05^2$ ps	
Repeatability without change in measurement conditions		1 % $\pm$ 0.05 <sup>2</sup> ps	

## General Specifications (FTB-5500 PMD ANALYZER)

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 80 % non-condensing	
Size (HxWxD) (module only)		9.6 cm x 7.6 cm x 260 cm	(3 3/4 in x 3 in x 10 1/4 in)
Weight (module only)		1.96 kg	(4.3 lb)

### Notes

1. Measurement range is 0.1 ps to 115 ps with a calculated value lower than 0.1 ps and estimated value higher than 115 ps.
2. With the 1550 nm light source. 0.06 ps with the 1310 nm light source.
3. At 1 ps. Dynamic range is reduced when PMD is over 5 ps.
4. With the M2100 Broadband Light Source.
5. With regard to EXFO standards.
6. For PMD < 1.2 ps at 1550 nm.

## Ordering Information

### PMD Analyzer

FTB-55XX-XX-XX

02 = 1310 nm  
 03 = 1550 nm  
 23 = 1310/1550 nm  
 ER = extended range option

#### Connector type

EI = UPC Universal Interface  
 EA = APC Universal Interface

The fixed baseplate (EI or EA) must be ordered with a removable universal connector adapter (EUI-XX). Please specify one EUI from the following list:

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

### Polarized Light Source

FLS-110-XXP-XX

02 = 1310 nm LED  
 03 = 1550 nm LED  
 P = polarized  
 Connector type  
 EI = UPC Universal Interface  
 EA = APC Universal Interface

### Broadband Light Source

M21XX-BP-XX-XXX

02 = 1300 nm  
 03 = 1545 nm

#### Connector code

58 = FC/APC narrow key

#### Power code

115 V  
 220 V

## Standard Accessories

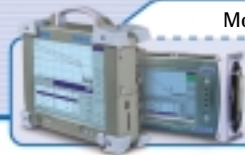
Instruction manual, Certificate of Calibration, connector cleaners.

Find out more about EXFO's extensive line of high-performance portable instruments by visiting our Web site at [www.exfo.com](http://www.exfo.com)



#### Rugged Handheld Solutions

- OLTS
- Power Meter
- Light Source
- Talk Set



#### Modular Platforms

- OTDR
- OLTS
- and more



#### Advanced DWDM Test Systems

- OSA
- PMD
- Multiwavelength Meter

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