FEMTOSECOND PMD ANALYZER

5600

FPMD-5600

R&D AND MANUFACTURING

- PMD measurement to the femtosecond range
- Second-order PMD measurement capabilities
- Fully polarimetric interferometry technique
- Fast data acquisition and anti-aliasing filter
- Reliable and extremely repeatable PMD values

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Telecommunications Test and Measurement

EXFO

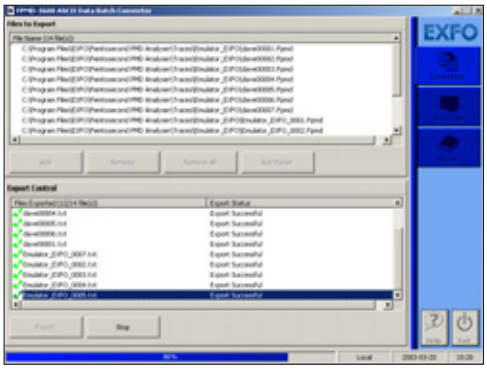
EXPERTISE REACHING OUT

Testing in the Femtosecond Range

DWDM and high-speed transmissions have made polarization mode dispersion (PMD) a major concern in the fiber-optic industry. PMD analysis is essential in high-speed, dispersion-compensated digital and analog long-haul networks. Determining the PMD characterization technique that best suits your needs requires careful consideration.

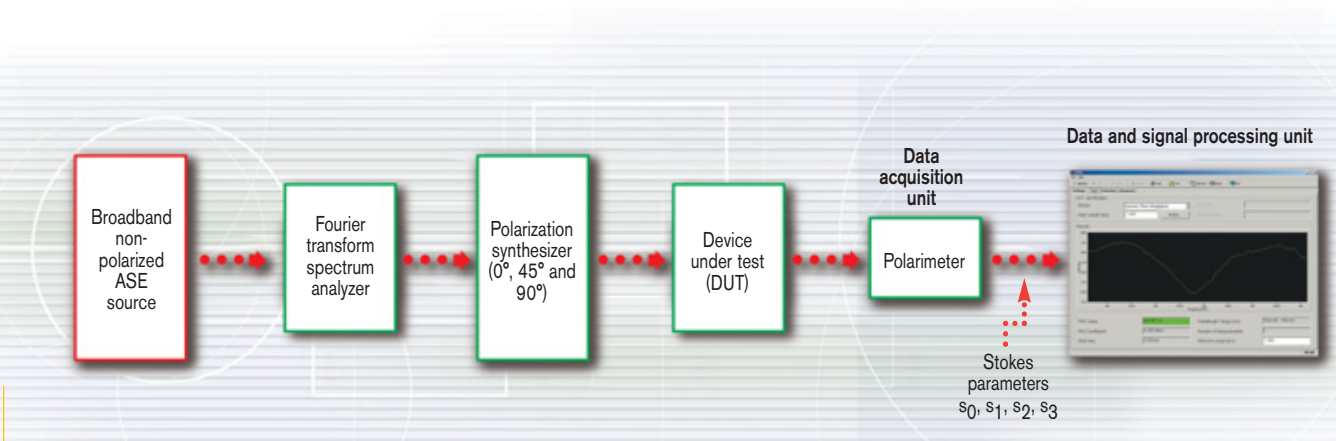
On the production floor, measurement speed is crucial. Fiber and component manufacturers are continuously improving manufacturing processes and want to measure ever-lower PMD values.

Given the rate at which standards are evolving, fiber and component manufacturers anticipate the need to measure PMD values down to the femtosecond range. To achieve this, manufacturers need to perform complete analyses of polarization states; they also need PMD test systems that use fully polarimetric techniques to measure all Stokes parameters. The output states of polarization can then be fully characterized as a function of optical frequency. This is precisely why EXFO is introducing the FPMD-5600 Femtosecond PMD Analyzer*: it's our answer to measuring ultra-low PMD values.



KEY FEATURES

- Measures all Stokes parameters
- Provides complete PMD characterization
- Minimizes adverse environmental effects
- Measures broadband and narrowband components
- Has anti-aliasing filter providing accurate PMD measurements



Customize user profiles. Supervisors, experts and operators have access to different privileges and to different levels of measurement results.

* Protected by US patent 6,865,398.

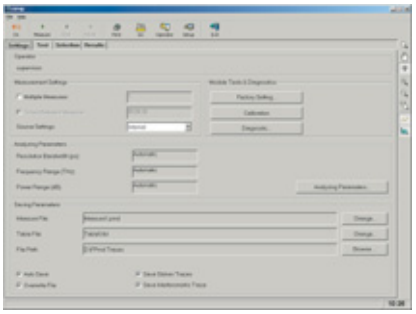
Fully Polarimetric Interferometry vs. the Swept-Wavelength Technique

The swept-wavelength method combined with Jones Matrix Eigenanalysis (JME) is generally regarded as the gold standard for PMD measurement in the femtosecond range. However, there are clear drawbacks to this technique. Fortunately, a less cumbersome method, the fully polarimetric interferometry (FPI) technique using an ASE broadband source has been validated as a serious contender for low-PMD measurement. Indeed, measuring PMD in the femtosecond range is best achieved using the FPI technique, as this method delivers fast, accurate PMD values while minimizing the effect of environmental changes, impact- or vibration-induced stresses and temperature variations. The FPI technique uses Poincaré Sphere Analysis, which is a proven mathematical equivalent to JME and has been approved by the ITU (G.650), IEC (60793-1-48) and TIA (FOTP-122) standards organizations. Obtain unbiased results with the FPI technique in any conditions.

The Fully Polarimetric Interferometry Advantage

A high-precision polarization controller determines the input states of polarization. Thanks to an input ASE broadband source and a polarimetric interferometer, all wavelength information becomes available simultaneously within the spectrum range in use. This translates into a system that needs just a few seconds to accurately acquire data for the next PMD analysis. The result? PMD measurements that are more reliable and less dependent on external variations.

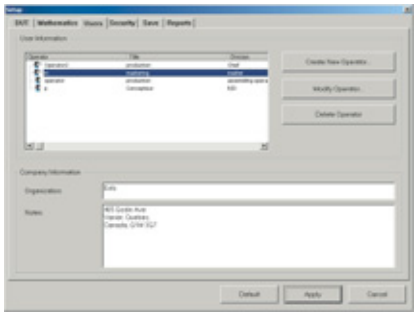
Add it all up–femtosecond PMD technology gives fiber and component manufacturers highly productive solutions to meet even their most stringent requirements.



Customize measurement conditions within each access level, or simply use the measurement profile set by the supervisor.

Applications

- Measure PMD in components used for 40 Gb/s transmission rates
- Characterize PMD and second-order PMD in narrowband and broadband components
- Test live amplifiers

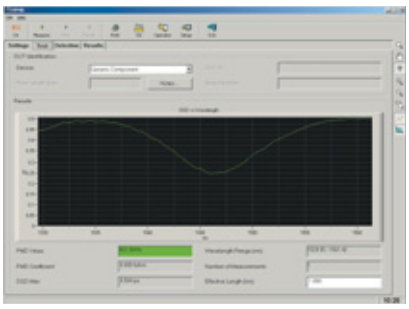


Customize user profiles. Supervisors, advanced and basic users have access to different privileges and to different levels of measurement results.

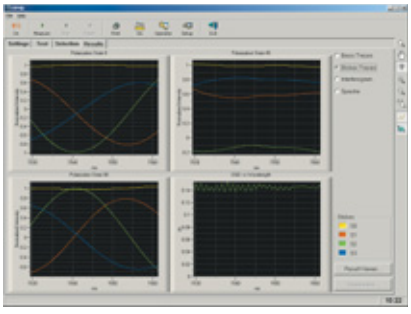
Choosing the Right Tool

FPI and JME are not the only solutions to PMD characterization. The interferometric technique, commonly used in field-testing, is a proven, sturdy and versatile method of PMD measurement. EXFO incorporates the interferometric technique in the FTB-5500B PMD Analyzer, one of the powerful modules available for our universal test systems.

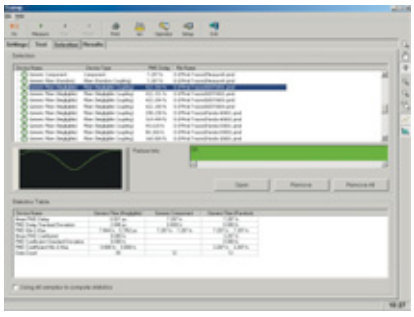
Choosing the best PMD characterization technique for you depends largely on your needs. Contact EXFO for help in determining which PMD characterization tool is best for you.



Differential group delay (DGD) is measured as a function of wavelength or frequency.



Advanced users can access critical information such as the Stokes vectors for the three input states of polarization (SOP).



Perform plenty of measurements and statistical analyses on collected data with the FPMD-5600.

SPECIFICATIONS[1]

Device type	**Broadband DUT**	**DWDM DUT** 100 GHz ITU Grid	**DWDM DUT** 50 GHz ITU Grid
Residual PMD[2]	~6 fs	~10 fs	~30 fs
PMD mesurement range	up to 35 ps (random coupling mode)[3]		
Repeatability[2,4]			
$PMD_{DUT} < 1$ ps	0.1 fs		
$PMD_{DUT} > 1$ ps	5 fs		
Optimal repeatability[2]			
$PMD_{DUT} < 1$ ps	0.001 fs (1 attosecond)[5]		
$PMD_{DUT} > 1$ ps	1 fs		
Reproducibility[6]	< 0.5 %		
Dynamic Range[7]	70 dB[8]		
Maximum input power	30 dBm		
Wavelength operating range[9]	1250 nm to 1700 nm		
Wavelength range (C+L-band source)	1530 nm to 1600 nm		
Measurement time[10]	80 s (data acquisition + calculation)		
Interferometer differential path	± 133 ps[11]		

GENERAL SPECIFICATIONS

Dimensions (H x W x D)	18.4 cm x 44.7 cm x 47.0 cm	(7 1/4 in x 17 5/8 in x 18 1/2 in)
Weight	16 kg	(35 lb)
Operating temperature	23 °C ± 3 °C	(68 °F to 79 °F)
Storage temperature	0 °C to 50 °C	(32 °F to 122 °F)
Relative humidity	0 % to 80 % non-condensing	
Power consumption	73 VA	

Notes

1. After a warm-up period of one hour.
2. These values are performance characteristics that provide information about non-warranted instrument performance in the form of nominal values.
3. Up to 125 ps in negligible coupling mode.
4. Plug-and-measure routine.
5. Stabilized measurement conditions as required by tunable laser-based systems. Regularly measured but operator dependent.
6. Multiple PMD measurements of a NIST artefact (PMD = 372 fs) were performed on five different FPMD-5600 systems by five different operators yielding a maximal variation of less than 0.5 %.
7. Composite systems with gain, attenuation and filtering properties can be measured.
8. For DUT with 25 dB gain to DUT with 45 dB attenuation and with integrated ASE source.
9. The standard calibration range is 1530 nm to 1600 nm. However, calibration over a custom wavelength range can be performed. Using the FPMD-5600 outside the calibration range would yield erroneous measurements.
10. Measurements performed over the C+L-band with a spectral resolution of 0.03 nm.
11. Corresponds to a spectral resolution of 0.03 nm.

ORDERING INFORMATION

FPMD-5600-XX

Source
00 = without source
01 = C-band ASE source
02 = C+L-band ASE source

Example: FPMD-5600-02

** System includes a Pentium III-based computer.*

ACCESSORIES

Model name		Quantity
TJ-B58-96	3-meter FC/APC to E-2000/APC test jumper	1
TJ-B58-58 WOLT.3	0.3-meter FC/APC loose-tube test jumper	2
TJ-B58-58 WOJLT	3-meter FC/APC loose-tube test jumper	2
TJ-B58-89 WOJLT	3-meter FC/UPC loose-tube test jumper	2
GP-3012	Binary-to-ASCII Data Batch Converter	Optional

SAFETY

21 CFR 1040.10	CLASS 3B LASER PRODUCT
IEC 60825-1:Ed. 1.1 1998	CLASS 3A LASER PRODUCT

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