

FTB-5700 single-ended dispersion analyzer

AUTOMATED CD AND PMD MEASUREMENTS IN A SINGLE MODULE



 EXFO Connect
compatible



Feature(s) of this product is/are protected by one or more of: US patent 8,373,852; US patent 7,957,436 and equivalent patent(s) pending in other countries; and US patent 9,829,429 and equivalent patent(s) pending in other countries.

The ultimate chromatic dispersion (CD) and polarization mode dispersion (PMD) characterization solution.

Standards
Compliant

CD: EIA/TIA FOTP-175B
PMD: EIA/TIA FOTP-243
and IEC 61282-9

KEY FEATURES

Single-ended testing of multiple links from one location—
for fewer truck rolls and reduced operational expenses (OPEX)

Standards-compliant approach

Get right results the first time thanks to a single-button operation

Fully automated, highly intelligent interface

From the no.1 vendor by market share for CD and PMD testing,
based on Frost & Sullivan 2014 FOTE study

APPLICATIONS

Accurate, complete 10 Gbit/s, 40 Gbit/s and 100 Gbit/s
qualification

Metro, core and cellular backhaul network testing

Effective fiber-type identification using lambda zero,
CD slope and coefficient in Raman deployments

PLATFORM COMPATIBILITY



Platform
FTB-2/FTB-2 Pro



Platform
FTB-4 Pro



Platform
FTB-500

4TECT

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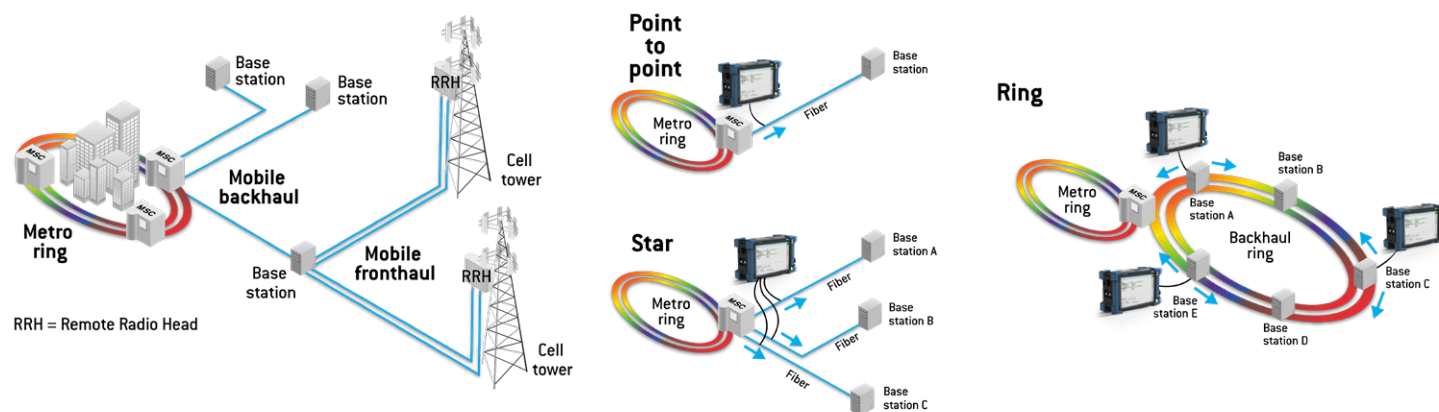
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EXFO

CD/PMD TESTING IN MOBILE BACKHAUL DEPLOYMENTS

Although capacity is expanding throughout the network, mobile backhaul is where growth is occurring the fastest. Mobile backhaul refers to the part of the network that connects the cell site base stations (also called baseband unit or EnodeB) to the metro network. With metro network spans sometimes exceeding 100 km, and mobile backhaul ranging from a few kilometers up to 120 km in length, these long distances can create dispersion issues which greatly degrade signal quality—since dispersion increases with distance. In addition, data rates now often reach 10 Gbit/s in mobile backhaul deployments; a data rate at which dispersion issues start to appear. It is therefore recommended to thoroughly test dispersion after construction or prior to upgrades.

Mobile backhaul architectures vary and can be point-to-point, ring or star. In all cases, single-ended testing with the FTB-5700 is preferable to dual-ended testing, because it requires less technicians and accordingly decreases OPEX.



Mobile backhaul

Benefits of single-ended dispersion testing in different mobile backhaul architectures

DISPERSION TESTING ON CLIENT SIDE DEPLOYMENT FEATURING CFPs

Historically, dispersion testing was performed mainly on the line side. Nowadays, dispersion testing is also required on the client side, driven by the adoption of compact form pluggables (CFPs) for 40G/100G transmission. Given that multiwavelength CFPs can reach much longer distances than their predecessors (SFP, SFP+ and XFP)—up to 40 km—dispersion phenomena like CD and PMD, which scale with distance, can become an issue. The IEEE 802.3ba standard has set CD and PMD tolerances for client side deployments as follows:

CD/PMD TOLERANCES			
Service	100GBASE-LR4	100GBASE-ER4	100GBASE-ER4
Operating distance	10 km	30 km	40 km
Positive dispersion (max) ^{a, b}	9.5 ps/nm	28 ps/nm	36 ps/nm
Negative dispersion (min) ^{a, b}	-28.5 ps/nm	-85 ps/nm	-114 ps/nm
DGD_max	8 ps	10.3 ps	10.3 ps
PMD max ^c	2.5 ps	3.2 ps	3.2 ps

If a particular link does not meet these thresholds, it means that the transmitter/receiver pair is not required to operate within the specified BER. Therefore, the advent of CFPs make dispersion testing mandatory on the client side, and the single-ended FTB-5700 is perfect for the job.

CHROMATIC DISPERSION TESTING IN RAMAN DEPLOYMENTS

Raman is now an integral part of most coherent system deployments. To optimize Raman gain and efficiency, the fiber type of the effective area must be known. While it is known in most greenfield deployments, the same cannot be said for brownfield. When in doubt, the fiber type can be determined using the FTB-5700: lambda zero, CD slope and coefficient at 1550 nm. The FTB-5700 is uniquely positioned to take these measurements, and since it is single-ended, you will save on OPEX. Plus, the unit will calculate the fiber length for an accurate slope and coefficient measurement.

a. Positive dispersion and negative dispersion, as found in the standard, represent max and min CD values.

b. Over the wavelength range 1294.53 nm to 1310.19 nm.

c. Values provided by EXFO (not part of the standard), using a 3.19 value for DGD_max/PMD ratio corresponding to a 0.001% outage probability.

🔗 New market reality requires a new CD and PMD testing approach 🔗

The high-speed networking market has been trying to reconcile two conflicting objectives: deliver the faster data rates—10G, 40G and 100G—demanded by subscribers, and keep OPEX down to maintain profitability. Most network operators are well on their way to achieving the first objective, thanks to new fiber deployments and new technology advances such as coherent detection, DPSK/DQPSK and ROADM-based mesh networks. However, the additional field work—installation, activation as well as the greater dispersion granularity now required—can push operation expenses in the wrong direction. These new requirements force operators to retain the services of more field crews, potentially reducing the average expertise level of technicians and increasing the rate of repeat jobs.

In a nutshell, network operators are having to absorb more CAPEX to equip their additional technicians, and even more importantly, they are also having to absorb more truck rolls and OPEX.

The good news is the aforementioned technology advances are making next-generation high-speed networks increasingly tolerant to dispersion, shifting the focus of the test instrument toward built-in intelligence, simpler setups and automated test sequences that generate results that are immediately accurate. EXFO's FTB-5700 was designed to deliver exactly that, adding an exclusive, game-changing feature—single-endedness, which in itself dramatically reduces truck rolls.

CD AND PMD TESTING COMBO—THE BENEFITS

Single lightweight unit that:

- › Enables single-ended testing, a market-exclusive feature
- › Allows one technician to test both CD and PMD
- › Fully automated, highly intelligent interface—no training required
- › Minimizes manual intervention for fail-safe results
- › Reduces required connections to just one
- › Leads to faster time to revenue



THE ONLY SINGLE-ENDED PMD AND CD ANALYZER ON THE MARKET

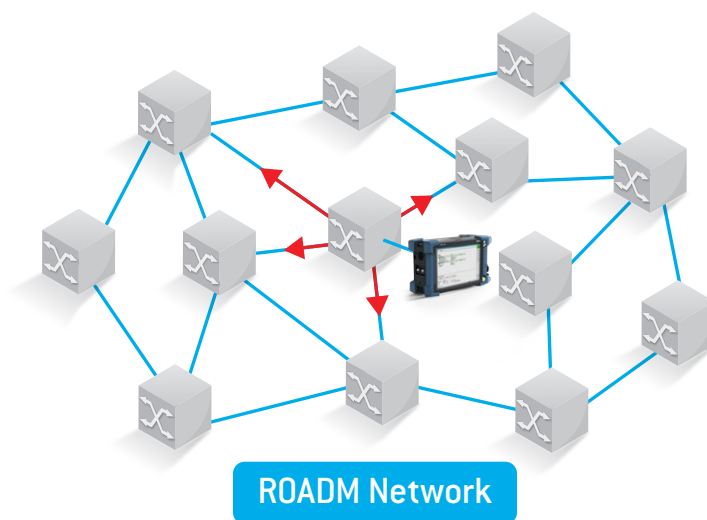
Combining PMD and CD into one test solution that enables technicians to characterize multiple links from a single location, the FTB-5700 is built specifically for today's high-speed network reality. Its highly intelligent interface and functionalities **ensure that test parameters are automatically optimized, whatever the link.**

FTB-5700 KEY FEATURES

- › Groundbreaking single-ended testing technology reduces both the testing time and OPEX
- › Highly robust technology for underground and aerial fiber
- › Intuitive user interface and single-ended approach offering first-time-right results
- › Link-length measurement
- › Complies with ITU G.650.3 fiber testing standard and FOTP-243 and FOTP-175B standards

SINGLE-ENDED TESTING: DRIVING OPEX DOWN IN A HURRY

In typical dual-ended dispersion testing scenarios, a technician has to be present at each fiber end. EXFO's single-ended solution speeds up the process in two ways. First, engineer A does not have to wait for engineer B to arrive at the other end of the link with the light source. And second, fibers can be tested in multiple directions, turning a job that could take hours into one that takes minutes while reducing truck rolls and OPEX.



In a typical mesh network, unless several sections can be tested from a single node, technical crews must travel a lot.

Typically, single-ended testing allows full network characterization in 66% less time than any other traditional test method. Here is the impact on truck rolls for the mesh network illustrated above:

TEST TYPE	NUMBER OF TECHNICIANS	TOTAL NUMBER OF TRUCK ROLLS
End-to-end	2	19
Single-ended	1	6

**In this case,
68% less truck rolls**

In addition to driving down OPEX, fewer truck rolls also mean faster delivery of new services—for faster time to revenue.

GET IT RIGHT THE FIRST TIME

In today's fast-paced world, repeat truck rolls are no longer an option. Thanks to its single-button operation and automated settings, the FTB-5700 guarantees that right results are obtained in a single measurement. Featuring easy-to-read pass/fail results and providing a view of all key parameters and values on one screen, the FTB-5700's user interface is all about field-testing simplicity and efficiency.

Simple as 1-2-3

1. CD/PMD testing

2. Start all tests automatically

3. See your results

Fiber autonaming

Results
 Length: 4465 m
CD Measurement ✓ PASS
 Dispersion (1550 nm): 78.16 ps/nm ✓
 Dispersion slope (1550 nm): 0.076 ps/(nm² x km)
 Coefficient (1550 nm): 17.50 ps/(nm² x km)
 Max dispersion (λ range): 160.14 ps/nm
PMD Measurement ✓ PASS
 PMD: 1.15 ps ✓
 PMD, 2nd order: 0.10 ps/nm
 Coefficient: 0.54 ps/√ km

Measurement
 CD
 PMD

Start **Save** **Discard**

Information
 Fiber prefix: Fiber Fiber suffix: 001
 Cable ID: Cable Thresholds: OC192 - STM64

List of Fibers

Fiber ID	Cable Name	File Name	Date
✓ Fiber001	Cable-4km1ps001	Fiber001	10/2/2007 3:44:59
✓ Fiber002	Cable-4km1ps001	Fiber002	8/16/2007 12:50:55
✓ Fiber003	Cable-4km1ps001	Fiber003	8/16/2007 12:37:44
✓ Fiber004	Cable-4km1ps001	Fiber004	8/16/2007 12:42:01
✓ Fiber005	Cable-4km1ps001	Fiber005	8/16/2007 12:46:38

3. See your results

Chromatic Dispersion

Dispersion (1550 nm):	78.16 ps/nm
Slope (1550 nm):	0.076 ps/(nm ² x km)
Coefficient (1550 nm):	17.50 ps/(nm ² x km)
Max. dispersion (λ range):	160.14 ps/nm

PMD

Fiber type:	Telecommunication
PMD:	1.15 ps
PMD, 2nd order:	0.10 ps/nm
Coefficient:	0.54 ps/√ km
Number of scans:	1

View critical info on selected test

FTB-5700 Single-Ended Dispersion Analyzer

List of Fibers

Fiber ID	Cable Name	File Name	Date
✓ Fiber001	Cable-4km1ps001	Fiber001	10/2/2007 3:44:59
✓ Fiber002	Cable-4km1ps001	Fiber002	8/16/2007 12:50:55
✓ Fiber003	Cable-4km1ps001	Fiber003	8/16/2007 12:37:44
✓ Fiber004	Cable-4km1ps001	Fiber004	8/16/2007 12:42:01
✓ Fiber005	Cable-4km1ps001	Fiber005	8/16/2007 12:46:38

General
 Length: 4465 m Fiber Type: G.652 DDF
 Threshold: OC192 - STM64 Measurement range: 1500 nm - 1625 nm

Chromatic Dispersion
 Dispersion (1550 nm): 78.16 ps/nm
 Slope (1550 nm): 0.076 ps/(nm² x km)
 Coefficient (1550 nm): 17.50 ps/(nm² x km)
 Max. dispersion (λ range): 160.14 ps/nm

PMD
 Fiber type: Telecommunication
 PMD: 1.15 ps
 PMD, 2nd order: 0.10 ps/nm
 Coefficient: 0.54 ps/√ km
 Number of scans: 1

FIBER CONNECTOR INSPECTION AND CERTIFICATION— THE ESSENTIAL FIRST STEP BEFORE ANY OTDR TESTING

Taking the time to properly inspect a fiber-optic connector using an EXFO fiber inspection probe can prevent a host of issues from arising further down the line, thus saving you time, money and trouble. Moreover, using a fully automated solution with autofocus capabilities will turn this critical inspection phase into a fast and hassle-free one-step process.

Did you know that the connector of your OTDR/iOLM is also critical?

The presence of a dirty connector at an OTDR port or launch cable can negatively impact your test results, and even cause permanent damage during mating. Therefore, it is critical to regularly inspect these connectors to ensure that they are free of any contamination. Making inspection the first step of your OTDR best practices will maximize the performances of your OTDR and your efficiency.

ConnectorMax



Five models to fit your budget

FEATURES	USB WIRED		
	Basic FIP-410B	Semi-automated FIP-420B	Fully automated FIP-430B
Three magnification levels	✓	✓	✓
Image capture	✓	✓	✓
Five-megapixel CMOS capturing device	✓	✓	✓
Automatic fiber image-centering function	X	✓	✓
Automatic focus adjustment	X	X	✓
Onboard pass/fail analysis	X	✓	✓
Pass/fail LED indicator	X	✓	✓

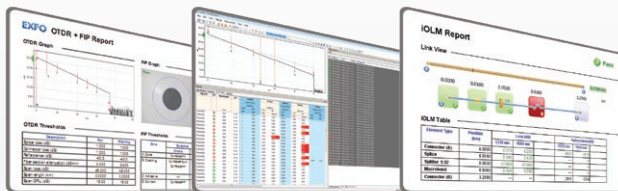
For more information, visit www.EXFO.com/fiberinspection.

SOFTWARE APPLICATIONS

Get the best out of your data post-processing—One software does it all



This powerful reporting software is the perfect complement to your test instrument, and can be used to create and customize reports to fully address your needs.



Automate asset management. Push test data in the cloud. Get connected.



EXFO Connect pushes and stores test equipment and test-data content automatically in the cloud, allowing you to streamline test operation from build-out to maintenance.



TECHNICAL SPECIFICATIONS^a

Measured wavelength range (nm)	1475 to 1626
Dynamic range (dB)	25 (32 with reflector)
Distance uncertainty (km)	$\pm(0.01 + 1 \% \times \text{distance})$

Chromatic dispersion

Number of test points	8
CD uncertainty (ps/nm) ^b	± 10
Test time (s)	40

PMD^c

PMD display range (ps)	up to 50
PMD range (strong mode coupling) (ps)	0.1 to 20
PMD uncertainty (strong mode coupling) (ps) ^d	$\pm (0.2 + 5 \% \times \text{PMD})$
Test time (s)	<180

GENERAL SPECIFICATIONS

Size (H x W x D)	96 mm x 50 mm x 281 mm (3 3/4 in x 2 in x 11 in)
Weight	1.3 kg (2.8 lb)
Temperature	Operating: 0 °C to 50 °C (32 °F to 122 °F) Storage: -40 °C to 70 °C (-40 °F to 158 °F)
Relative humidity	0 % to 95 % non-condensing

LASER SAFETY

a. Typical.

b. At 1550 nm, on 100 km of G.652 singlemode fiber.

c. For a fiber length ≥ 100 m.

d. For strong mode coupling PMD (telecom fiber) up to 15 ps, with averaging.

ORDERING INFORMATION

FTB-5700-XX-XX

Model

CD-PMD = Single-ended CD and PMD analyzer
 PMD = Single-ended PMD analyzer
 CD = Single-ended CD analyzer

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-5700-CD-PMD-EI-EUI-89

Specialized tests

For ultra-long-haul, submarine and amplified network applications, EXFO also offers the FTB-5800 CD analyzer and FTB-5500B PMD analyzer. For these modules, the above connector choice applies, but the FLS-5834A light source is required.

Locating high-PMD fiber spans can save a significant amount of time and OPEX. Conversely, failure to do so can result in substantial costs. Building on EXFO's proven PMD measurement expertise, the FTB-5600 distributed PMD analyzer, which breaks down link assessment to pinpoint high-PMD sections, enables cost-effective, targeted upgrades.



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In case of discrepancy, the web version takes precedence over any printed literature.