

WHITE PAPER

5000 km in a 1U 19-inch Rack Mount – Chromatic Dispersion Emulator

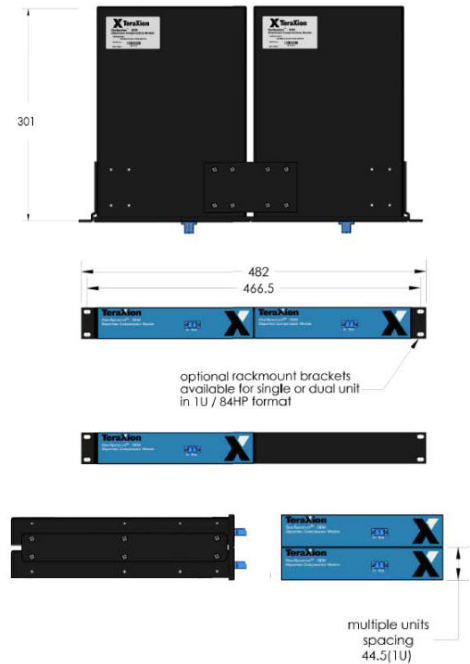
Benoit Maheux-L, Product Line Manager, Dispersion Compensators

Introduction

This paper aims to explain the value proposition of TeraXion’s dispersion emulator, the ClearSpectrum™-CDE, in coherent detection systems. We will review its key technical features and pinpoint the main advantages of using such an FBG-based chromatic dispersion emulator instead of fiber spools.



TeraXion’s ClearSpectrum™-CDE



ClearSpectrum™- CDE mounting options

Chromatic dispersion emulation using an FBG-based emulator

The ClearSpectrum™-CDE is a chromatic dispersion emulator designed to emulate ten thousand picoseconds per nanometer in a compact 1U half 19-inch unit while maintaining a very low insertion loss. Available in two standard configuration presented below, this module can emulate up to 45 000 ps/nm in one unit with three 15 000 ps/nm outputs. Entirely passive, it can be cascaded several times to achieve dispersion levels as high as transpacific links (200 000 ps/nm) with a granularity of 3 333 ps/nm. Commonly used to emulate long haul dispersion level of 45 000 ps/nm (~2700 km of SMF) these modules have a very low latency, a high input power handling (27 dBm) and minimal non-linear behavior.

Compensation Level ¹	+3,333 ps/nm	+6,666 ps/nm	+10,000 ps/nm	+ 15,000 ps/nm	+ 30,000 ps/nm	+ 45,000 ps/nm
Channel Spacing	200 GHz ^{2, 3}			200 GHz ^{2, 3}		
Operation Bandwidth	> 50 GHz			> 50 GHz		
Insertion Loss	< 4 dB	< 8 dB ⁴	< 12 dB ⁴	< 18 dB ⁴	< 36 dB ⁴	< 54 dB ⁴
Latency	< 50 ns	< 100 ns	< 150 ns	< 225 ns	< 450 ns	< 750 ns

(1): Same dispersion on each channel
 (2): 100 GHz option available.

(3): C-band or L-band
 (4): Multiple outputs option available

Table 1: ClearSpectrum™-CDE main specifications

5000 km in a 1U 19-inch Rack Mount– Chromatic Dispersion Emulator

What makes CDE the solution of choice for coherent communication systems?

Coherent detection has become the most promising technology for next-generation high-speed transmission systems. In fact, while many coherent detection systems are under development, some are already available. Manufacturers of coherent receivers and line cards are now using advanced digital signal processor (DSP) algorithms to compensate fiber impairments such as significant amount of chromatic dispersion (CD). One of the key challenges that they are facing regarding CD is to generate significant amount of dispersion in order to test their CD system tolerances in a typical set-up such as the one presented in Figure 1. Whether at the development stage or in volume production, it is obvious that dealing with thousands of kilometers of fiber is not an easy task: the obvious problems are how you stock all of those bulky SMF spools and how you will manage the tremendous loss of hundreds of dB.

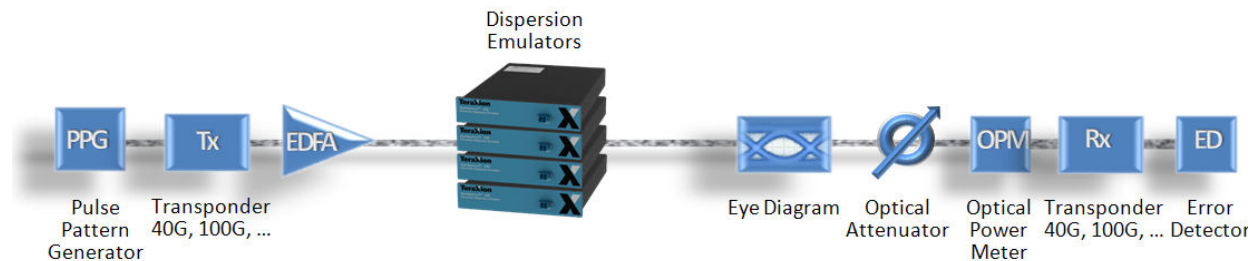


Figure 1: Typical setup to achieve dispersion tolerance measurement of coherent detection transponder/line card.

A good way to avoid these problems is to use TeraXion's ClearSpectrum™-CDE instead of fiber spools. The two main advantages are:

Ultra-low-loss

With losses below 12 dB for a module of ten thousand picoseconds per nanometer, losses for chromatic dispersion generation can drastically be reduced by a **factor of 10**, thus significantly reducing the number of amplifiers required.

Compact 1U half 19-inch module

Being able to emulate the dispersion of over 5350 km of SMF (90 000 ps/nm) using only two modules in a 1U 19-inch slot reduces by at least a **factor 20** the required space of the dispersion emulators compare to cumbersome fiber spools. Less precious work space has to be dedicated to dispersion emulation and the system test becomes easier to move.

Please visit TeraXion's web site at www.teraxion.com for more information, or contact Benoit Maheux at bmaheux@teraxion.com

About TeraXion

TeraXion is a leading-edge photonic solutions provider for high-end applications of the optical communications, industrial lasers and optical sensing markets. Its line of OEM chromatic dispersion management solutions includes Telcordia-qualified low-loss static and tunable dispersion compensators for terrestrial and submarine networks. TeraXion offers customized filtering solutions based on advanced FBG technology and narrow linewidth semiconductor laser sources for RF photonic and coherent detection systems.

© 2012 by TeraXion Inc. All rights reserved.

TeraXion Inc. reserves all of its rights to make additions, modifications, improvements, withdrawals and/or changes to its product lines and/or product characteristics at any time and without prior notice. Although every effort is made to ensure the accuracy of the information provided on this spec sheet, TeraXion Inc. does not guarantee its exactness and cannot be held liable for inaccuracies or omissions.

TeraXion
TERAXION.COM