24926 Highway 108
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Model OT-DCM-Gxx

Dispersion Compensation Module

OPERATING MANUAL

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SAFETY

Safety Precautions

While this DCM is a totally passive device, it typically handles high light levels that can present a hazard,

Laser Safety Procedure

ALWAYS read the product data sheet and the laser safety label before powering the product. Note the operation wavelength, optical output power and safety classifications.

If safety goggles or other eye protection is used, be certain that the protection is effective at the wavelength emitted by the device under test **BEFORE** applying power.

ALWAYS connect a fiber to the output of the device **BEFORE** power is applied. Power should never be applied without an attached fiber. If the device has a connector output, a connector should be attached that is connected to a fiber. This will ensure that all light is confined within the fiber waveguide, virtually eliminating all potential hazard.

NEVER look at the end of the fiber to see if light is coming out. **NEVER!** Most fiber optic laser wavelengths (1310nm and 1550nm) are totally invisible to the unaided eye and will cause permanent damage. Shorter wavelengths lasers (e.g., 780nm) are visible and are very damaging. Always use instruments, such as an optical power meter, to verify light output.

NEVER, NEVER, NEVER look into the end of a fiber on a powered device with **ANY** sort of magnifying device. This includes microscopes, eye loupes and magnifying glasses. This **WILL** cause a permanent and irreversible burn on your retina. Always double check that power is disconnected before using such devices. If possible, completely disconnect the unit or transmitter from any power source.

If you have questions about laser safety procedures, please call Olson Technology before powering your product.

THEORY OF OPERATION

The most commonly used fiber in the world today is NDSF (non-dispersion shifted fiber), such as Corning SMF-28®. For long distance applications, a wavelength near 1550nm is usually used for low loss resulting in dispersion of about 17ps/nm/km as shown in Figure 1 below. Dispersion causes the bit error rate (BER) to increase in digital systems and the analog distortion, primarily CSO and 2nd order distortion, to increase sharply with increasing fiber distance. The DCM offers a way to nullify most of this dispersion allowing very long fiber links to be achieved.

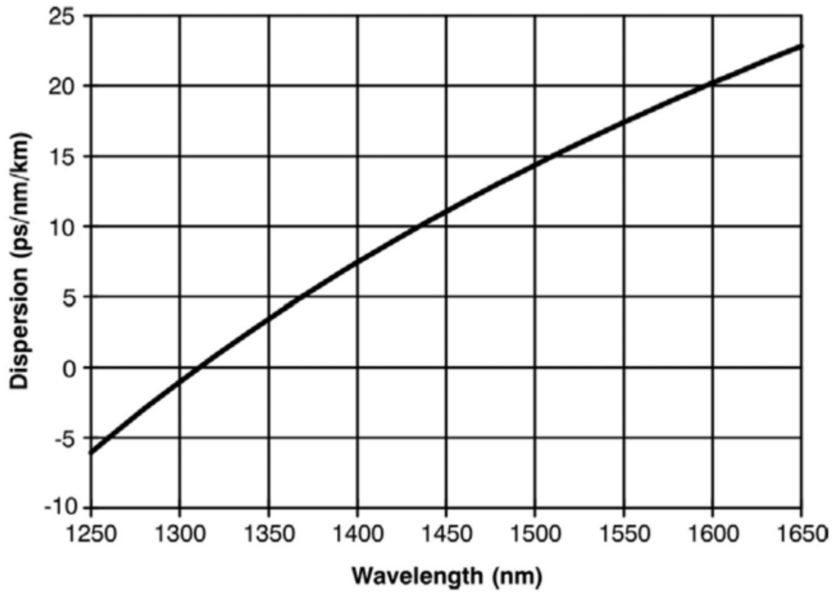

Figure 1 - Dispersion Characteristics of NDSF

A DCM is a device that has negative dispersion. The Olson OT-DCM-G series module contains a special fiber that has a very high negative dispersion equivalent to "xx" km (ranging from 5 to 120) of Corning SMF-28® fiber. It operates over a wide wavelength range. Figure 2 below shows the benefit of using a DCM.

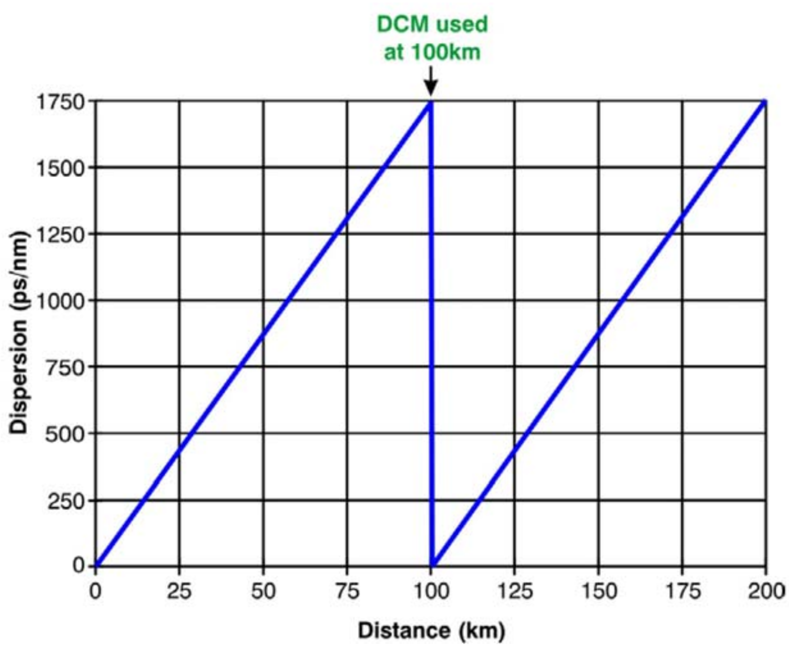

Figure 2 - The Effect of a DCM on a Long Fiber Run

In Figure 2, an OT-DCM-G100 (optimized for 100km or Corning SMF-28®) was inserted in-line at the 100km distance. This resets the dispersion to nearly zero and allows an additional 100km distance can be achieved with essentially the same results as were achieved at 100km. One downside of a DCM is its relatively high insertion loss. Figure 3 illustrates how this is usually circumvented.

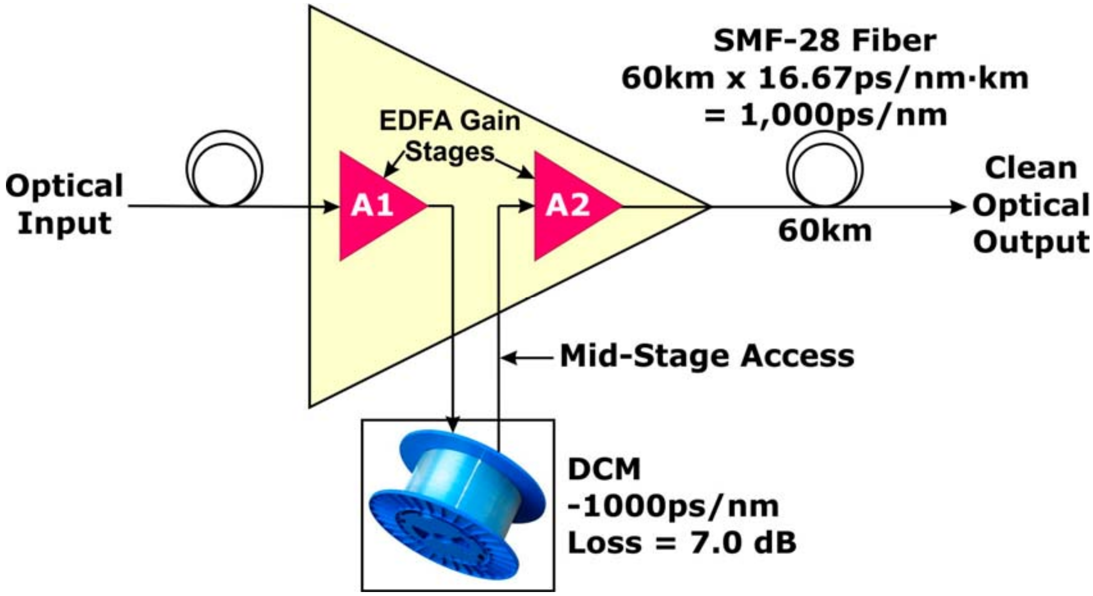

Figure 3 - Typical DCM Application

GENERAL FEATURES

The Olson Technology OT-DCM-G Series Dispersion Compensation Module operates near 1550nm where NDSF dispersion has a typical value of 16.67ps/nm/km. The DCM is a totally passive device consisting of a spool of special fiber (Dispersion Compensating Fiber (DCF)) that has high negative dispersion. Unlike Fiber Bragg Gratings (FBG's), DCM's based on DCF work over a continuous range of wavelengths. The front panel of the DCM, shown in Figure 4, only has vendor and part number markings. The rear panel of the DCM, shown in Figure 5, has the optical input and output connectors. These are always angle polished connector (APC) types.

Figure 4 - OT-DCM-G Front Panel

Figure 5 - OT-DCM-G Rear Panel

Table 1 – Part Numbers and Optical Dispersion Performance

Part Numbers and Optical Dispersion Performance

Model	SMF-28 Fiber Compensation Distance (km)	Dispersion @1545nm (ps/nm)	Max PMD (ps)	Max Insertion Loss (dB)
OT-DCM-G05	5	-85 ±5	0.4	2.0
OT-DCM-G10	10	-170 ±5	0.4	2.7
OT-DCM-G20	20	-340 ±10	0.4	3.5
OT-DCM-G30	30	-505 ±15	0.5	4.0
OT-DCM-G40	40	-670 ±20	0.6	4.4
OT-DCM-G50	50	-835 ±25	0.7	5.6
OT-DCM-G60	60	-1000 ±30	0.7	6.8
OT-DCM-G70	70	-1170 ±35	0.8	7.4
OT-DCM-G80	80	-1340 ±40	0.8	8.0
OT-DCM-G90	90	-1510 ±45	0.9	8.8
OT-DCM-G100	100	-1680 ±50	0.9	9.5
OT-DCM-G110	110	-1845 ±55	1.0	10.2
OT-DCM-G120	120	-2010 ±60	1.0	11.0

Note: Each DCM module is designed to compensate for a specific amount of dispersion. For example, the OT-DCM-G10 is designed to compensate for 10 km of G.652 fiber dispersion, and the OT-DCM-G100 is designed to compensate for 100 km of G.652 fiber dispersion. The units can be ordered for compensation distance from 5km to 120km.

Figure 6 Residual Dispersion