Chromatic Dispersion Emulation using Chirped Fiber Bragg Gratings

The Challenge

An ever-increasing need for bandwidth is driving the development and deployment of new technologies, ranging from 200 Gb/s to 800 Gb/s, in the optical communications field. A critical aspect of this research is the assessment and mitigation of chromatic dispersion effects. Dispersion in optical networks occurs when a narrow pulse of light broadens in the time domain due mainly to different wavelengths traveling at different speeds. In long haul networks, this causes bit errors and limits the speed of data transmission. Therefore, as 200G and 400G are gaining traction, more complex DSP algorithms are needed for chromatic dispersion robustness.

To develop and test these algorithms within high-speed coherent transceivers, engineers need to emulate the conditions of the intended deployment. For long-haul applications, this involves the use of hundreds or thousands of kilometers of fiber, which can be expensive and impractical and can require amplification to correct for attenuation losses.

A Proximion dispersion emulation module (DEM) uses an optical device called a chirped fiber Bragg grating (CFBG) which has a grating period that varies along its length, so reflecting different wavelengths at different spatial positions along the CFBG. As the diagram to the right shows, such a CFBG can be used to time-stretch a narrow spectral pulse into a broad pulse, so emulating the chromatic dispersion effects of long fiber networks.

The length and period variation of the CFBG can be customised to create the exact amount of dispersion that the transceiver design must be able to accommodate in the intended application. In this way, a single, low-cost component with negligible insertion loss can be used to avoid the cost and complexity of ultra-long fibers in evaluating network component performance. Proximion's CFBGs offer seamless operation over a broad wavelength bandwidth, and so can be used for any channel plan of modulation format of the transceiver application.
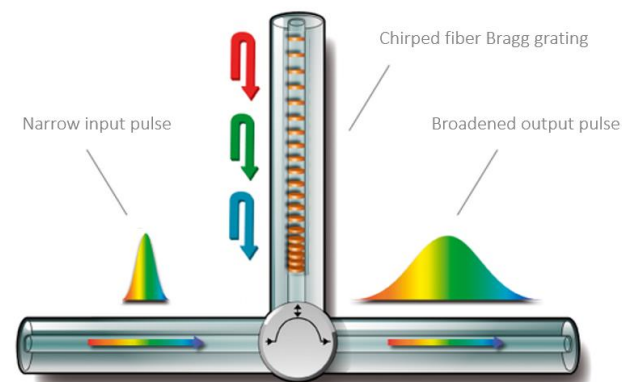
A Proximion CFBG broadens a spectral pulse to emulate chromatic dispersion

A datasheet for the Proximion DEM Module can be found at
www.proximion.com/hubfs/bu-pr/datasheet/dispersion-emulation/DEM_Datasheet.pdf