Chirped Fiber Bragg Grating Measurements

Overview

The purpose of this document is to outline the capabilities of the Optical Backscatter Reflectometer (OBR) 4600 in characterizing a chirped fiber Bragg grating (FBG). Data taken with the OBR instrument on a chirped FBG are presented and several competing technologies are mentioned.

OBR 4600

The OBR 4600 enables ultra-high resolution reflectometry with backscatter-level sensitivity. The technology contained in the OBR is based on a patented interferometric measurement technique that provides a spatial resolution of 10 microns over 30 meters of fiber device length or 20 microns over 70 meters of fiber device length. The OBR 4600 provides -130 dB sensitivity and 70 dB of dynamic range in a commercially available product. Wavelength scan ranges of either the C and L bands or the O band are available.

Luna's unique swept wavelength interferometric measurement technique provides both amplitude and phase information as a function of wavelength and distance. With the OBR 4600 and the OVA 5000 with OFDR capability, a user can fully characterize the features of a chirped grating, including wavelength as a function of distance, amplitude as a function of distance, and amplitude as a function of wavelength, all with a single scan.

Example Data

Below are a few screen captures taken from Luna's OBR software displaying data on a chirped FBG. Note that this data was taken with 20 micron spatial resolution. The grating measured is well over 1 meter in length.

In the first screen capture shown in Figure 1, the top graph shows reflected amplitude as a function of distance. This allows the user to view the response and shape of the grating as a function of distance along the fiber. Highlighting the grating with one of the two integrated cursors allows for the processing of only the selected segment of data. The bottom graph in Fig. 1 plots the phase derivative as a function of distance, or the wavelength of the grating as a function of distance along the fiber.

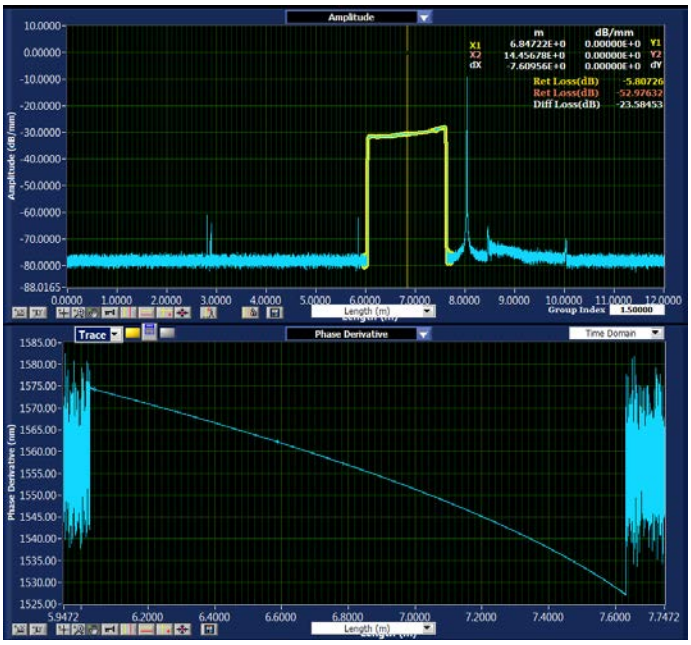

Figure 1: Phase Derivative (Wavelength) of Grating Versus Distance

In addition to the phase derivative information displayed in Figure 1, the user also has the capability of viewing the return loss of the grating as a function of wavelength, as shown in the bottom graph of Figure 2. The user can switch between these views in seconds, using the simple, intuitive user interface of the OBR 4600 product. The data may be saved to files and recalled for further analysis at a later time.

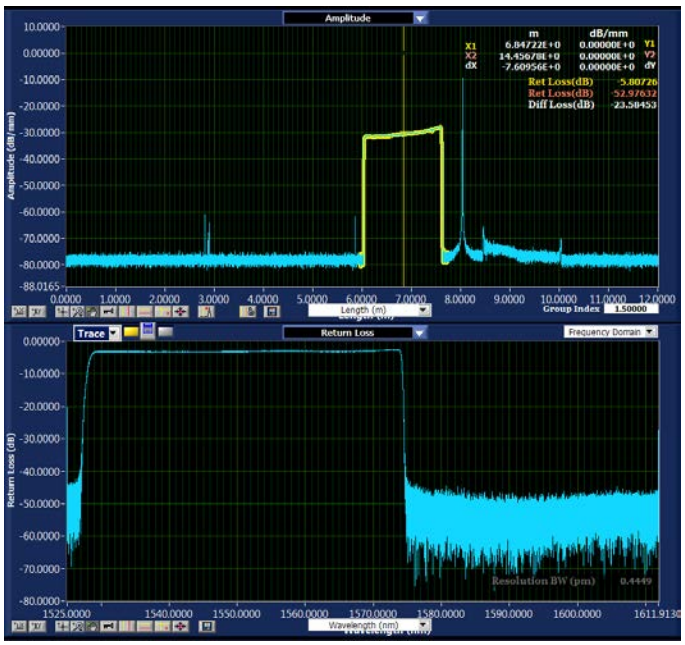

Figure 2: Return Loss of Grating as a Function of Wavelength

Competing Technologies

Product / Technology	Drawbacks
Optical Spectrum Analyzer	• Measures the spectrum of the grating, or return loss vs. wavelength • Provides no spatial information, i.e. wavelength or amplitude vs. distance
OTDR	• Poor spatial resolution (0.5-2 m) • Provides no spectral information, only amplitude vs. distance
Agilent 8504B - Precision Reflectometer	• Discontinued in 2006 • Requires external offset cables to get desired length • Acquires measurements over only 2m at a time • Provides no spectral information, only amplitude vs. distance

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Specifications of products discussed in this document are subject to change without notice. For the latest product specifications, visit Luna's website at www.lunainc.com.

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