Study of fiber bragg gratings apodized with different apodiztion

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Abstract
A fiber Bragg grating (FBG) is a period perturbation of the effective refractive index in the core of an optical fiber. There are many types of Bragg gratings, most notably the normal or uniform Bragg gratings, tilted Bragg and chirped Bragg grating. Interest in FBGs has grown rapidly in recent years because of their potential applications in several devices and systems such as the wavelength division multiplexer (WDM), dense wavelength division multiplexer (DWDM), optical filter, Laser, and optical add/drop multiplexer (OADM). FBGs have also been used as strain and temperature sensors.

The spectal response of a grating with uniform index modulation along the length of the fibre has secondary maxima on the sides of the main reflexion peak which is undesirable and which may be suppressed by a procedure called apodization.
Apodization is a variation of the modulation depth along the length of the grating and is used to suppressed the side lobes. The side lobes are due to multiple reflexions at the grating ends.
In this work, we study the spectral characteristics of various types of FBGs using numerical simulations. The reflection, transmission spectrum and group delay for several functions of apodized profile, show how the side lobes can suppressed and the simulated reflectance of FBGs with different lengths and the modulations of the refractive index were described.
The simulations are based on the T-Matrix method was adopted to solve the coupled mode equation to simulated the spectral profiles of the apodized fiber bragg grating for the two cases of uniform and non-uniform optical fiber.

Keywords: Optical fiber Bragg grating, Reflexion, Transmission, Apodization, T-Matrix method, group delay riplle.