

# Analysis of TE-Pass Reflection Mode Optical Polarizer using Method of Lines

Muhammad Ajmal Khan and Hussain A. Jamid

Electrical Engineering Department  
King Fahd University of Petroleum and Minerals  
Dhahran-31261, Saudi Arabia  
E-mails: {ajmal, hajamed}@kfupm.edu.sa

**Abstract:** In this work, a reflection-mode TE pass polarization filter is proposed and analyzed. Guided TE-polarized waves are highly reflected at the input end of this polarizer. On the other hand guided TM-polarized waves experience very low reflection at the same input end. The TE pass polarizer is realized by adding a corrugation in cascade with a simple three layer metal-clad optical waveguide. The metal-clad section of the polarizer provides the necessary TE/TM discrimination. The corrugated section provides two functions, namely, the necessary high reflectivity and in addition wavelength selectivity. This in addition to being a TE pass reflection mode filter, the device also functions as a narrow band wavelength filter. The analysis of the filter is carried out numerically using the method of lines with a perfectly matched layer in order to absorb the radiative field. A doubling and cascading algorithm is also utilized to efficiently account for the large number of grating periods forming the corrugated section of the filter.