

Analysis of TE-Pass Optical Polarizers using Method of Lines

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Abstract: In this work, we analyze two types of polarization filters, both of which pass TE polarized waves and reject TM polarized waves. The first type is a TE-pass transmission mode polarizer, which has been reported in the past, and the second one is a TE-pass reflection mode polarizer, which is new. The transmission mode TE-pass polarizer is simply a three layer metal-clad waveguide. This structure is characterized by TM polarized waves with much higher absorption loss compared to the TE modes of the structure. The reflection mode TE-pass polarizer is realized by corrugating the transmission mode polarizer. This reflection mode polarizer also functions as an optical wavelength filter. The reflection spectra of the reflection mode polarizer are calculated for different lengths of metal-clad section. We also account simultaneously for the absorption loss due to the presence of the metal and the loss due to reflection at the input and output ends of the polarizer.

These two types of polarizers are analyzed numerically using the Method of Lines (MOL). A perfectly matched layer (PML) approach based on transforming distance to the complex domain is used to numerically absorb the radiative field. In addition, a doubling and cascading algorithm is used to efficiently account for the large number of periodic grooves in the reflection mode TE-pass polarizer.