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Title

Characterization of Plasmonic Modes in a Low-Loss Dielectric-Coated Hollow Core Rectangular Waveguide at Terahertz Frequency

Source

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Abstract

In this paper, a low-loss hollow-core rectangular plasmonic waveguide with a dielectric coating of Teflon is analyzed for terahertz (2.5 THz) propagation using a full-vectorial finite-element method (FEM). The modal properties of the waveguide, their effective indices, and power confinements have been calculated with a particular emphasis on the loss characteristics of the different modes. It has been observed that the loss characteristics of the guide are greatly affected by the thickness of the dielectric coating. It has been identified that, in contrast to the fundamental H(10)(x) mode, the H(12)(x) mode shows interesting modal properties and offers the lowest possible loss for the structure. This mode also tends to yield a near-Gaussian field profile when the dielectric coating thickness is optimized. The optimization of the loss values has been evaluated by comparing the loss characteristics for different dielectric materials, as well as by using different metal claddings.