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Abstract:In this Letter we propose a scheme providing control over an optical waveguide mode by a terahertz (THz) wave. The scheme is based on an optimization of the overlap between the optical waveguide mode and the THz field, with the THz field strength enhanced by the presence of a metallic nanoslit surrounding the waveguide. We find an optimum balance between the optical mode attenuation and Kerr-induced change in the propagation constant. The criterion for a π/2-cumulative phase shift, for instance for application in a Mach-Zehnder interferometer configuration, requires 10 kV/cm THz field, which in turn is estimated to result in a nonlinear change of the refractive index in the waveguide of 0.001. Our simulations prove that it is quite reasonable to observe the effect experimentally.
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