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Title

Propagation of terahertz waves in an atmospheric pressure microplasma with Epstein electron density profile

Source

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Abstract

Propagation properties of terahertz (THz) waves in a bounded atmospheric-pressure microplasma (AMP) are analyzed in this study. A modified Epstein profile model is used to simulate the electron density distribution caused by the plasma sheaths. By introducing the dielectric constant of a Drude-Lorentz model and using the method of dividing the plasma into a series of subslabs with uniform electron density, the coefficients of power reflection, transmission, and absorption are derived for a bounded microplasma structure. The effects of size of microplasma, electron density profile, and collision frequency on the propagation of THz waves are analyzed numerically. The results indicate that the propagation of THz waves in AMPs depend greatly on the above three parameters. It is demonstrated that the THz wave can play an important role in AMPs diagnostics; meanwhile, the AMP can be used as a novel potential tool to control THz wave propagation. (36 References).