

341. Title:FDTD Analysis of Terahertz Wave Propagation in a High-Temperature Unmagnetized Plasma Slab

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Source title:IEEE Transactions on Plasma Science

Issue date:May 27, 2011

Publication year:2011

Document type:Article in Press

Abstract:Terahertz (THz) waves have been attracting much attention for a variety of technologies in recent years. However, only limited several experimental investigations on the terahertz characterization of plasmas have been reported. In this paper, a finite-difference time-domain method is applied to model the terahertz wave propagation in a high-temperature unmagnetized plasma. The rational polynomial function is established based on a hot plasma dispersion relation, and then, the relationship between D and E is deduced in the time domain. In the frequency domain, the reflection and transmission coefficients of terahertz waves through the hot unmagnetized plasma slab are computed, and their dependences on plasma frequency, plasma thickness, and collision frequency are studied. The results show theoretically that, when the terahertz wave passes through the plasma layer, its amplitude is obviously modulated by the electron density profile, the collision frequency, and the electron temperature. Finally, the potential application of terahertz waves in plasma diagnostics has been discussed.