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Generation of new modes in the process of passing waves through two semi-bounded waveguides with cylindrical metallic wall, with a dissipative plasma rod in one of them

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Abstract

In this paper, generation of new modes in the problem of transfer of electromagnetic waves from a semi-bounded cylindrical waveguide with a metallic wall to a plasma column is investigated. An electromagnetic wave with symmetric mode TM_{0j} is sent from a semi-bounded cylindrical dielectric waveguide to a plasma column. The plasma column is placed on axis of another semi-bounded dielectric waveguide. The two mentioned waveguides are connected to each other in $z=0$. The incident wave is reflected and transmitted on interface surface of the two waveguides. The reflected and transmitted waves are considered as a series of new modes; by using the appropriate boundary conditions, the reflection and transmission coefficients of each new mode are calculated. The calculations show that the reflection and transmission coefficients of the reflected and transmitted waves are a function of collision frequency of the plasma. Also, phase difference of the reflected and transmitted waves respect to the incident are shown because the reflection and transmission coefficients are obtained as a complex number. The graphs of the transmission and reflection coefficients and graphs of the phase difference of the reflected and transmitted waves in terms of collision frequency of the plasma are investigated as well.

Keywords: collisional plasma, electromagnetic waves, reflection and transmission coefficients, symmetric modes

For full article, refer to the Persian section

