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Propagation Matrix Method Study on effect of container on terahertz wave propagation of dusty plasma

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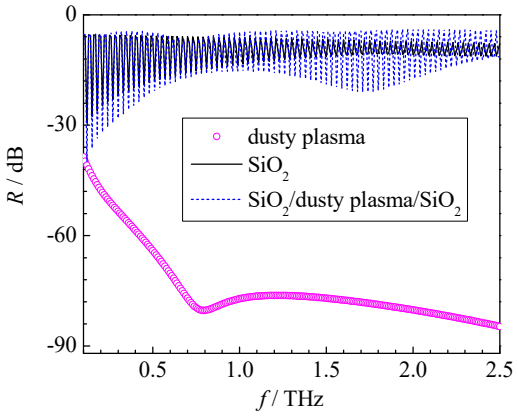
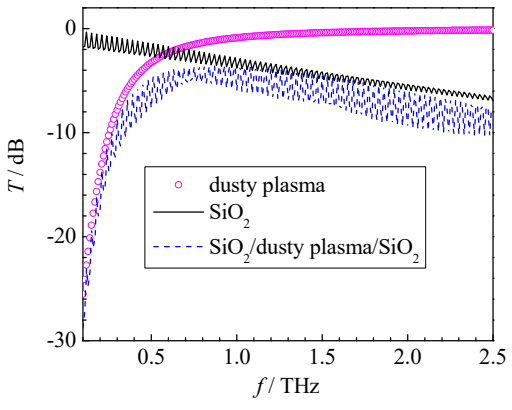
Dusty plasma [1-4] generated in the laboratory may be placed in a glass container. The effect of the container on the terahertz wave propagation characteristics of dusty plasma is studied by using the propagation matrix method in this paper.



(a)



(b)

Fig 1. Reflection and transmission coefficients of a dusty plasma, SiO_2, and SiO_2/dusty plasma/ SiO_2 slab. (a) reflection coefficients, (b) transmission coefficients.

Figure 1 gives reflection and transmission coefficients of dusty plasma (d=0.06 m), glass (SiO_2, ε_r=4+j0.005, d=0.01 m), SiO_2/dusty plasma/SiO_2 (0.005 m/0.06 m/ 0.005 m) slab. The relative permittivity of dusty plasma can be seen in Ref. [2]. The medium parameters for dusty plasma are N_e=1×10^{19} m^{-3}, N_d=3×10^{14} m^{-3}, v_{eff}=10^{12} rad/s, r_d=10^{-6} m, T=T_i=6000 K, m_i=5×10^{-26} kg, Z_d=300. One can find that the introduction of the glass make the smoothed terahertz wave reflection and transmission coefficients for the dusty plasma slab exhibit some resonant peaks, the reflection coefficient increase and the transmission coefficient decrease. The terahertz waves are reflected at each medium interface for many times.

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