Reflection and Transmission Coefficients of Thin Films in Green's Function Approach

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It is well known that the effective susceptibility of nano-object (the linear response to the external field) allows to describe the electrodynamic properties of the system.
In this paper the effective susceptibility of the thin film was obtained in the framework of the approach based on formally exact solution of Lippmann-Schwinger equation [1] for the self-consistent field, developed in [2]. As a result the effective susceptibility can be written in the form

$$\mathrm{X}_{jm}(\vec{k}, z', \omega) = \left[\chi^{-1}_{jm}(\omega) + M_{mj}(\vec{k}, z', \omega)\right]^{-1} , \qquad (1)$$

with the self energy part

$$M_{ij}(\vec{k}, z) = i\omega\mu_0 \int_0^h dz' G_{ij}(\vec{k}, z, z', \omega) \quad , \qquad (2)$$

defined by the electrodynamic Green's function (photon propagator) $G_{mj}(\vec{k}, z, z', \omega)$ of the medium in which the thin film is situated . The effective susceptibility allows to calculate the reflection and transmission coefficients of the film using knowledge of linear response to the local field $\chi_{ij}(\omega)$, which can be calculated within the standard microscopic theory.

[1] Greffet J-J, Carminati R 1997 Progr. Surf. Sci. 56 139.
[2]. S.Bozhevolnyi, V.Lozovski, Phys.Rev. B 61 (2000) 11139.