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Analytic Calculation of the Scattering Parameters from the Tunneling Equation with Absorption, CHUNG-SANG NG and

D. G. SWANSON, Auburn University AL 36849. - The Tunneling equation models the wave propagation in weakly inhomogeneous media near a back-to-back resonance-cutoff pair. Analytic expressions of the scattering parameters, i. e., transmission, reflection and mode conversion coefficients, for the case without absorption have long been known. For the case with absorption, solutions for the tunneling equation, and thus scattering parameters, can be found by solving an integral equation iteratively, making use of the numerical solutions of the tunneling equation without absorption. Recently, it has been shown analytically that some scattering parameters, namely, transmission coefficients (which are equal to each other) from both side and the reflection coefficient (which is identically zero) from the side which encounters the resonance before the cutoff, remain unchanged in both cases. However, analytic expressions for other scattering parameters which do change with absorption have been unknown so far. Here, we develop a new method to calculate these parameters directly by an analytic series expansion involving parameters of the tunneling equation itself only. Solutions of the tunneling equations with or without absorption are no longer needed in this calculation. Therefore it is a much faster method. This method has been applied successfully in calculating the non-zero reflection coefficient. Results agree well with those calculated by the integral equation method. The application of this method in calculating other mode conversion coefficients seems also possible.

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