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Title:Generalised formulation for electromagnetic scattering from finite arbitrarily shaped grooves in a perfect conducting plane
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Abstract:This study presents an analytical-based solution of electromagnetic plane wave scattering from a finite number of general-shaped grooves in a perfectly conducting plane. The formulation, for the near as well as far-field, is based on Fourier-integral representation of the scattered field and stair-case approximation of the grooves' fields. An efficient formulation of the scattering matrix based on hierarchical and modular formulations, which combines the boundary conditions between fields in groove layers and upper half space is demonstrated. The scattering matrix construction consists of two levels of matrices. The first level of matrices is the individual grooves scattering matrices and the coupling matrices between grooves. The second level of the matrices contains all the geometrical and physical parameters of the grooves as well as the incident field. The near and far-field results of finite rectangular and isosceles right triangle (IRT) grooves are in excellent agreement with a solution from high frequency simulation software, a finite-element simulator and previously published results. The proposed method is able to optimise finite asymmetric gratings for optical and terahertz applications.
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