Abstracts

Multimode Network Description of a Planar Periodic Metal-Strip Grating at a Dielectric Interface--Part II: Small-Aperture and Small-Obstacle Solutions

M. Guglielmi and A.A. Oliner. "Multimode Network Description of a Planar Periodic Metal-Strip Grating at a Dielectric Interface--Part II: Small-Aperture and Small-Obstacle Solutions." 1989 Transactions on Microwave Theory and Techniques 37.3 (Mar. 1989 [T-MTT]): 542-552.

In Part I of this pair of papers, we developed new multimode equivalent network representations for the scattering of a plane wave incident on a metal-strip grating at an air-dielectric interface. The analytical phrasing led to two Fredholm integral equations of the first kind with singular kernels. In this paper (Part II) we present two analytical small-argument solution procedures for those integral equations, and we derive explicit expressions for the elements of the coupling matices in the small-aperture and small-obstacle ranges for both TE and TM polarizations. Simple and useful equivalent network descriptions are derived in which all of the network elements are in very simple analytical form. When the discontinuity is "electrically small," the resulting network becomes dramatically simple. The various networks are discussed together with estimates for their ranges of applicability. Finally, numerical comparisons are presented with an independent numerical reference solution, showing that the new simple networks are indeed very accurate within their ranges of applicability.

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