Abstracts

Matrix Description of Waveguide Discontinuities in the Presence of Evanescent Modes

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The properties of the impedance and scattering matrix describing waveguide discontinuities are examined; both propagating and evanescent modes are considered. It is shown how different normalization conditions for the normal mode solutions in the guide affect the impedance matrix. A suitable choice of normalization always leads to a symmetric imaginary impedance matrix for a lossless structure. The scattering matrix is no longer symmetric or unitary.The simple relationship S=(Z- U)(Z+U)/sup -1/ is shown to hold only under special normalization conditions. Next the matrices describing a plane of lossless obstacles arranged in a periodic array are examined. A different type of normalization condition must be used here, since the normal modes are orthogonal in the conjugate sense (biorthogonal). Although the structure is reciprocal, none of the matrices is symmetric. A suitable normalization leads to a skew-hermitian impedance matrix and to a unitary submatrix of the scattering matrix corresponding to propagating modes.

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