Abstracts

A Generalized Scattering Matrix Approach for Analysis of Quasi-Optical Grids and De-Embedding of Device Parameters

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A generalized scattering matrix approach to analyzing quasi-optical grids used for grid amplifiers and grid oscillators is developed. The approach is verified by a novel method for de-embedding, in a waveguide simulator, the active device parameters of a differential pair high electron mobility transistor (HEMT) from the single unit cell of a grid amplifier. The method incorporates the additional ports presented to the active device into a method of moments solution of the embedding periodic array. The port(s) defined at the device or load location are within the plane of the array, and not terminated in a microstrip line with a known characteristic impedance. Therefore the generalized scattering matrix for the embedding array is normalized to the calculated input impedance(s) at these port(s). The approach described here uses a Floquet representation of the fields incident and reflected from the grid as the remaining ports in the generalized scattering matrix. The use of Floquet modes allows analysis of general geometries and nonnormal incident angles without the need for magnetic and electric wall assumptions. By developing a generalized scattering matrix for the embedding periodic array, this approach now allows conventional amplifier design techniques and analysis methods to be applied to quasi-optical grid amplifier and oscillator design. The major advantage of this unification for grid amplifier design being that the stability of the design can be predicted.

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