Abstracts

Quasi-Optical Power Combining Using Mutually Synchronized Oscillator Arrays

R.A. York and R.C. Compton. "Quasi-Optical Power Combining Using Mutually Synchronized Oscillator Arrays." 1991 Transactions on Microwave Theory and Techniques 39.6 (Jun. 1991 [T-MTT]): 1000-1009.

A quasi-optical method for solid-state power combining is discussed, with application to high-power millimeter-wave generation. The approach uses two-dimensional planar arrays of weakly coupled oscillators. Limiting the strength of the coupling avoids multifrequency moding problems and simplifies the design. A radiating element is embedded in each oscillator so that the power combining is accomplished in free space. The concept has been demonstrated with two prototype arrays, one rising Gunn diodes and the other MESFET's. A theoretical description of the coupled-oscillator arrays is also presented for design purposes, and is used to investigate phasing problems and stability. Experiments indicate that in-phase operation is facilitated by using a quasi-optical reflector element, which influences the operating frequency and coupling between the elements. Equivalent isotropic radiated powers of 22 W at 1% efficiency for a 16-element Gunn array and 10 W at 26% efficiency for a 16-element MESFET array have been obtained at X band.

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