Abstracts

Planar MESFET Grid Oscillators Using Gate Feedback

R.M. Weikle, II, M. Kim, J.B. Hacker, M.P. De Lisio and D.B. Rutledge. "Planar MESFET Grid Oscillators Using Gate Feedback." 1992 Transactions on Microwave Theory and Techniques 40.11 (Nov. 1992 [T-MTT]): 1997-2003.

A new method for quasi-optically combining the output power of MESFET's is presented in which drain and source leads couple directly fo the radiated field. The design consists of a planar grid of devices placed in a Fabry-Perot cavity. Capacitive feedback is provided to the gate. This is in contrast to previous MESFET grid designs where the radiated electric field was coupled to the drain and gate currents. The new gate-feedback grids can oscillate at much higher frequencies than these previous grids. The oscillation frequency is dependent on the device characteristics, the resonator cavity, and is also a function of the symmetries of the grid. A transmission-line model for tlhe grid is discussed and used to design two oscillator arrays. Experimental results are presented for oscillator grids operating at X-band and Ku-band. A 16-element grid has produced 335 mW of power at 11.6 GHz with a DC-to-RF conversion efficiency of 20%. This design was scaled to produce a 36-element grid oscillator with output power of 235 mW at 17 GHz. These results represent a significant improvement in the performance of planar grid oscillators which were previously limited to an operating frequency of 5 GHz and output power of 6 mW per device when using the same transistor. In addition, the planar configuration of the grid is very convenient for monolithic integration and is easily scalable to millimeterwave frequencies.

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