Abstracts

Hybrid integrated HEMT oscillator with a multiple-ring nonradiative dielectric (NRD) resonator feedback circuit

Songxin Qi, Ke Wu and Zifei Ou. "Hybrid integrated HEMT oscillator with a multiple-ring nonradiative dielectric (NRD) resonator feedback circuit." 1998 Transactions on Microwave Theory and Techniques 46.10 (Oct. 1998, Part II [T-MTT] (Special Issue on New Developments in the Design of Microwave and Millimeter-Wave Oscillators)): 1552-1558.

In this paper, a novel hybrid integrated-oscillator scheme is developed for millimeter-wave sources. A nonradiative dielectric (NRD) multiple-ring resonator is used, not only as a frequency-stabilizing element, but also as a feedback circuit coupled to a planar amplifier through the input and output slots. Such a three-dimensional circuit design indicates that a strong positive feedback can be easily implemented at millimeter wave frequencies to improve characteristics of the oscillator. A field-theoretical model is derived for accurate prediction of the resonant frequency of NRD multiple-ring structures. The very satisfactory agreement observed between our measured and calculated results validates the modeling approach. Subsequently, a 23.3-GHz hybrid integrated high electron-mobility transistor (HEMT) oscillator has been designed, fabricated, and characterized with a dual-ring NRD resonator. The oscillator exhibits 7.0-dBm output power with 6.4% dc-to-RF efficiency and less than -95.7-dBc/Hz phase noise at 1-MHz offset from the carrier. The attractive electrical performance demonstrates a new approach to the design of cost-effective millimeter-wave sources by the use of an extremely low-cost and low-loss NRD material instead of an otherwise expensive conventional high permittivity (usually ceramic-material based) dielectric resonator.

❑ Return to main document.