Abstracts

Simulation of 100-300 GHz Solid-State Harmonic Sources

M.F. Zybura, J.R. Jones, S.H. Jones and G.B. Tait. "Simulation of 100-300 GHz Solid-State Harmonic Sources." 1995 Transactions on Microwave Theory and Techniques 43.4 (Apr. 1995, Part II [T-MTT] (Special Issue on Space Terahertz Technology)): 955-961.

Accurate and efficient simulations of the large-signal time-dependent characteristics of second-harmonic Transferred Electron Oscillators (TEO's) and Heterostructure Barrier Varactor (HBV) frequency triplers have been obtained. This is accomplished by using a novel and efficient harmonic-balance circuit analysis technique which facilitates the integration of physics-based hydrodynamic device simulators. The integrated hydrodynamic device/harmonic-balance circuit simulators allow TEO and HBV circuits to be co-designed from both a device and a circuit point of view. Comparisons have been made with published experimental data for both TEO's and HBV's. For TEO's, excellent correlation has been obtained at 140 GHz and 188 GHz in second-harmonic operation. Excellent correlation has also been obtained for HBV frequency triplers operating near 200 GHz. For HBV's, both a lumped quasi-static equivalent circuit model and the hydrodynamic device simulator have been linked to the harmonic-balance circuit simulator. This comparison illustrates the importance of representing active devices with physics-based numerical device models rather than analytical device models.

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