Abstracts

Theoretical Investigations of a Proposed Series Integration of Resonant Tunneling Diodes for Millimeter-Wave Power Generation

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Double-barrier quantum-well resonant tunneling diode (RTD) has great potential for power generation at millimeterwave frequencies. If a number of RTD's are integrated in series, the integrated device can greatly increase the total output power and help remove the problem of low-frequency spurious oscillations associated with a single RTD. The feasibility of such a proposed series integration scheme is investigated. The advanced monolithic nonlinear transmission line (NLTL) generating picosecond voltage shock waves can be used to initiate oscillation in such series-integrated RTD's to over-come the dc instability. The large-signal RF characteristics of the series-integrated RTD's are analyzed and simulated, including transit time effects in the depletion region. Using one of the available GaAs/AIAs RTD data, our computer simulation results show that a total cw output power of about 0.1 W with a dc-to-RF conversion efficiency of about 8% can be generated to a 5-omega load at 100 GHz, if ten such RTD's are integrated in series.

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