

# Abstract

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## **A Resonant Tunneling Diode characterization for high frequency communication systems**

In this paper, a detailed derivation process is proposed to characterize the Resonant Tunneling Diode (RTD) for high frequency regime. The proposed model is used to design and analyze a simple microwave oscillator based on the RTD using the commercial circuit simulation software, ADS from Agilent Technologies. The simulation is carried out using different equivalent circuit models the proposed model, the original constant RC model, and the series/parallel double RC model, which is an alternative to the quantum-inductance RLC model. This is performed in terms of oscillation frequency and output power against resonant circuit elements, considering the CPU time. A comparison between the simulation results of the three models indicates that the proposed model is simple, accurate, and appropriate to investigate the behavior of the RTD at high frequency without any singularity and convergence problems. Also, its complexity (CPU time) is less than that of the series/parallel double RC model and higher than that of constant RC model. However, the constant RC model is inaccurate, especially in high frequency regime. In addition, the proposed technique can be easily incorporated into computer aided circuit design software, such as SPICE and ADS software, to simulate circuits containing RTD in high frequency regime. In brief, this work adds important contributions to the accurate characterization and modeling of RTDs and analyzes its based circuits in high frequency regime by addressing the problems of the current RTD equivalent circuit models.