

# Abstract

**Moustafa Hussein Aly**

## **A Simplified Analytical Technique for High Frequency Characterization of Resonant Tunneling Diode**

This paper proposes a simplified analytical technique for high frequency characterization of the resonant tunneling diode (RTD). An equivalent circuit of the RTD that consists of a parallel combination of conductance,  $G(V, f)$ , and capacitance,  $C(V, f)$  is formulated. The proposed approach uses the measured DC current versus voltage characteristic of the RTD to extract the equivalent circuit elements parameters in the entire bias range. Using the proposed analytical technique, the frequency response - including the high frequency range - of many characteristic aspects of the RTD is investigated. Also, the maximum oscillation frequency of the RTD is calculated. The results obtained have been compared with those concluded and reported in the literature. The reported results in literature were obtained through simulation of the RTD at high frequency using either a computationally complicated quantum simulator through difficult RF measurements. A similar pattern of results and highly concordant conclusion are obtained. The proposed analytical technique is simple, correct, and appropriate to investigate the behavior of the RTD at high frequency. In addition, the proposed technique can be easily incorporated into SPICE program to simulate circuits containing RTD.