Abstracts

Analytical theory for the subfrequency excitation of a parametric series-integrated RTD oscillator

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We have developed an analytical theory for the subfrequency excitation of a series-integrated resonant tunneling diode (RTD) oscillator. The mathematical principle used in the derivation of the theory is very similar to the so called "averaging principle". We may call the subfrequency excitation of a sustained oscillator considered here a "parametric oscillator" since the negative resistance of the series-integrated RTDs can be viewed as a parametric function. We have derived simplified equations that can describe the transients of the subfrequency excitation of the parametric oscillator. The theory clearly shows how a subfrequency-induced negative resistance can be shared at the fundamental frequency to build up the oscillation. A comparison has been made with SPICE simulations and it shows good agreement. The analytical theory developed here provides both good insight and quantitative analysis for the preliminary design of the parametric oscillators of series-integrated RTDs.

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