Abstracts

Frequency-Saturation Effects in Transferred Electron Oscillators

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Frequency-saturation effects have been observed in the mechanical tuning characteristics of transferred electron (Gunn) oscillators operating in conventional waveguide cavities at frequencies from 12 to 40 GHz. Their existence leads to a restriction in oscillator tuning range and enhances frequency switching and hysteresis effects in the oscillators. Investigation of oscillator behavior in coaxial cavities as well as in waveguide cavities of varying height has shown that frequency saturation is caused by a coaxial resonance along the mounting post, which in the limit of fully reduced-height waveguide becomes the resonance of the diode with the encapsulation itself, or by a frequency limitation imposed by the diode thickness and operating voltage. The transverse coaxial resonance will occur in any waveguide size at a frequency near to if not within the band of interest. Simulation of the encapsulated diode by a localized reduction in mounting-post diameter shows that the frequency of transverse resonance can be increased by moving the encapsulation to a central position in the waveguide cross section. It is suggested that this technique and that of using cavities with a local reduction of height will make an important contribution to improving the performance characteristics of waveguide-mounted oscillators.

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