Abstracts

An Investigation of Parametric Noise in Millimeter-Wave IMPATT Oscillators

A. Rydberg and P.T. Lewin. "An Investigation of Parametric Noise in Millimeter-Wave IMPATT Oscillators." 1987 Transactions on Microwave Theory and Techniques 35.7 (Jul. 1987 [T-MTT]): 663-671.

The IMPATT oscillator used as an LO source in a receiver has often been found to contribute a large amount of excess noise to the system (sometimes more than 40 dB compared to a klystron). Often the IMPATT noise has been referred to as avalanche noise, but theoretically this should only reduce the carrier-to-noise ratio by 10-15 dB when compared to a klystron. In the following paper, we show that the excess noise far from the carrier frequency (i.e., sideband noise) is much more dependent on parametric oscillations excited below the cutoff frequency of the mount than, on avalanche noise. By modifying the Hines equation for parametric stability, we have been able to investigate the parametric noise properties of realistic millimeter-wave IMPATT oscillators. Using theoretical waveguide models, we have investigated how the sideband noise depends on various mount configurations, avalanche currents, and IMPATT diodes, The calculated curves show good correlation with the measured noise at 4 GHz from the carrier. It often has been found to be very difficult to completely reduce the parametric noise in avalanche oscillators. In these cases, the method of comparison between different mounts presented here for finding the diode-mount configuration which gives least parametric noise can be an aid in the construction of low-noise IMPATT oscillators.

❑ Return to main document.