SESSION 25: MILLIMETER WAVE MIXERS

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The current research and development in the area of millimeter wave mixers is involved in the fabrication and processing of better Schottky barrier diodes for their applications in unique imbedding circuits. Because of their covertness and ability to penetrate battle field smoke, haze and fog, providing all weather capability in the millimeter-wave region, millimeter-wave mixers and subsystems are finding widespread application in tactical and strategic systems, such as communications, radar, target acquisition and submunitions. However, the use of conventional waveguide mixers for system applications often is hampered by their size, weight and labor intensive fabrication. To produce these mixers and subsystems at affordable cost, the use of hybrid planar integrated or monolithic circuit techniques will prove to be attractive because a large quantity of circuits can be fabricated by batch-processing of wafers using advanced semiconductor processing techniques.

In this session we have four papers on millimeter-wave mixers. The first paper entitled "A Comparison of the Measured and Theoretical Performance of A 140-220 GHz Schottky Diode Mixer", addresses the problem of the wide variation in mixer performance reported at frequencies above 100 GHz using diodes fabricated on the same semiconductor wafer. The results of a theoretical analysis show that the extreme sensitivity of diode parameters have a bearing on mixer performance. Experimental measurements at 180 GHz show excellent agreement with the predictions of the analysis, and comparable agreement has been obtained at 150 GHz.

The second paper entitled "Noise Measurements and Noise Mechanisms In Microwave and Mixer Diodes", reports on extensive temperature and frequency dependent noise measurements performed on microwave and millimeter-wave mixer diodes. An analytic model of the basic noise mechanism is presented and compared with measurements of GaAs mixer diodes over the temperature range from 10K to 300K and over the frequency range from 0.5 GHz to 17.5 GHz.

The paper entitled "Broadband MM-Wave Crossbar Mixer on Soft Substrate", reports on a crossbar mixer designed and fabricated using 5 mil duroid substrate in the frequency range from 110-170 GHz. The mixer has a bandwidth of 18 GHz with a measured conversion loss of 7.0dB.

The last paper in the session entitled "Low Noise Fixed Tuned, Broadband Mixer for 200 - 270 GHz", describes a single-ended, fixed tuned mount comprising a whisker contacted Schottky diode in a reduced height waveguide. The SSB mixer noise temperature remains between 500K and 600K, with the corresponding SSB conversion losses between 8 to 9dB in the frequency range from 20 GHz to 270 GHz. This is the lowest noise temperature reported for a fixed tuned mixer with this very broad bandwidth.

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