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60 GHz MONOLITHIC SCHOTTKY VARACTOR TRANSMISSION BEAM SWITCHING ARRAY

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Millimeter wave switches may be used in a variety of radar applications including millimeter wave imaging systems, (e.g. for airport runways), and collision avoidance systems for automotive vehicles. High speed switches can also be used in fusion plasma diagnostics. Both transmitters and receivers are needed, with high speed electronic scanning and high power capabilities highly desirable. Monolithic integrated diode grid beam controllers can perform switching and amplitude modulation functions at high power levels. EM modeling using HFSS has been performed, which allows one to analyze the switch grid using actual geometry, and to determine the circuit parameters including parasitics. In our design, a single grid with an optimum unit cell size can provide a contrast ratio of 24 dB with a minimum insertion loss of 1.5 dB, and 50 dB contrast ratio and a minimum insertion loss of 2 dB with a stacked grid pair.

Four beam control arrays have been fabricated (courtesy of Martin Marietta laboratories) on 3" diameter GaAs substrates. Experimental results have been achieved with a contrast ratio of 24 dB with a single grid and 40 dB contrast ratio with a grid pair. Figure 1 illustrates the comparison of simulated and experimental results for a single grid transmission switch at 62 GHz. Similarly, figure 2 shows the comparison for a grid pair transmission switches as a function of frequency.

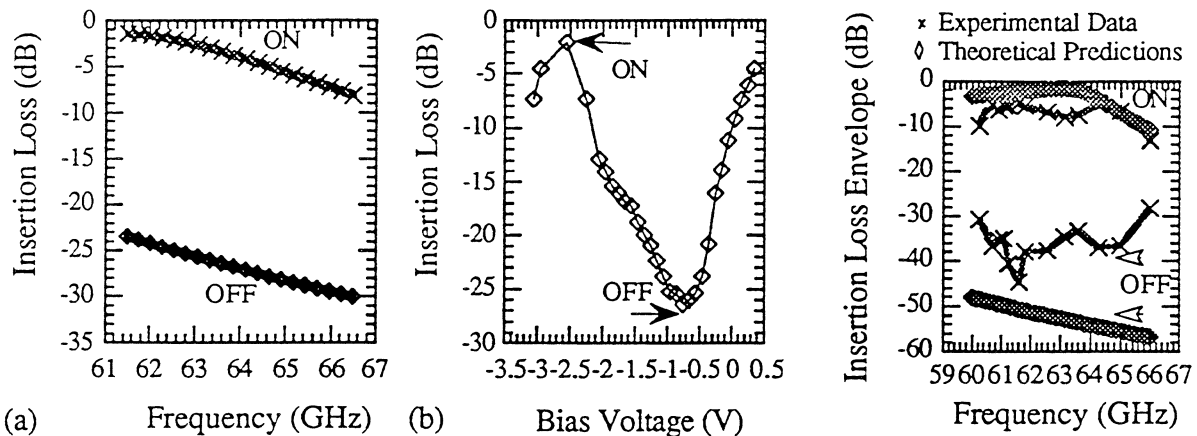


Fig. 1 Comparison of the predicted (a) and experimental (b) results of transmission switches with a single grid at 62 GHz.

Fig. 2 Comparison of the predicted and experimental results of four grid pair transmission switch as a function of frequency.

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