Abstracts

Broadband Electronically Tunable Planar Active Radiating Elements and Spatial Power Combiners Using Notch Antennas

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A Gunn device has been integrated with two types of active planar notch antennas. The first type uses a coplanar waveguide (CPW) resonator and a stepped-notch antenna with bias tuning to achieve a bandwidth of 275 MHz centered at 9.33 GHz with a power output of 14.2 ± 1.5 dBm. The second type uses a CPW resonator with a varactor for frequency tuning to achieve a bandwidth of over 1.3 GHz centered at 9.6 GHz with a power output of 14.5 ± 0.8 dBm. This is equivalent to over 14% electronic tuning bandwidth. Both configurations exhibit a very clean and stable output signal. A theoretical circuit model was developed to facilitate the design. The model agrees well with experimental results. Injection-locking experiments on the second configuration show a locking gain of 30 dB with a locking bandwidth of 30 MHz at 10.2 GHz. Power combining experiments of two varactor-tuned CPW active notch antenna elements in a broadside configuration have achieved well over 70% combining efficiency throughout the wide tuning range. The circuits have advantages of small size, low cost, and excellent performance.

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