Abstracts

2.5-THz GaAs monolithic membrane-diode mixer

P.H. Siegel, R.P. Smith, M.C. Graidis and S.C. Martin. "2.5-THz GaAs monolithic membrane-diode mixer." 1999 Transactions on Microwave Theory and Techniques 47.5 (May 1999 [T-MTT]): 596-604.

A novel GaAs monolithic membrane-diode (MOMED) structure has been developed and implemented as a 2.5-THz Schottky diode mixer. The mixer blends conventional machined metallic waveguide with micromachined monolithic GaAs circuitry to form, for the first time, a robust, easily fabricated, and assembled room-temperature planar diode receiver at frequencies above 2 THz. Measurements of receiver performance, in air, yield at T/sub receiver/ of 16500-K double sideband (DSB) at 8.4-GHz intermediate frequency (IF) using a 150-K commercial Miteq amplifier. The receiver conversion loss (diplexer through IF amplifier input) measures 16.9 dB in air, yielding a derived "front-end" noise temperature below 9000-K DSB at 2514 GHz. Using a CO/sub 2/-pumped methanol far-infrared laser as a local oscillator at 2522 GHz, injected via a Martin-Puplett diplexer, the required power is /spl ap/5 mW for optimum pumping and can be reduced to less than 3 mW with a 15% increase in receiver noise. Although demonstrated as a simple submillimeter-wave mixer, the all-GaAs membrane structure that has been developed is suited to a wide variety of low-loss high-frequency radio-frequency circuits.

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