

An All Solid-State Receiver at 2 THz for Atmospheric Sounding

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Abstract— Schottky diode front-end receivers have been demonstrated up to 2.5 THz with a CO₂-pumped methanol gas laser local oscillator sources [1, 2]. In this work we report on the progress towards demonstrating a fully solid-state heterodyne receiver in the 2 THz range. A subharmonically pumped mixer chip pumped by a cascaded multiplier chain as the LO has been designed, developed and tested. The mixer chip [3] is packaged in a split waveguide block with an integrated diagonal horn for RF coupling. To reduce losses, current implementation is based on last stage tripler and mixer housed together. Recent results obtained at room temperature will be discussed. The LO scheme can provide 1-2 mW of power around 1 THz which is enough to make preliminary receiver sensitivity measurements indicating a DSB mixer noise temperature of better than 15,000 K. On-going work is focused on improving the mixer sensitivity and making cryogenically cooled measurements.

- [1] P. Siegel, R. Smith, M. Gaidis, and S. Martin, “2.5-THz GaAs monolithic membrane-diode mixer,” *IEEE Trans. Microw. Theory Techn.*, vol. 47, no. 5, pp. 596–604, May 1999.
- [2] H.-W. Hübers, T. W. Crowe, G. Lundershausen, W. C. B. Peatman, H. P. Röserl “Noise Temperatures and Conversion Losses of Submicron GaAs Schottky—Barrier Diodes,” *4th International Symposium on Space Terahertz Technology*, 1993.
- [3] B. Thomas, A. Maestrini, J. Ward, E. Schlecht, G. Chattopadhyay, J. Gill, C. Lee, R. Lin, and I. Mehdi, “Terahertz cooled sub-harmonic Schottky mixers for planetary atmospheres,” *5th ESA Workshop Millimeter Wave Tech. Apps*, 3/30/2015.