

A 780-950GHz Frequency Tripler for Radio Astronomy

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Abstract— We report on the design and fabrication of a fix-tuned wide bandwidth balanced frequency tripler working in the 780-950 GHz band. The multiplier features four GaAs Schottky planar anodes in a balanced configuration integrated on a few micron thick membrane. The multiplier is bias-able and is designed for 15 mW of input power. However, for the preliminary RF tests presented in this paper, the 780-950 GHz tripler was pumped by a chain of two cascaded fixed-tuned balanced doublers able to deliver 4-10.5 mW in the band 273-320 GHz when pumped by a 120-150 mW solid-state source. Due to the limited bandwidth of the driver chain, only tests at frequencies above 820 GHz have been performed. A dual-chip version of the wideband six-anode 260-340GHz frequency tripler presented in [1] is currently in the process of being fabricated and should replace soon the current driver.

Room temperature measurements show a conversion efficiency above 1% across the 820-950 GHz band with a peak conversion efficiency of 3.6% at 820 GHz. The output power is above 100 μ W from 820 GHz to 935 GHz and falls to 40 μ W at 950 GHz with a maximum of 325 μ W of output power at 852 GHz. Predictions are in close agreement with these measurements, thus, the multiplier is expected to cover frequencies below 820 GHz (which is actually the peak efficiency) down to 870 GHz once a broader-band driver is assembled. During the measurements all the bias voltage of all three multipliers were kept constant therefore the local oscillator chain was very easy to operate (it was fix-tuned and fix-biased).

[1] Alain Maestrini, Charlotte Tripon-Canseliet, John S. Ward, John J. Gill, and Imran Mehdi, "A High efficiency Multiple-Anode 260-340 GHz Frequency Tripler", to appear in the proceedings of the 17th International Conference on Space Terahertz Technology, Paris, 10-12 May 2006.

This work was primary supported by the Jet Propulsion Laboratory, California Institute of Technology and by the University Pierre et Marie Curie-Paris6 and the Observatory of Paris.