

NOVELLO FREQUENCY CONTROL FOR A 220 GHz RADIOMETER WITH A 110 GHz GUNN OSCILLATOR

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Abstract - Because of the drive for "faster, better, cheaper" missions, future space missions will require low-power, compact millimeter and submillimeter wave instruments. Eliminating phase-locked loop (PLL) systems as well as active thermal control systems from standard receivers can result in a significant reduction of mass and power in some applications, such as planetary atmospheric sounding. Here we report on a novel 1.0 frequency control for millimeter and submillimeter wave subharmonic Schottky receivers using GUNN oscillators for the 1.0. In this approach, the GUNN oscillator frequency is voltage tuned to compensate for the frequency drift due to the temperature change, and therefore neither a PLL, nor **active** thermal control are required. A temperature-compensated, fixed-tuned GUNN oscillator was characterized for a wide temperature range (0 to 50 °C), and frequency versus voltage and temperature behavior was recorded. Based on this information, a simple computer program was written to calculate the required bias voltage for a desired frequency and a given temperature. A 220 GHz subharmonic receiver using such a 1.0 frequency control was tested with a laboratory signal source. It was shown that the GUNN frequency could be repeatably predicted within a few MHz, giving sufficient accuracy for Mars atmospheric sounding.

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