

Development and Testing of the 1.46 THz and 1.9 THz GUSTO Flight-Model Local Oscillator Arrays

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This talk will describe recent work on the 1.46 THz and 1.9 THz local oscillator (LO) arrays for the Galactic/Extragalactic ULDB Spectroscopic Terahertz Observatory (GUSTO) project [1]. This project is led by the University of Arizona, and consists of a long duration balloon astronomy mission to be launched from Antarctica. VDI is developing 2x4 pixel arrays of LOs at 1.46 THz and 1.9 THz that will be used to drive 2x4 pixel HEB arrays. Each LO pixel consists of a stand-alone amplified multiplier chain, that had been previously developed. These chains have been re-packaged to fit the requirement of a 15 mm spacing between pixels. A photograph of a 1x4 array of the 1.9 THz local oscillator pixels is shown in Fig. 1.

Full 2x4 arrays of both frequencies have been tested extensively to verify that they meet the flight requirements. First, a minimum of 15 uW output power is required for each pixel over the frequency range. Also, the THz power must be electronically controllable over a 6 dB range of power. In addition, the amplitude noise of each pixel is measured to insure that the amplitude noise stays below the specified -147 dBc/Hz at both full power and at minimum power. The inset in Fig. 1 shows a typical curve for a 1.9 THz pixel at full output power, with a maximum noise of -157 dBm. This measurement uses a method previous developed for the ALMA local oscillators [2]. Finally, the chains are tested over an operational temperature range of 0C to close to 50C, to verify proper performance over this range.

The results of these test for the two arrays will be presented at the symposium.

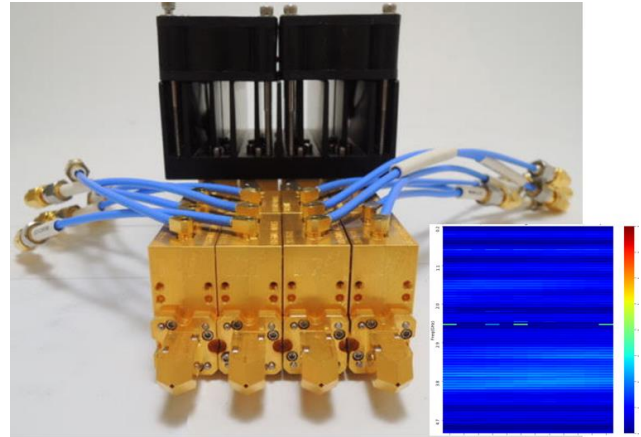


Fig. 1. Photograph of a 1x4 array of 1.9 THz local oscillators. The inset shows an amplitude noise measurement of one of the pixels over the required frequency band. The dark blue indicates -170 dBm/Hz and the light blue peaks are at -157 dBm, well below the specified -147 dBm.

REFERENCES

- [1] <https://www.as.arizona.edu/gussto>
- [2] E. Bryerton and J. Hesler “Sideband noise screening of multiplier-based Sub-millimeter LO chains using a WR-10 Schottky mixer”, Proc. Of 19th Int. Symp. on Space Terahertz Tech., 2008, pp. 498-501.

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