

4.7 THz flight mixers for upGREAT

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Abstract—We summarize our laboratory results for the flight mixers that we delivered to the 7-pixel high frequency array (HFA) focal plane extension of the GREAT receiver in operation on SOFIA. The HFA targets the [O I] fine structure transition at 4745 GHz (63 μm) of mainly galactic sources. The HFA went into commissioning in November 2016 and greatly increases mapping speed over its single pixel receiver predecessor GREAT H (see presentation from C. Risacher et al. on the receiver performance on SOFIA).

Based on the performance of the single-pixel receiver we selected waveguide NbN hot electron bolometer devices with a similar LO power consumption. The quantum-cascade laser (QCL) based LOs used at 4.7 THz demonstrate significantly higher output power levels (> 1 mW) than the solid-state multiplier sources used e.g. for the 1.9 THz low frequency array (LFA). This significantly relaxes the maximum allowable LO pump power limit during mixer selection.

We compare the heterodyne characterization results at 4.7 THz for these mixers using one common lab setup with a QCL based LO and single shot 0-5 GHz IF processing capability. All measurements were performed with an evacuated signal path using a 3 μm thick Mylar beamsplitter as diplexer. We measure uncorrected Trec noise temperatures less than 1500 K for all mixers averaged over an 1-2 GHz IF band in our lab setup with 3 dB IF noise roll-offs above 3 GHz.