# DIFFUSION-COOLED ALUMINUM HOT-ELECTRON BOLOMETER MIXERS AT SUBMILLIMETER WAVELENGTHS

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Aluminum hot-electron bolometer (HEB) mixers are of interest for use in low-noise heterodyne receivers for astrophysical observations at terahertz frequencies. The main advantage over existing diffusion-cooled niobium mixers and phonon-cooled mixers is that an Al device can be made fast enough to allow intermediate frequency (IF) bandwidths of several GHz, while requiring one to two orders of magnitude less local oscillator (LO) power. This is of major significance for space-borne applications since there are at present no compact, solid-state tunable LO sources that can produce sufficient power to operate existing HEB mixers.

In our talk, we will present the first experimental results for aluminum HEB mixers at submillimeter wavelengths. The measurements were made at an LO frequency of 618 GHz using a quasioptical mixer design. For a 1 μm long device, the IF conversion bandwidth was 3 GHz, with about 1 nW of absorbed LO power. This is consistent with theoretical predictions based on a thermalized, distributed temperature model. The IF bandwidth implies a diffusivity for the Al microbridge of $\approx$ 19 $cm^2/s$.

We have also measured the device output noise and find it agrees with theoretical model predictions for thermal fluctuation noise. We will present results of mixer noise and conversion versus device length and sheet resistance. Comparisons of these results to predictions of bolometric mixer theory will be made.

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