

YBCO HEB THz mixers

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We report on an experimental investigation of high-Tc superconducting hot electron bolometer (HEB) mixers of YBCO. These mixers were tested at 100 and 530 GHz LO for a range of temperatures around 77 K. The conversion gain of -32 dB was measured at an LO power of about 1 mW (530 GHz) and 0.3 GHz IF. The mixers were integrated with a logarithmic spiral antenna on a silicon lens, providing a broad frequency coverage (well above 1 THz). To measure the incident RF signal power we used the homodyne responsivity (see abstract "*Terahertz response of YBCO HEB homodyne detectors*") which is referenced to the input of the silicon lens where the bolometers were glued. Corrections were made for losses in the cryostat window and polarization losses between the signal and antenna. We made the measurements at different temperatures and different LO power levels which were measured using a quasi optical detector at room temperature. The 3 dB gain bandwidth was measured to be about 0.2 GHz. The bolometer bridges have nominal dimensions 1 μm x 2 μm x 50 nm and are fabricated on sapphire substrates using UV photolithography. Backward wave oscillators sources were used at 530 GHz and Gunn diodes at 100 GHz.