

MgB₂ THz HEB mixer with an 11GHz bandwidth

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Abstract—We have developed a hot-electron bolometer (HEB) mixer with a noise bandwidth (noise temperature rises by a factor of 2) of 11GHz. Mixers were tested with both a 0.69THz and a 1.63THz local oscillators (LO) where noise temperatures, T_r of 800-900K and 900-1000K were demonstrated at 5K operation. Mixers were working with a low noise performance up to 20K. Devices were fabricated from ultrathin magnesium diboride (MgB₂) superconducting films as thin as 5-7nm with a superconducting transition (in the device) at 30-32K. Films were deposited with a custom made Hybrid Physical Chemical Vapor Deposition (HPCVD) system, which will be discussed in a separate presentation at this conference. Comparison to state of the art NbN HEB mixers shows that with MgB₂ HEB mixers noise bandwidth increases by a factor of 2-3. We have managed to reproduce results in at least two separate batches at the moment. MgB₂ HEB mixers show to be very robust against ESD. Current mixers are fabricated in the quasioptical scheme, and we are working towards waveguide based device technology adaptation as well.