MgB_2 Hot Electron Bolometers for THz radio astronomy

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***Abstract*—We discuss Hot Electron Bolometer (HEB) THz mixers made of superconducting Magnesium Diboride (MgB_2) films. The films of 30 nm, 15 nm and 10 nm thick were deposited on sapphire substrates. The MgB_2 HEBs were patterned as a bridge at the feed point of a spiral antenna. The performance of the devices was investigated with respect to the gain bandwidth (GBW) and the noise temperature. The GBW was measured via mixing two signal sources (BWOs at 600 GHz). For the given films thicknesses, the GBW was measured to be 1.3 GHz, 2.3 GHz and 3.4 GHz, which is larger than for the NbN HEB mixers made of the same films thicknesses. Using the Y-factor technique a noise temperature of 800 K at 600 GHz local oscillator (LO) frequency was measured for mixers made of 10 nm MgB_2 film. Besides the films thickness, the gain and the noise bandwidths are functions of the films critical temperature, Tc. For 10nm films, with Tc=15K, a noise bandwidth on the order of 8GHz was measured. From these measurements and from the material parameters a GBW of 8 GHz (noise bandwidth >10GHz) is expected for 3-5 nm MgB_2 films.**