

The upGREAT THz heterodyne arrays for SOFIA: 1.9 THz and 4.7 THz first results

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Abstract— We present the status and results of the upGREAT heterodyne array receivers for astronomy, used with the SOFIA airborne observatory, a 2.5-m telescope flying on a NASA/DLR Boeing 747. The low frequency array (LFA) will cover ultimately the 1.9-2.5 THz band with 14 pixels, and the high frequency array (HFA) covers the 4.745 THz line of atomic oxygen [O I] with 7 pixels. The frontend operates superconducting Hot Electron Bolometers (HEB) waveguide mixers. The local oscillators are based on commercial synthesizer driven solid-state multiplier chains for the LFA and a QCL for the HFA. Both receivers are cooled using closed cycle pulse tube refrigerators, reaching temperatures below 4 K.

The upGREAT LFA receiver, with its 14 channels, was successfully commissioned in 2015 covering parts of the frequency range 1.83-2.07 THz and has flown since then dozens of science flights. The HFA receiver was successfully commissioned in November 2016, with the 7 pixels at 4.745 THz reaching 800-1000 K DSB uncorrected receiver noise temperature at 0.5 GHz IF with an IF noise bandwidth of ~3.5 GHz. The two upGREAT receivers were used separately until now and from May 2017, they will be used simultaneously. This new system is already offered to the scientific community from observing Cycle 5 (2017).