Optical test facility for SAFARI bolometers

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Abstract—We have developed an optical test facility for Transition Edge Sensor (TES) bolometers for the FIR. This activity is part of the program to develop TES-detectors for the SAFARI instrument, which is an imaging spectrometer on the SPICA satellite. For SAFARI, bolometers for three bands spanning from 30 to 210 µm are required to exhibit a noise performance limited by the celestial background that translates into a detector NEP requirement of $2 \times 10^{-19}$ W/√Hz. Because of this extreme sensitivity and the limited dynamic range of the TES detectors, optical access to calibration sources operating at room temperature is excluded. We therefore have developed a low temperature, pass-band limited calibration source. Our optical test facility is set up in a dilution refrigerator providing a detector-plate base temperature of 10 mK. FIR radiation is generated by means of a black-body source that can be temperature controlled between 3 K and 35 K. Radiation is coupled to the 5 x 5 detector array using feedhorns. The radiation bands are defined by metal mesh filters. The TES signal readout is performed using low noise SQUID current sensors. We present the mechanical and thermal design of the detector plate / black body assembly and we hope to present the optical measurements performed on low-power (fW level) TES bolometers.