TES technology for SPICA-SAFARI

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***Abstract*—To prepare the detector technology for the SAFARI imaging spectrometer on the Japanese Space Infra-Red Telescope for Cosmology and Astrophysics telescope (SPICA) and explore detector technologies for other future FIR space telescopes, several European research groups, supported in part by the European Space Agency, are collectively developing transition edge sensor (TES) and array technologies suitable for the short wavelength band (34-60 μm) and long wavelength band (110-210 μm) of SAFARI. To take maximum advantage of the cooled-aperture telescope (~5 K), the detector sensitivity (NEP) for SAFARI should be a few times 10^{-19} WHz$^{-1/2}$. The challenge of achieving this ultra-high detector sensitivity is further complicated by the requirements for moderate saturation powers (a few fW), fast response times (detector roll-off > 40 Hz for the short-wavelength band), and high optical efficiencies. Furthermore, the imaging array pixels should be packed such that they can simultaneously fulfill the instrument's requirements for optical sampling, low noise operation, and compatibility with a multiplexed readout.**

Enormous progress has already been made as a result of the joint effort made by the European groups. For example, the detector sensitivity is approaching the SAFARI requirements. In this paper we will give an overview of the achieved results with regard to the detector physics, TES single pixels, arrays, single- and multi-pixel feedhorns, optical performance modeling, and measurement techniques for both the short-wavelength and long-wavelength bands of SAFARI.

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