

V258a **A SPICA far-IR spectrometer SAFARI toward ESA M5 proposal**

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SAFARI (SpicA FAR-infrared Instrument) is a powerful spectrum mapping machine that covers 34–230 μm , where we can observe many important gas diagnostic lines of distant galaxies and reveal their evolutionary histories. A grating spectroscopy mode with $R \sim 300$ achieves a high sensitivity of $6 \sim 8 \times 10^{-20} [\text{Wm}^{-2}]$, which enables us to study not only exotic bright galaxies but also main-stream galaxies from $z \simeq 3$ to the present. By adding a Martin-Puplett Fourier spectrometer to its optical path, SAFARI achieves higher spectral resolutions of $R = 11000$ (34 μm) to $R = 1500$ (230 μm) with a comparable sensitivity of $1 \times 10^{-19} [\text{Wm}^{-2}]$ to its base spectroscopy mode. SAFARI has three sky pixels with one on-target and two reference sky pixels, and each of them can map $\sim 2' \times 2'$ area of the sky by using a beam-steering mirror with a fixed satellite attitude. With a combination of SPICA's low-temperature ($< 8\text{K}$) telescope, thus SAFARI is efficient to observe spatially extended sources (e.g., nearby galaxies). TES detector with ultra-low noise ($\text{NEP} < 2 \times 10^{-19} [\text{W}/\sqrt{\text{Hz}}]$) is the key technology item to achieve the ultra-high sensitivity of SAFARI. Detector arrays are being tested for the successful signal read-out of total ~ 3300 TES pixels.

We present the details of the instrument specifications to be proposed as the candidate ESA M5 mission.