The SAFARI Imaging Spectrometer for the SPICA space observatory

From planets to galaxies, revealing the origins of the universe.

Peter Roelfsema1,2, Martin Giard, Francisco Najarro, Keia Walthausker, Willem Jellema1, Brian Jackson3, Bruce Swinyard4, Marc Auyard5, Anna di Giorgio6, Javier Goicoechea7, Matt Griffith8, Frank Helmich9,10, Franz Kerschbaum9,10, Michael Meyer11, David Nayak11, Arbrecht Poglitch7, Luigi Spinoglio10, Bart Vandenbussche5,11, Albrecht Poglitch7, Brian Jackson3, Javier Goicoechea7, Matt Griffith8, Frank Helmich9,10, Franz Kerschbaum9,10, Michael Meyer11, David Nayak11, Arbrecht Poglitch7, Luigi Spinoglio10, Bart Vandenbussche5,11

1 SRON Netherlands Institute for Space Research, Groningen, The Netherlands; 2 Kapteyn Astronomical Institute, Groningen, The Netherlands; 3 IRSF, Toulouse, France; 4 CBIO-INTA, Madrid, Spain; 5 RAL, Didcot, United Kingdom; 6 University, Vienna, Vienna, Austria; 7 ETH, Zurich, Switzerland; 8 CSL, Canada; 9 SRON, to jointly design and implement the Spica Far infrared Instrument SAFARI, an imaging spectrometer designed to fully exploit this extremely low far infrared background environment provided by the SPICA observatory.

SAFARI’s large instantaneous field of view combined with the extremely sensitive Transition Edge Sensing detectors will allow astronomers to very efficiently map large areas of the sky in the far infrared – in a square degree survey of a 1000 hours many thousands of faint sources will be detected. A large fraction of these sources will be fully spectroscopically characterised by the instrument. Efficiently obtaining such a large number of complete spectra will be essential to address several fundamental questions in current astrophysics: how do galaxies form and evolve over cosmic time?, what is the true nature of our own Milky Way?, and why and where do planets like those in our own solar system come into being?

SAFARI science – the multi-colored universe

The key science drivers for SAFARI

How do stars and galaxies form and evolve over cosmic ages?

SAFARI will be used to observe thousands of obscured, far away galaxies and determine what processes govern their evolution

How does our solar system relate to other planetary systems and could life evolve elsewhere?

SAFARI will characterize oxygen, water, ice and rock in young planet forming systems and study their relation to the rocks and ice in our own Solar System

The SAFARI instrument

The SAFARI instrument is an imaging Fourier Transform Spectrometer. It operates simultaneously in three wavelength bands to cover the 34–310 µm range over the full sky view. Within one hour in a single field SAFARI will typically observe spectra for 5–7 individual sources, thus allowing large area surveys yielding data for many thousands of objects.

The SPICA satellite

The Japanese SPICA satellite, to be launched in 2026, will provide a 3 meter class 6K cold telescope. This will allow astronomers for the first time to also in the far infrared observe sources as weak as the faintest galaxies are one ten billionth the brightness of what the human eye can see.