Invited Talk

SAFARI new and improved - extending the capabilities of SPICA's Imaging Spectrometer

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The Japanese SPace Infrared telescope for Cosmology and Astrophysics, SPICA, will provide astronomers with a new window on the universe in the next decade. With a large -3 meter class- cold -6K- telescope, the mission will provide a unique environment optimally suited for instruments that are limited only by the cosmic background itself. SAFARI, the SpicA FAR infrared Instrument SAFARI, is a Fourier Transform imaging spectrometer designed to fully exploit this extremely low far infrared background environment provided by the SPICA observatory.

The SAFARI consortium, comprised of European and Canadian institutes, has established a reference design for the instrument based on a Mach-Zehnder interferometer stage with outputs directed to three extremely sensitive Transition Edge Sensor arrays covering the 35 to 210 µm domain. Thus the baseline instrument provides R~1000 spectral imaging capabilities instantaneously over a 2' by 2' field of view. A number of modifications to the instrument to extend its capabilities are under investigation. With the reference design SAFARI's sensitivity for many objects is limited not by the detector NEP but by the level of broad band background radiation – the zodiacal light for the shorter wavelengths and baffle structures for the longer wavelengths. Options to reduce this background are dedicated masks or dispersive elements which can be inserted in the optics as required. The resulting increase in sensitivity will directly impact one of the prime science goals of SPICA and SAFARI, the evolution of galaxies over cosmic times. With the expected factor of a several better sensitivity as compared to the reference design astronomers will be able to study thousands of galaxies out to redshift 3 and even many hundreds out to redshifts of 5 or 6. Secondly, in the context of the modified approach towards the SPICA mission, changes to the instrument to also accommodate longer wavelength operation -up to 400 µm- is being investigated. Finally elements to increase the wavelength resolution, at least for the shorter wavelength bands, are investigated as this would significantly enhance SAFARI's capabilities to study starformation in our own galaxy.