



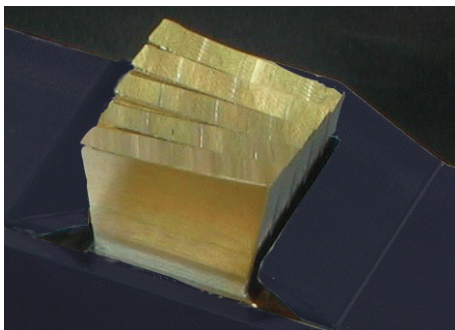
FIFI LS

A Far-Infrared Field-Imaging Line Spectrometer for SOFIA



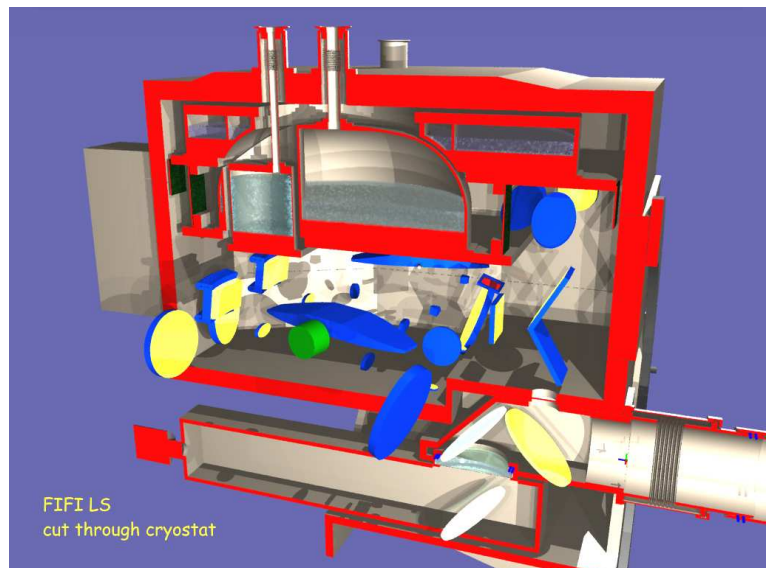
We are building FIFI LS, the Field-Imaging Far-Infrared Line Spectrometer, which will utilize the unprecedented high angular resolution and sensitivity of the joint NASA/DLR airborne observatory SOFIA. FIFI LS will be able to efficiently map spectral lines in two FIR bands simultaneously (Red 42-110 μm , Blue 110-220 μm) with its integral field concept. The scientific aim of FIFI LS is the interstellar medium of galaxies and galactic HII regions to investigate star formation, active galactic nuclei, and baryonic dark matter.

SOFIA is a Boeing 747SP equipped with a 2.5m telescope operated by NASA & DLR to carry out infrared observations in an altitude up to 14km. Several institutes in the US and two in Germany are building instruments for SOFIA. FIFI LS is one of them, getting ready for the first science flights of SOFIA end of 2005.



On the left, you see one of the two image slicers, that enable FIFI LS to do spectroscopy of its 5x5 pixel field of view at once. The image slicer rearranges the field of view onto the 25x1 pixel pseudo-slit of the grating spectrometer. The grating disperses the light of each of the 25 spatial pixels onto 16 spectral pixels. Thus, the detector of each channel consists of 25x16 Ge:Ga detector pixels (cf. Ge:Ga Detector development).

The vacuum vessel of FIFI LS has a volume of about 1m³. As shown on the right, it uses three cryogen vessels (LN₂, LHe, superfluid He) for cooling the optics and detectors. The entrance optics features a K-mirror for image de-rotation, at LN₂ temperature. The gratings with their drives and position sensors (green) are mounted on the LHe working surface. The two detectors block require temperatures about 2K provided by the superfluid He. Below the cryostat, there is an additional visible light camera for guiding.



References:

Realizing Integral Field Spectroscopy in the Far-Infrared, Looney et al. (2003), ApJ 597, 628
FIFI LS: the far-infrared integral field spectrometer for SOFIA, Raab et al. (2004), Proc. of SPIE

<i>FIFI LS Basic Data</i>	Detector	Pixels	Pixel size	Field of view	Velocity resolution	Line sensitivity	
Blue 42-110 μm	Ge:Ga	25x16	6"	30'x30'	50-150 km/s	50 μm : $5.5 \cdot 10^{-17} \text{ W/m}^2$	100 μm : $3.5 \cdot 10^{-17} \text{ W/m}^2$
Red 110-210 μm	stressed Ge:Ga	25x16	12"	60'x60'	100-250km/s	150 μm : $2.2 \cdot 10^{-17} \text{ W/m}^2$	200 μm : $1.4 \cdot 10^{-17} \text{ W/m}^2$

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