

FAR INFRARED SURVEYOR (FIS)

The Far Infrared Surveyor (FIS) instrument will carry out an All Sky Survey and deep scans in pointed mode in 4 far infrared bands from 50-180 μm and is also equipped with a Fourier Transform Spectrometer

Basic FIS Capabilities:

The FIS is designed primarily to perform the All-Sky Survey in 4 photometric bands at wavelengths between 50 and 180 μm (two broad bands and two narrow bands). The instruments are operated such that data acquisition is continuous as the telescope scans the sky, resulting in sets of strip data of sky brightness. This operation can also be used for pointed observations in a slow-scan mode for deeper observations. The FIS is also equipped with a Fourier Transform Spectrometer (FTS) that enables imaging spectroscopy over the full FIS wavelength range with the two wide-band arrays (WIDE-S and WIDE-L) and a resolution of $\sim 0.36 \text{ cm}^{-1}$ ($R = 450 - 170$) or 2.4 cm^{-1} ($R = 75 - 30$). FTS observations are performed in staring pointing mode.

FIS Photometric Mode

FIS Band	N60	WIDE-S	WIDE-L	N160
Wavelength [μm]	50 - 75	50 - 110	110 - 180	140 - 180
Central Wavelength [μm]	65	80	140	160
Array format	20 x 2	20 x 3	15 x 3	15 x 2
Pixel size [arcsec^2]	27 x 27	27 x 27	44 x 44	44 x 44

FIS Detectors

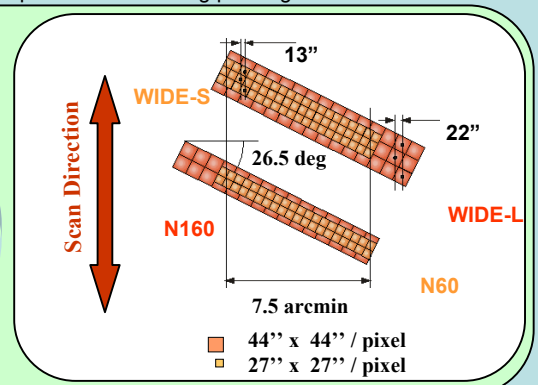
WIDE-S: 3x20

N60: 2x20

N160: 2x15

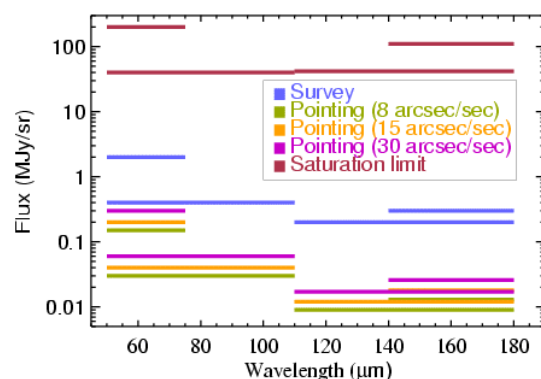
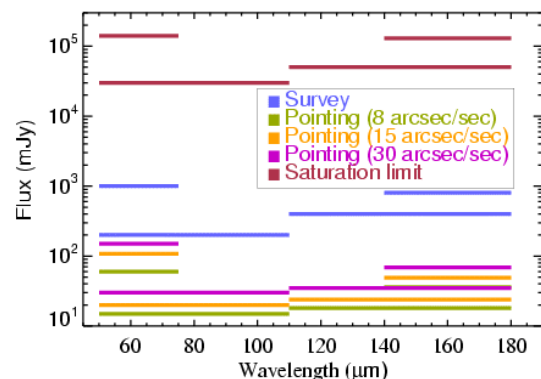
WIDE-L: 3x15

Overlap each other



44'' x 44'' / pixel
27'' x 27'' / pixel

FIS Imaging: 5σ detection and saturation limits for a point (left) and an extended (right) source (reset interval = 1.0).



FIS Astronomical Observation Templates (AOT):

Three AOTs are available for the FIS pointed observations.

• **FIS01:** Photometry of point sources and/or mapping of small areas of sky of up to around $\sim 25 \times 10 \text{ arcmin}^2$. All four bands are available. Scan pattern: two round-trip scans with a cross-scan shift. Scan speed is either 8 or 15 arcsec/sec. Two parameters can be specified: the readout mode (Nominal/CDS) and reset interval (0.5, 1.0 or 2.0) if the Nominal mode is selected. The scan sequence of AOT FIS01 is shown in the figure below.

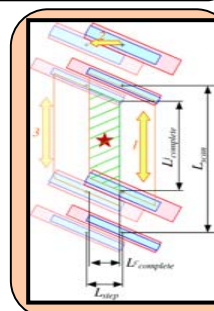
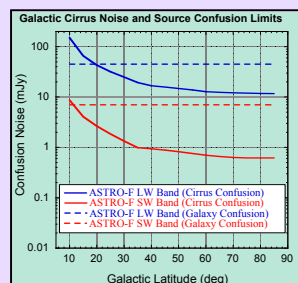
• **FIS02:** Mapping of large areas ($\sim 1 \text{ deg} \times 8 \text{ arcmin}$). All four bands are available. Scan pattern: one round-trip scan with fixed speed of either 15 or 30 arcsec/sec. No cross-scan shift is operated during a pointed observation to maximize the scan length. Sampling mode and reset interval as in FIS01.

• **FIS03:** Imaging spectroscopy with the FTS. In FULL or SED mode. Pointing mode: staring. For accurate spatial-spectroscopic information, the AOT must be repeated with a slightly shifted target position. Observations of a wider area require the repetition of the AOT on different orbits. **The FTS mode is subject to several constraints, as specified in the Observers Manual and in the Call For Proposal Policies and Procedure document.**

Sky Confusion Estimates: Very likely, FIS observations will be affected by galactic cirrus noise and background source confusion. Users are encouraged to take confusion into account when planning observations, it may save significant amount of observing time. The sky confusion noise due to galactic diffuse emission (cirrus) is a function of Galactic Latitude as shown in the figure.

Sky confusion tool:

<http://www.ir.isas.jaxa.jp/ASTRO-F/Observation/Confusion/>



Instrument Performance tool:

<http://astro-f.esac.esa.int/tools/IPT.shtml>