FIFI-LS: Field Imaging Far-Infrared Line Spectrometer

Facility Class, Integral Field, Far-Infrared Spectrometer

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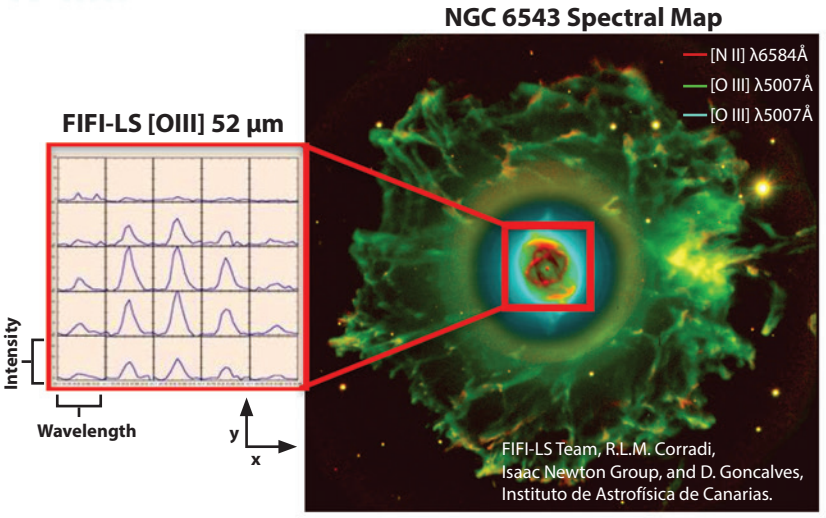
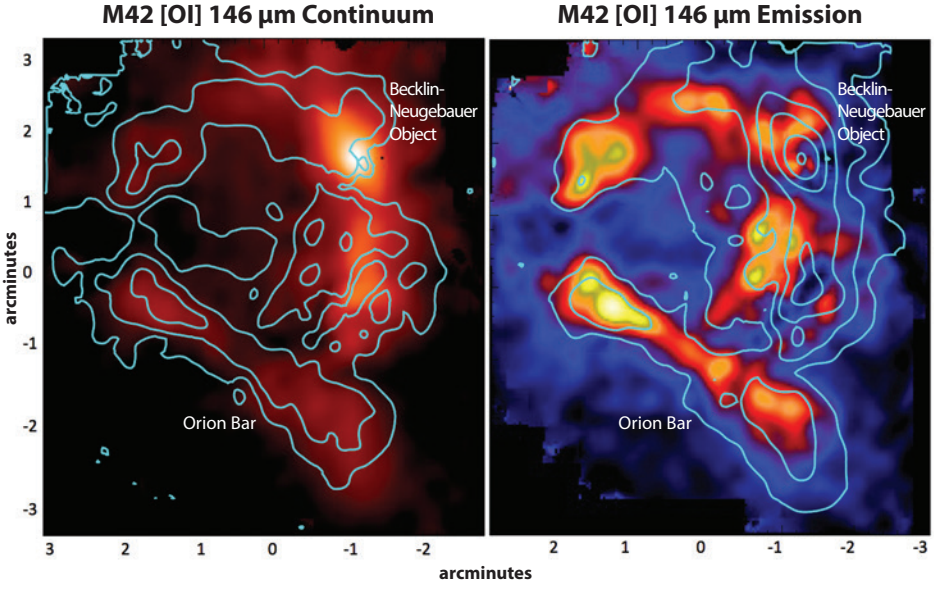
Cat's Eye Nebula: [OIII] 52 µm

The FIFI-LS [O III] 52 µm spectral map of the Planetary Nebula NGC 6543 (the Cat's Eye Nebula) traces the location of the ionized gas. Shifts in the central wavelength correspond to velocity gradients that are present across the nebula. Each pixel in the 5x5 map corresponds to about 6000 AU at the ~1 kpc distance of NGC 6543. The FIFI-LS field of view is shown superimposed on an image obtained with the Nordic Optical Telescope. *(FIFI-LS Team)*



Orion Nebula: [OI] 146 µm

The Orion Nebula was mapped by FIFI-LS at 146 µm to study the physical conditions of its atomic and molecular gas. The far infrared continuum (logarithmic scale) is shown peaking at the Becklin-Neugebauer object, but also clearly shows the Orion Bar and a similar structure to the north-east *(left)*. Additionally, the [OI] line emission tracing the photon-dominated regions around the Trapezium stars where the star's UV radiation irradiates the surrounding molecular cloud *(right)*. *(FIFI-LS Team)*



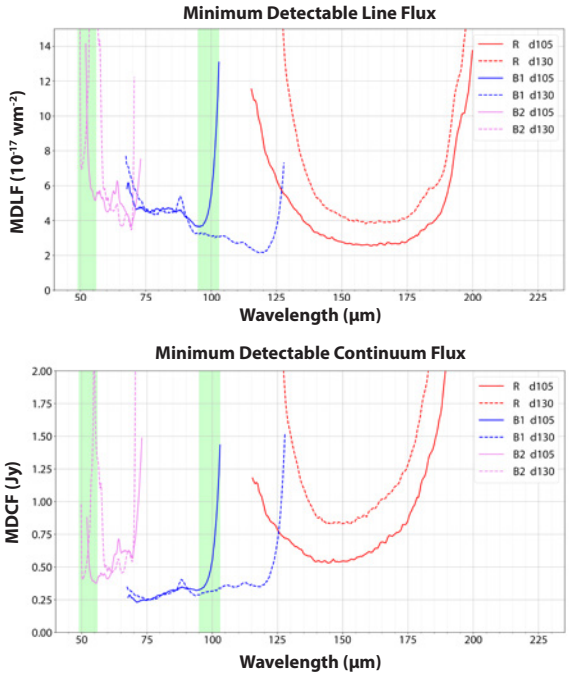
Specifications

FIFI-LS is an integral field, far-infrared spectrometer consisting of two independent grating spectrometers. Each spectrometer has a detector consisting of 400 pixels of Gallium-doped Germanium photoconductors. The projection onto the sky of the 5x5-pixel FOVs of the blue channel and the red channel is nearly concentric (10" offset), but the angular coverage differs. The spectral resolution channels vary between 500 and 2000, depending on the observed wavelength, with higher values reached towards the long wavelength ends of each spectrom-

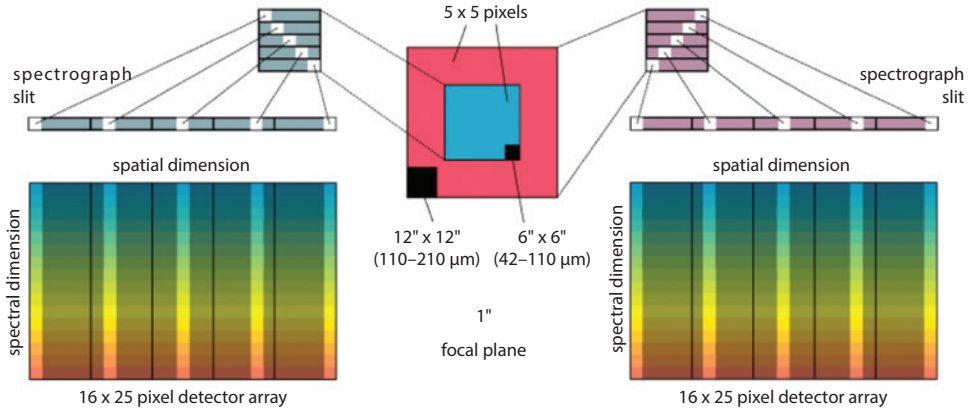
Channel Parameters

Channel	Field of View	Pixel Size	λ Range
Blue	30" x 30"	6" x 6"	51–120 µm
Red	1' x 1'	12" x 12"	115–200 µm

Predicted Sensitivity for SNR = 4 in 900 s

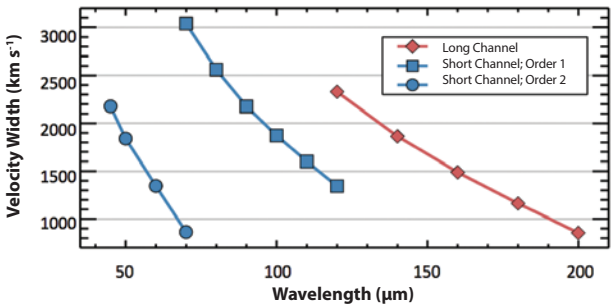


Data Cube



Left: The integral field unit for each channel consists of 15 specialized mirrors to slice the two dimensional 5x5 pixel FOV into five slices that are each five pixels long, which are then reorganized along a one dimensional line (25x1 pixel), forming the spectrometer entrance slit. The diffraction grating disperses the incoming light, which reaches the 16x25 pixel detector array. The result is a "data cube" with 5x5 spatial pixels and 16 pixels in the spectral dimension.

Instantaneous Spectral Coverage



Spectral Resolution