

Title: Development status of Herschel-Heterodyne Instrument for the Far-Infrared (HIFI)

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Abstract:

The Heterodyne Instrument for the Far-Infrared is a single-pixel, high-resolution (>300.000), spectrometer for ESA's Herschel Space Observatory.

The instrument is designed to provide a wide and continuous frequency coverage with velocity resolved resolution and high sensitivity. This will allow detailed investigations of a wide variety of astronomical sources, ranging from solar system objects, star formation regions to nuclei of galaxies. The frequency bands cover many emission and absorption lines of molecules, like water, and atomic and ionic lines, like CII and NII.

The instrument comprises 5 frequency bands covering 480-150 GHz with SIS mixers and a sixth dual band for the 1410-1910 GHz range with Hot Electron Bolometer Mixers. The LO subsystem consists of a Ka-band synthesiser followed by 14 chains of frequency multipliers, 2 for each frequency band. Each frequency band has two mixers operating on orthogonal polarisations. All mixers are designed to have noise performance close to the quantum noise limit. One frequency band is operated at a time. Modular design of the Focal Plane Unit, with a common optical path for all the mixer bands, and of the Local Oscillator Unit with a common LO Source Unit for all the LO chains, make the instrument very compact.

A pair of Auto-Correlators and a pair of Acousto-optic spectrometers process the two IF signals from the dual-polarisation front-end and provide instantaneous frequency coverage of 4 GHz with a set of resolutions (140 KHz to 1 MHz) better than < 0.1 Km/s.

We will present instrument design, qualification status and an update of expected performances based upon instrument level tests of the Development Model together with a summary of the specific HIFI science goals.