

# **The HIFI Focal Plane Unit**

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The Heterodyne Instrument for the Far-Infrared (HIFI) is a high-resolution, single-pixel heterodyne spectrometer being built for ESA's Herschel Space Observatory. Mounted on the 10 K optical bench of the Herschel cryostat, the HIFI Focal Plane Unit will provide the optical, mechanical, electrical, and thermal infrastructure for 14 SIS and HEB mixers offering dual-polarization coverage in 7 frequency channels: 5 SIS channels covering 480-1250 GHz and 2 HEB channels covering 1410-1910 GHz.

The main structure (or Common Optics Assembly) of the FPU includes focal plane relay and channel splitting optics, a focal plane chopper, an internal calibration source, and cold local oscillator beam relay optics. The common optics assembly interfaces with a diplexer box, in which the each of the seven astronomical signal beams is combined with its corresponding local oscillator beam, and then split into two linearly polarized beams that are injected into the mixers. Each of the mixers is mounted in a mixer sub-assembly that includes beam-shaping optics, a mechanical structure that isolates the mixer (at 2 K) from the FPU structure (at 10 K), filtering on the mixer bias lines, and a low-noise 4-8 GHz amplifier chain. A second, 14-channel IF amplifier box is used to further boost the IF output signals before they are coupled out of the cryostat to the IF spectrometers, which are located in the Herschel Service Module.

This presentation provides an overview of the opto-mechanical design of the HIFI Focal Plane Unit, and of the SIS and HEB mixers at the core of the focal plane. The current status of the fabrication and testing of development model hardware is also presented.