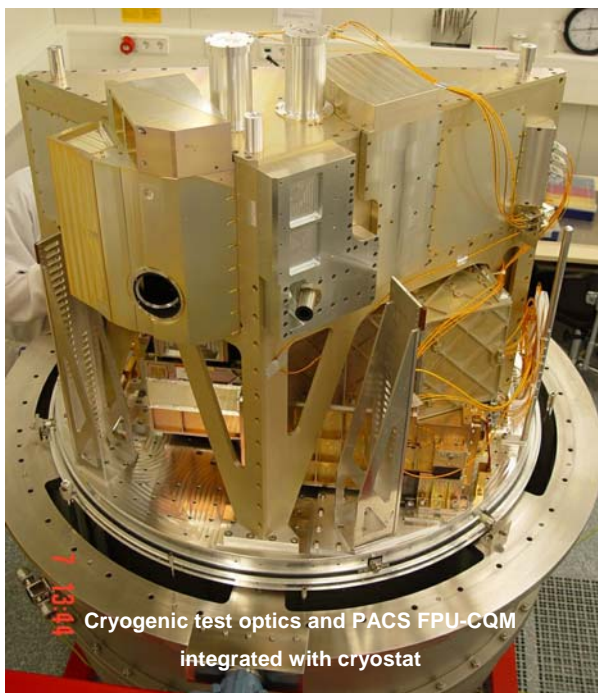
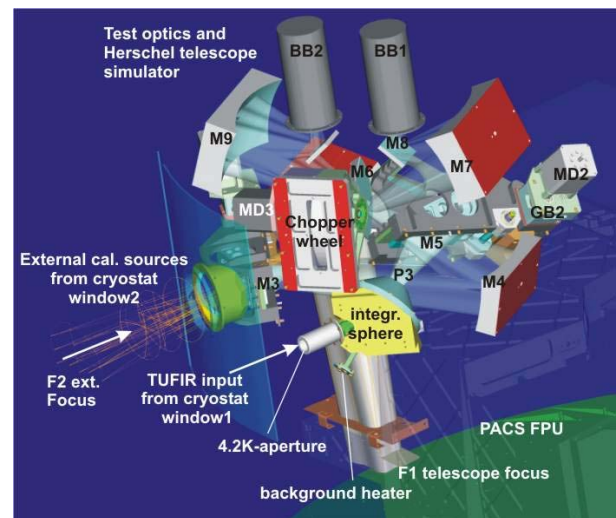


A **cryogenic test facility** for on-ground calibration and characterization will be used for the qualification model (CQM), flight model (PFM) and flight spare model (FS) of the Herschel PACS instrument. The test set-up comprises a test cryostat providing the satellite temperature levels 1.75 Kelvin for operation of all PACS detectors and 3 to 5 K for instrument focal plane structure cooling, as well as a cryogenic test optics with a Herschel telescope simulator operated at about 5 K. The test optics is designed to provide a realistic IR background (expected Herschel telescope temperatures 70-90K). The set-up is mounted on the same optical bench of the test cryostat that carries the PACS focal plane unit. The instrument characterization program includes alignment checks, optimization of detector operating parameters, spectral response function measurement, spectral and spatial instrumental profiles, detector flat fielding, wavelength calibration and point source simulation.

Two cryogenic blackbody sources were developed for absolute flux calibration. Several IR sources can be selected via different optical paths using cryogenic mechanisms, based on newly developed miniature cryo-torquer motors in combination with gear-boxes, which actuate flip-mirror mechanisms and a chopper wheel. A satellite representative cryogenic and ambient test harness (1600 wires!) is included to approximate on-board signal paths and EMC conditions during the instrument performance tests. Design and hardware status of the test facility are shown on the right and below.



The cryogenic test facility consists of

- Optics comprising 10 gold coated spherical and flat aluminum mirrors
- Herschel telescope simulator producing a focus outside the cryostat window, accessible for external sources
- Optics internal alignment accuracy is 1 arcmin
- Two cryogenic blackbody sources for absolute flux calibration (10 – 80K, 1 mK stability)
- Two flip mirror mechanisms driven by newly developed cryogenic torquer motors
- One chopper wheel to switch between the BBs
- Integrating sphere to feed in calibration sources operated outside the cryostat, e.g., FIR lasers
- External X-Y stage with a point source mask
- Water vapor absorption cell

Reference:

Jakob G., Geis N., Katterloher R., Thiel M., SPIE Vol 5487, 2004

G. Jakob, N. Geis, R. Katterloher, M. Thiel