

The band 3 and 4 Flight Model mixer units for HIFI

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The Heterodyne Instrument for the Far-Infrared (HIFI) will cover the 0.48-1.9 THz frequency range. This frequency range is divided into 7 bands. SRON is developing the band 3 and 4 SIS waveguide mixer units. Band 3 and 4 cover the 800-960 GHz and 960-1120 GHz frequency range, respectively. Each of these bands contains two mixers for dual polarization measurements. Delivery of the Flight model mixer units is due spring 2005.

The mixers have a corrugated horn antenna and operate with a 4-8 GHz IF bandwidth. Nb/AlOx/Nb SIS tunnel junctions with NbTiN/Al wiring layers are used as mixing element. Besides the heterodyne functionality, the units also incorporate a superconducting magnet, an internal ESD/EMC protection circuit, a 4-8 GHz bias T, and a de-flux heater.

The mechanical and optical design is to a large extent driven by the specific environmental requirements for a space mission, the mass and thermal budget, and the electrical and optical interfaces with the rest of the instrument.

In the paper we discuss the design and performance of the Flight Model mixer units. The current best laboratory receiver noise temperatures are 250-280 K DSB across the band 3 frequency range and 400-600 K across the band 4 frequency range. The performance within HIFI is expected to be significantly lower, because of the absence of warm optics. Results of the characterization of the Flight Model mixer units will be presented. Furthermore we will show some of the specific design solutions necessary for building reliable space instrumentation and the problems encountered in implementing these. .