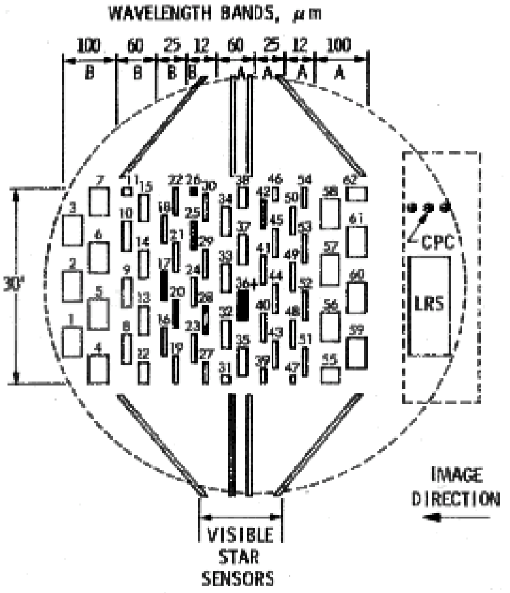
IRAS Satellite & Mission Strategy

IRAS was a spacecraft with a telescope mounted in a liquid helium cooled cryostat. The telescope was a f/9.6 Ritchey-Chretien design with a 5.5 m focal length and a 0.57 m aperture. The mirrors were made of beryllium and cooled to approximately 4 K.

The focal plane assembly contained the survey detectors, visible star sensors for position reconstruction, a Low Resolution Spectrometer (LRS) and a Chopped Photometric Channel (CPC). The focal plane assembly was located at the Cassegrain focus of the telescope and was cooled to about 3 K.

IRAS Focal Plane



The survey array consisted of 62 rectangular infrared detectors arranged in staggered rows such that any real point source crossing the focal plane as the satellite scanned would be seen by at least two detectors in each wavelength band. Most of the detectors in each band had standard size apertures (see table below), with one or two being half-sized.

The LRS was a slitless spectrometer sensitive from 7.5 to 23 μm with a resolving power of about 20. For questions or further information on the Dutch LRS instrument, see http://www.sron.rug.nl/irasserver/irasserverman.html or http://www.iras.ucalgary.ca/database.html

The CPC operated during some pointed observations. It mapped sources simultaneously at 50 and 100 μm, and used a cold internal chopper for flux reference. However, the focal plane temperature was lower than expected, which resulted in CPC detector anomalies that rendered CPC data very difficult to use.

Instrument Summary

In the table below, the center wavelengths are in μm. For the survey array, the FOV is determined by the rather large detector mask size and is roughly the native "resolution" of the data in that band. The resolution of the IRAS image data is not governed by the resolution of the telescope, which was diffraction limited longwards of 12 μm, but by the size of the detectors.

Survey Array					
Center Wavelength	# working detectors	FOV (arcmin)	Bandpass (μm)	Detector Material	Average 10-sigma Sensitivity (Jy)

12	16	.75 x 4.5	8.5 - 15	Si:As	0.7
25	13	.75 x 4.6	19 - 30	Si:Sb	0.65
60	15	1.5 x 4.7	40 - 80	Ge:Ga	0.85
100	13	3.0 x 5.0	83 - 120	Ge:Ga	3.0

CPC					
Center Wavelength	**# working detectors**	**FOV (arcmin)**	**Bandpass (μm)**	**Detector Material**	**Average 10-sigma Sensitivity (Jy)**
50	1	1.2	41 - 63	Ge:Ga	7.0
100	1	1.2	84 - 114	Ge:Ga	7.0

LRS			
Slit width (arcmin)	**Wavelength Range (μm)**	**Detector Material**	**Resolving Power**
5.0	8 - 13	Si:Ga	14-35
7.5	11 - 23	Si:As	14-35

Survey Strategy

IRAS was launched in January of 1983 into a sun-synchronous near-polar (99 degree) orbit, which precessed by about a degree each day. The celestial sphere was divided into "lunes" bounded by ecliptic meridians 30 degrees apart. The survey covered the sky by "painting" each lune in overlapping strips as the satellite scanned through the lune during each orbit. Most (96%) of the sky was covered by at least two hours-confirming scans (HCONs) and 2/3 of the sky was covered by a third (which used a slightly different observing strategy). Some sources, near the ecliptic poles, had more than three hours-confirmed coverages.

One HCON was separated from the next by up to several months. Thus the data combined into a single image from the survey may have been taken over a period of many months, and are subject to variations in the actual observed foreground due to the changing geometry with which the zodiacal light was observed and to variations in detector response.

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