The wavelength and flux calibrations of the Near-Infrared Spectrometer (NIRS) onboard the Infrared Telescope in Space (IRTS)

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We describe the calibration process for the Near-Infrared Spectrometer (NIRS; Noda et al. 1996), which is one of the four focal plane instruments of the Infrared Telescope in Space (IRTS; Matsumoto & Murakami 1996), onboard the Space Flyer Unit (SFU). The SFU was launched in March 1995 with the Japanese rocket HII. The IRTS was operated for about one month and surveyed about 7 % of the whole sky. The NIRS is the spectro-photometer covering the wavelength range from 1.4 to 4.0 μm with 24 channels. The spectral resolution is about 0.13 μm for the diffuse source and 0.10 μm for the stars. The NIRS uses an InSb detector. The response of the detector was stable during the mission. The main scientific aim was to measure the diffuse emission from the cosmic background (Matsumoto et al. 1997), as well as the 3.3 μm UIR bands around HII regions (Tanaka et al. 1996). In addition, more than 10,000 point sources, were detected (Freund et al. 1997), mainly the Galactic stars.

The SFU was retrieved by NASA's space Shuttle Endeavor in January 1996, and we have worked on the post-flight calibration of the NIRS. More accurate analysis of the post-flight measurements using optics model indicated that the actual central wavelengths of most channels are systematically shifted to shorter wavelengths than those obtained from the pre-flight experiments. The shift is approximately 0.03 μm at maximum (the shortest channel). The wavelength shift is not found for the channels beyond 3.67 μm.

We derived the conversion factors for the flux calibration of all detector channels using four stellar templates developed by Cohen et al. (1999). The reliability of these conversion factors is approximately 5 %. We compared narrow band magnitudes of the NIRS in the 2.2 μm channel with the K-band magnitudes in the Two-Micron Sky Survey (Neugebauer & Leighton 1969). The correlation is good and the linear term has slope 0.98. The NIRS is based on the same Kurucz model for Vega (Cohen et al. 1992; to define narrow band "zero magnitudes") that underpins several space-borne, airborne, and ground-based sensors. thus, our calibration is valid for systematic scientific studies.

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