

Near Infrared Spectrometer on boarded the spacecraft HAYABUSA, Initial Observation Results.

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NIRS is a near infrared spectrometer on-boarded the spacecraft HAYABUSA (MUSES-C), which aims to return samples from a near-earth asteroid, (25143) Itokawa (1998 SF36). HAYABUSA was successfully launched by Japanese M-V-5 rocket on May 19, 2003. After the earth swing-by in Jun 2004, the spacecraft will arrive at the asteroid in summer 2005. During the rendezvous phase with the asteroid, we will observe the asteroid surface using NIRS and obtain reflectance spectra of the surface materials across the wavelength range of 850nm to 2100nm. Based on ground-based observations, (25143) Itokawa appears to be an S(IV) type asteroid. NIRS can detect absorption bands due to olivine and pyroxene and investigate the mineralogical composition of the surface materials. Combining with the data from asteroid multiband imaging camera (AMICA) and X-ray spectrometer (XRS), we can reveal a relationship between asteroids and meteorites.

NIRS-S has a 64-channel InGaAs photodiode array as a detector and a grism (grating - prism) system. Spectral resolution is 23.6nm/channel. The second order light is separated from the first order image by a cross disperser attached to the grism. The field of view is 0.1 x 0.1 degrees. Aperture size of collecting area affected by front hood is 27.2mm of the diameter.

After the successfully launch, initial operation of NIRS had been held at May 12 and 16. During initial operation we have checked and confirmed NIRS's function and property. Obtained on-board lamp and LED data agreed with that obtained before the launch. Responsivity and relationship between the channel and observed wavelength had not changed before/after the launch. At May 23 and June 5, we checked and measured co-alignment between the line of sight of NIRS and -Z axis of spacecraft coordination by observing alpha Scorpius. We confirmed that the co-alignment has not changed before/after the launch. From June to December, the spacecraft used ion thruster engines for almost time to put the spacecraft into the earth swing-by orbit. During this period we only obtained lamp and LED data for about once per month to monitor the variation of the responsivity and relationship of the channel and wavelength, except for the chance to observe Mars on November 11 and 18. In this observation, we succeeded at obtaining the reflectance spectrum of the surface material of Mars and detecting the atmospheric CO₂ absorption band. On January 6, 2004, we performed simultaneous observations with NIRS and AMICA, and checked and measured co-alignment between the line of sights of NIRS and AMICA. We are planning to observe the Moon and the Earth at the earth swing-by in June of this year. This is only a chance of the area source observation. Until the arrival at the asteroid, we will perform point source (bright star and planet) observations several times, and monitor the lamp and LED data about once per month.