Pointing control of extreme ultraviolet spectroscope onboard the SPRINT-A satellite

Fuminori Tsuchiya[1]; Atsushi Yamazaki[2]; Kazuo Yoshioka[3]; Go Murakami[4]; Tomoki Kimura[5]; Takeshi Sakanoi[6]; Yasumasa Kasaba[7]; Masato Kagitani[8]; Kazunori Uemizu[9]; Ichiro Yoshikawa[10]; Yoshikawa Ichiro Exceed mission team[11]

[1] Planet. Plasma Atmos. Res. Cent., Tohoku Univ.; [2] ISAS/JAXA; [3] JAXA/ISAS; [4] ISAS/JAXA; [5] JAXA/ISAS; [6] Grad. School of Science, Tohoku Univ.; [7] Tohoku Univ.; [8] PPARC, Tohoku Univ; [9] ISAS/JAXA; [10] EPS, Univ. of Tokyo; [11] -

http://pparc.gp.tohoku.ac.jp/

SPRINT-A is an earth-orbiting EUV spectroscopic mission being developed by ISAS/JAXA and will be launch on August 2013. Primary science targets are plasma dynamics in Jupiter's inner magnetosphere and atmospheric escape from Venus and Mars. Pointing control of extreme ultraviolet spectroscope (EXCEED) onboard the satellite is one of key issues of this mission. Scientific requirement for spatial resolution is 10-arcsec to derive radial structure of Io plasma torus (IPT) and detect plasma emissions from ionosphere, exosphere and tail separately (for Venus and Mars). However, change of alignment between the satellite bus and the telescope could be caused by the changing thermal inputs from the Sun and Earth to the satellite. The pointing displacement due to the misalignment is larger than 10-arcsec. In this mission, a target guide camera is used to compensate the displacement. The camera is designed to capture a part of a target planet disk whose light is reflected from the front side of the slit. Mission data processor (MDP) acquires the image every 3 seconds, calculates the centroid position of the disk on the image, and sends it to the attitude control system. The attitude control system keeps the centroid on an uplinked position with accuracy less than 10 arc-second. To test the algorithm, a small pinhole image was taken by the guide camera with the flight-model optics. The designed algorithm has been confirmed to work well and the stability of the centroid position was confirmed to be less than 0.3 arc-second. The centroid position derived onboard the satellite will be downlinked to the ground. The guide camera image will also be downlinked in 2 min/image in normal operation (15 sec/ image at a maximum). These data could be used to confirm the stability of the pointing control and further correct position of EUV photons before the integration. After the launch, MDP and the guide camera will turn on soon and take actual images of Jupiter and Venus to optimize parameters for image processing and centroid calculation. In the presentation, the designed algorithm and result of initial operation of the camera will be shown.