Development of the extreme ultraviolet detector for the EXCEED mission

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The extreme ultraviolet (EUV) telescope EXCEED (Extreme Ultraviolet Spectroscope for Exospheric Dynamics) onboard the Japan's small satellite SPRINT-A will be launched in August 2013. The EXCEED instrument will observe tenuous gases and plasmas around the planets in the solar system (e.g., Mercury, Venus, Mars, Jupiter, and Saturn). One of the primary observation targets is Jupiter, whose magnetospheric plasma dynamics is dominated by planetary rotation. In the EUV range, a number of emission lines originate from plasmas distributed in Jupiter's inner magnetosphere. The EXCEED instrument is designed to have a wavelength range of 55-145 nm with a spectral resolution of 0.4-1.0 nm. The spectrograph slits have a field of view of 400 x 140 arc-seconds (maximum), and the attitude fluctuations are stabilized within 5 arc-seconds. The optics of the instrument consists of a primary mirror with a diameter of 20cm, a laminar type grating, and an EUV detector using microchannel plates (MCPs). The surfaces of the primary mirror and the grating are coated with CVD-SiC.

The detector employs 5 MCPs in the V- and Z-stacks configuration, and its surface coincides with the grating's focal plane. A resistive anode encoder (RAE) is used for position analysis. This type of overall assembly is commonly used for EUV observations. As the photocathode, CsI is evaporated on the surface of the first MCP. The MCPs with CsI photocathode have much higher quantum efficiencies in the EUV spectral range, compared with bare MCPs. However, the detector must be kept under vacuum during the ground-based operations because CsI is deliquescent material. The window of the vacuum chamber will be opened after the launch thanks to an actuator.

We have measured the resolution and efficiency of the EUV detector, and evaluated the degradation of the CsI photocathode. In this presentation, we report the design and optical performance of the EUV detector for the EXCEED mission.