Newly developed ultraviolet detector for future space missions

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The extreme ultraviolet (EUV) telescopes and spectrometers have been used as powerful tools in a variety of space applications, especially in planetary science. For example, an EUV telescope onboard Japan’s lunar orbiter KAGUYA first took a global meridian image of the Earth’s plasmasphere. In addition, the EUV spectrometer EXCEED (Extreme Ultraviolet Spectroscope for Exospheric Dynamics) onboard the Japan's small satellite Hisaki was launched in 2013 and it has observed tenuous gases and plasmas around the planets in the solar system (e.g., Mercury, Venus, Mars, Jupiter, and Saturn). These EUV instruments adopted microchannel plate (MCP) detection systems with resistive anode encoders (RAEs). An RAE is one of the position sensitive anodes suitable for space-based applications because of its low power, mass, and volume coupled with very high reliability. However, this detection system with RAE has limitations of resolution (up to 512 x 512 pixels) and incident count rate (up to ~10^4 count/sec). Concerning the future space and planetary missions, a new detector with different position sensitive system is required in order to a higher resolution and dynamic range of incident photons. One of the solutions of this issue is using a CMOS imaging sensor. The CMOS imaging sensor with high resolution and high radiation tolerance has been widely used. Here we developed a new CMOS-coupled MCP detector for future UV space and planetary missions. It consists of MCPs followed by a phosphor screen, fiber optic plate, and a windowless CMOS. We manufactured a test model of this detector and performed vibration, thermal, and performance tests. In this paper, we report the concept of this detector and initial results of our tests.

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