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## Measurement of the GEM gain uniformity for the PRAXyS mission

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We have developed a gas electron multiplier (GEM) for the NASA small satellite mission, PRAXyS (Polarization from Relativistic Astrophysical X-ray Sources), which carries a photoelectron tracking type gas X-ray polarimeter using a time projection chamber technique. The GEM foil has a hole diameter of 70  $\mu\text{m}$ , hole pitch of 140  $\mu\text{m}$ , and insulator thickness of 100  $\mu\text{m}$ . We adopted a liquid crystal polymer sheet as the GEM insulator.

To achieve good energy resolution and high sensitivity for X-ray polarimetry, we should select GEM foils that have a uniform gain across the whole effective area. We scanned the whole active area, 30x78 mm<sup>2</sup>, of the semi-flight GEM in 1-atm Ar/CO<sub>2</sub> (70%/30%) mixture gas and obtained two-dimensional maps of gain and energy resolution. The scan was performed at 2 mm intervals by perpendicularly irradiating the GEM plane with collimated 6.4 keV X-rays from an X-ray generator. In addition, we measured insulator thicknesses across the whole GEM active area.

The measured maps show a negative correlation between the GEM gains and insulator thickness. The correlation is thought to be due to the electric field strength variation in GEM holes. The strong electric field produced by a thin insulator is expected to make a high gain. Therefore, it is necessary to select the GEM that has a uniform insulator thickness. Currently, we are trying to establish a method to increase the production yield of the GEM with a uniform gain distribution by screening the flexible substrate before the GEM fabrication. In this presentation we report the result of the mapping of GEM gain and the insulator thickness, then propose the method to increase the production yield.

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