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A new glass GEM with a single sided guard-ring structure

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The GEM is widely used in variety of applications today, but its flexible structure requires careful handling. The GEM is also made of organic material, so it emits outgas. Therefore, we have developed a Glass GEM, whose substrate is made of Photosensitive Etching lass, PEG3 from HOYA Corporation. The conventional GEMs have a simple structure of thin foil with many tiny holes, but its tolerance to discharge is an issue. In addition, severe discharge may damage the front-end circuit, especially ASICs. Therefore spark tolerance solution is strongly required. As a new idea for suppressing discharge at high gain operation, we propose an asymmetric GEM which has a new guard-ring structure. A guard ring is formed surrounding each hole of Glass GEM. The main aim of guard rings is to reduce he capacitance, which is effective to restrict the total amount of charge in the discharge event. Although an additional guard-ring structure requires a higher applied voltage if we keep the same electric field inside the hole, the single sided guard rings can provide a sufficient gas gain with the suppression of the parallel capacitance to each hole. We have investigated the characteristics of guard ring Glass GEM with 6keV X-ray, and found that it provides a high gas gain up to 6,000 and high energy resolution around 16%. Discharge events are suppressed compared with the standard Glass GEM structure without guard rings.

Presenter: MITSUYA, Yuki

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