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## Development of GEM tracker for J-PARC E16 experiment

The J-PARC E16 experiment measures the mass modification of phi meson in nuclear matter at J-PARC high-momentum beam line to study an origin of hadron mass. The tracking detector of the experiment is composed of three layers of position sensitive devices that employ 10 cm x 10 cm, 20 cm x 20 cm and 30 cm x 30 cm Gas Electron Multipliers (GEMs) and two-dimensional readout boards. Required position resolution is 100  $\mu\text{m}$  upto the incident angle of 30°.

We have successfully generated all sizes of GEM foils using a wet-etching method in Japan. The avalanche gain is tested with 55Fe X-ray source to check the healthiness of the foils and the gain of  $10^4$  is achieved for all the sizes.

Position resolution and efficiency are evaluated in the beam test. Position resolution of better than 100  $\mu\text{m}$  is obtained for 0° incident angle by calculating the weighted mean of charge. Inclined tracks have worse resolutions using the same method. Thus, we have developed a new technique to measure a position using arrival timing information of generated charge clusters in a drift gap. Arrival timings are measured by the timings of signals from read-out strips. Timing information is converted to a cluster generated position in the drift gap using a known drift velocity. Cluster generated positions are fitted by a linear function and a hit position can be calculated by a fitting result. As a result, position resolution of 105  $\mu\text{m}$  is obtained for 15° beam by the timing analysis.

### quote your primary experiment

J-PARC E16

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**Track Classification:** Gaseous Detectors