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Development of GEM Tracker for the J-PARC E16 experiment

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A GEM Tracker (GTR) is a micro-pattern gas detector using GEM foils for tracking charged particles. In the J-PARC E16 experiment, momenta of electrons and positrons from decays of the ϕ meson are measured by three layers of the GTRs whose sizes are 100×100 , 200×200 , and 300×300 mm² in a magnetic field. In order to achieve a mass resolution of $5 \text{ MeV}/c^2$, position resolutions of $100 \mu\text{m}$ in a bending direction by the magnetic field and $700 \mu\text{m}$ in a direction perpendicular to the bending plane are required. Note that an incident angle of charged tracks to the GTR in the bending plane is up to 30° . To cope with the inclined tracks, a new analysis method called “timing method” was developed. We have developed GTRs satisfying the requirements and evaluated their performance, such as a position resolution and detection efficiency, by beam tests. Incident angle dependencies of the evaluated items for all sizes of the GTRs were obtained as the test results. We are ready to start a final detector production for the GTRs. In this presentation, we report our GTRs and the achieved performance.

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