Development of a Cerenkov Trigger Detector for the COMET Experiment

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The COMET experiment at the J-PARC Hadron Experimental Facility [1] searches for the muon-to-electron conversion in a muonic atom, \( \mu^- + N(A,Z) \rightarrow e^- + N(A,Z) \), at a branching ratio of ~10^{-15} in the first phase of the experiment. Signal electrons are identified and triggered with a Cerenkov-type trigger detector. The trigger detector is placed upstream and downstream of the inner wall of the cylindrical drift chamber as shown in Fig.1 and consists of 64 segments in each end. A prototype of the one segment has two layers; 300 × 45 × 5 mm³ ultra-fast plastic scintillator and 300 × 45 × 30 mm³ UV transparent acryl radiator. Multi-Pixel Photon Counters (MPPCs) as the photo sensors are attached on the edge. A coincidence of signals from the two layers is used for the trigger.

We constructed and tested a prototype detector. Studies for the radiator and reflector optimization, and a test of UV sensitive MPPC were carried out with cosmic rays. A beam test using an electron beam is planned in this fall. Details of the trigger detector development will be described in the symposium.

References

Fig. 1. The detector geometry. Yellow parts are the trigger detector.