Development of the StrECal system for COMET experiment at J-PARC

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The COMET experiment at J-PARC aims to search for the charged lepton flavor violating process of neutrinoless μ-e conversion with an improvement of a sensitivity by a factor of 10000 to the current limit, in order to explore the parameter region predicted by most of well-motivated theoretical models beyond the Standard Model [1]. When the μ-e conversion occurs, almost all the energy of the muon mass is carried out by the electron which is expected to have the monochromatic energy of about 105 MeV. The experiment requires to detect such electron with an excellent momentum resolution, better than 200 keV/c, in order to achieve the goal sensitivity. High rate capability of up to 5×10^9 μ^-/s is also necessary for accumulation of enough statistics with high power proton driver at J-PARC. In addition, the detector system needs the ability of particle identification (PID) with those conditions described above. On the basis of these requirements, we plan to construct a StrECal system which consists of a straw tube tracker and an electron calorimeter (ECal) as shown in Fig.1. The system are put in the detector solenoid with a field strength of 1 T. The straw tube tracker detects the particle momentum with the operation in the vacuum. The tracker is constructed by the extremely light material, which can achieve the high momentum resolution and handle the high intensity beam. The ECal consists of segmented scintillating crystals, which is placed downstream of the straw tube tracker. The ECal measures the energy of electron with good resolution to add redundancy to the momentum measurement, which can provide the ratio E/p for PID combining the measured momentum in the straw tracker. The ECal also provides the trigger signals, carrying the timing with respect to which the events are referenced. In this presentation, we report the progress of the development of the StrECal system. The prospect of final detector system is also described.

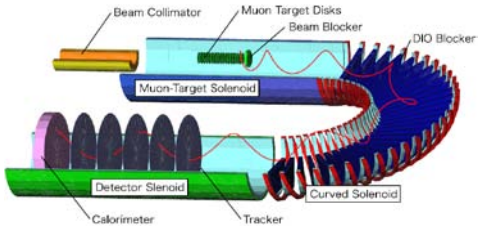

Fig. 1 Schematic view of StrECal system (Straw tube tracker and electron calorimeter).

References

[1] Y. Kuno for the COMET collaboration, Prog. Theor. Exp. Phys. 2013 022C01