

Operation of multi-MPPC system for cylindrical scintillation fiber tracker

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The J-PARC E40 experiment is a scattering experiment between a Σ hyperon and proton in order to hyperon-nucleon interaction and to confirm the repulsive force due to the Pauli effect in quark level.

In order to measure the cross section of Σp scattering, we will use a new detector system called CATCH which surrounds a liquid hydrogen target. The trajectories and the kinetic energies of related charged particles such as recoil proton and decay particles are measured by CATCH in order to identify Σp scattering.

CATCH consists of a Cylindrical Fiber Tracker (CFT) and a bismuth germanate (BGO) calorimeter. CFT is a tracking detector with a fast time response made of 5,000 scintillation fibers with a diameter of 0.75 mm. Each fiber signal is read by Multi-Pixel Photon Counter MPPC fiber by fiber. All MPPCs are operated by the EASIROC boards which is optimized for the readout of a large number of MPPCs. In order to reconstruct trajectories three dimensionally, CFT has two types of cylindrical layers where fibers are placed with the straight and spiral configurations.

We have just launched a Σ proton scattering experiment at J-PARC in this year. I will report on the operation and energy calibration method of such a large number of scintillation fibers for CFT in the test experiment and actual Σp scattering experiment. I also show the separation of proton and π by using the energy deposit in CFT as a result of the energy calibration.

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