

Hyperon Time Projection Chamber for J-PARC experiments

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We are developing a Hyperon Time Projection Chamber (HypTPC) as the main detector of two experiments at the J-PARC Hadron Facility.

The J-PARC E42 experiment proposes to search for the H-dibaryon resonance in $\Lambda\Lambda$ production from (K^-, K^+) reactions off nuclei and the bound H-dibaryon by its weak decays in order to answer the long-standing question about the existence of the H-dibaryon, which has a "uuddss" quark configuration.

The J-PARC E45 experiment approaches to fundamental understanding of non-perturbative QCD through high-precision data of baryon resonance spectra for $\pi N \rightarrow \pi\pi N$ and $\pi N \rightarrow KY$ channels.

Both experiments demand high-intense hadron beams of 10^6 cps and detector acceptance of almost 4π solid angle around a experimental target.

HypTPC is designed to have a sensitive volume of $\phi \sim 500$,mm \times H ~ 550 ,mm and a inner target holder.

Since beams are directly injected into the sensitive volume, we are able to reconstruct the primary vertex by measuring the beam trajectory in addition to the trajectories for produced particles.

However, it is very challenging to operate a TPC with a exposure to the high-rate beam.

Our solutions are electron amplification using Gas Electron Multipliers (GEMs) and a gating method of electric field with wires to control electron drift.

A specialized frontend electronics are also essential to handle about 6000 channels of HypTPC readout pads.

We collaborate with the GET (General Electronics for TPC) project led by Saclay, GANIL, MSU, IRFU and CERNBG. The project provides us the total readout system including hardware and software.

In this presentation, we will discuss physics interests of the J-PARC experiments. R&D status of HypTPC with the GET system will also be reported.

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