1. T2K experiment

Located 280m downstream from the neutrino production target. Consists of detectors surrounded by a magnet to measure beam flux and energy spectrum prior to oscillation.

2. Near detector (Off-Axis)

Optimum detector for CC interaction measurement.
- FGD: Measure short tracks around ν interaction vertex ⇒ Identify the interaction type
- TPC: Measure the momentum of long tracks ⇒ Reconstruct neutrino energy

3. Fine-Grained Detector

MPPC & fiber readout
- Wavelength shifting fiber: 0.96×0.96 cm²
- MPPC (Multi Pixel Photon Counter)
  - Compact
  - Photon counting capability
  - Works in magnetic field
  - High noise rate (10⁴~10⁵ kHz)
  - Temperature dependency
- Excellent performance for detecting charged particles around ν vertex

4. Initial beam measurements

We accumulated ~3*10¹⁹ POT (Proton On Target) data in the first half of 2010. We analyzed the neutrino event rate in FGD to confirm the performance of the detector and beam.

Simple neutrino event selection:
1. Noise rejection
   - Hit time clustering (2.5pe noise threshold, 80ns coincidence)
   - Beam timing cut (expected timing ±70 ns)
2. Charged Current event selection
   - Fiducial volume cut (cut if the vertex is in the veto region)
   - 3 XY layers continuous hits (enhance CC muon track)

As a result, we confirmed that the FGD is observing neutrino events with stable rate. The measured event rate was 1.5 events / 10¹⁵ POT (chi-square / ndf = 0.77). Systematic error for this number is not calculated yet, but this number roughly agree with the expected event rate in MC.

5. Summary

The T2K FGD detector is designed to measure neutrino interactions in the near detector complex. The powerful combination of MPPC and AFTER ASIC chip readout provides excellent performance for detecting charged particle tracks around interaction vertex.

We started physics run in 2010 and accumulated ~3*10¹⁹ POT data. Our simple hit level analysis shows that the neutrino events rate is stable and the beam operation is successful. The first result of neutrino oscillation analysis will be presented very soon.