Simulation studies for anti-neutrino interactions on iron target using the T2K INGRID module

K. Wakamatsu[1#] for the T2K collaboration

[1]*Osaka City University, Department of Physics, Osaka, Osaka 558-8585, Japan*

 # corresponding author: E-mail wakamatsu@ocupc1.hep.osaka-cu.ac.jp

Large uncertainties exist in neutrino interactions on the iron in sub-GeV energy region due to insufficient experimental data on cross sections. One module of the T2K on-axis near-detector, the INGRID, has been moved to the second basement of the near detector hall for cross section measurements in such low-energy region. The INGRID consists of 14 identical modules arranged in horizontal and vertical arrays around the beam center. Each module has a sandwich structure of iron targets and scintillator trackers. The main purpose of the INGRID is to monitor the muon-neutrino beam profile and intensity. The module move has no effect on this monitoring task. The direction of the beam center is 2.5 degrees away from the direction of the far-detector Super-Kamiokande so that the neutrino beam has a narrow energy peak at the energy suitable for oscillation measurements. The neutrino energy peak varies as a function of the off-axis angle. The off-axis angle of the second basement module is about 1.66 degrees. The larger off-axis angle provides the lower peak energy. It is larger than any other INGRID module and enables us to observe neutrino interactions in the sub-GeV region. Anti-neutrino beams are planned for upcoming physics runs toward the summer 2014, and we will have a chance to observe anti-neutrino interactions on the iron target. We present the studies of the Monte Carlo simulation for anti-neutrino interactions expected in the INGRID module located in the second basement based on the anti-neutrino runs.