

Towards a better understanding of neutrino-16O NCQE: study of the gamma-rays from knocked out neutron-16O interaction

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Neutral Current Quasi Elastic interactions (NCQE) of atmospheric neutrinos with ^{16}O is a source of irreducible background for Supernova Relic Neutrinos (SRN) searches in water Cherenkov detectors like Super Kamiokande.

To get a better understanding of this background, T2K measures NCQE cross section via gamma rays emitted by ^{16}O de-exciting after its interaction with a neutrino. However, there are large systematic errors on this measure as it is very difficult to separate the gamma rays emitted by the initial interaction of neutrino and ^{16}O from the secondary gamma rays emitted by the interaction of knocked out neutrons and ^{16}O . To solve this problem, the rate of secondary gamma ray production is determined by T2K using Monte Carlo simulations, but the results don't match the data and present high uncertainties, due to the lack of experimental data for photon emission from neutron interaction above 20 MeV.

Therefore, at the Research Center for Nuclear Physics of Osaka University (RCNP), an experiment was realized at the end of 2018 to measure the secondary gamma ray production cross section. This presentation will focus on this new experiment using a neutron beam at two different energies (30 MeV and 250 MeV) on a water target. Gamma rays are studied with high precision by using an High Purity Germanium detector (HPGe). In order to measure the production cross section, two other detectors are also used: an organic liquid scintillator to get the neutron flux and a CsI(Tl) scintillator for scattered neutron background estimation.

Working Group

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