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P3.029 Measurement of neutrino interactions in gaseous argon with T2K

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on behalf of T2K collaboration

The T2K near-detector, ND280, employs three large argon gas TPCs (Time Projection Chambers) for particle tracking and identification. The gas inside the TPCs can be used as an active target to study the neutrino interactions in great detail. The low density of the gas leads to very low track energy thresholds, allowing the reconstruction of very low momentum tracks, e.g. protons with kinetic energies down to $\mathcal{O}(1 \text{ MeV})$. Since different nuclear interaction models vary a lot in their predictions of those low momentum track multiplicities, this makes neutrino interactions on gases a great probe to test those models.

The TPCs operate with an argon-based gas mixture (95 %-vol Ar) and have been exposed to the T2K neutrino beam since the beginning of the experiment in 2010. Due to the low total mass of the gas, neutrino argon interactions happen only rarely, compared to the surrounding scintillator-based detectors. We expect about 600 such events in the recorded data so far.

We are able to separate those events from the background and thus demonstrate the viability of using gaseous argon as a target for a neutrino beam. This enables us to do a cross-section measurement on gaseous argon, the first measurement of this kind. All previous neutrino cross-section measurements on argon were done in liquid argon TPCs.