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# Probing nuclear effects in neutrino $CC1\pi^+$ interactions with transverse kinematic imbalance measurement in T2K

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Neutrino interactions with nuclei are the main experimental tool used to study neutrinos in many different contexts, and systematic uncertainties arising from neutrino-nucleus interactions, especially those related to nuclear effects, can be a limiting factor in their energy reconstruction. For the  $CC1\pi$  interaction, which is dominated by resonant production, physics of the initial state nucleon correlations, self-energy corrections of the force mediator, and the Delta resonance propagation inside the nucleus are not well-modelled. We present the first experimental study of nuclear medium effects in  $CC1\pi^+$  interaction by measuring the kinematic imbalance between the muon, pion and proton in the plane transverse to the incoming neutrino. The extracted cross-section as a function of the imbalance is sensitive to the nuclear physics model and final state interactions. This new measurement provides unique constraints to characterize the nuclear effects in neutrino interaction modelling.

## Collaboration name

T2K Collaboration

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