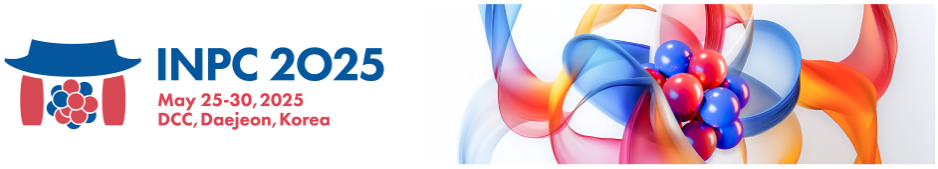

Contribution ID: **6** Type: **Contributed Oral Presentation**

Neutrino-nucleus reactions on argon and oxygen

Thursday, 29 May 2025 12:05 (15 minutes)

Neutrino-induced reactions on nuclear targets, which are important for neutrino detection and neutrino properties, are studied.
The B(GT) and charged-current reactions on ^{40}Ar were studied based on the monopole-based universal interaction [1] within the $sd^{-2}pf^{2}$ shell-model space [2]. Here, a new effective interaction in the sd-pf shell obtained by the extended Kuo-Krenciglowa (EKK) method [3] is used in the study of both charged- and neutral-current reactions on ^{40}Ar. The B(GT), B(M1), and the reaction cross sections are evaluated by the shell model for the 1+ multipole in the $sd^{-2}pf^{2}$ +$sd^{-4}pf^{4}$ model space, while forbidden transitions are treated by RPA [4]. Calculated results are compared with the previous study [2], and the dependence of the cross sections on the quenching of the axial-vector coupling constant g_A, constrained by the experimental B(GT) and B(M1) data, is examined [4].
The effective interaction in the sd-pf shell obtained by the EKK method is used to study the GT β-de cay strength of sd-shell nuclei with contributions including up to 2p-2h excitations. The extension of the model space is found to enhance the quenching factor for g_A by $\sim$0.05 compared to the conventional Hamiltonians in the sd-shell [5].\\

Neutrino-nucleus reaction cross sections on ^{18}O are evaluated by shell-model calculations and compared with those on ^{16}O [6]. The cross sections for ^{18}O (ν_e, e$^-$) ^{18}F are larger than for ^{16}O at low neutrino energies below 20 MeV in natural water with the 0.205% admixture of ^{18}O due to the lower threshold energy for ^{18}O than that for ^{16}O and large contributions from the GT transitions in ^{18}O. Events from reactions on ^{16}O and ^{18}O, which take place at different electron energies separated by 10-15 MeV, are shown to be distinguished by the measurements of DAR ν_e [5]. Possible effects of the ^{18}O admixture in water Cherenkov detectors on the evaluations of the event rate of supernova neutrinos are examined for both the cases with and without the neutrino oscillations [7].

[1] T. Otsuka, T. Suzuki, M. Honma, Y. Utsuno, N. Tsunoda, K. Tsukiyama, and M. Hjorth-Jensen, Phys. Rev. Lett. 104, 012501 (2010)
[2] T. Suzuki and M. Honma, Phys. Rev. C 87, 014607 (2013).
[3] N. Tsunoda, T. Otsuka, N. Shimizu, M. Hjorth-Jensen, K. Takayanagi and T. Suzuki, Phys. Rev. C 95, 021304 (2020); N. Tsunoda, T. Otsuka, K. Takayanagi, N. Shimizu, T. Suzuki, Y. Utsuno, S. Yoshida, H. Ueno, Nature 587, 66 (2020).
[4] T. Suzuki and N. Shimizu, Phys. Rev. C 108, 014611 (2023).
[5] T. Suzuki and N. Shimizu, Frontiers in Physics 12, 1434598 (2024).
[6] T. Suzuki, S. Chiba, T. Yoshida, K. Takahashi and H. Umeda, Phys. Rev. C 98, 034613 (2018).
[7] T. Suzuki, k. Nakazato and M. Sakuda, Nucl. Phys. A1038, 122719 (2023).

Primary authors: Prof. SUZUKI, Toshio (Nihon University); Prof. SHIMIZU, Noritaka (University of Tsukuba); Prof. NAKAZATO, Ken'ichiro (Kyushu University); Prof. SAKUDA, Makoto (Okayama University)

Presenter: Prof. SUZUKI, Toshio (Nihon University)

Session Classification: Parallel Session

Track Classification: Neutrinos and Nuclei