Contribution ID: **47** Type: **2.Parallel session talk**

Validation and application of nuclear deexcitation event generator NucDeEx

Neutron multiplicity associated with neutrino-nucleus interactions has become important observable in large neutrino detectors such as Super-Kamiokande, KamLAND, and JUNO. The neutron multiplicity can be measured by detecting gamma rays emitted by neutron capture. It is expected to improve the results of various physics analyses using the measured neutron multiplicity to enhance flavor identification or signal-to-background ratio. However, predicting neutron multiplicity is challenging because neutrino-nucleus interactions involve highly uncertain many-body nuclear effects.
Nuclear deexcitation particularly plays an important role in neutron multiplicity. This process emits various particles, including neutrons, while transitioning to the ground state when the residual nucleus has exciting energy. One issue is that most widely used neutrino interaction generators omit this process or describe it with a simplified model. Another issue is that the deexcited particles have low energy as a few MeV. Therefore, they are un-constrainable by most accelerator neutrino detectors due to higher detection thresholds. This feature of deexcitation requires us to rely on precise nuclear theory and experiments to verify it.
The author developed a dedicated nuclear deexcitation simulator, NucDeEx, based on the nuclear calculation software TALYS. NucDeEx can be easily integrated with the neutrino interaction generators and other hadron simulators, such as Geant4 and the hadron cascade model INCL. The source code of NucDeEx and the interfaces and build scripts necessary for use with the above software are available on the web, thus, a wide range of applications are expected. In this talk, the author will present an overview of NucDeEx, validations with nuclear experiments, the impact of integrating NucDeEx into neutrino interaction generators, and its application to other particle simulators.

[Paper]: https://link.aps.org/doi/10.1103/PhysRevD.109.036009
[GitHub]: https://github.com/SeishoAbe/NucDeEx

Primary author: ABE, Seisho (Kamioka Obs., ICRR, the University of Tokyo)

Presenter: ABE, Seisho (Kamioka Obs., ICRR, the University of Tokyo)

Session Classification: Parallel 7：Interdisciplinary aspects of few-body physics and techniques

Track Classification: Neutrinos and their interactions with matter