Advances in High Energy Physics

Special Issue on

Neutrino Physics in the Frontiers of Intensities and Very High Sensitivities 2018

CALL FOR PAPERS

The physics of neutrinos includes a plethora of modern research subjects covering a wide energy region like GeV accelerator neutrino oscillations, solar and astrophysical neutrinos in the sub-MeV up to about 100 MeV region, neutrino nucleon and neutrino-nucleus interactions, neutrino nucleosynthesis, double beta decays and tritium beta decays, neutrinos as dark matter, and many other topics.

Intensity frontier is a wide assortment of precision measurements for the properties of particles like the neutrinos which may be well known, but their parameters have a long way before they are understood. It is a multidirectional approach with global participation using multibillion, megawatt sources, and megaton and extremely quiet detectors. The field of neutrino physics itself is very wide, including areas from accelerator produced neutrinos for high energy oscillations to solar and galactic sources at very low energies. There are neutrino-nuclear interactions, double beta decays, tritium beta decays, and interactions with complex nuclei that need to be understood at a high precision level of their absolute cross section which can fix the strong part of the radiative corrections and can be model-independent checks of the standard model, particularly in the light of the new boson discoveries.

Moving forward from the early years of successful push for the precision measurements of the theta-13 and theta-23 mixing angles to predict oscillation rates, the focus is shifting now on the energy resolution of these neutrino interactions. The simple interaction models on free electrons and nucleons with inflated uncertainties, covering for form factors and nuclear modeling effects in determining the energy and flavor of the outgoing neutrino, can no longer explain the high-sensitivity spectra of the final state interactions that are the signatures of our experiments. The challenge now is studying the effect of interaction uncertainties, the capability limitations of the event generators, and how the prolific electron-nucleus scattering can shed light on the neutrino-nucleus scattering. Numerous small groups provide theoretical calculations and new viewpoints. These developments though are slow in being absorbed in the event generators because the nuclear matrix elements show large differences coming from different nuclear structure methods. The lead theoretical work is for calculating nuclear matrix elements for leptonic, nucleon, and nuclear effects of the final state interaction signatures for high-sensitivity double beta-decay experiments. The community understands that there is no single point solution or one measurement that can solve this. We must leverage the current development through multidisciplinary work and cross-experiment cooperation.

In this spirit, we invite researchers in these fields to contribute articles on the subjects. These can be original research articles as well as reviews of either the experimental or theoretical nature.

Potential topics include but are not limited to the following:

- Coherent neutrino-nucleus scattering
- Cross section of neutrino interactions with nucleons and nuclei
- Many-body and effective theories in neutrino-nucleus scattering
- Astrophysical neutrino sources and neutrino nucleosynthesis
- Terrestrial detection of astrophysical and laboratory neutrinos
- Neutrino interactions as probe to neutron densities
- Neutrino-nucleus cross sections at finite temperatures
- Nuclear matrix elements for beta and double beta decays
- Precision measurements of disappearance
- Short baseline interactions and oscillations
- Determination of mass differences and mass hierarchy
- Constraints on theta-13 and theta-23
- Nonstandard neutrino interactions with nucleons and nuclei
- Searches for new physics within neutrino interactions
- Neutrinos as dark matter

Authors can submit their manuscripts through the Manuscript Tracking System at https://mts.hindawi.com/submit/journals/ahep/npf18/.

Papers are published upon acceptance, regardless of the Special Issue publication date.

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