

PRISMA+ Colloquium

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Lorentz-Raum, 05-127, Staudingerweg 7

Prof. Dr. Stephan Dolan
CERN, Switzerland

Neutrino Interaction Modelling for Neutrino Oscillation Experiments

Accelerator-based neutrino oscillation experiments have the potential to revolutionise our understanding of fundamental physics, offering an opportunity to characterise charge-parity violation in the lepton section, to determine the neutrino mass ordering and to explore the possibility of physics beyond three-flavour neutrino mixing. However, as more data is collected the current and next-generation of experiments will require increasingly precise control over the systematic uncertainties within their analyses. It is well known that some of the most challenging uncertainties to overcome stem from our uncertain modelling of neutrino-nucleus interactions, arising because measured event rates depend on the neutrino interaction cross section in addition to any oscillation probability. The sources of these uncertainties are often related to subtle details of the pertinent nuclear physics, such as the details of the target nucleus ground state, which are extremely difficult to control with sufficient precision. Confronting such uncertainties requires both state-of-art theoretical modelling and precise measurements of neutrino interaction event rates at experiment's near detectors, before oscillations occur. In this talk, we review the role of neutrino interaction systematic uncertainties in current and future measurements of neutrino oscillations as well as the experimental and theoretical prospects for reducing them to an acceptable level for the next generation of experiments.