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Intermediate near detector NuPRISM for T2K extension and HyperK

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CP violation in the lepton sector is the next major milestone in neutrino physics. Recent T2K and NOvA results show some preference for a large CP violation. In the next several years, the statistical sensitivity will start to reach the sensitive region if the systematic uncertainties are suppressed down to a few percent level, in particular for nuclear uncertainties in the neutrino cross sections. NuPRISM is a proposed water Cherenkov detector as a T2K and Hyper-K intermediate near detector. It locates at around 1km from the production target, covering off-axis angles of 1-4 degrees which provides ranges of well predicted neutrino spectra at each off-axis positions. By taking a linear combination of neutrino interaction events at different off-axis positions, neutrino cross sections, including lepton kinematics, in the water Cherenkov detector can be measured for a given neutrino energy spectrum, e.g. monochromatic neutrino spectrum. NuPRISM thus provides an elegant solution to experimentally constrain the systematic uncertainties of neutrino cross sections for the CP violation measurement. NuPRISM can also measure neutron tagging efficiencies for atmospheric neutrino interactions in the coming Gd loaded phase of Super-K (SK-Gd), which would suppress backgrounds for proton decay search and enable anti-neutrino tagging for atmospheric neutrino oscillation studies. NuPRISM is also sensitive to the LSND/MiniBooNE sterile neutrino oscillation with an additional information of varying neutrino energy spectrum to test oscillation hypotheses.

An overview and status of NuPRISM will be presented in this talk.

Authors: KONAKA, Akira (TRIUMF); SCOTT, Mark (TRIUMF)

Presenter: SCOTT, Mark (TRIUMF)

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