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Constraining cross-section and flux uncertainness in T2K using Markov Chain Monte Carlo

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T2K (Tokai to Kamioka) is a long-baseline neutrino oscillation experiment
located in Japan. One of the most challenging tasks of T2K is to determine
whether CP is violated in the lepton sector. By utilizing the near detector
(ND280) data, T2K can constrain neutrino interaction and flux uncertainties
by fitting a parametrised model to data. This allows for a significant reduction
of the systematic uncertainties in neutrino oscillation analyses. This year T2K
oscillation analysis include a number of improvements to the cross-section model including: expanded treatment of shell structure in Spectral Function model, 2p2h
pair uncertainties, updated removal energy and nucleon FSI. Flux systematic have also been updated using the NA61/SHINE 2010 replica target data.
To better constrain the new model, the near detector fit has introduced new samples using
proton as well as photon tags, in additions to the muon and pion information. T2K uses two different methods to constrain flux and cross
section at ND280, one of which uses Markov Chain Monte Carlo and will be
discussed in this poster. The poster includes posterior distributions for selected
cross-section parameters, impact of new samples as well as prior and posterior
predictive distribution for chosen samples. These results are part of the recent
T2K oscillation analysis.

In-person participation

Yes

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