Future neutrino oscillation program and its challenges

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Abstract: Neutrino oscillation measurement entered a precision era. In summer 2017, T2K disfavoured CP conserving phase of $\delta_{\text{CP}}=0,\pi$ at $2\sigma$ level. CP asymmetry in neutrino and anti-neutrino $\nu_\mu \to \nu_e$ appearances can be as large as 20% depending on the CP phase $\delta_{\text{CP}}$, within the reach of new projects, HyperK and DUNE, aiming at statistical errors of $\sim 3\%$. It is essential to control the systematic uncertainties well below the statistical errors for the discovery. The mixing angle $\theta_{23}$, which was discovered in the atmospheric neutrino mixing, is consistent with maximal mixing ($\sin^2(2\theta_{23}) \sim 1$), possibly indicating $\mu-\tau$ symmetry in the lepton mixing. This result is already started to be limited by the systematic uncertainty and improvement in systematic uncertainties is even more urgent. The systematic uncertainties originate from the neutrino cross section in particular nuclear/hadronic effects, neutrino flux in particular the uncertainties in the hadron production cross section, and the detection efficiency.

In this talk, I will describe essential challenges and opportunities in handling systematic uncertainties in precision neutrino oscillation measurements, and describe emerging efforts to handle them lead by the Canadian long baseline neutrino group.

Friday
February 2, 2018
3:30 pm, 330 Allen Building

Coffee & Snacks will be served prior to the talk, at 3:00 pm, in 316 Allen Building (Coffee Room).
Please join us for follow-up discussion, at 4:45 pm, in 316 Allen Building (Coffee Room).