CU Physics Department Particle Seminar

Results from the T2K long baseline neutrino experiment

Neutrino oscillations have been observed and confirmed at two mass splittings (Δm^2), which is consistent with three generations of neutrinos and an unitary mixing (PMNS) matrix. Despite the rapid progress in understanding neutrino oscillations in the last decade, further study of the large mixing in the leptons (as compared to the quark CKM matrix) may give additional insight into the nature of neutrinos. If θ_{23} is maximal (2$\theta_{23}=90$ degrees) and/or $\theta_{13}=0$, then the PMNS matrix has a symmetry, indicative of underlying physics. If, however, θ_{13} is non-zero, and sufficiently large, then a programme to study CP violation with neutrinos is possible, such as the proposed Long Baseline Neutrino experiment in the US (LBNE) or Hyper-Kamiokande experiment in Japan. In this case, CP violation with light neutrinos may have some relationship to the CP violation in the decay of a hypothetical heavy neutrino partner and to the development of the early universe.

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Triumf

The Tokai-To-Kamioka (T2K) long baseline neutrino experiment is designed to precisely measure ν_{μ} disappearance (Δm^2_{23}, θ_{23}) and search for ν_e appearance (θ_{13}). A beam of muon neutrinos is generated at the J-PARC facility in Tokai-mura, Japan, and is sampled by two near detectors, ND280 and INGRID, before reaching the Super-Kamiokande detector, 295km away. This talk will report updated results from T2K on ν_{μ} disappearance and ν_e appearance. Future prospects for T2K and long baseline neutrino physics will also be discussed.

Wednesday, April 11, 2012 705 Pupin Hall 1:00 PM