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Neutrino-Anti-neutrino beaming across the Earth to test CPT asymmetry

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Here we considered how the longest baseline neutrino oscillation available,
crossing most of Earth's diameter, may improve the measurement and at best disentangle any hypothetical CPT violation occurring between neutrino-antineutrino , while testing τ neutrino and even the appearance of anti tau one at the highest rate. The νμ and anti νμ disappearance correlated with the tau appearance is considered for those events at the largest distances. We thus propose a beam of νμ and anti νμ crossing through the Earth, within an OPERA-like experiment from CERN (or Fermilab), beaming in the direction of the IceCube–DeepCore or future Pingu detector at the South Pole. The similar test may be done with future Hyperkamiokande in Japan and in Korea, The ideal energy lies at 21 GeV to test the disappearance or (for any tiny CPT violation)
the partial anti νμ appearance. Such a tuned detection experiment may lead to a strong signature of τ or anti tau generation even within its neutral current noise background events. The tau appearance signal is above (or within) 10σ a year, even for one year a 1% OPERA-like experiment. Peculiar configurations for θ13 and the hierarchy neutrino mass test may also be better addressed by a DeepCore–PINGU array detector beaming νμ and observing νe at 6 GeV neutrino energy windows.

Content of the contribution

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