Contribution ID: **80** Type: **not specified**

Neutrino Mass Hierarchy Determination using Reactor Antineutrinos

Wednesday, 16 March 2011 19:44 (1 minute)

Building on earlier studies, we investigate the possibility to determine the type of neutrino mass spectrum (i.e., "the neutrino mass hierarchy") in a high statistics reactor electron antineutrino experiment with a relatively large KamLAND-like detector and an optimal baseline of 60 Km. We analyze systematically the Fourier Sine and Cosine Transforms (FST and FCT) of simulated reactor antineutrino data with reference to their specific mass hierarchy-dependent features discussed earlier in the literature.
We perform also a binned \chi2 analysis of the sensitivity of simulated reactor electron antineutrino event spectrum data to the neutrino mass hierarchy, and determine, in particular, the characteristics of the detector and the experiment (energy resolution, visible energy threshold, exposure, systematic errors, binning of data, etc.), which would allow us to get significant information on, or even determine, the type of the neutrino mass spectrum. We find that if \sin2 2\theta_{13} is sufficiently large, \sin2 2\theta_{13} \gtap 0.02, the requirements on the set-up of interest are very challenging, but not impossible to realize.

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Session Classification: Poster session