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Sensitivity to leptonic δ_{CP} and θ_{12} with low energy atmospheric neutrinos

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Leptonic CP violation phase δ_{CP} is one of the current unknowns in neutrino oscillation physics. Not knowing the hierarchy of neutrino masses can bring an ambiguity in the measurement of δ_{CP}. While accelerator based long baseline experiments like the proposed DUNE experiment can determine δ_{CP} without hierarchy ambiguity, it is interesting to study low energy atmospheric neutrinos also for this purpose. Atmospheric neutrinos whose flux peaks at low (sub-GeV) energies will give a significant amount of events in addition to the event spectra being hierarchy independent at these energies. The effect of detector resolutions and systematic uncertainties on the sensitivity to δ_{CP} are studied.

It is also found that a detector which can separate neutrinos (ν) from anti-neutrinos ($\overline{\nu}$) will give a better sensitivity to δ_{CP}. In view of the large future neutrino detectors, low energy atmospheric neutrinos are interesting since a wide variety of physics other than δ_{CP} can be probed. We also study the sensitivity to θ_{12} using low energy atmospheric neutrinos.

Reference:
D. Indumathi, S. M. Lakshmi, and M. V. N. Murthy,"Hierarchy independent sensitivity to leptonic δ_{CP} with atmospheric neutrinos", Phys.Rev. D 100, 115027, 2019.

Secondary track (number)

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