

A Study of the Neutrino Mass Hierarchy with MINOS Far Detector Atmospheric Neutrinos

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MINOS is a long-baseline neutrino oscillation experiment utilizing the NuMI neutrino beam from Fermilab. Although not designed for atmospheric neutrino analyses, the uniqueness of the MINOS magnetized detector enables neutrino induced muon charge discrimination and the measurement of the charge asymmetry due to matter effects as a function of zenith angle and neutrino energy. The oscillation probabilities are significantly modified by matter effects due to a coherent charged-current forward scattering of electron-type neutrinos with electrons as the neutrinos propagate through the Earth. The matter effects have an opposite sign for neutrinos versus antineutrinos and for the normal versus inverted neutrino mass hierarchy. We present in this talk an analysis of using the MINOS far detector atmospheric neutrinos for the potential neutrino mass hierarchy determination. A realistic analysis for atmospheric neutrinos is performed with simulated data.

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