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Event reconstruction and particle identification for low energy events in DeepCore and PINGU

We report on the algorithm and expected performance of an event reconstruction tailored for lower-energy neutrino events detected by IceCube/DeepCore and PINGU. The new reconstruction enables a precision measurement of nu_mu disappearance and nu_tau appearance using DeepCore data, and a measurement of the neutrino mass hierarchy by PINGU (see talk by D. Grant, et al. and posters by L. Schulte, et al., and J.P.A.M. de Andre, et al.).

While there are existing IceCube reconstructions that allow the measurement of nu_mu disappearance with DeepCore (see talk by JP Yanez, et al), these algorithms have low efficiencies that limit the size of the signal sample. Substantial improvements in efficiency and/or reconstruction quality are realized using the charge and timing information of all detected photons in a likelihood based reconstruction. For PINGU, the new reconstruction provides the neutrino zenith and energy resolutions required to measure the neutrino mass hierarchy using atmospheric neutrino events in the 5-15 GeV energy range, as well as the ability to perform particle identification that distinguishes between cascade-like events (mainly composed of nu_e CC interactions) and track-like events (mainly composed of nu_mu CC interactions).

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Track Classification: Cosmic Neutrinos