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Atmospheric muon Neutrino backgroung suppressions at 20 GeV opening to a new Astronomy

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At twenty GeV upward atmospheric neutrino are suppressed (above a factor ten) offering a quite energy windows to look for upward galactic and extragalactic neutrino sources.
We did estimated the present Deep Core and possibly future Pingu neutrino detectors spectra for atmospheric background in the tens GeV range taking care of known flavor (muon-tau) mixing signature and eventual additional CPT violation inprint. We also considered an exciting tuned experiment beaming twenty GeV neutrinos across the Earth Opera-like toward Deep Core for a similar sharper test.
A comparision with other ongoing competitive experiments will be also shown.

Summary

Atmospheric muon neutrino in Deep Core (whose rate and spectra might be soon available) should exhibit a suppression (due to tens GeV up-going muon neutrino converted into tau flavor) that must be imprinted in out-coming rate spectra. We estimate here our independent muon neutrino spectra based on SK and its projected record on Deep Core Channels. Our estimate (based on cosmic rays, muon records and tested Super-Kamiokande (SK) data) differs both in shape and in rate from other previous published spectra. At the flux minimum around channel 6-8, (a flux suppressed respect the non oscillated case at least by an order of magnitude) the atmospheric neutrino paucity offers a better windows to a twenty GeV Neutrino Astronomy. Therefore by doubling the string array we may foresee a richer rate and a more complete (zenith and azimuth) atmospheric neutrino distribution and an exciting first twenty GeV Astronomy pointing to North pole sky.
Moreover a new MINOS result hint a different anti-neutrino mass splitting and different mixing angle with respect to the neutrino. We propose a future long baseline experiment with a beam of neutrinos through the Earth in the direction of DeepCore at the South Pole, to test their anti-muon disappearance or (for CPT violation) appearance at the longest distances, compatible with present sources and tuned to DeepCore minimal detectable energies.We suggest also anti-muon beaming that may sharply confirm or disfavor the CPT violation, by one an anti-tau a day (in CPT conserved scenario) versus nearly five anti-muon a week in CPT violated case, even beaming at 1% of an Opera-like experiment.

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