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Ultra-High Energy Muon Neutrino Propagation through the Earth and Induced Muon Energy Distribution near the One Cubic Kilometer Detector

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We calculate high and ultra-high energy upward-going muon neutrino propagation through the Earth and the induced muon energy distribution near the one cubic kilometer detector using the Monte Carlo simulation, according to neutral current interaction. The primary neutrino energies on the surface of the Earth are 1PeV, 1EeV, and 1ZeV.

The mean free paths of ultra-high energy neutrino events generated by the deep inelastic scattering may be comparable with the diameter of the Earth or less than it. Therefore, the induced muon production distribution is influenced by the change of the densities interior to the Earth. Furthermore, in such situation, the contribution from the neutral current neutrino interaction to the induced muon production distribution cannot be neglected.

We report several examples of the deep inelastic scattered depth of muon neutrino in the Earth and the induced muon energy distribution near the detector.

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