

GeoSynchrotron Radiation from Earth Skimming Tau Neutrino Shower

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The origins of the ultra-high energy cosmic rays remain a fundamental and unsolved problem in astroparticle physics. Promising clues could be provided by the associated high energy neutrinos since they would neither interact with intergalactic or interstellar media nor be deflected by the magnetic fields. Various detectors have been proposed for detecting high energy neutrinos. Some of them rely on measuring the air shower by the so-called earth-skimming ν_τ , for which horizontal showers are generated by the ensuing τ decay. Using CORSIKA to simulate the tau decay induced air shower, we extract universal particle energy and lateral distribution. We then calculate the synchrotron radiation from tau decay showers of $10^{16.5}$ eV $\sim 10^{18.5}$ eV energies by adapting the “Coherent Geosynchrotron Radiation” model proposed by Huege and Falcke 2003. Taking into account in detail the conversion from tau neutrinos to tau leptons and the detection efficiency of the designed antennae, we estimate the expected tau neutrino event rate for an integrated tau neutrino flux $\phi_{\nu_\tau} \sim 10^{-17} \text{cm}^{-2} \text{s}^{-1} \text{sr}^{-1}$ above 10^{18} eV.

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