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Probing non-standard neutrino properties by using the Earth matter effects on supernova neutrinos

The observation of Earth matter effects in the spectrum of neutrinos coming from a next galactic supernova could, in principle, reveal if neutrino mass ordering is normal or inverted. A way to identify these effects is through the observation of the modulations that appear in the spectrum when neutrinos travel through the Earth before they arrive at the detector. These features in the neutrino spectrum depend on two factors, the average neutrino energies, and the difference between the primary neutrino fluxes of electron and other flavors produced inside the supernova. However, recent studies indicate that the Earth matter effect is expected to be rather small and difficult to be observed because of the similarity of average energies between electron and other flavors of neutrinos. Here, we are looking towards the possibility if the non-standard neutrino properties can enhance the Earth matter effect. In this poster we focus on possibility of invisible neutrino decay which can lead to situations where the difference between these primary fluxes is large enough to make the Earth matter effect observable.

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