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Testing invisible neutrino decay scenarios by using Earth matter effects on Core-Collapse Supernova neutrinos.

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As the core-collapse supernova (CCSN) neutrinos cross the Earth, the matter effects introduce modulations on the CCSN neutrino spectra. Studying these modulations could help us to solve the neutrino mass ordering problem. However, the matter effect besides is expected to be rather small, could be difficult to observe because of the uncertainties in the calculation of the CCSN neutrino spectra such as the average neutrino energies and even the supernova distance. In this work we explore the possibility that, by including a non standard neutrino property as invisible neutrino decay, would enhance the Earth matter effects. We find that in the invisible neutrino decay scenario, Earth matter effects exist for both ν_e and $\bar{\nu}_e$ for both mass ordering at the same time. Also we find that if the CCSN neutrino crosses the mantle there is a high probability of observing the Earth matter effects.

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