

How Matter Matters: The Story of Time Invariance Violation in Neutrino Oscillations

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While neutrino oscillations provide a well motivated probe for CP violation, non-trivial matter effects and our inability to build experiments in an anti-Earth limits our studies to improper tests of its effects. These limitations in turn motivate (from CPT theorem) time invariance studies, as under certain matter potential profiles, proper time invariance and improper time invariance are the same. With this in mind, the following talk will focus on revisiting the pedagogical study of time invariance in matter-based neutrino oscillations, providing potential consequences in the case where we have a new beam source (i.e. muon storage rings) which would allow for an experiment to make time invariance channel comparisons. We discuss the above for different types of matter potential profiles, in an effort to distinguish between intrinsic and matter-induced time invariance violation, if at all, in neutrino oscillation probabilities.

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