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Studying CPT with Neutral Mesons - Standard Model Extension Approach (SME)

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The Standard Model of particle physics (SM) is the embodiment of our current understanding of the subatomic Universe and describes all fundamental forces except gravity. Despite its success, the SM has a few shortcomings. Apart from not including the description of gravity, it fails to explain the scale of the observed matter-antimatter imbalance and does not give the rationale behind the apparent non-zero neutrino masses. These problems are at the core of particle physics research today, as even a minor deviation from the SM (such as CPT violation) would be a breakthrough suggesting the existence of a more fundamental theory beyond the SM (BSM). The BSM effects are expected to be very small, for example at the Planck scale.

Fortunately, physics at the scale approaching the Planc scale can be tested with existing technology through the search for spacetime-symmetry violation. The realisation of this fact brought about the development of a comprehensive framework, known as the Standard Model Extension (SME). It was set up for studying deviations from exact Lorentz and CPT symmetries. This framework can be successfully applied to studies of CPT violation (CPTV) in neutral meson oscillations. Where the order of magnitude of results of CPTV measurements with neutral kaons approaches an interesting region of m^2_{K}/M_Planck=2*10^{-20} GeV. In my talk, I will try to outline the basic notions regarding the theoretical description of neutral meson oscillations, as well as, the key concepts behind the analysis regarding the search for CPT breaking in the charm sector.

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