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CP violation in tau decays into states with neutral kaons

CP violation in the kaon system can manifest in decays to final states containing neutral kaons. This effect depends on the experimental setup and the applied cuts. We show that the measured time-integrated CP asymmetry depends on the specific decay process, as it is influenced by the experimental detection efficiency as a function of both the energy in the lab frame and the decay time of the kaon. We refine the theoretical predictions for the measured CP asymmetries in τ decays to final states containing neutral koans, and we show that the CP asymmetry in $\tau \to \pi K_S K_L \nu$ is non-vanishing. We investigate the effect of neutral kaons oscillations in matter and discuss how this modifies the CP asymmetries for decays into neutral kaons observed in realistic experiments.

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