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Entangled neutral kaons as a tool for precision tests of CPT symmetry and Quantum Mechanics from KLOE-2

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The process $\phi \to K_S K_L \to \pi^+\pi^-\pi^+\pi^-$ exhibits the characteristic Einstein–Podolsky–Rosen correlation that prevents both kaons to decay into pairs of charged pions at the same time. This constitutes a formidable tool to test with high precision the quantum coherence of the entangled kaon state, and to search for tiny deviations from the quantum mechanical prediction that may arise in a quantum gravity scenario. The fit to the observed difference of the kaon decay times with decoherence and CPT violation parameters of various phenomenological models will be discussed. The results, based on data sample of about 1.7 fb^{-1} (~ 1.7 $\times 10^9 \phi \to K_S K_L$ decays) collected with the KLOE detector at DAΦNE, are consistent with no deviation from quantum mechanics and CPT symmetry violation. The measurement technique together with specific data analysis chain will be presented.

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