

DISCRETE '08: Symposium on Prospects in the Physics of Discrete Symmetries



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CPT and Decoherence in Quantum Gravity

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In this talk I give first a brief review of several models of quantum gravity entailing quantum decoherence of matter propagating in space-time foam backgrounds, and discuss the pertinent physical consequences. In particular, I discuss various parametrizations of quantum-gravity decoherence effects in a wide range of probes, from neutral mesons to neutrinos, including cosmic ones. I pay particular emphasis on discussing the strong model dependence of the magnitude of these effects. Then, I discuss the emergence of a perturbatively ill-defined CPT operator (intrinsic CPT Violation), as a consequence of the evolution of initially pure quantum mechanical states to mixed ones in such stochastic quantum gravity media. This leads to observable (in principle) and rather unique modifications to the Einstein-Podolsky-Rosen (EPR) correlations in entangled states of neutral mesons (omega-effect), which for some models of foam, especially those based on string theory ideas, could be falsifiable already at the next generation facilities. Current bounds of the omega-effect from KLOE Experiment at DaPhiNE and B-factories are also given.

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