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Quantum Gravity and Flavor: Probing New Frontiers with Neutrinos

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Quantum gravitational effects are expected to reveal themselves at extreme energies, cosmological distances, in a break-down of standard quantum mechanics, or in the breaking of global symmetries. Neutrinos offer a unique potential to probe such effects: they are perfect quantum probes, their masses may be related to lepton number or flavor and thus global symmetry breaking and extra-galactic neutrinos have been observed at energies up to the PeV scale. We discuss Lepton Number Violation, Quantum-Gravitational Decoherence, Altered Dispersion Relations, Holographic Scaling and Entanglement Measures and assess the future perspectives of such experimental probes of quantum gravity.

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