Polymer Quantization in Symmetry – Reduced Black Hole Models

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The polymer representation of quantum mechanics provides a quantization scheme that is physically and mathematically distinct from the conventional Schrodinger quantization. In the polymer approach, one effectively confines the configuration space of the quantized Hamiltonian dynamics to a discrete lattice. While mainly motivated by loop quantum gravity, polymer quantization is a consistent quantization scheme in its own right and has been applied to wide range of physical systems.

In this talk we describe the effects of polymer quantization in two distinct, but related, models of spherically symmetric black holes. Firstly, we show that the semiclassical polymerization of the black hole interior gives rise to a interesting candidate for a complete, single-horizon, quantum-corrected black hole spacetime, where the classical singularity is replaced by a quantum bounce. General properties of the spacetime are discussed. Secondly, we consider polymer quantization of the Einstein-Rosen wormhole throat and investigate the effect of polymerization on the black hole mass spectrum. We show numerically that for large eigenvalues the area spectrum of the black hole becomes evenly spaced. The spectrum is not qualitatively sensitive to the issues of factor ordering or boundary conditions except for the lowest few eigenvalues.

WEDNESDAY

November 25, 2009
3:30 pm
Room 330 Allen Building

Coffee will be served in Room 316 Allen at 3:00 pm