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Quantum gravity predictions for black hole interior geometry

Thursday, January 16, 2020 10:15 AM (15 minutes)

In this talk I will show how to derive an effective Hamiltonian constraint for the Schwarzschild geometry starting from the full loop quantum gravity Hamiltonian constraint and computing its expectation value on coherent states sharply peaked around a spherically symmetric geometry. I then use this effective Hamiltonian to study the interior region of a Schwarzschild black hole, where a homogeneous foliation is available. I show how, for several geometrically and physically well motivated choices of coherent states, the classical black hole singularity is replaced by a homogeneous expanding Universe. The resultant geometries have no significant deviations from the classical Schwarzschild geometry in the pre-bounce sub-Planckian curvature regime, evidencing the fact that large quantum effects are avoided in these models. In all cases, we find no evidence of a white hole horizon formation. However, various aspects of the post-bounce effective geometry depend on the choice of quantum states and, in particular, to the numerical value of the Immirzi parameter.

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