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General Relativity and Quantum Cosmology

Black holes in an ultraviolet complete quantum gravity

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In this Letter we derive the gravity field equations by varying the action for an ultraviolet complete quantum gravity. Then we consider the case of a static source term and we determine an exact black hole solution. As a result we find a regular spacetime geometry: in place of the conventional curvature singularity extreme energy fluctuations of the gravitational field at small length scales provide an effective cosmological constant in a region locally described in terms of a de Sitter space. We show that the new metric coincides with the noncommutative geometry inspired Schwarzschild black hole. Indeed, we show that the ultraviolet complete quantum gravity, generated by ordinary matter is the dual theory of ordinary Einstein gravity coupled to a noncommutative smeared matter. In other words we obtain further insights about that quantum gravity mechanism which improves Einstein gravity in the vicinity of curvature singularities. This corroborates all the existing literature in the physics and phenomenology of noncommutative black holes.

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