

Covariance in Spherically Symmetric Effective Models of Quantum Gravity and Quantum Black Holes

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The effective models of quantum gravity are expected to make phenomenological predictions of the fundamental theories. The issue of general covariance in effective models of quantum gravity will be addressed in this talk, which arises when canonical quantum gravity leads to a semiclassical model described by an effective Hamiltonian constraint. In the context of spherically symmetric models, general covariance is precisely formulated into a set of equations, leading to the necessary and sufficient conditions for ensuring covariance. Several candidates for effective Hamiltonian constraints, satisfying the covariance conditions and depending on a quantum parameter, are proposed. The resulting quantum modified black holes show the spacetime structures dramatically different from those of classical black holes.

Refs:

- [1] Cong Zhang, Jerzy Lewandowski, Yongge Ma, Jinsong Yang, Black Holes and Covariance in Effective Quantum Gravity, arXiv:2407.10168, accepted by PRDLetters.
- [2] Cong Zhang, Jerzy Lewandowski, Yongge Ma, Jinsong Yang, Black holes and covariance in effective quantum gravity: A solution without Cauchy horizons, arXiv:2412.02487.
- [3] Jerzy Lewandowski, Yongge Ma, Jinsong Yang, Cong Zhang, Quantum Oppenheimer-Snyder and Swiss Cheese models, Phys. Rev. Lett. 130, 101501 (2023).
- [4] Cong Zhang, Yongge Ma, Jinsong Yang, Black hole image encoding quantum gravity information, Phys. Rev. D 108, 104004 (2023).

Working Group

WG5 - Connection between low-energy and high-energy quantum gravity

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