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Formation and evaporation of quantum black holes from the decoupling mechanism

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Quantum counterparts to classical black holes provide an exciting ground for phenomenology of quantum gravity. Within the functional renormalization group approach to quantum gravity, we propose a novel method to account for quantum effects in classical spacetimes. At the core of our construction is the decoupling mechanism: when a physical infrared scale overcomes the effect of the artificial regulator implementing the Wilsonian integration of fluctuating modes, the effective average action freezes out and approximates the standard quantum effective action. Starting from the Einstein-Hilbert truncation, we use the decoupling mechanism to explore the dynamics of quantum black holes in the phases of collapse and evaporation.

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