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Loop quantum Schwarzschild interior and black hole remnant

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The interior of a Schwarzschild black hole is quantized by the method of loop quantum gravity. The Hamiltonian constraint is solved and the physical Hilbert space is obtained in the model. The properties of a Dirac observable corresponding to the Arnowitt-Deser-Misner mass of the Schwarzschild black hole are studied by both analytical and numerical techniques. It turns out that zero is not in the discrete spectrum of this Dirac observable. This supports the existence of a stable remnant after the evaporation of a black hole. Our conclusion is valid for a general class of schemes adopted for loop quantization of the model.

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