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Quantum fermion superradiance and vacuum ambiguities on charged black holes

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Unlike a classical charged bosonic field, a classical charged fermion field on a static charged black hole does not exhibit superradiant scattering. We demonstrate that the quantum analogue of this classical process is however present. We construct a vacuum state for the fermion field which has no incoming particles from past null infinity, but which contains, at future null infinity, a nonthermal flux of particles. This state describes both the discharge and energy loss of the black hole, and we analyze how the interpretation of this phenomenon depends on the ambiguities inherent in defining the quantum vacuum.

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