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Entropy in the gravitational collapse or a scalar field

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As a first step towards semiclassically simulating a gravitationally collapsing spherical symmetric configuration of a scalar quantum field, we numerically study such a system in the quenched case. In this approximation, only the uniquely defined classical part of the stress energy tensor is considered as a source in the Einstein equation. While avoiding complications with renormalization, this approximation still contains interesting physics on its own. Here, we focus on the entanglement entropy of the quantum field and related observables and compare them to the result of Srednicki in flat spacetime as well as to the Beckenstein-Hawking value for the entropy of a Schwarzschild black hole. We also discuss possible strategies towards unquenching.

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