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Macroscopic Effects of the Trace Anomaly at Event Horizons
EMIL MOTTOLA, Los Alamos National Laboratory, RUSLAN VAULIN[1], Florida Atlantic University — Although the trace anomaly was first obtained by a one-loop quantum calculation, it has macroscopic effects at low energies. These effects can be studied in a local auxiliary field description of the effective action for the anomaly, which requires two new scalar potentials, not contained in classical general relativity. These additional scalar degrees of freedom and the stress-energy they generate depend upon boundary conditions for their complete specification. The stress tensor is generally non-vanishing in spacetimes with boundaries or event horizons, with different choices of boundary conditions corresponding to different choices of the macroscopic quantum state of the system. The scalar potentials provide a coordinate invariant description of divergences in the stress tensor components as the event horizon is approached, and signal the breakdown of the semi-classical approximation in the vicinity of horizons. The consequences for the final state of gravitational collapse leading to a non-singular compact object quite different than a classical black hole will be discussed.

[1]Also giving related presentation at same session

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