General Relativity and Quantum Cosmology

Quantum Mechanical Effects in Gravitational Collapse

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In this thesis we investigate quantum mechanical effects to various aspects of gravitational collapse. These quantum mechanical effects are implemented in the context of the Functional Schr\"odinger formalism. The Functional Schr\"odinger formalism allows us to investigate the time-dependent evolutions of the quantum mechanical effects, which is beyond the scope of the usual methods used to investigate the quantum mechanical corrections of gravitational collapse. Utilizing the time-dependent nature of the Functional Schr\"odinger formalism, we study the quantization of a spherically symmetric domain wall from the view point of an asymptotic and infalling observer, in the absence of radiation. To build a more realistic picture, we then study the time-dependent nature of the induced radiation during the collapse using a semi-classical approach. Using the domain wall and the induced radiation, we then study the time-dependent evolution of the entropy of the domain wall. Finally we make some remarks about the possible inclusion of backreaction into the system.

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