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Semiclassical Einstein equations from holography and boundary dynamics

Monday, 28 August 2023 11:50 (1 hour)

We consider how to formulate semiclassical problems in the context of the AdS/CFT correspondence, based on the proposal of Compere and Marolf [arXiv:0805.1902]. Our prescription involves the effective action with self-action term for boundary dynamical fields, which can be viewed as imposing mixed boundary conditions for the gravity dual. We derive the semiclassical Einstein equations sourced by boundary CFT stress-energy tensor. Analyzing perturbations of the holographic semiclassical Einstein equations, we find a universal parameter which controls the contribution from boundary CFTs and specifies dynamics on the AdS boundary. As a simple example, we examine the semiclassical Einstein equations in 3-dimensions with 4-dimensional AdS gravity dual, and show that the boundary BTZ black hole with vanishing expectation value of the stress-energy tensor becomes unstable due to the backreaction from quantum stress-energy tensor when the parameter exceeds a certain critical value.

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