Contribution ID: **36**   Type: **Contributed talk**

Linear Stability of Semiclassical Theories of Gravity

Wednesday, 30 August 2023 15:00 (20 minutes)

A characteristic feature of semiclassical theories of gravity involving the backreaction of a quantum matter field is the presence of higher order derivatives in the dynamical equations. Hence, the appearance of pathological "runaway solutions" is often argued, i.e., solutions of the linearized equations around a background spacetime that grow exponentially in time. In this talk, this issue is studied in a semiclassical toy model, consists of a quantum scalar field coupled with a classical scalar field in Minkowski spacetime. This toy model mimics also the evolution induced by Semiclassical Einstein Equations for linear perturbations on flat and cosmological spacetimes. It is shown that, if the quantum field which drives the backreaction is massive, then there are choices of the renormalization parameters for which the linear perturbations with compact spatial support decay polynomially in time for large times, thus indicating stability of the underlying semiclassical solution.

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Session Classification: Afternoon session 1