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Energy in ghost-free massive gravity theory

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Abstract

© 2014 American Physical Society. The detailed calculations of the energy in the ghost-free massive gravity theory are presented. The energy is defined in the standard way within the canonical approach, but to evaluate it requires resolving the Hamiltonian constraints, which are known, in general, only implicitly. Fortunately, the constraints can be explicitly obtained and resolved in the spherically symmetric sector, which allows one to evaluate the energy. It turns out that the energy is positive for globally regular and asymptotically flat fields constituting the "physical sector" of the theory. In other cases the energy can be negative and even unbounded from below, which suggests that the theory could still be plagued with ghost instability. However, a detailed inspection reveals that the corresponding solutions of the constraints are either not globally regular or not asymptotically flat. Such solutions cannot describe initial data triggering ghost instability of the physical sector. This allows one to conjecture that the physical sector could actually be protected from the instability by a potential barrier separating it from negative energy states.

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