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Black hole in Massive Gravity and its thermodynamics

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Massive gravity is one of the well-known modification of Einstein's general relativity by promoting the massless mediator, so-called graviton, to be a massive one. As the modified gravity, it is natural to consider the black hole solution of the theory. Here we present the static spherically symmetric black hole solution in massive gravity, proposed by de Rham, Gabadadze, and Tolley, along with its thermodynamics descriptions. The solution we found is in the form of Schwarszchild solution with additional terms due to massive gravity, including the cosmological-like term without introducing a bare cosmological constant, which is quite natural in massive gravity. We also found that introducing the graviton mass also affects thermodynamical natures of the black hole. Furthermore, the phase structure of the solution is analyzed in order to investigate the thermodynamical stability of the black hole.

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