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Quantum backreactions in (A)dS3 massive gravity and logarithmic asymptotic behavior

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We study the interplay between higher curvature terms and the backreaction of quantum fluctuations in 3-dimensional massive gravity in asymptotically (Anti-)de Sitter space. We focus on the theory at the special point of the parameter space where the two maximally symmetric vacua coincide. In the case of positive cosmological constant, this corresponds to the partially massless point, at which the classical theory admits de Sitter black holes and exhibits an extra conformal symmetry at linear level. We explicitly find the quantum corrected black hole geometry in the semiclassical approximation and show that it induces a relaxation of the standard asymptotic conditions. Nonetheless, the new asymptotic behavior is still preserved by an infinite-dimensional algebra, which, in addition to Virasoro, contains logarithmic supertranslations. Finally, we show that all the results we obtain for the quadratic massive gravity theory can be extended to theories including cubic and quartic terms in the curvature.

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