

Spherical black holes in quadratic gravity: Bachian generalization of the Schwarzschild-(A)dS solution

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The metric of all spherically symmetric black holes in a fully general quadratic gravity is derived in an explicit form. First, we express the complicated 4th-order field equations in terms of the Ricci and Bach tensors. Then we apply a convenient conformal-to-Kundt-metric ansatz, reducing the field equations to a compact autonomous system whose solutions can be found as power series.

These Schwa-Bach-(A)dS black holes form a 3-parameter family determined by the horizon position, the value of the Bach invariant on the horizon, and the cosmological constant. When the additional Bach parameter is set to zero, the solutions reduce to standard Schwarzschild-(A)dS metric of general relativity. The new metric can be used for investigation of geometrical and physical properties of these black holes, for example specific tidal effects on particles caused by non-zero Bach tensor, or basic thermodynamic quantities (temperature, entropy).

References

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