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Homogeneous black strings in Einstein–Gauss–Bonnet with Horndeski hair and beyond

In this talk we construct new exact solutions in Einstein-Gauss-Bonnet and Lovelock gravity, describing asymptotically flat black strings. The solutions exist also under the inclusion of a cosmological term in the action, and are supported by scalar fields with finite energy density, which are linear along the extended direction and have kinetic terms constructed out from Lovelock tensors. The divergenceless nature of the Lovelock tensors in the kinetic terms ensures that the whole theory is second order. For spherically, hyperbolic and planar symmetric spacetimes on the string, we obtain an effective Wheeler's polynomial which determines the lapse function up to an algebraic equation. For the sake of concreteness, we explicitly show the existence of a family of asymptotically flat black strings in six dimensions, as well as asymptotically AdS5 × R black string solutions and compute the temperature, mass density and entropy density. We compute the latter by Wald's formula and show that it receives a contribution from the non-minimal kinetic coupling of the matter part, shifting the one-quarter factor coming from the Einstein term, on top of the usual non areal contribution arising from the quadratic Gauss-Bonnet term. Finally, for a special value of the couplings of the theory in six dimensions, we construct strings that contain asymptotically AdS wormholes as well as rotating solutions on the transverse section. By including more scalars the strings can be extended to p-branes, in arbitrary dimensions.

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