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Numerical Black Hole Solutions in Modified Gravity Theories: Axial Symmetry Case ANDREW SULLIVAN, Montana State University, NICOLAS YUNES, University of Illinois at Urbana-Champaign, THOMAS SOTIRIOU, University of Nottingham — We extend recently developed numerical code to obtain stationary, axisymmetric solutions that describe rotating black hole spacetimes in a wide class of modified theories of gravity. The code utilizes a relaxed Newton-Raphson method to solve the full nonlinear modified Einstein's Equations on a two-dimensional grid with a Newton polynomial finite difference discretization scheme. We validate this code by considering static and axisymmetric black holes in General Relativity. We obtain rotating black hole solutions in scalar-Gauss-Bonnet gravity with a linear (linear scalar-Gauss-Bonnet) and an exponential (Einstein-dilaton-Gauss-Bonnet) coupling and compare them to known perturbative solutions. From these numerical solutions, we construct a fitted analytical model and study observable properties calculated from this model and the numerical results.

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