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Principal Null Directions and Symmetries of Black holes in Quadratic Gravity[1] CAROLINE OWEN, NICOLAS YUNES, HELVI WITEK , University of Illinois at Urbana-Champaign — The gravitational waves emitted when a small compact object falls into a supermassive black hole depend sensitively on the orbital trajectory of the small object, which in turn depends on the properties of the spacetime generated by the supermassive black hole. The ability to test general relativity in this extreme gravity regime using gravitational wave observations from future space-based detectors such as the Laser Interferometer Space Antenna motivates the mathematical study of the symmetries of black holes in modified theories of gravity. In this talk, I will focus on the quadratic gravity modified theories dynamical Chern-Simons gravity and scalar Gauss-Bonnet gravity. While the Kerr metric for a spinning black hole in general relativity possesses two distinct principal null directions, the still unknown analogous exact solutions in both modified theories are each thought to possess four. I will present all principal null directions and Weyl scalars of such modified black holes in the slow rotation approximation. Additionally, for each modified theory I will investigate the existence of a Killing tensor that would generate a fourth constant of the motion.

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Caroline Owen
University of Illinois at Urbana-Champaign

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