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Comparing Kerr-Sen and Kerr-Newman black hole shadows

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Celebrating the centennial of its first experimental test, the theory of General Relativity (GR) has successfully and consistently passed all subsequent tests with flying colors. It is expected, however, that at certain scales new physics, in particular, in the form of quantum corrections, will emerge, changing some of the predictions of GR, which is a classical theory. In this respect, black holes (BHs) are natural configurations to explore the quantum effects on strong gravitational fields. BH solutions in the low-energy effective field theory description of the heterotic string theory, which is one of the leading candidates to describe quantum gravity, have been the focus of many studies in the last three decades. The recent interest in strong gravitational lensing by BHs, in the wake of the Event Horizon Telescope (EHT) observations, suggests comparing the BH lensing in both GR and heterotic string theory, in order to assess the phenomenological differences between these models. In this work, we investigate the differences in the shadows of two charged BH solutions with rotation: one arising in the context of GR, namely the Kerr–Newman (KN) solution, and the other within the context of low-energy heterotic string theory, the Kerr–Sen (KS) solution. We show and interpret, in particular, that the stringy BH always has a larger shadow, for the same physical parameters and observation conditions

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