Shadows of charged rotating black holes: Kerr-Newman versus Kerr-Sen

Sérgio Vinicius Monteiro C. B. Xavier and Luis Carlos Bassalo Crispino
Universidade Federal do Pará (UFPA) 66075-110, Brasil.

Pedro Vieira Pinto da Cunha
Max Planck for Gravitational Physics - Albert Einstein Institute, Am Mühlenberg 1, Potsdam 14476 Germany.

Carlos Alberto Ruivo Herdeiro
Departamento de Matemática da Universidade de Aveiro and Centre for Research and Development in Mathematics and Applications (CIDMA), Campus de Santiago, 3810-183 Aveiro, Portugal.

Celebrating the centennial of its first experimental test, the theory of General Relativity (GR) has successfully and consistently passed all subsequent tests with flying colours. It is expected, however, that at certain scales 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 mechanics of strong gravitational fields. String theory is a leading candidate to describe quantum gravity. BH solutions in the low energy effective field theory description of the heterotic string theory have been the focus of many studies in the last three decades. The recent interest in gravitational lensing by BHs, in the wake of the Event Horizon Telescope 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 solution, and the other within the context of low-energy heterotic string theory, the Kerr-Sen solution. Our results indicate, in particular, that the stringy BH always has a larger shadow, for the same physical parameters and observation conditions.