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Distorted black holes: exact solutions in an external magnetic field and local shadows

Abstract

Distorted black holes are local solutions describing the near-horizon region of a black hole, which interacts quasi-stationary with an external gravitational source. They can model astrophysical scenarios such as a black hole surrounded by an accretion disk, or a black hole in a binary system in the very initial stages of the inspiral. Astrophysical processes are frequently accompanied by the generation of strong magnetic fields. This motivates the construction of black hole solutions, which interact not only with an external matter distribution, but also with a large-scale magnetic field. In the first part of the talk we present a family of exact solutions reflecting the described scenario in the strong field regime. We investigate their thermodynamical properties, as well as the Meissner effect in the extremal case. In the second part we discuss the influence of the external matter on the light propagation in the black hole spacetime. For the particular case of quadrupole distortion we study the light ring structure, and the occurrence of multiple shadows.