

Black holes: on the universality of the Kerr hypothesis

Thursday 17 November 2022 09:00 (50 minutes)

To what extent are all astrophysical, dark, compact objects both black holes (BHs) and described by the Kerr geometry? We embark on the exercise of defying the universality of this remarkable idea, often called the “Kerr hypothesis”. After establishing its rationale and timeliness, we define a minimal set of reasonability criteria for alternative models of dark compact objects. Then, as proof of principle, we discuss concrete, dynamically robust non-Kerr BHs and horizonless imitators, that 1) pass the basic theoretical, and in particular dynamical, tests, 2) match (some of the) state of the art astrophysical observables and 3) only emerge at some (macroscopic) scales. These examples illustrate how the universality (at all macroscopic scales) of the Kerr hypothesis can be challenged.

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Session Classification: Plenary session

Track Classification: Cosmology and gravitation