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Physics of quadrupolar compact astrophysical objects

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Theoretical and observational efforts are being pursued to understand and test general relativity. The ideal regime for such surveying involves the strong gravitational fields in the vicinity of the astrophysical black holes and compact objects, which are not directly accessible. Large international collaborations like the Event Horizon Telescope, and LISA, among many others, make access to a wide range of observational data. Mostly, it is assumed that astrophysical black holes are described by Kerr solution. However, others can also imitate a blackhole's properties, making it challenging when one tries to link the models to the observation. The black hole mimickers are currently of significant interest in the astrophysics communities. It appears essential to explore departures due to exercising relatively small parameters that can be taken as the additional physical degrees of freedom to the set-up and facilitate the link to the observational data with analytical and numerical approaches. This talk will present the construction of such an alternative background and be followed up by a recap on the physics and astrophysical properties that one expects to observe, using analytical and numerical methods and testing them with observational data.

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