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Chaotic Solutions and Black Hole Shadow in f(R) gravity

Wednesday, 7 July 2021 06:30 (20 minutes)

We discuss the emergence of black hole shadow and photon-sphere inthe context of f(R) gravity. It is shown that the shadow is exponentially sensitive to linear instabilities of metric coming from some f(R) solutions. Thus, the instabilities of photon circular trajectories, delimiting the black hole photon-sphere, are double exponentialized. Specifically we individuate two Lyapunov exponents, rather than only one, related to two different sources of chaos in geodesic orbits as a sort of butterfly effect. Such a result violates the black hole chaos bound proposed by Maldacena, Shenker and Stanford for General Relativity. Wealso explore the impact of the black hole metric instabilities in f(R) gravity on the quasi-normal modes. In the framework of Extended Theories of Gravity, our analysis suggests a new paradigm to deal withblack hole shadow and gravitational waves observations coming from black hole merging in the ringdown phase.

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