

Trajectories of bright stars and shadows near supermassive black holes as tests of gravity theories

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Observations of bright near the Galactic Center give an opportunity to test GR predictions but also to constrain alternative gravity parameters, in particular, to limit graviton mass for the case of massive gravity theories. Due to an expected progress of observational facilities Zakharov et al. (2005a) proposed to use global and ground – space VLBI observations in mm band to detect a shadow at Sgr A* to use it as a tool to evaluate a black hole spin and a position angle of distant observer. In particular, it was predicted that the shadow diameter is around 52 μ as for the Sgr A* case and this prediction was remarkably confirmed by the Event Horizon Telescope (EHT) Collaboration on 12 May 2022. Also Zakharov et al. (2005b) showed that a black hole charge may be evaluated from shadow observations. Zakharov (2014) generalized these relations for the tidal charge case. In 2019 the EHT Collaboration reconstructed shadows at M87* in 2019 and at Sgr A* in 2022. As it was shown by Zakharov (2022) black hole charge may be found analytically from these observations.

References

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