

## IberiCOS 2022



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# Unveiling the nature of SgrA\* with the geodesic motion of S-stars

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We have used publicly available astrometric and spectroscopic measurements of the S0-2 star to constrain the metric around the supermassive object without finding any evidence either favouring or ruling out the wormhole nature. Secondly, we have designed a mock catalogue of future observations of the S0-2 star mirroring the accuracy and precision of GRAVITY. Afterwards, we firstly tested our methodology showing that our procedure recovers the input model, and subsequently we demonstrated that the constraining power of such a dataset is not enough to distinguish between black hole and wormhole. Finally, we built some toy models representing stars orbiting much closer to the central object than S0-2. We used these toy models to investigate which are the ideal orbital features and observational strategies to achieve our aim of unveiling the fundamental nature of the central supermassive object, demonstrating that a star with a period of the order of  $\sim 5$  years and a pericentre distance of  $\sim 5$  AU could identify the nature of the central object at almost  $5\sigma$  accuracy.

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