Contribution ID : **33** Type : **Oral talk**

Search for traversable wormholes using astrophysical methods

Friday, 30 October 2026 12:05 (15)

We present simulated detectability of traversable wormholes (WHs) in wide binary astrophysical systems without accretion (dormant binary systems) and in the Galactic center. The wormhole spacetime is represented as a gluing of two asymptotically flat Schwarzschild spacetimes, without specifying the detailed geometry of the throat. We consider a traversable WH candidate as a compact object in a binary system, whose companion star is perturbed by a massive object on an elliptical orbit on the other side of the WHthroat. In the case of a supermassive BH as WH candidate the perturbing acceleration is analyzed and compared with the stochastic gravitational influence of surrounding stars. For dormant wide binary systems, we analyze the radial velocity perturbations and their distinguishability from triple-system scenario. Under the model assumptions and the considered observational sampling, radial velocity perturbations are detectable in simulations with an observational accuracy of 1.5 km/s for all considered observation time spans. For a more conservative accuracy of 10 km/s, the spectral analysis methods become statistically significant after ≈ 17 years of simulated data accumulation. The spectral and non-parametric methods significantly reduce the required accumulation time compared to matched-filtering applied in isolation.

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Session Classification : Gravitation and cosmology

Track Classification : Gravitation and cosmology