

Gravitational Geometry and Dynamics Group Seminar

Wed., July 8, 2026, at 11h00.

Room: Sala Sousa Pinto and Teams ID: 383 592 490 722 303

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Time delay as a probe of multiple photon spheres

Recent investigations into non-vacuum general relativity and parametrized spacetimes have reported viable black hole solutions that admit multiple photon spheres. Investigations of these black holes through their shadows often suffer from parameter degeneracy. In this talk, I will demonstrate that time-domain lensing observables from transient sources provide a robust mechanism to break these degeneracies.

Using a model-independent framework, we analyzed the temporal signatures of null geodesics that probe the region between the unstable photon spheres. We found that these trajectories exhibit non-monotonic behavior, characterized by a minimum travel time and a minimum angular deflection. For a fixed source-observer configuration, strongly lensed photons generate higher-order image triplets that arrive in a characteristic time sequence. Crucially, we show that a shallower potential well at the anti-photon sphere significantly shortens photon travel times, providing a direct observational handle on otherwise inaccessible regions of spacetime trapped between the two photon spheres.