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Photon Surfaces and Shadows of Compact Objects

Tuesday 18 June 2024 09:30 (30 minutes)

In this talk, I will define the photon surface conditions using Cartan scalars within an invariant spin frame which offers a comprehensive description of the local spacetime geometry. By employing this approach, one can gain novel insights into the geometry and dynamics of photon surfaces, independent of the global spacetime structure. I will first discuss the photon surface conditions in a Petrov type-D spacetime manifold, and then I simplify those conditions assuming the existence of spherical symmetry. Finally, employing the simplified, spherically symmetric photon surface conditions, I will show the dynamics of photon surfaces in static spacetimes and collapsing Lemaitre-Tolman-Bondi (LTB) spacetimes and Vaidya spacetimes. Following the discussion on the local geometry of photon surfaces, I will talk about the recent advancements in comprehending the existence of shadows and relativistic photon rings, along with the necessary and sufficient conditions for their existence.

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