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Remarks on the black hole shadows in Kerr-de Sitter space times

This work is geared towards analysis of shadows cast by Kerr-de Sitter (kds) and Revisited Kerr-de Sitter (RKdS) black holes. Considering observers in the vicinity of the static radius, we derive the impact parameters defining the apparent positions of the shadows. Such observers are of interest to our work because embedding diagrams have shown that de Sitter space-time is analogous to an asymptotically flat one in the vicinity of the static radius. We also perform a comparative analysis between our result with that in Ref.[1]. Furthermore, we numerically obtain the radii of curvature, vertical diameters and horizontal diameters of the shadows. We find that for $\Lambda = 1.11 \times 10^{-52} m^{-2}$, M87*observations cannot distinguish a RKdS black hole shadow from that of a Kerr black hole. Additionally, for the same value of* Λ*, KdS and RKdS black hole shadows are, in practise, indistinguishable. Previously, it has also been shown that when* $\Lambda = 1.11 \times 10^{-52} m^{-2}$*, KdS and Kerr black hole shadows are indistinguishable. Utilizing the 2017 EHT observations of M87* on the allowed range of the characteristic radius of the shadow, we obtain constraints on both black holes. When, $a/M > 0.812311$, we observe that large angles of inclination ($\theta > 30.5107^{\circ}$) do not pass the constraints for both KdS and RKdS black holes.

Authors: OMWOYO, Eunice; Prof. VELTEN, Hermano (Universidade Federal de Ouro Preto); Prof. BELICH, Humberto (Universidade Federal do Esp\'irito Santo); Prof. C. FABRIS, Julio (Universidade Federal do Esp\'irito Santo)

Presenter: OMWOYO, Eunice

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