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M. Oi: Constraining regular black holes with S2 star data

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Black-hole existence has been widely tested in several contexts, with all observations in agreement with general relativity (GR). However, GR predicts the presence of a curvature singularity at the black- hole core, where the theory breaks down. Consequently, there has recently been increased interest in studying regular black-hole geometries, i.e., objects that are completely regular everywhere. Although their behavior resembles that of a GR solution at great distances from the source, they usually exhibit interesting phenomenological properties at the horizon scale.

In this talk, we present a novel regular black-hole model, characterized by an additional length scale l, which has the strongest possible corrections at great distances compared to the Schwarzschild black hole. Interestingly, our geometry modifies the precession angle proportionally to l, and we find that the orbit becomes retrograde for l > GM . For this reason, we can impose an upper bound on the deformation parameter using the orbits of the S2 star around the compact radio source SgrA* in the Galactic Center. Finally, we observe that this upper bound is compatible with our thermodynamic stability analysis.

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