GRAVITY Collaboration: Probing the gravitational potential around Sagittarius A* with stellar orbits

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Abstract

Since 2017, the GRAVITY interferometer at ESO's Very Large Telescope has allowed us to obtain astrometric data with unprecedented accuracy of the S-stars orbiting around Sagittarius A*, turning them into a wonderful tool to investigate the gravitational potential around Sagittarius A* probing the regime of intermediate-strong gravitational fields. In particular, we have been able to detect two effects predicted by General Relativity on the orbit of the star S2, namely the gravitational redshift of spectral lines and the in-plane, Schwarzschild precession of the orbit's pericenter angle.
In this talk, I will present the progress we have made in recent years regarding the detection of the Schwarzschild precession, having continued to monitor S2 and other S-stars with GRAVITY, and describe which are the orbital characteristics of more penetrating, potentially observable, S-stars that could allow to measure the spin of Sagittarius A*.
Additionally, I will present the upper limits we obtain on the extended mass component in the Galactic center, which could consist of other stars, stellar remnants, and possibly dark matter distributed around Sagittarius A*, assuming typical density profiles. If present, such an extended mass component would add a retrograde precession of the stellar orbits, counter-acting the prograde Schwarzschild precession.

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