Contribution ID: **125** Type: **Oral**

Dyonic Kerr-Sen black holes revisited: shadow profiles and consequences

Black holes with dyonic charges in Einstein-Maxwell-dilaton-axion supergravity theory are revisited in the context of black hole shadows. We consider static as well as rotating (dyonic Kerr-Sen) black holes. The matter stress-energy tensor components, sourced by the Maxwell, axion and dilaton fields satisfy the standard energy conditions. The analytical expressions for the horizon and the shadow radius of the static spacetimes demonstrate their dependence on P^2+Q^2 (P, Q the magnetic and electric charges, respectively) and the mass parameter M.

The shadow radius lies in the range $2M < R_{shadow} < 3\sqrt{3}M$ ($G=1$, $c=1$) and there is no stable photon orbit outside the horizon. Further, shadows cast by the rotating dyonic Kerr-Sen black holes are studied and compared graphically with their Kerr-Newman and Kerr-Sen counterparts. Deviation of the shadow boundary is prominent with the variation of the magnetic charge, for the relatively slowly rotating dyonic Kerr-Sen spacetimes. We test any possible presence of a magnetic monopole charge in the backdrop of recent EHT observations for the supermassive black holes M87* and Sgr A*. Deviation from circularity of the shadow boundary (ΔC) and deviation of the average shadow radius from the Schwarzschild shadow radius (quantified as the fractional deviation parameter δ) are the two observables used. The observational bound on ΔC (available only for M87*) is satisfied for all theoretically allowed regions of the parameter space and thus cannot constrain the parameters. The observational bound on δ available for Sgr A* translates into an upper limit on any possible magnetic monopole charge linked to Sgr A* and is given as P
$lesssim 0.873M$.

Constraints on P obtained from other astrophysical effects, such as the observed temperature of clouds of warm ionized medium (WIM) in the Milky Way and the Parker bound on the flux of magnetic monopoles, are however expected to be far more stringent though rigorous analyses along these lines is lacking. Future refined imaging (shadow) observations
will surely help in improving the bound on P arrived at here.

Reference: S. Jana and S. Kar, Phys. Rev. D **108**, 044008 (2023).

Email

soumyajana.physics@gmail.com

Affiliation

Sitananda College (Vidyasagar University), Nandigram

Author: Dr JANA, Soumya (Sitananda College)

Co-author: KAR, Sayan (Indian Institute of Technology Kharagpur)

Presenter: Dr JANA, Soumya (Sitananda College)

Session Classification: Classical & Quantum Gravity

Track Classification: Classical & Quantum Gravity