Contribution of tidal distortion of polytropic stars to periastron shift within an extended mass region of the Galactic Centre black hole Sgr A*

P.C LALREMRUATI [1,*]

1 GAUHATI UNIVERSITY

* Presenting author (pcremruati905@gmail.com)

A star orbiting the Galactic Centre black hole experiences tidal distortion. Depending upon the radius and mass of the star, it can be captured by the black hole. For a binary star, there are scenarios where a star is ejected with high velocity from the system while its companion is captured with high eccentricity by the black hole, a phenomena best described as Hills mechanism. In this work, we estimate the periastron shift of compact stellar orbits (the S-stars) contributed by tidal effect by taking the best available mass radius relation (MRR) and considering the stars as polytropes of order n = 0,1 and 3 in compact orbits near the Galactic Centre supermassive black hole Sgr A*. The S-stars are assumed to be enclosed within a spherical uniform mass distribution around Sgr A* having eccentricity, e = 0.9. We have considered Low Mass Stars (LMS) with stellar masses 0.18Ã°Â□â€˜â‚¬ÃŽÆ , 1.0Ã°Â□â€˜â‚¬ÃŽÆ and 1.5Ã°Â□â€˜â‚¬ÃŽÆ, High Mass Stars (HMS) with stellar masses 10Ã°Â□â€˜â‚¬ÃŽÆ , 20Ã°Â□â€˜â‚¬ÃŽÆ and 30Ã°Â□â€˜â‚¬ÃŽÆ. The orbital inclination is fixed at i = 90 Ã‚Â° and spin value of the supermassive black hole Sgr A* is taken at Ã°Â□Å“â€™ = 0.1, 0.44 and 0.9.The estimated values of periastron shift are compared with the astrometric capabilities of the existing and upcoming Extremely Large Telescopes (ELTs). The effect of extended spherical mass near Sgr A* will be highlighted.