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Gravitational lensing by rotating Simpson–Visser black holes

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We investigate strong-field gravitational lensing by rotating Simpson-Visser black hole, which has an additional parameter (l), apart from mass (M) and rotation parameter (a). It can admit Cauchy and event horizons for some parameters and free from the singularity and assess phenomenological differences from the Kerr black holes. We also find a decrease in the deflection angle α_D, angular position θ_1 decreases more slowly and x_m more quickly, but angular separation s increases more rapidly, and their behavior is similar to that of the Kerr black hole. We apply the formalism to discuss the astrophysical consequences in the supermassive black holes NGC 4649, NGC 1332, Sgr A*and M87* and find that the rotating Simpson-Visser black holes can be quantitatively distinguished from the Kerr black hole via gravitational lensing effects. However, the deviations of the angular positions of the first image from that of the Kerr black hole are not more than 0.194 μas for Sgr A*, 0.04565 μas for M87, 0.0920051 μas for NGC 4649, and 0.0487413 μas for NGC 1332 and thus required resolution is much higher than current astronomical observation capability like of EHT.

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