

R14c Trigonometric parallax and proper motion of Sagittarius A* measured by VERA using the new broad-band back-end system OCTAVE-DAS

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We successfully measured the trigonometric parallax of Sagittarius A* (Sgr A*) to be 117 ± 17 microarcseconds (μas) using the VLBI Exploration of Radio Astrometry (VERA) with the newly developed broad-band signal-processing system named “OCTAVE-DAS.” The measured parallax corresponds to a Galactocentric distance at the Sun of $R_0 = 8.5_{-1.1}^{+1.5}$ kpc. By combining the astrometric results with VERA and the Very Long Baseline Array (VLBA) over a monitoring period of 25 years, the proper motion of Sgr A* is obtained to be $(\mu_\alpha, \mu_\delta) = (-3.133 \pm 0.003, -5.575 \pm 0.005)$ mas yr⁻¹ in equatorial coordinates, corresponding to $(\mu_l, \mu_b) = (-6.391 \pm 0.005, -0.230 \pm 0.004)$ mas yr⁻¹ in Galactic coordinates. This gives an angular orbital velocity of the Sun of $\Omega_\odot = 30.30 \pm 0.02$ km s⁻¹ kpc⁻¹. We find upper limits to the core wander, $\Delta\theta < 0.20$ mas (1.6 AU), peculiar motion, $\Delta\mu < 0.10$ mas yr⁻¹ (3.7 km s⁻¹), and acceleration, $a < 2.6 \mu\text{as yr}^{-2}$ (0.10 km s⁻¹ yr⁻¹) for Sgr A*. Thus, we obtained upper mass limits of $\approx 3 \times 10^4 M_\odot$ and $\approx 3 \times 10^3 M_\odot$ for the supposed intermediate-mass black holes at 0.1 and 0.01 pc from the Galactic center, respectively (Oyama et al. 2024, PASJ, 76, 163).