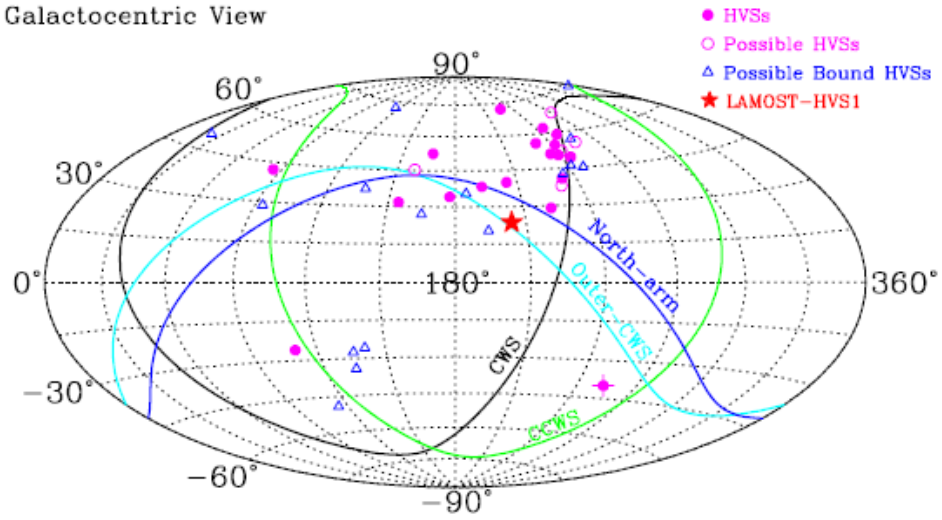
Joint Institute for Nuclear Astrophysics

The First Hypervelocity Star from the LAMOST Survey



Galactocentric view of the sky distribution of HVSs in the Galactic coordinate system and the position of LAMOST-HVS1 (shown as the red star symbol). The positions of stars are shifted to match what would be seen by an observer at the Galactic center. The great circles correspond to different structures of stellar distribution near the massive black hole at the center of the Milky Way.

Scientists from JINA and their international colleagues have recently reported the first hypervelocity star (HVS) discovered from the LAMOST spectroscopic survey. LAMOST is a Chinese telescope, now engaged in carrying out a dedicated medium-resolution spectroscopic survey of some 10 million stars, roughly a factor of 20 larger than the stellar surveys carried out by the Sloan Digital Sky Survey.

Hypervelocity stars are stars with velocities higher than the escape velocity of the Galaxy. They were first predicted by Hills (1988, Nature, 331, 687) as a consequence of the tidal disruption of tight binary stars by the central massive black hole (MBH). Since the first discovery of an HVS in the Galactic halo, around 20 HVSs have been found.

This new HVS is a B-type star with a heliocentric radial velocity of about 620 km s^{-1}, which projects to a Galactocentric radial velocity component of ~ 477 km s^{-1}. With a heliocentric distance ~13 kpc and a magnitude about ~13 mag, it is the nearest and brightest HVS, and it also one of the two most massive (~9$M_{\odot}$). The star is clustered on the sky with many other known HVSs, and the position suggests a connection to Galactic center structures. The LAMOST spectroscopic survey has the potential to discover a large number of HVSs.

The LAMOST telescope at the Xinglong Observing Station, about 100 miles northeast of Beijing, China. The large 4-meter mirror of LAMOST enables it to obtain spectra of faint objects. LAMOST is designed with 4000 optical fibers in the optical path, covering a large region of the sky simultaneously. This unique system is being used to conduct a survey of 10 million stars in our Galaxy over the next 5 years. JINA personnel have worked with the LAMOST team in order to develop and apply spectroscopic pipelines for this effort.

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