Analyzing the Effects of General Relativity on Hypervelocity Star Ejection Velocities

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Hypervelocity stars (HVSs) move on unbound trajectories with extremely high velocities. HVSs are ejected in three-body interactions where binaries are disrupted by a massive black hole's (MBH) tidal gravity. Binaries that undergo sufficiently close passes may exhibit differences in ejection velocities compared to Newtonian models due to general relativistic effects. Ejection velocity differences between Newtonian and relativistic models were quantified using numerical simulations. The relativistic model exhibits faster ejection velocities with a difference of approximately 103 km/s at the time of ejection for a 1 + 1 Msun binary with semimajor axis 0.1 AU and a 3.5 x 10^6 Msun MBH.

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