

High Spectral Resolution Observations of the Massive Stars in the Galactic Center

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We present high-resolution near-infrared spectra, obtained with the NIRSPEC spectrograph on the W. M. Keck II Telescope, of a collection of hot, massive stars

within the central 25 arcseconds of the Galactic center. We have identified a total of twenty-one emission-line stars, seven of which are new radial velocity detections with five of those being classified as He I emission-line stars for the first time. These stars fall into two categories based on their spectral properties: 1) those with narrow $\lambda\lambda$ 2.112, 2.113 micron He I doublet absorption lines, and 2) those with broad 2.058 micron He I emission lines. These data have the highest spectral resolution ever obtained for these sources and, as a result, both components of the absorption doublet are separately resolved for the first time. We use these spectral features to measure radial velocities.

The majority of the measured radial velocities have relative errors of 20 kms, smaller than those previously obtained with proper-motion or radial velocity measurements for similar stellar samples in the Galactic center. The radial velocities estimated from the He I absorption doublet are more robust than those previously estimated from the 2.058 micron emission line, since they do not suffer from confusion due to emission from the surrounding ISM. Using this velocity information, we agree with previous stellar velocity studies that the stars are orbiting in a somewhat coherent manner but are not as defined into a disk or disks as previously thought. Finally, multi-epoch radial velocity measurements for IRS 16NE show a change in its velocity presumably due to an unseen stellar companion.

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