

Discovery of WASP-85 Ab: A Hot Jupiter in a Visual Binary System

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Abstract

We report the discovery of the transiting hot Jupiter exoplanet WASP-85Ab. Using a combined analysis of spectroscopic and photometric data, we determine that the planet orbits its host star every 2.66 days, and has a mass of $1.09 \pm 0.03 M_{\text{Jup}}$ and a radius of $1.44 \pm 0.02 R_{\text{Jup}}$. The host star is of G5 spectral type, with magnitude $V=11.2$, and lies 125 ± 80 pc distant. We find stellar parameters of $T_{\text{eff}}=5685 \pm 65$ K, super-solar metallicity ($[Fe/H]=0.08 \pm 0.10$), $M_{\text{star}}=1.04 \pm 0.07 M_{\text{sun}}$ and $R_{\text{star}}=0.96 \pm 0.13 R_{\text{sun}}$. The system has a K-dwarf binary companion, WASP-85B, at a separation of approximately $1.5''$. The close proximity of this companion leads to contamination of our photometry, decreasing the apparent transit depth that we account for during our analysis. Without this correction, we find the depth to be 50 percent smaller, the stellar density to be 32 percent smaller, and the planet radius to be 18 percent smaller than the true value. Many of our radial velocity observations are also contaminated; these are disregarded when analysing the system in favour of the uncontaminated HARPS observations, as they have reduced semi-amplitudes that lead to underestimated planetary masses. We find a long-term trend in the binary position angle, indicating a misalignment between the binary and orbital planes. WASP observations of the system show variability with a period of 14.64 days, indicative of rotational modulation caused by stellar activity. Analysis of the Ca ii H+K lines shows strong emission that implies that both binary components are strongly active. We find that the system is likely to be less than a few Gyr old. WASP-85 lies in the field of view of K2 Campaign 1. Long cadence observations of the planet clearly show the planetary transits, along with the signature of stellar variability. Analysis of the K2 data, both long and short cadence, is ongoing.