

Precise masses for the transiting planetary system HD 106315 with HARPS [★]

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ABSTRACT

Context. The multi-planetary system HD 106315 was recently found in K2 data. The planets have periods of $P_b \sim 9.55$ and $P_c \sim 21.06$ days, and radii of $r_b = 2.44 \pm 0.17 R_\oplus$ and $r_c = 4.35 \pm 0.23 R_\oplus$. The brightness of the host star ($V=9.0$ mag) makes it an excellent target for transmission spectroscopy. However, to interpret transmission spectra it is crucial to measure the planetary masses.

Aims. We obtained high precision radial velocities for HD 106315 to determine the mass of the two transiting planets discovered with Kepler K2. Our successful observation strategy was carefully tailored to mitigate the effect of stellar variability.

Methods. We modelled the new radial velocity data together with the K2 transit photometry and a new ground-based partial transit of HD 106315c to derive system parameters.

Results. We estimate the mass of HD 106315b to be $12.6 \pm 3.2 M_\oplus$ and the density to be $4.7 \pm 1.7 \text{ g cm}^{-3}$, while for HD 106315c we estimate a mass of $15.2 \pm 3.7 M_\oplus$ and a density of $1.01 \pm 0.29 \text{ g cm}^{-3}$. Hence, despite planet c having a radius almost twice as large as planet b, their masses are consistent with one another.

Conclusions. We conclude that HD 106315c has a thick hydrogen-helium gaseous envelope. A detailed investigation of HD 106315b using a planetary interior model constrains the core mass fraction to be 5-29%, and the water mass fraction to be 10-50%. An alternative, not considered by our model, is that HD 106315b is composed of a large rocky core with a thick H-He envelope. Transmission spectroscopy of these planets will give insight into their atmospheric compositions and also help constrain their core compositions.

Key words. planetary systems: detection – planetary systems: fundamental parameters – planetary systems: composition – stars: individual HD 106315, EPIC 201437844 – techniques: photometric – techniques: radial velocities