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**POSSIBLE DETECTION OF THE PLANET TRANSITS  
OF HD 209458 IN THE HIPPARCOS PHOTOMETRY**

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Recently, the spectroscopically detected 3.52 day planet to HD 209458 has been observed by photometric transits (Charbonneau et al. 1999, Henry et al. 1999). The star (= HIP 108859) is bright ( $V = 7.65$ ), and the Hipparcos epoch photometry (ESA, 1997) lists 89 observations with median  $H_p = 7.772$  and typical 0.014 magnitude scatter. This is only marginally sufficient to discern 0.02 magnitude minima (covering 3.4% of the orbit), but by a lucky distribution of the observations, data may have been obtained at five epochs near minimum light.

What I have done is basically just to check the  $\chi^2$  fit of the Hipparcos observations to the Charbonneau et al. light-curve, by starting at the well-observed transit epoch 2451430.823 and varying the as yet imperfectly known period. The  $\chi^2$  sum [ $(O - C)/\sigma$  squared] for constant light is about 148, but at around  $P = 3.52473 \pm 0.00005$ , the  $\chi^2$  is down to 118, the lowest minimum for any period 3.25–3.75 days. It also fits very well with the spectroscopic period  $3.5245 \pm 0.0003$ . (Checking the whole 2–5 day range, there are only two other equally good fits, at the spurious periods 2.9542 and 3.7904 days). Charbonneau et al. predict a deeper minimum than their 0.018 mag  $R$  value in  $B$  or  $V$ , and repeating the fit with a 50% deeper minimum gives minimum  $\chi^2$  around 116, at the same period(s). One may also test excluding some presumably poor observations, but the results remain basically unchanged.

As stated above, the ‘detection’ is in the following five observations, as listed (on CD-ROM) in the epoch photometry Annex (ESA, 1997):

JD – 2400000	phase ( $P$ )	$H_p$	$\sigma$
48364.301	–0.002	7.798	0.012
48364.316	+0.002	7.787	0.010
48413.623	–0.009	7.791	0.008
48565.209	–0.002	7.809	0.012
48565.223	+0.002	7.798	0.007

The full phase-plot with all observations is not very convincing (Fig. 1.), and the main evidence remains the above tests of all possible periods. It will not be too long until repeated photometric observations will have determined the true period, but until then there is a small probability that Hipparcos may have contributed to give the best value to date.

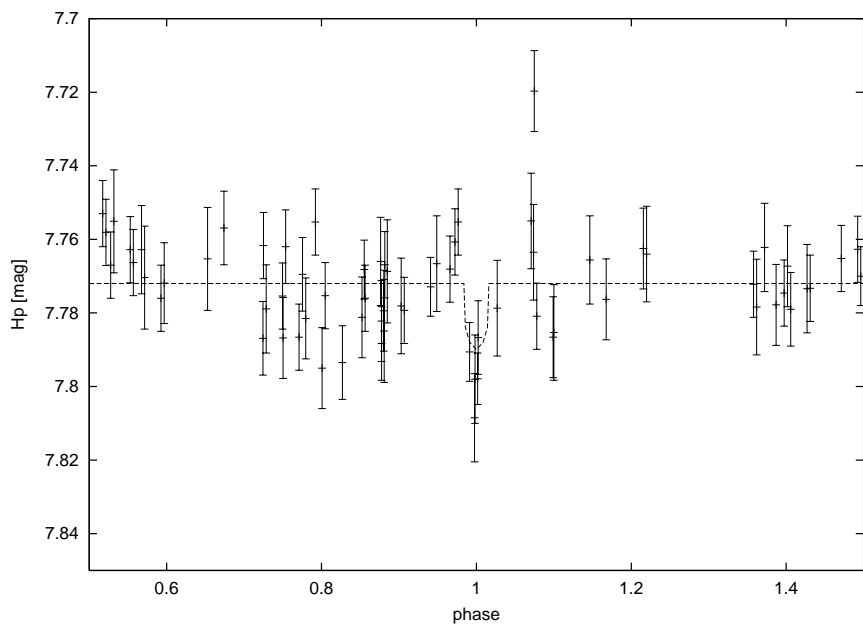


Figure 1.

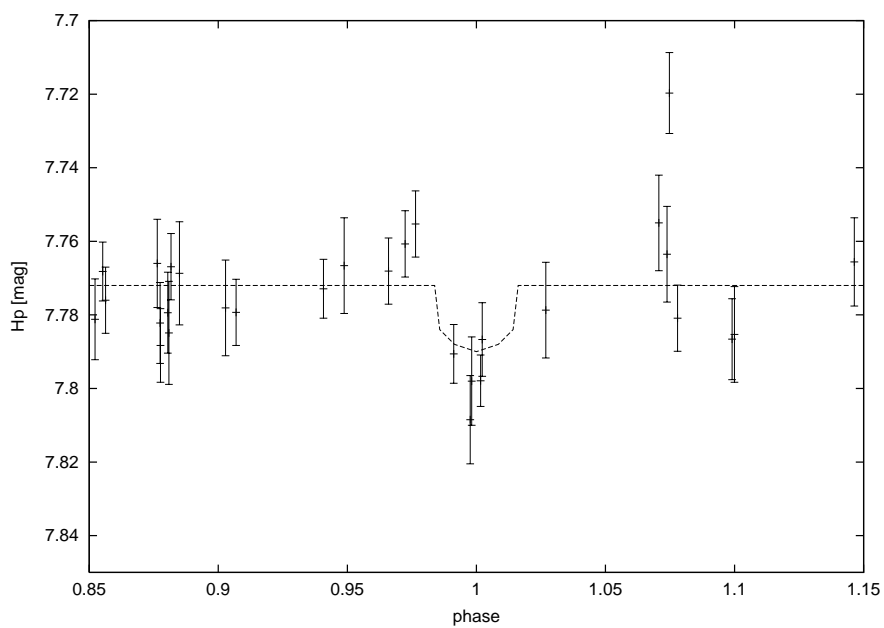


Figure 2.

## References:

- Charbonneau D., Brown T.M., Latham D.W., Mayor M., 1999, *ApJL* (in press)  
ESA, 1997, *The Hipparcos and Tycho Catalogues*, ESA SP-1200  
Henry G.W., Marcy G.W., Butler R.P., Vogt S.S., 1999, *ApJL* (in press)