From laugh@ucolick.org Fri Jul 2 19:29:21 2004
Date: Thu, 1 Jul 2004 19:03:27 -0700 (PDT)
From: Gregory Laughlin <laugh@ucolick.org>
To: Andrew Cumming <cumming@ucolick.org>
Cc: gmarcy@etoile.berkeley.edu, laughlin@ucolick.org, paul@dtm.ciw.edu,
fischer@serpens.berkeley.edu, vogt@ucolick.org
Subject: HD80606 update

Hi Everyone,

Here is an update regarding the upcoming periastron passage of HD 80606b on July 11. It is a real stroke of luck that this extraordinary event corresponds with a Keck run.

First the airmass situation... HD 80606 is a serious stretch for July, and Geoff told me that the telescope operator will need to be notified in advance of the large hour angle involved.

HD 80606 airmass table for July 8-12 Keck run:

local time=20:00	Airmass	HA	Sun Alt	JD	
July 7	2.839	05 25	-12.4	2453194.75	
July 8	2.924	05 29	-12.4	2453195.75	
July 9	3.014	05 33	-12.4	2453196.75	
July 10	3.109	05 37	-12.5	2453197.75	<- critical night
July 11	3.211	05 41	-12.5	2453198.75	

Using the Monte Carlo generation of synthetic data sets method to estimate undertainties, I calculate the following fit to the combined Keck+Swiss data sets. Andrew, using an independent code, found a fit that is identical to within the estimated error bars.

```
        P =  111.301 +/- 0.033 d
        Mean anomaly  =  296.7 +/- 0.8 deg at epoch JD 2451508.677
        (equivalent to Tperi= JD 2453197.75)
->      e = 0.9712 +/- 0.018
        w  = 309.946014 +/- 5 deg
        M=4.83 +/- 0.58 Mjup (assuming 1.1 Msun for the star)
```

The best fit therefore has the planet coming within 2 stellar radii at close approach, which would have many very interesting ramifications.

The attached postscript figure shows the predicted radial velocity curve during the upcoming Keck run. The four vertical red lines show 08:00 PM Keck time on July 9, July 10, July 11, and July 12. For the best-fit to the current data, the July 10th observing opportunity falls right on the rapidly varying portion of the radial velocity curve. RV's obtained on this portion of the curve will strongly constrain the eccentricity. Currently, the location of the big swing is uncertain by about 1/3 of a day.

The two green lines show the predicted ingress and egress times in the event of a transit. The July 11 opportunity falls very close to this window, and gives rise to the possibility of measuring the Rossiter McLaughlin effect. The transit probability is about 5%.

Here is the predicted radial velocity curve for the early evening of July 10th.

JD-2400000 vel (m/s)