Announcement: NRL-USNO-AAVSO-TransitSearch Join in a Radio-Visual Exoplanet Campaign

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Draft 4 March 2005

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The U.S. Naval Observatory (USNO), the U.S. Naval Research Laboratory (NRL), the AAVSO, and TransitSearch.org have joined to undertake a pan-spectral demonstration campaign to observe planet-bearing stars. Although the planets that accompany the target stars of this first campaign are known to be non-transiting, it is possible that coordinated observations across a wide range of the electromagnetic spectrum can potentially reveal useful information concerning the nature of extrasolar planets and their respective parent stars.

While TransitSearch and AAVSO observers photometrically target two particularly interesting systems in the visual, Dr. Joe Lazio of NRL will observe these systems in the decameter bands with the Giant Metrewave Radio Telescope (GMRT) located in Pune, India (itself under the auspices of India's National Centre for Radio Astrophysics). The GMRT is a 12 antenna radio telescope, with a central array 1 km x 1 km in size having 6 antennas set along each of three 14-km arms of a Y-array. Front-end electronics allow it to operate at 150, 235, 327, 610, 40-60 and 1000-1430 MHz as an interferometer (much like the US VLA), since observations there began in mid-1997. Dr. Lazio will be observing these two (and several other) exoplanet systems in the decameter bands during the visual campaign.

The data obtained in this campaign will be correlated and assessed by Greg Laughlin (UCSC/Lick Observatory/TransitSearch), Paul Shankland (USNO), and Dr. Lazio, once the visual data is reduced by the AAVSO team lead (Aaron Price). The primary goal of this campaign is to establish a capacity for the AAVSO and TransitSearch networks to collaborate with professional radio observatories in order to conduct simultaneous observations of known planet-bearing stars across many bands of the spectrum. One specific result could be the detection of synchrotron-induced auroral activity around the planet(s) and/or other types of dusty debris in the system – and perhaps correlating these with a visual precursor. There may also be magnetic correlations and other dynamic interactions between the planets and their stars, which a radio-visual correlation could reveal. In any event, these are uncharted scientific waters requiring high precision optical

observations. Further information about the candidate stars can be located for Tau Boo (highest priority) at: http://www.ucolick.org/%7elaugh/tau_boo__b.results.html, and for HD162020 at http://www.ucolick.org/%7elaugh/HD162020_b.results.html. Less is known photometrically of the tertiary target, 70 Vir. Note that the latter possibly exhibits an unusual 1:1 resonance; while there is no current evidence assuring that configuration, this campaign may help to clarify the nature of any resonance found in the system. Specific characterizations of each system is as follows:

Tau Boo Planet b

Period:	3.312450+/- 0.00003 days
Periastron:	2451653.1400+/- 0.01500 days
Eccentricity:	e=.0000 +/- .0000
Argument of Perihelion:	omega= 0.000 +/- 0.000deg.
Velocity Half-amplitude:	K= 469.000 +/- 5.000
Minimum Planet Mass:	4.106Mjup
Stellar mass:	1.30Msun
Stellar Effective Temperature	Teff=6000K
Stellar radius:	1.60Rsun
Predicted Radius (with core):	1.12Rjup
Predicted Radius (w/o core):	1.13Rjup

HD162020 Planet b

Period:	8.428198+/- 0.00006 days
Periastron:	2451990.6670+/- 0.00500 days
Eccentricity:	e=.2770 +/- .0020
Argument of Perihelion:	omega= 28.400 +/- 0.230deg.
Velocity Half-amplitude:	K=1813.000 +/- 4.000
Minimum Planet Mass:	14.578Mjup
Stellar mass:	0.75Msun
Stellar Effective Temperature	Teff=4830K
Stellar radius:	0.75Rsun
Predicted Radius (with core):	1.10Rjup
Predicted Radius (w/o core):	1.11Rjup

70 Vir Planet b

Period:	116.689000+/- 0.10000 days
Periastron:	2450040.2600+/- 1.00000 days
Eccentricity:	e=.4000 +/- .0200
Argument of Perihelion:	omega=358.000 +/- 2.000deg.
Velocity Half-amplitude:	K= 315.200 +/- 3.000
Minimum Planet Mass:	7.434Mjup
Stellar mass:	1.10Msun
Stellar Effective Temperature	Teff=5800K
Stellar radius:	1.10Rsun
Predicted Radius (with core):	1.09Rjup
Predicted Radius (w/o core):	1.10Rjup

For AAVSO and TransitSearch observers, high precision, time-series photometric observations in V and B are requested for these stellar targets during the following windows:

Target	**Location**
Tau Boo	RA 13:47 Dec +17:27
HD162020	RA 17:51 Dec-40:19
70 Vir	RA 13:28 Dec +13:46

Start	**End**
17:30 March 5	13:30 March 8
16:30 March 14	13:30 March 17

Photometrically, each of these targets presents unique challenges; refer to AAVSO announcements in order to optimize methodology and retrieve charts for observations of each target exoplanet system. AAVSO has devised charts for each of these objects and can be found found at the AAVSO website. Further campaign details can be located at http://www.aavso.org/news/gmrt.shtml, along with ongoing discussions on the AAVSO and transitSearch e-lists/chats. It is possible that someone may detect some unusual activity in a star during the campaign. If modifications to this campaign occur (e.g., unusual detections or activity compels a need to retarget or concentrate observations mid-campaign), these will be posted via chat and the e-lists. If so we may ask all visual observers to turn their attention to a single object.

Also, Lazio and Shankland may need these observations to update/modify the GMRT observing run. We request that you monitor your photometry as it comes in. If you notice anything strange or interesting please post it to the AAVSO Photometry Discussion Group or the chat room, even if preliminary in nature; follow-up reduction via normal submission means would then be appropriate. As well, coordination of observations should follow AAVSO guidelines as put forth in relevant announcements.

Note that a follow-on, more extensive campaign is tentatively slated for April 15-17 and may involve more targets. We will issue a separate announcement for that in April.

References

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