

**SPECTROPOLARIMETRIC OBSERVATIONS OF TRANSITING EXTRASOLAR PLANETARY SYSTEM HD189733** Anatolij P. Vid'machenko<sup>1</sup>, Yu.S. Ivanov<sup>1</sup>, N.M.Kostogryz<sup>1</sup>, Main Astronomical Observatory of NAS of Ukraine, Kyiv, 03680, Ukraine; kosn@mao.kiev.ua

**Introduction:**

Spectropolarimeter was manufactured to measure the linear polarization of radiation from celestial objects in a spectral region (depends from CCD camera) 350-11500 nm (Vidmachenko et al., 2007). The polarimeter satisfy the following requirements: it equipped by panoramic light receiver; the number of elements and their thickness are minimized; each optical element of polarimeter was designed to realize a maximal number of functions (power, polarimetry, correction) simultaneously. Dispersive elements were excluded from the construction of polarimeter. Instead of these, it was used a Wollaston prism unique design. It consists of two wedges with spherical surfaces assembled at the optical contact, and the curvature centers of the wedges were displaced. Thus, the functions of image formation, selection of wavelength, and polarimetric analysis are concentrated in one element. It splits the light on two parallel ordinary and extraordinary beam and the sky contributes to both beams and its polarization can be accurately compensated in the entire region of the spectrum. To measure linear polarization, the retarder was rotated on 22.5 degree intervals.

In this abstract we present our test observations with mentioned spectropolarimeter, which were made during the planet transit through the host star. We choose HD189733 because it is currently the brightest ( $m_V = 7.67$  mag) known star to harbour a transiting exoplanets (Bouchy et al. 2005). This, along with the short period (2.2 d), makes it very suitable for different type of observations including polarimetry.

**Spectropolarimetric Observations:** Spectropolarimetric observations were carried out in 17 July 2010 with spectropolarimeter mounted in the Cassegrain focus at the 70cm telescope of Golosiiv (Kyiv). We observed HD189733, when the planet crossing the host star. Exposure time was 16 seconds per 16 position of plate. The beginning of star eclipse by the planet was at 20:10 UTC, center was at 21:05 UTC, and the end was at 22:00 UTC. During the transiting we carried out observations in 7 moments: 1) 20:13, 2) 20:27, 3) 20:52, 4) 21:08, 5) 21:34, 6) 21:50 and 7) 22.06 UTC, respectively. Its means that the first two (1, 2) correspond to the first and second contact. Another three observations (3, 4 and 5) were made when the planet was near the center of the stellar disk. The next one (6) was observed during the third contact, and during the last one (7) the hole planet disk was out the stellar disk. Except HD189733 we also observed two invariable and unpeculiar stars with high level of linear polarization

and with zero polarization to determine the instrumental polarization. All spectra are reduced using the Spectra package designed by A.Baklanov.

**Results:** On July 17th 2010 we observed the planet hosting star HD189733 with the spectropolarimeter with the aim of looking for some changes during the transit. After reducing the data, we obtain that smoothing resulting standard deviation of the calculated values of the linear polarization is about 0.03% at  $\lambda = 490-950$  nm, and 0.04-0.07% at  $\lambda = 420-470$  and  $\lambda = 970-1050$  nm. Spectral scans of linear polarizations (in  $10^{-4}\%$  of P) for HD189733 are presented on Figure 1. We note a slight increase in the degree of linear polarization of HD189733 in the wavelength range 970-1030 nm. Another polarization degree increasing that is a nearly two-fold greater, is in the spectral range 440-480 nm. The largest value of linear polarization degree is at the moment when the planet is near the central meridian near the pole star.

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**References:**

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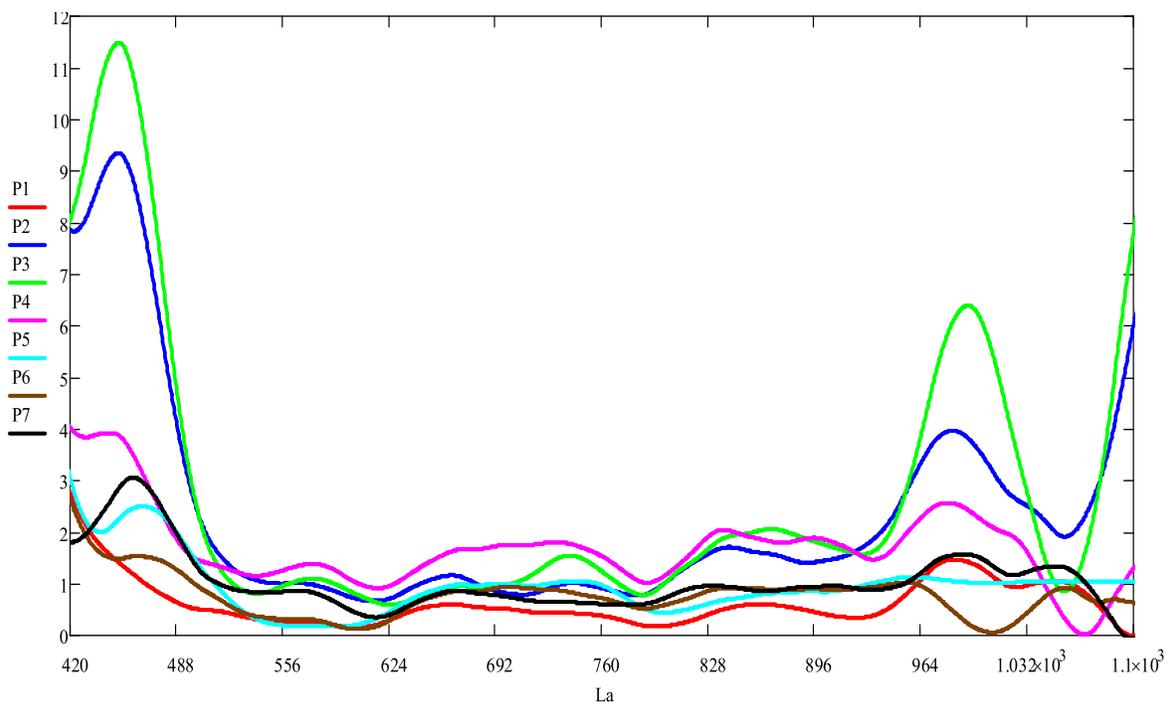


Figure 1: Spectral scans of linear polarizations (in  $10^{-4}\%$  of P) versus wavelength (in nm) for HD189733. Different curves correspond to different transit time and planet position on the stellar disk. P1, P2, P3, P4, P5, P6, and P7 are polarization degree for seven position of planet projected on the stellar disk.