



AGENTÚRA  
NA PODPORU  
VÝSKUMU A VÝVOJA

International meeting on variable stars observing

# KOLOS 2009

**Vihorlat Observatory Humenné**

**Gymnázium Snina**

**N. F. "Teleskop" Snina**

DRZ Vihorlat Sninské rybníky, Snina, Slovakia

**December 3–5, 2009**

## ABSTRACT BOOK

### Oral presentations, scientific part:

#### **I. Kudzej**

Vihorlat Observatory, Humenné, Slovakia

##### **From Kolos to Kolos**

Brief overview of recent achievements in instrumental and infrastructural equipment of Astronomical Observatory at Kolonica Saddle.

#### **P. Dubovský**

Vihorlat Observatory, Humenné, Slovakia

##### **Annual Report on Observational results of AO at Kolonica Saddle**

Introductory presentation about observing program at Astronomical Observatory at Kolonica Saddle. Short overview of main observing campaign during last year, most important results, interesting light curves, new publications based on observations at AO Kolonica Saddle.

#### **N. Virnina (1) (2), I. Andronov (1), P. Dubovský (3), I. Kudzej (3)**

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(2) Institute of Mathematics, Economics and Mechanics, Odessa National University, Odessa, Ukraine

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### **Discovery of two new variable eclipsing stars Kol7 and Kol8 near RX J2133**

Two new eclipsing variable stars USNO-A2.0 1350-14360622 and USNO-A2.0 1350-14361755 were discovered in the 10' field of 1RXS J213344.1+510725 = RX J2133 which had been observed using the 1-meter telescope "VNT" in Astronomical Observatory on Kolonica Saddle. These stars were already preliminary published in the VSX (<http://vsx.aavso.org/>) and got names VSX J213321.5+510857 and VSX J213320.0+510819, respectively.

Types of variability were determined as EW for USNO-A2.0 1350-14360622 and EB for USNO-A2.0 1350-14361755. For the statistical modeling, the program FDCN (Andronov, 1994, OAP 9, 49) was used, which allowed to calculate degrees of the statistically optimal trigonometric polynomials and all photometric parameters, needed for the General Catalogue of Variable Stars, with corresponding errors: Kol7:  $P=0.371786(8)$ ,  $T_0=2455084.1989(58)$ , max (R) 15.651(4), min 15.940(9); Kol8:  $P=0.91504(15)$ ,  $T_0=2455083.7583(32)$ , max (R) 16.783(7), min 17.299(13).

### **N. Virnina (1) (2), I. Andronov (1), P. Dubovský (3), I. Kudzej (3)**

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### **Classification of two newly discovered variable stars in the field of BS Cas**

Two new variable stars USNO-A2.0 1425-1825909 and USNO-A2.0 1425-1870026 have been discovered by L. Hambalek (Astronomical Institute, Slovak Academy of Sciences) near eclipsing binary star BS Cas.

In this work we have obtained observations for these stars on the telescope-reflector "Pupava" (D=280mm, F=1500mm): 1847 points for USNO-A2.0 1425-1825909 and 2182 points for USNO-A2.0 1425-1870026 in filter R. We determined all photometric parameters, needed for GCVS. USNO-A2.0 1425-1825909 was classified as EW, and USNO-A2.0 1425-1870026 is pulsation star and may be classified as B CEP or as RRc. The statistical modelling in the program FDCN (Andronov, 1994, OAP 9, 49) gave the following results. For USNO-A2.0 1425-1825909: the statistically optimal degree of the trigonometric polynomial is  $s=7$ , the initial epoch is  $E_0=HJD2455055.5109+-0.0004$  and the period  $P=0.514450+-0.000052$  d, the brightness at the maximum is  $Max=12.127+-0.002$  and at the minima  $MinI=12.581+-0.017$ ,  $MinII=12.463+-0.002$ . The same parameters for USNO-A2.0 1425-1870026 are:  $s=4$ ,  $E_0=HJD2455056.2929+-0.0015$ ,  $P=0.41891+-0.00009$ ,  $Max=11.490+-0.002$ ,  $Min=11.618+-0.001$ .

### **M. Timko**

Institute of experimental Physics Košice

### **Magnetic Irregularities of the Earth**

### **D. Bruncko**

Institute of experimental Physics, Košice

### **LHC finally start a GRID as a helpful efficiently tool for computing data from LHC**

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Short review of present situation of the LHC collider and ATLAS detector will be presented. I will shortly discuss the present status quo and our schedule for next year.

### **I. Andronov et al.**

Department "High and Applied Mathematics", Odessa National Maritime University, Odessa, Ukraine

#### **Deep Luminosity Minimum of the Nova-Like Cataclysmic Variable TT Ari**

### **I. Andronov et al.**

Department "High and Applied Mathematics", Odessa National Maritime University, Odessa, Ukraine

#### **The Unique Eclipsing Polar OTJ 071126+440305**

### **M. Zejda, Z. Mikulášek**

Department of Theoretical Physics and Astrophysics, Masaryk University, Brno, Czech Republic

#### **Timings of minima. Estimation or determination?**

The determination of minima timings is the basic task of astronomical research. However, it seems many authors do not take care about it and use unsuitable or wrong methods which depreciate the research results of their work. We present short introduction and summary of used methods of minima timing determination.

### **Z. Mikulášek (1), (2), M. Zejda (1), J. Žižňovský (3), J. Zverko (3)**

(1) Department of Theoretical Physics and Astrophysics, Masaryk University, Brno, Czech Republic

(2) Observatory and Planetarium of J. Palisa, VŠB-TU Ostrava, Czech Republic

(3) AsÚ SAV Tatranská Lomnica

#### **AR Aurigae as an excellent O-C laboratory**

AR Aurigae is an often observed detached eclipsing binary which can serve as a laboratory for various techniques for the time minima determination. We present a rigorous method of light curves extrema determination and compare it with the standard Kwee-van Woerden method. We discuss also causes of the discrepancies among various estimates the uncertainty of the time extrema determination and real scatter of O-C values.

### **I. Andronov,**

Department "High and Applied Mathematics", Odessa National Maritime University, Odessa, Ukraine

#### **Determination of Extrema of Variable Stars; Comparison of Different Mathematical Methods**

We review different mathematical methods for determination of the characteristics of the extrema with a special attention to a case of irregular distribution of arguments and to an asymmetric shape of the signal. The reviewed methods are: Herzprung's method (curves with a shape template with unknown mean, phase and amplitude); method of Kwee and van der Woerden (1956) which is applicable to symmetric shapes only; cubic splines (Andronov, 1984), running parabolae (Andronov, 1989, 1997), Asymptotic parabolae (Marsakova and Andronov 1996), asymmetric hyperbolic secant (Andro-

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nov 2002), adaptive wavelet fit (Andronov 1998), trigonometric polynomial added to a polynomial trend (Andronov 1994), multi-periodic fit (Andronov 1994), running sine, running trigonometric polynomial and running symmetric trigonometric polynomial. Applications of the methods mentioned above are shown for variable stars of different types.

**Š. Parimucha (1), T. Pribulla (2), S. Rucinski (2), M. Vaňko (3), L. Hambálek (4)**

(1) Institute of Physics, Šafárik University Košice, Slovakia

(2) Department of Astronomy, University of Toronto, Canada

(3) Astrophysikalisches Institut und Universitäts-Sternwarte, Jena, Germany

(4) Astronomical Institute of the SAS, Tatranska Lomnica, Slovakia

### **A preliminary analysis of DV Psc: The spotted, short-period, eclipsing binary**

We present preliminary results of the analysis of new photometric and spectroscopic observations of DV Psc.

**M. Zejda (1), Z. Mikulášek (1), M. Wolf (2)**

(1) Department of Theoretical Physics and Astrophysics, Masaryk University, Brno, Czech Republic

(2) Astronomical Institute, Faculty of Mathematics and Physics, Charles University Prague

### **Secrets of TW Dra**

TW Draconis is one of the best studied Algol-type eclipsing binary. There is significant evidence for miscellaneous interacting physical processes between binary components manifesting themselves by period and light curve changes. Obtaining new set of photometric and spectroscopic observations, we analysed them together with the older spectroscopic and photometric data to build model of this eclipsing system with respect to observed changes of O-C diagram and light curve. Photometry shows small irregularities in light curves as a results of pulsating of one component and spot activity. Using grid of KOREL outputs we found the mass ratio  $q=0.405(3)$ . We confirm the presence of stellar matter around the primary. Even after subtraction of ADS 9706B influence, light curve solutions show third light in the system. We present LC and RV curves solutions in FOTEL and PHOEBE .

**N. Virnina**

(1) Department "High and Applied Mathematics", Odessa National Maritime University, Odessa, Ukraine

(2) Institute of Mathematics, Economics and Mechanics, Odessa National University, Odessa, Ukraine

### **A new Algol-type variable star, discovered on remotely controlled telescope**

Variability of the star USNO-A2.0 0750-00561346 had been discovered on the remotely controled 206-mm astrophysical refractor of Tzec Maun observatory (New Mexico, USA), which has been equipped with an SBIG monochrome camera (STL-11000) plus a photometric filter wheel. Further observations were obtained on 180-mm unfiltered refractor of the same observatory.

The time series light curve shows narrow eclipses indicating that the object is an Algol-type binary without secondary minimum. Using the trigonometric polynomial fit of the statistically optimal order  $s$

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(Andronov, 1994), the value  $s=9$  was determined, the initial epoch is  $E_0 = \text{HJD } 2455106.3231 \pm 0.0005$ , period  $P = 0.522734 \pm 0.000015$ . The smoothed brightness at the minimum is  $m_{\text{min}} = 16.079 \pm 0.008$  and at the maximum  $m_{\text{max}} = 15.417 \pm 0.011$ .

## **M. Cikota**

Nicolaus Copernicus University, Torun, Poland

### **Symbiotic stars**

## **N. Virnina (1)(2), I. Andronov (2), P. Dubovský (3), I. Kudzej (3)**

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(2) Institute of Mathematics, Economics and Mechanics, Odessa National University, Odessa, Ukraine

(3) Vihorlat Observatory, Humenné, Slovakia

### **Superhumps in the old Nova V603 Aql**

We present results based on the VR CCD photometry of the Nova-like variable V603 Aql (Nova Aql) obtained during 23 nights using the 1-m Vihorlat National Telescope (13 nights in 2009) and 10 nights at other telescopes in 2006-2008. The color index shows only minor changes, whereas the light curve is dominated by the superhumps and flares. We have applied different methods for the time series analysis - periodogram, wavelet, scalegram et al. Characteristics of the individual observational runs are tabulated. We discuss the observational appearance of the positive and negative superhumps, which, according to some previous studies, may occur at different time intervals or sometimes simultaneously. Observations are compared to previous observational results as well as to the existing theoretical models of cataclysmic variables and retrograde/prograde precession of the accretion disk.

## **E. Świerczyński, T. Tomov, M. Mikołajewski, C. Galan, E. Ragan, M. Wiecek, T. Brozek.**

Torun Centre for Astronomy, Nicolaus Copernicus University, ul. Gagarina 11, Torun, Poland

### **Targets of Opportunity Project in Piwnice Observatory**

Amateur astronomers are often the first to report on many interesting events on the sky, which observations cannot be planned in advance by professionals. Fast decision to add to the list of an observing objects can give many scientific benefits. Path from the alert to approval of observations is as winding as big is observatory. Institution with small and medium-sized telescopes are in better position and here is field for their activity. Objects that can be most effectively observed with these instruments are novae stars, supernovae, comets and even planets. In Piwnice Observatory we realized observing program call Targets of Opportunity. In center of our interest are novae stars, but during the last three years we observed also the closest to Earth microlensing event or outburst of the comet 17P/ Holmes.

## **Oral presentations, educational part:**

**I. Andronov (1), V. Breus (1)(2), L. Chinarova (2), L. Kudashkina (1)(2), V. Marsakova (2), N. Virnina (1)**

„This work was supported by the Slovak Research and Development Agency under the contract No. LPP-0049-06“

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(2) Astronomical Observatory and Department of Astronomy, Odessa National University, Odessa, Ukraine

### **Amateur Astronomy in Ukraine**

Various directions of the amateur astronomy in Ukraine are presented. The work is officially co-ordinated by the Ukrainian Astronomical Association - UAA (President - Academician of the National Academy of Sciences of Ukraine (NASU) Yaroslav. S. Yatskiv) within its direction "Popularization of Astronomy and Amateur Astronomy" (supervised by a Vice-President of the UAA, from 2009 - Prof. Ivan L.Andronov). There is another separate public organization - "Ukrainian Association of the Amateur Astronomers" (UAAA, President - corresponding member of the NASU Klim I. Churyumov), which has 14 directions/branches of the amateur astronomy: Information support; Ukrainian Association of the Variable Stars Observers (UAVSO), Ukrainian Comet Section (UCS), Meteors, Occultations of Stars, Planets and the Moon, The Sun and Solar-Terrestrial Interaction, Deep Sky Objects, Construction of Telescopes, Astrophotography, CCD Astronomy, Computer Astronomy, Correspondence Astronomical School, Space Art (verses, songs, tales, drawings, models). The Internet- address of the UAVSO (co-ordinator Prof. Ivan L. Andronov): <http://uavso.pochta.ru>. According to the number of amateur observations to the international AAVSO database, UAVSO has 11-th place in the world.

There are few scientific-popular journals for the amateurs: "Vselennaja, Prostranstvo, Vremja" ("Universe, Space and Time", in Russian, Editor-in-chief Sergej Gordienko, <http://www.vselennaya.kiev.ua>), "Nashe Nebo" ("Our SKY", in Ukrainian for the advanced amateurs, Editor-in-Chief Klim Churyumov). Popular papers on Astronomy regularly appear in the journals "Svitogljad" ("World View", <http://mao.kiev.ua/papers.html>, Editor-in-Chief Yaroslav S. Yatskiv) and "Svit Fizyky" ("World of Physics", <http://www.franko.lviv.ua/publish/phworld/>, Editor-in-Chief Ivan O. Vakarchuk). There are also "Astronomical Calendar" (in Ukrainian, Editor Yaroslav S. Yatskiv) and "Odessa Astronomical Calendar" (in Russian, Editor Prof. Valentin G.Karetnikov).

For schoolers, exists the state-supported so-called "Youth Academy of Sciences", in which children make their "first step" researches under a supervision of professionals. There are weekly consultations and annual conferences - competitions. In the Odessa region, the Section of Astronomy is supervised by Prof. Ivan L.Andronov since 1987. There is also a weekly "Youth Astronomical School" (supervisor Dr. Vladislava I.Marsakova, <http://astroschool.chat.ru>). Among few amateur astronomical societies, one of the most active is "AstrOdes" (supervisor Alexandr V. Angelskij)

Professional and amateur astronomers present talks in the "Odessa House of Scientists" as well as in the Planetarium, making intensive public relations with newspapers, radio and TV.

In a frame of UAA and UAAA, regularly are organized the annual conferences - summer schools with a joint name "AstroFest". Taking into account the same popular name of similar events in other countries, starting from 2009, we call our conference "Astrofest-UA". Although it is organized by the Ukrainian Astronomical Association, it has really become international. In 2009, it was organized in Odessa in the campus "Chernomorka" of the Odessa National University. The WEB site is <http://uavso.org.ua/?page=astrofest>.

Ukrainian Societies work in a close contact with similar societies over the world - either in trips, or in the professional analysis of the amateur observations of variable stars - in Russia, Byelorussia, Moldova, Slovakia, Czechia, Hungary, Finland, France, Japan, USA and other countries for the benefit of Astronomy.

## **T. Hegedüs**

BKMÖ Baja Astronomical Observatory, Baja, Hungary

### **IYA2009 activity results in Hungary**

In this talk the main areas of the Hungarian astronomical activities are shown, which performed many

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of the cornerstones projects of the IAU offered for the International Year of Astronomy, in the order of the time. General trends, continuous activities and concrete events are also demonstrated.

## **Š. Parimucha (1), A. Kutka, J. Kapus, L. Balint, M. Kocka**

(1) Institute of Physics, Šafárik University Košice, Slovakia

### **SOSA - Slovak Organization for Space Activities**

Slovakia is one of the last European countries, which does not cooperate with the European Space Agency (ESA) at any level. A new civil organisation called "Slovak organisation for space activities" (SOSA) started therefore to focus on this theme by popularising space-science and space-business among schools, universities and enterprises. By organising various seminars, workshops and public space-activities, SOSA continually aims to explain advantages of being involved into European space activities. One of their main activities is building and launching stratospheric near-space balloons, which will carry various student-modules into the altitude of ~30km. The launch of the first platform is planned to spring 2010 and SOSA hopes in a great boost of interest in space-technologies among the Slovak public.

## **R. Prajsnar**

I Liceum Ogólnokształcące w Jaśle (Poland)

### **Alternative forms of teaching physics and astronomy at Liceum**

New experiences about popularisation of astronomy astronautics and aviation with professional support of Observatory and planetarium in Presov (Slovakia) and University and Politechnics of Rzeszow (Departaments of Physics and Aviation).

## **R. Bury**

City of Krosno, Poland

### **Project Carpathian Sky**

## **P. Dubovský**

Vihorlat Observatory, Humenné, Slovakia

### **Project The Universe for Advanced**

## **J. Uniwersal**

Uniwersal company, Zywiec, Poland

### **Solaris**

## **P o s t e r s :**

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## **P. Wychudzki, B. Kulesza, M. Grzemski**

Olsztyn Planetarium And Astronomical Observatory, Nicolaus Copernicus University

### **Photometric telescope of the Olsztyn Astronomical Observatory**

We would like to announce the new observational capabilities of the Olsztyn Observatory. In 2009 we purchased professional CCD camera, B, V and R Bessell's filters and new telescope form photometric system allowing perform professional observations of the variable stars.

## **L. Chinarova (1), I. Andronov (2)**

(1) Astronomical Observatory, Odessa National University, Odessa, Ukraine

(2) Department "High and Applied Mathematics", Odessa National Maritime University, Odessa, Ukraine

### **Characteristics of individual pulsations in RV Tau pulsating variables**

Based on the photometric observations of the RV Tau - type star AC Her, we present time series analysis of the variations using different methods. RV Tauri type stars show a complex temporal behaviour, thus the time series analysis should be resulted both in the average parameters of variability, which characterize double-peak structure of the light curve as well as long-term waves, and in the analysis of the cycle-to-cycle variability. For this purpose, the following methods have been applied:

- Periodogram analysis using the sinusoidal approximation with the program "Four" (Andronov 1994).
- Determination of the corrected value of the period (as well as amplitudes and phases) using the trigonometric polynomial fit with a statistically optimal value of the degree of mathematical model (program "FDCN" described in Andronov 1994).
- Scalegram analysis using the  $\sigma(Dt)$  and  $\lambda(Dt)$  test-functions (Andronov 1997, 2003) to determine statistically optimal value of the filter half-width  $Dt$  and thus the best "running parabola" fit for the light curve.
- Wavelet analysis based on the weighted least squares extension of the method to the case of non-homogeneously distributed times of observations (Andronov 1998, 1999), which allows to study variability of the shape of the light curve with a time scale of few pulsation periods. An example of the application of the method to the RV Tauri type star DF Cygni can be found in Andronov (1999).
- "Running sine" analysis (Chinarova 1998, Andronov 1999, 2003), which results in the time dependency of the period-averaged mean value, amplitude and phase of the pulsations with a relatively stable period.
- "Running 2cosine" analysis (in preparation), which results in the time dependency of the period-averaged mean value, amplitude and phase of the pulsations with a relatively stable period specially for the RV Tau and EW - type stars.

- Determination of times and magnitudes of the individual extrema using either the "asymptotic parabola" (Marsakova & Andronov 1996), or "best timing polynomial" (Chinarova & Andronov 2000)

This work is based on the visual observations presented in the AFOEV international database and is a part of the "Stellar Bell" subproject of the "Inter-Longitude Astronomy" (ILA) international campaign.

## **L. Chinarova**

Astronomical Observatory, Odessa National University, Odessa, Ukraine

### **Binary stars and their evolution (Book for Amateurs)**

The new edition of the book "Binary Stars and Their Evolution" (Odessa, Ukraine,, 2009, 60 pp.) is presented. This book was written as a part of the work of the Ukrainian Astronomical Association for the amateur astronomers, students, scholars, members of the Section of Astronomy of the Young Academy of Sciences. It contains a series of complementary reviews: "Birth and Life of Stars", "Main

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Types of Binary Stars and Their Main Characteristics", "Complex Interactions in Close Binary Stars", "Evolution of Binary Stars", "Symbiotic Stars", "cataclysmic Variables" and of an extended list of the astronomical literature on a topic. The book is devoted to the International Astronomical Year - 2009 UNESCO and to the Anniversary of Vladimir Platonovich Tsessevich (1907-1983).

### **V. Breus (1), I. Andronov (2), K. Petrík (3), T. Hegedüs (4),**

(1) Department of Astronomy, Odessa National University, Ukraine

(2) Department of High and Applied Mathematics, Odessa National Maritime University, Ukraine

(3) Hlohovec Observatory and Planetarium, Slovak Republic

(2) Baja Astronomical Observatory, Baja, Hungary

### **Characteristics of Spin Variability vs Luminosity in the Intermediate Polar RXS J213344.1+510725**

We observed newly discovered intermediate polar RXJ 2133 (Bonnet-Bidaud et al. 2006 A&A 445, 1037) using the Zeiss-Cassegrain 600mm telescope of the Hlohovec Observatory and Planetarium, Slovakia, and 500mm telescope of the Baja Observatory, Hungary. Totally 1115 observations in R and 1078 in V were recorded. Time series analysis was carried out using the MCV program (I.L.Andronov, A.V.Baklanov, Astronomical School Reports, 2004, 5, 264, <http://uavso.pochta.ru/mcv>) and FDCN (I.L.Andronov, Odessa Astron. Publ., 1994, 7, 49).

The photometric wave is originated due to a spin rotation of the white dwarf. One hump shape at the phase light curve argues for a high inclination of the magnetic axis in this system, so we see mainly an upper accretion column. The adopted fit  $m(t)=m_0-r*\cos(2*\pi*(t-T_0)/P)$ , where  $m_0$  is a mean brightness averaged over the spin period,  $r$ - semi-amplitude of sine variations,  $T_0$  is an initial epoch for the brightness maximum (minimum of stellar magnitude) and  $P$  - is period.

For the spin variability in R:  $T_0=2454514.7715(2)$ ,  $P=0.006606766(4)d$ ,  $r=0.0371(56)$  mag,  $m_0=14.422(4)$  with corresponding values in V:  $T_0=2454524.2787(1)$ ,  $P=0.006606769(3)d$ ,  $r=.0437(54)$  mag,  $m_0=15.262(4)$ . Obviously, the period for V and R should be the same, i.e. the mean weighted value  $P=0.006606768(2)$ . The amplitudes in V and R are significantly different, showing a blue spectral energy distribution in the spectrum of the accretion column. We have computed quasi-simultaneous sets of data in V and R filter. The color index was computed for the moments of observations for which both V and R data were available.

The orbital elements for V:  $P=0.2798968(22)d$ ,  $T_0=2454524.1764(19)$ ,  $r=0.108(4)$ ,  $m_0=15.2735(32)$  and for R:  $P=.2798900(23)$ ,  $T_0=2454514.6597(19)$ ,  $r=0.110(4)$ ,  $m_0=14.432(3)$ .

The color index shows a statistically significant dependence on the spin phase, indicating a necessity of multicolor observations rather than mono-filter or unfiltered ones. These results will be used for most precise period determination after the data reduction of all data obtained in other observatories (Ukraine, Slovakia, Hungary and Korea).

### **V. Bejdová**

Gymnázium Medzilaborce

#### **New variable in the field of CN And**

New variable was discovered by M. Mašek during the summer expedition Perzeydy 2007 in the field of eclipsing binary CN And. Following observations with different telescope lead to the conclusion that it is EB type eclipsing binary with strong O'Connell effect. Identification: **KoI003** = GSC 2787-1836,  $P=0.297106(4)d$ ,  $M_0=2454749.5230(2)$ .  $M_{min}=12.31V$ ,  $M_{maxI}=11.93V$ ,  $M_{maxII}=12.02V$ . Recent observations indicates strong spot activity.

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