

**Session: [B5B-3] S3 : Stars, Exoplanets and Stellar Systems**
**Date:** August 22, 2014 (Friday)

**Time:** 11:00~12:30

**Room:** Room C (Room 104)

**Chair:** Puji Irawati (National Astronomical Research Institute of Thailand)

**[B5B-3-1]**
**11:00~11:15**
**The BIMA Project: O-C Diagrams of Eclipsing Binaries' Systems**

Gabriela Kezia Haans (Institut Teknologi Bandung, Indonesia), Dhimaz Gilang Ramadhan, Saeful Akhyar, Rhisa Azaliah, Janette Suherli, Puji Irawati, Zainuddin Muhammad Arifin, Thawicharat Sarotsakulchai, Andrea Richichi, Rifqi Wisnu Aryawardhana, Hakim Luth

Eclipsing Binaries' Minima (BIMA) Monitoring Project is a CCD-based photometric observational program initiated by Bosscha Observatory – Lembang, Indonesia in June 2012. Since December 2012 National Astronomical Research Institute of Thailand (NARIT) joined BIMA Project as the main partner. This project aims to build an open-database of eclipsing binaries' minima and to establish the orbital period of each system and its variations. The project is conducted on the basis of a multisite monitoring observations on eclipsing binaries with magnitudes less than 19 mag. Differential photometry method has been applied for data reduction. The observations were carried out in the BVRI bands using three different small telescopes situated in Indonesia, Thailand, and Chile. A number of software have been developed for calculating time of minima. Up to now 92 eclipsing binaries have been observed. Out of them 20 light curves have been secured. We present and discuss the O-C diagrams from some eclipsing binaries' systems.

**[B5B-3-2]**
**11:15~11:30**
**The New Eclipsing Post Common-Envelope Binary SDSS J074548.63+263123.4**

Niwat Hemha (Suranaree University of Technology, Thailand), Nuanwan Sanguansak, Puji Irawati, Vik Dhillon, and Tom R. Marsh

The common-envelope process is known as one complicated phase in binary evolution. A lot of efforts have been dedicated to study this common-envelope stage, but the many questions related to this process are yet to be answered. If one binary survives the common-envelope, the binary will emerge as a white dwarf accompanied by low-mass main sequence star in close orbit, or often referred as the post common-envelope binary (PCEB). SDSS J074548.63+263123.4 is among the list of the newly found PCEB from the Sloan Digital Sky Survey (SDSS). This star is proposed to be a strong eclipsing system candidate due to the ellipsoidal modulation in its light curve. In this work, we aim to confirm the eclipsing nature of SDSS J0745+2631 and to determine the stellar and orbital parameters using the software Binary Maker 3. We detected the primary eclipse in the light curve of SDSS J0745+2631 from our follow-up observations in January 2014 using the ULTRASPEC instrument from the Thai National Observatory. The data obtained on 7 January 2014 in g' filter show an evident drop in brightness during the eclipse of the white dwarf, while this eclipse is less prominent in the data taken in the next night using clear filter. According to our preliminary model, we find that SDSS J0745+2631 hosts a rather hot white dwarf with an effective temperature of 50,000K. The companion star is a red dwarf star with a temperature of 3160 K and radius 0.322R<sub>\*</sub>. The red dwarf star almost fills its Roche lobe, causing a large ellipsoidal modulation. The mass ratio of the binary given by the BM3 model is M<sub>2</sub>/M<sub>1</sub> = 0.38.

**[B5B-3-3]**
**11:30~11:45**
**Low Mass Stars in Eclipsing Binary Systems**

Priyanka Chaturvedi (Physical Research Laboratory, India), Abhijit Chakraborty, B.G. Anandarao, and Vaibhav Dixit

Eclipsing Binary systems serve as an effective tool for the precise determination of masses and radii of both the components. Single lined eclipsing binary systems via radial velocity technique give us a unique opportunity to study the low mass end of the main sequence as companions to brighter primaries. Despite a large number of low mass stars present in our galaxy, masses and radii for these stars are still not determined at higher accuracies, primarily due to their fainter magnitudes in visible band. Radii for stars less massive than Sun are known to be 10% smaller theoretically than observed and temperatures are 5% higher. It is suggested that strong magnetic fields inhibit convection, which causes these stars to inflate. In general, low mass stars form an interesting area for stellar astronomers. A high-resolution echelle spectrograph, Physical Research Laboratory Advanced Radial-velocity Abu-sky Search (PARAS) working at a resolution (R) of 67000, coupled with the Physical Research Laboratory Mt. Abu, India 1.2m telescope is used for making observations of primary stars of F, G and K spectral type. One of the programs with our high resolution spectrograph PARAS operational in the wavelength regime 3800-6800 Angstroms is to look for candidates having secondaries in the low massive end of the main sequence. I will be presenting the intriguing method used to nail down the orbital parameters of these fascinating eclipsing binary systems followed by highlighting few results discovered by PARAS.

We have discovered two such systems, one of them is SAO 106989 of an F7 (1.1 Msun) type primary star and a mid M dwarf by making radial velocity measurements using Physical Research Laboratory Advanced Radial velocity Abu-sky Search (PARAS) at the 1.2 m telescope at Mount Abu, India. Radial velocity measurements indicate that the mass of the M dwarf is 250 MJup with a period of 4.35 days and an eccentricity of 0.25. The other system is HD 23765 which is also a F-type main sequence star having a 0.4 Msun M dwarf orbiting at a period of 1.68 days. Similar systems discovered and analysed will contribute more to our understanding of fundamental stellar properties and make the sample of F+M and G+M binaries statistically significant.

[B5B-3-4]

11:45~12:00

### **Low-Resolution Spectroscopic Studies for the Globular Clusters with Multiple Populations**

Dongwook Lim (Yonsei University, Korea), Sang-II Han, Dong-Goo Roh, and Young-Wook Lee

Recent narrow-band calcium photometry discovered two distinct red giant branch (RGB) populations in some massive globular clusters (GCs) including M22, NGC 1851, and NGC 288. In order to investigate the difference in light/heavy elements abundances between the two subpopulations, we have performed low-resolution spectroscopy for stars on the two RGBs in these GCs. We find significant differences (more than  $4\sigma$ ) in calcium abundance from the spectroscopic HK index for both M22 and NGC 1851. We also find more than  $8\sigma$  differences in CN band strength between the Ca-strong and Ca-weak subpopulations. For NGC 288, however, we detect the presence of a large difference only in the CN strength. The calcium abundances of two subpopulations in this GC are identical to within the errors. We also find interesting differences in CN-CH relations among these GCs. While CN and CH indices are correlated in M22, they show anti-correlation in NGC 288. However, NGC 1851 shows no difference in CH between two groups of stars having different CN strengths. The CN bimodality in these GCs would be explained by the pollutions from intermediate-mass asymptotic giant branch stars and/or fast-rotating massive stars. For the presence or absence of calcium bimodality and the differences in CN-CH relations, we suggest they would be best explained by how strongly type II SNe enrichment has contributed to the chemical evolutions of these GCs.

Poster Session

12:00~12:30

**Chairs:** Puji Irawati (National Astronomical Research Institute of Thailand)

Wen-Ping Chen (National Central University)