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DETECTION OF SHORT-PERIODIC OSCILLATIONS IN UW Vir

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Mkrtichian et al. (2002, 2004) introduced a new class of semi-detached Algol-type systems which has mass-accreting pulsating primary components, so called oEA stars. The oEA stars generally lie inside the instability strip after the first high-mass transfer stage and the pulsational characteristics of primary components are similar to characteristics of classical δ Scuti type stars, while the evolutionary status of pulsating components is different. These stars are promising targets for asteroseismic studies as their pulsation properties can be changed by the mass-accretion. Our report is a part of the "**Tha**i **S**ky **S**urvey for **o**EA **S**tars" (THASSOS) project initiated at the National Astronomical Institute of Thailand (NARIT) for detection of new oEA stars and studying their oscillation spectra.

UW Vir is a semi-detached Algol-type eclipsing binary systems with P = 1.8107646 d orbital period. The coordinates are RA = $13^h15^m20\overset{s}{.}7355$, DEC= $-17^\circ28'16\overset{''}{.}924$. The general properties of physical parameters in the binary system were determined by Brancewicz and Dworak (1980). Qian (2000) studied the changes in orbital periods of UW Vir by O–C observations. The O–C curves represented the periodic variations superimposed on upward parabolic segments with periods of 45.9 years. The components of upward curving parabolic variations in UW Vir showed secular period increase with rates of $+1.73 \times 10^{-6}$ d/yr respectively. The secular period increase in UW Vir indicated that the mass transfer occurs from the less to the more massive component which is consistent with their semi-detached configurations. In addition, the periodic changes of the orbital periods of UW Vir also caused by the light-time effects due to the existence of the third body. 12 nights of new photometric observation for UW Vir were acquired from 13 May

Table 1: Pulsation frequencies and amplitudes.

Frequency (c/d)	Amplitude (mag)
$f_1 = 28.78482 \pm 0.00006$	0.0054 ± 0.0006
$f_2 = 46.9010 \pm 0.0001$	0.0030 ± 0.0006

2014 to 14 March 2017. During the first season of observation of this target, 11 night were taken with the 0.6-meter Thai Southern Hemisphere Telescope (TST) PROMPT8 at Cerro Tololo Inter-American Observatory (CTIO) equipped with an Apogee Alta E42 CCD camera. 6 s exposure times through Johnson B filter were used. For the last night, 15 s exposure through Johnson B filter were obtained from the 0.7 m telescope at Gao Mei Gu Observatory (GMO) in China.

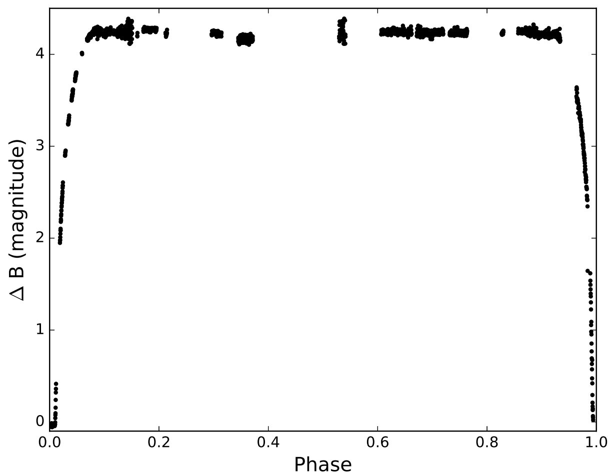

Figure 1. The light curve of UW Vir with the period of 1.8107646 days.

All stars in the field of view were reduced by SExtractor code (Bertin & Arnouts, 1996) and with Python codes written for differential photometry. These pipeline codes were developed for reduction of CCD data coming from the Thai Robotic Telescope (TRT) network. USNOA2 0675-12506346 (TYC 6120-50-1; RA = $13^h14^m47\overset{s}{.}27$, DEC= $-17°30'56\overset{''}{.}4$ V=13.2) was used as a comparison star. Phased differential light curve folded according to $HJD = 2452501.1080 + (E \cdot 1.8107646)$ is plotted in Figure 1.

To extract the pulsation variation in the primary component, we omitted all data at primary minimum within phase interval of 0.93–1.07. The oscillation frequencies were analysed after removal of slow orbital variations in out-of-eclipse parts of light curves, using low-order polynomial fits. Residual light curves are shown in Figure 2. After subtracting the orbital variations, the residual data were analysed for the frequencies of pulsation using the Discrete Fourier Transforms (DFT) algorithm realized in the Period04 software (Lenz and Breger, 2005). The signal pre-whitening technique was also used for consecutive detection of signals in the data.

As a result, we detached two pulsational frequencies, amplitudes and phases periodic signals. The periodograms of two the consecutive steps of the DFT analysis are illustrated in Figure 3 from top to bottom in the order as they were performed. The frequencies and amplitude in Table 1 are numbered in the order of successive pre-whitening. The second frequency at 46.9010 c/d is questionable, it has a S/N = 3.75 compared to mean noise in the frequency domain of interest 20-70 c/d and should be checked by further observations.

In summary, we discovered a short-period pulsational oscillations in a primary component of a semi-detached Algol-type binary system, UW Vir. We conclude that UW

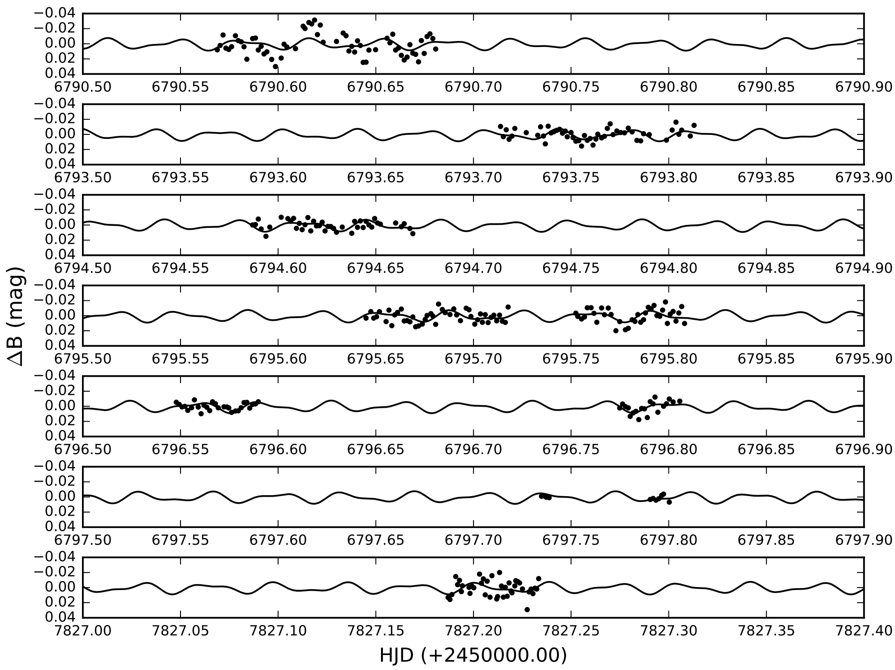

Figure 2. The nightly residual light variations of UW Vir (dots). Solid line is a two-frequency fit to the data.

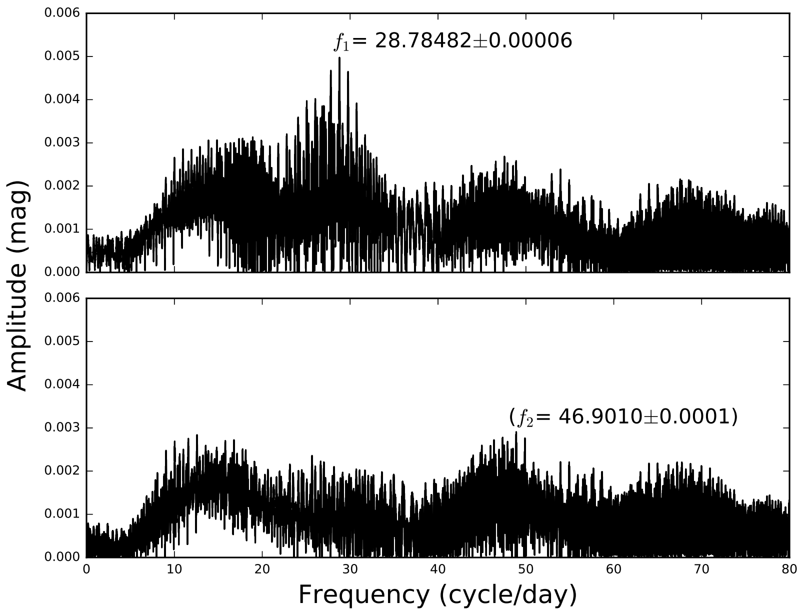

Figure 3. The consecutive steps of DFT analysis of the residual light curve of UW Vir. The top panel shows the DFT of original residual data, bottom panel shows DFT spectrum after removing the dominant frequency of 28.78 c/d.

Vir is a new member of oEA group exhibiting the low-amplitude pulsations of primary component at the dominant frequency $f_1 = 28.78482 c/d$. We would like to mention, that with an ecliptic latitude of –8.8 degrees UW Vir will be potentially observable with the TESS mission, so more pulsation components could be resolved with a short-cadence observations.

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