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**DETECTION OF A PULSATING COMPONENT  
IN THE ECLIPSING BINARY AB Per**

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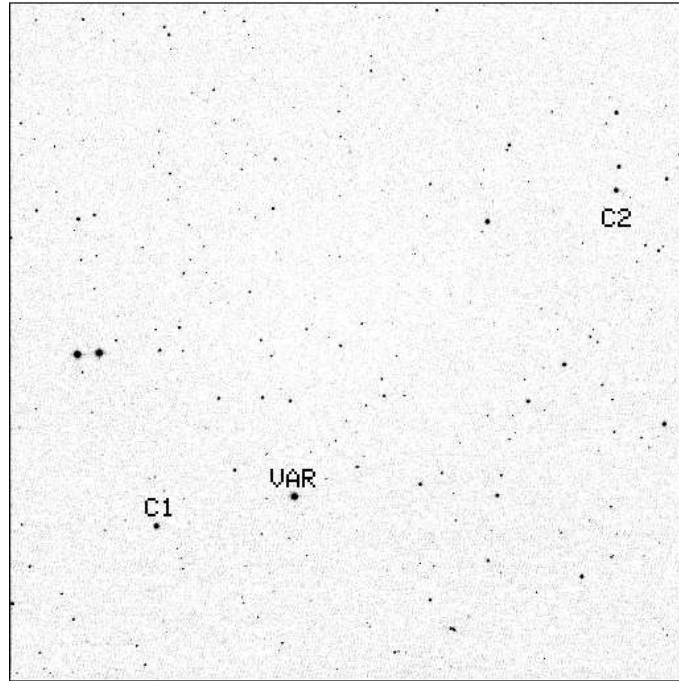
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<b>Observatory and telescope:</b>	
Sobaeksan Optical Astronomy Observatory, 61cm telescope	
<b>Detector:</b>	SITe 2K CCD camera
<b>Filter(s):</b>	<i>B, V</i>
<b>Transformed to a standard system:</b>	No
<b>Availability of the data:</b>	
Upon request	
<b>Method of data reduction:</b>	
Standard CCD-frame reduction using the IRAF <sup>1</sup> package.	

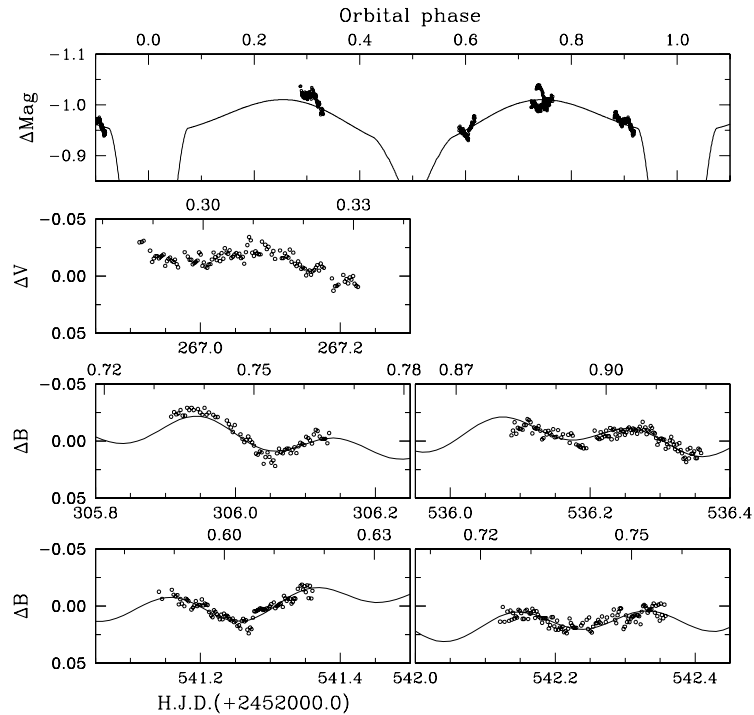
**Table 1.** Photometric parameters of observed stars

ID	Name	RA (J2000)	DEC (J2000)	<i>V</i>	( <i>B-V</i> )	Sp. Type
VAR	AB Per	03 <sup>h</sup> 37 <sup>m</sup> 45 <sup>s</sup> .20	+40°45′49″.4	9 <sup>m</sup> .69	0 <sup>m</sup> .43	A5
C1	HD 275605	03 <sup>h</sup> 38 <sup>m</sup> 06 <sup>s</sup> .82	+40°44′58″.3	10 <sup>m</sup> .55	0 <sup>m</sup> .48	F5
C2	GSC 02866-01819	03 <sup>h</sup> 36 <sup>m</sup> 54 <sup>s</sup> .76	+40°54′58″.1	11 <sup>m</sup> .7	1 <sup>m</sup> .0	–

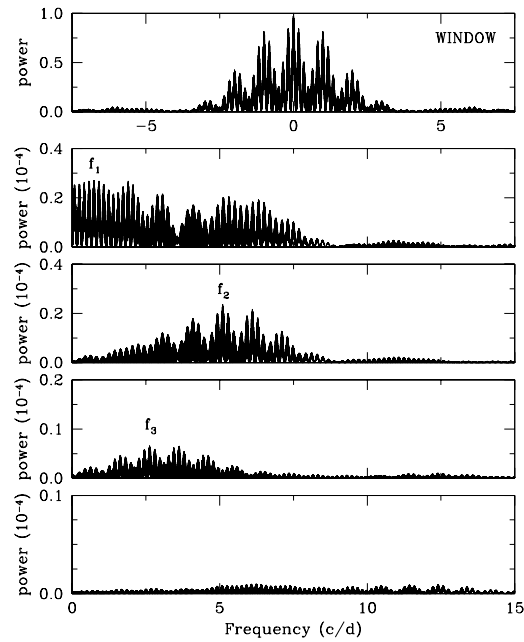
<sup>1</sup>IRAF is distributed by the National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.



**Figure 1.** A  $B$ -band observed CCD image ( $20'.5 \times 20'.5$ ) near the eclipsing binary AB Per (VAR). The comparison star (C1) and the check star (C2) are marked. North is up and east is to the left



**Figure 2.** Differential magnitudes between the variable star AB Per and the comparison star C1. The synthetic light curves represented by solid lines in the top panel were constructed using the Wilson-Devinney (1971) method and photometric parameters presented in the literature. The lower five panels show residuals after fitting the curve to the data. Sinusoidal curves obtained from the multiple frequency analysis are superimposed on the residuals in four  $B$ -band panels



**Figure 3.** Power spectra of AB Per. Window spectrum is in the top panel. The successive pre-whitening procedure shows three frequencies of  $f_1 = 0.747$  c/d,  $f_2 = 5.106$  c/d and  $f_3 = 2.624$  c/d

#### Remarks:

During the observational survey to search for A-F spectral type pulsating components in eclipsing binary systems, in collaboration with the Central Asian Network group (Mkrtychian et al. 2002a), we detected short-term variabilities of AB Per in out-of eclipsing orbital phases. Observations were performed for five nights from December 23, 2001 to September 24, 2002, with *B* or *V* filter. We applied simple aperture photometry to get instrumental magnitudes with an aperture radius of  $4''.8$ ; typical atmospheric seeing was about  $2''.4$  during the observing runs. The comparison star C1 did not show any peculiar light variations.

Figure 2 shows light variations of AB Per. Because the light elements in the GCVS (Kholopov et al. 1988) might have some problems (Isles 1991), we calculated the orbital phases from the following elements which were newly derived from all previously-known minimum epochs (Kreiner et al. 2001),

$$\text{Min H.J.D.} = 2422987.3254 + 7.16007115 \times E.$$

In order to remove the eclipsing light variations, we constructed synthetic curves using the Wilson-Devinney (1971) method and photometric parameters from the literature (Brancewicz & Dworak 1980, Budding 1985, van Hamme 1993). Residuals after fitting the curves to the data show short-term variabilities with a period of about 0.2 day and  $\Delta B \sim 0^m.04$ . We estimated its period from the multiple frequency analysis (Kim & Lee 1996), using only the *B*-band data. Figure 3 displays the power spectra of the residuals. The successive prewhitening procedure shows three frequencies of  $f_1 = 0.747$  c/d (cycles per day),  $f_2 = 5.106$  c/d and  $f_3 = 2.624$  c/d.

**Remarks:**

The first frequency was selected in order to remove long-term trends of the residuals. The second frequency was clearly detected in the power spectra. Its period value of 0.196 day is much smaller in comparison with the orbital period of about 7.16 day for AB Per. The variable star AB Per is a member of a semi-detached eclipsing binary system which revolution and rotation are normally supposed to be synchronised. Very probably  $f_2$  does not originate from rotation-induced variabilities such as ellipsoidal variability or surface inhomogeneity. Instead, it is more reasonable that  $f_2$  is a pulsating frequency of the primary component. Considering the spectral type, sinusoidal light curves, frequency and amplitude of pulsation, and the membership in a semi-detached Algol type system, we suggest that the primary component of AB Per is a new, eighth member of the oscillating EA group (Mkrtychian et al. 2002b, Kim et al. 2002).

The third frequency with the smallest amplitude is uncertain so far whether it is a real frequency of the star ;  $f_3$  seems to be the sub-harmonic frequency of  $f_2$ ,  $f_3 \approx 1/2 f_2$ . More intensive and long time-based observations of AB Per are needed.

**Acknowledgements:**

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