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OW Gem: THE 1991 PRIMARY MINIMUM

The variability of SAO 095781, which was previously listed as the possible variable NSV 03005, was confirmed by Kaiser et al. (1988a). This star was found to be a long-period eclipsing binary with period $1258^{d}.56$ by Kaiser (1988b). Its new name is OW Gem. Kaiser predicted the next primary miminum to occur on September 2, 1991.

The CCD photometry of OW Gem during the primary minimum presented here is part of an observing program, of which the results will be published soon (Hanžl et al. 1992).

From August 30 to September 13, 1991, CCD observations of the long-period eclipsing binary OW Gem were performed at the Ondřejov Observatory during 7 nights. A small SBIG ST-4 camera with 7-cm lens (focal length of 10.5 cm) was used. Having only an 8-bit AD convertor, this camera was not designed as a photometric device, but when certain conditions are fulfilled, it can be used as a multichannel photometer that yields an accuracy of about 0.03 mag. These conditions are the following:

- the peak signal of the measured object must be kept in the upper half of the dynamical range of the CCD-camera (that is, 0 to 255);
- when the image of the measured object extends over several pixels, the error due to a finite number of levels of analogue-digital (8-bit) conversion is suppressed.

These conditions were fulfilled only during the last three nights on account of the strong interference of the Moon during the first four nights.

During each observing night, one to three images of the star field around OW Gem — including the variable star and comparison stars — were obtained. The comparison stars were SAO 095777, SAO 095810, and the third star at R.A.(1950)= $6^{h}29^{m}02^{s}$, Decl.(1950)= $+17^{\circ}08'05''$ (Kaiser et al. 1988a). Observing conditions were not ideal; there was strong interference of the Moon before September 5 and measurements were performed at an air mass of about 2.2 at the beginning of dawn. Exposures varied from 15 to 60 seconds, with median value 30 seconds. No filter was used; the maximum of the spectral sensitivity of the camera has a flat maximum around 730 nm with halfwidth of 350 nm (530–880 nm).

Dark subtraction and flat fielding of images were performed and also sky subtraction was made. Signals of the variable star and all the comparison stars were measured by integrating counts over a 3x3 pixel area centered at the position of the measured object (such a 3x3 pixel box contains more than 96% of all light of the measured star). In what follows, we briefly describe the reduction procedure.

The comparison stars were assumed to be non-variable (checked by residuals after reduction). Co-adding signals from all comparison stars in a particular image we obtained the intensity of a fictitious star less affected by a noise. Differential magnitudes of all comparison stars as well as the variable star with respect to the fictitious star were then obtained. Errors of differential magnitudes of comparison stars were derived from deviations from the mean values on individual images (errors of summed signals were also accounted for). The accuracy of a differential magnitude of OW Gem at every particular image was estimated from errors of comparison stars by comparing the signal of the variable with signals of comparison stars on the image. Finally, a constant value was added to all differential magnitudes to reduce the mean differential magnitude of SAO 095810 to zero.

The mean differential instrumental (ST-4) magnitudes of the comparison stars were SAO 095810: 0.000±0.009; SAO 095777: 1.268±0.014; the third star: 2.086±0.032.

The standard errors of differential instrumental magnitudes of OW Gem were found to be between 0.014 and 0.058 (average 0.031 mag), except for measurements on September 2 and 3, when the use of the ST-4 camera as multichannel photometer was not possible. The magnitudes obtained are given in Table 1.

Table 1: Differential instrumental (ST-4) magnitudes of OW Gem.

UT 1992	$JD - 2448000$	ΔMag_{instr}	Exposure (seconds)
Aug. 30.0936	498.5936	0.698 ±0.056	30
Sept. 2.0820	501.5820	1.38 ±0.19	30
3.0913	502.5913	1.343 ±0.083	30
3.0921	502.5921	1.36 ±0.16	15
4.0939	503.5939	1.140 ±0.026	30
4.0949	503.5949	1.092 ±0.058	15
4.0957	503.5957	1.215 ±0.029	60
5.0892	504.5892	0.917 ±0.018	30
5.0906	504.5906	0.918 ±0.027	60
10.0754	509.5754	0.252 ±0.014	30
10.0764	509.5764	0.316 ±0.024	15
10.0767	509.5767	0.258 ±0.016	60
13.1032	512.6032	0.201 ±0.048	30
Sept.13.1040	512.6040	0.209 ±0.026	30

Our observations confirm the correctness of Kaiser's prediction of the 1991 primary minimum of OW Gem. Combining these measurements with results obtained by D. Hanžl, D. Chochol, and J. Papoušek, we derived an improved ephemeris for OW Gem. That analysis will be published by Hanžl et al. (1992).

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Petr PRAVEC
Astronomical Institute
CS-25165 Ondřejov
Czechoslovakia

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