PHOTOMETRIC INVESTIGATION OF XX CYG

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ABSTRACT. The photometric observations of SX Phe type star XX Cyg (V=12^m, A5) were made in five nights using 48 cm reflector at the Astronomical Observatory of Odessa National University. The CCD photometer and the V filter of the UBV system was used. The variable and comparison stars monitored in the frame simultaneously. Light curves indicates a total light range 0.8 mag. A frequency analyses allow to find only one frequency of pulsating and it cause to consider this star as unique among this type. The light variation of XX Cyg can be well fitted with a single pulsation frequency during 60 years. This pulsating is in generally stable, but, there is a slight variation of period and, possibly, the light curves show, besides the primary maximum, a small bump of an amplitude of approximately 0.1 mag.

Key words: SX Phe – stars: individual (XX Cyg).

XX Cyg (V=12m, A5) – one of the well known as metal-poor and high-velocity SX Phe type star (McNamara, Feltz, 1980). The light variation was discovered by Ceraski in 1904. The period of light variation 0.134865070d, amplitude up to 1 mag (from the General Catalog of Variable Stars). The photometric observation of XX Cyg in different years show the variation of amplitude and period during a long time (Zhou at all., 2002). Szeidl and Mahdy (1981), Kiss and Derekas (2000) have published the concluding that the period of XX Cyg suffered a sudden little change and was constant otherwise.

The radial-velocity curve has a total velocity range of 37 km/s. The mean radial velocity was found to be 108 km/s. This indicated the high-velocity nature of XX Cyg (Mc.Namara and Feltz, 1980).

To study a behavior of the period change of XX Cyg, new observations were made on 5 nights of October 2001 using the CCD photometer and 48 cm reflector at the Astronomical Observatory of Odessa National University. The CCD photometer was created by author, using chip ISD015 (520x580 pixels), vacuum housing and thermoelectric (Peltier) cooler. In the observations the V filter of the UBV system was used. Two stars were chosen as comparison and check stars (comp=GSC 3948-2542, 10.0, check=GSM 3948-2105, 10.9).

Table 1: The times of maximum light XX Cyg

HJD max	O - C
2452193.2807	0.008
2452193.4144	0.003
2452196.3818	0.005
2452200.2929	0.006
2452200.4275	0.004
2452207.4403	0.003
2452208.2501	0.007
2452208.3850	0.007

The observed light curves of XX Cyg are shown in Figure 1. A preliminary analysis show that light curves indicates a total light range 0.8 mag in filter V. Possibly, the light curves show, besides the primary maximum, a small bump of amplitude of approximately 0.1 mag. The light variation of XX Cyg can be well fitted with a single pulsation frequency, but an analysis on multiple mode pulsation is carrying out.

Eight new times of maxima were determined from the individual light curves. The mean value O - C = 0.005±0.0006. To constract the updated O-C diagram, all available data from literature have been collected: (Kleissen E., 1939; Born F., Sofronievitsch H., Pohl E., 1953; Oskanjan V., 1953; Payne-Gaposhkin S., 1954; Alaniya I.F., 1954; Fitch W.S., Wisniewski W.Z, Johnson H.L., 1966; Firmanyuk B.N., 1976). The resulting diagram is plotted in Fig.2. The estimated accuracy is about 0.0006 days and correspond of dots size.

The single pulsating is in generally stable during 60 years, but slight change of period near JD=2430500 have been occured. The sudden change of period $\Delta P/P = 2x10^{-7}$. A least-squares linear fit of O-C diagram have been obtained by new formula HJD max = 2416564.4885 + 0.134865076 x E.

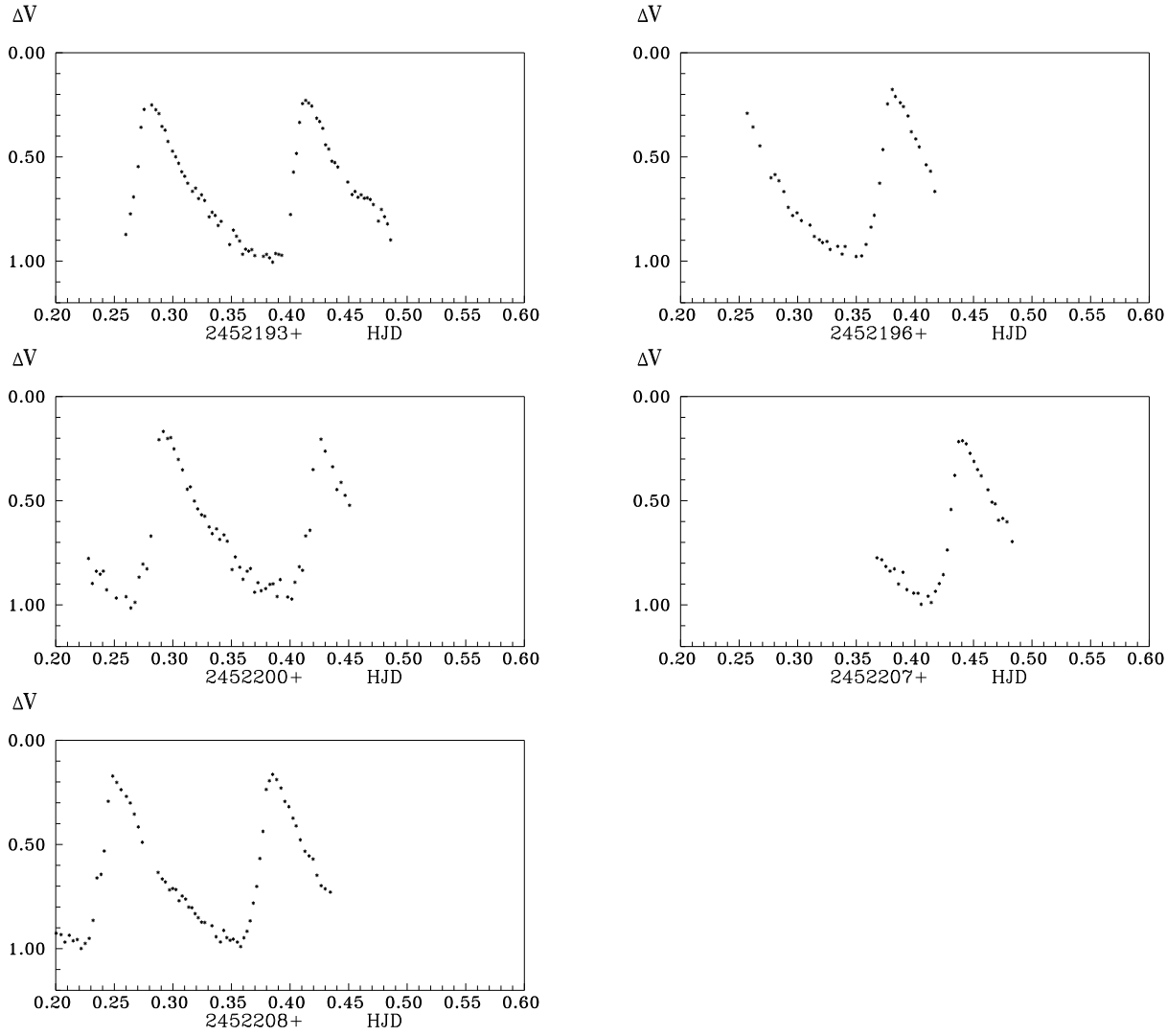

Figure 1: The light curves XX Cyg in 2001

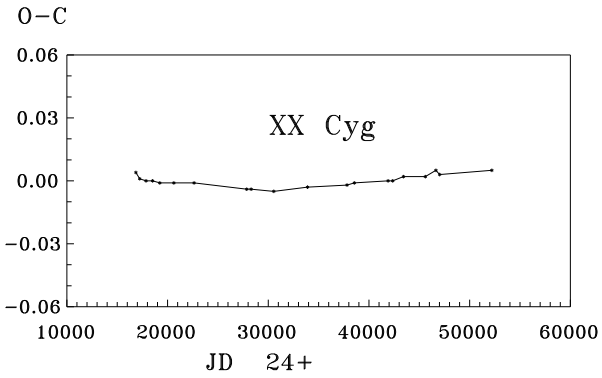

Figure 2: The mean O - C diagram of XX Cyg during 60 years

References

McNamara D.H., Feltz K. A. Jr.: 1980, *PASP*, **V. 92**, 195.

Zhou, Ai-Ying, Jiang, Shi-Yang, Chayan, B., Du, Bai-Tian.: 2002, *Astroph. Space Science.,* **V. 281**, 4.

Szeidl B., Mahdy H.A.,: 1981, *Comm. Konkoly Obs.*, No. 75.

Kiss L.L., Derekas A.: 2000, *IBVS*, No. 4950.

Kleissen E.: 1939, *Astron. Nach.*, 267.

Born F., Sofronievitsch H., Pohl E.: 1953, *Astron. Nachr.*, 281.

Oskanjan V.: 1953, *Bull. observ. astron.*, Belgrad, **V.18**, 3-4.

Payne-Gaposhkin S.: 1954, *Harvard Ann.*, **V. 113**, 3.

Alaniya I.F.: 1954, *Astron. Cyr.*, No. 981.

Fitch W.S., Wisniewski W.Z., Johnson H.L.: 1966, *Comm. of the Lunar and Planetary Lab.*, The Univer. of Arizona, 1966, **V. 5**, 71.

Firmanyuk B.N.: 1976, *IBVS*, No. 1152.