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DETECTION OF SHORT-PERIOD OSCILLATION IN V592 Cas

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V592 Cas was originally discovered as a blue, luminous object (LS I +55°8) in the northern Milky Way. Greenstein et al. (1970) suggested that this object may be a cataclysmic variable (CV), based on their spectroscopy. On the blue spectrum by Greenstein et al. (1970) broad Balmer lines were in absorption, while He II and C III/N III were in emission, which made UX UMa-type CV classification likely (Warner 1976). Africano and Quigley (1978) obtained high-speed photometry of this object, and concluded that rapid, non-periodic variations (up to amplitudes of 0.4 mag) were present. With this finding, the object received a variable star designation of V592 Cas (Kholopov et al. 1981). Zwitter and Munari (1994) presented a CCD spectrum, which showed Hα and possibly He I in emission, confirming the CV nature. Downes et al. (1995) reported a temporal variation of the emission lines, particularly in the appearance of the C III/N III lines.

Huber et al. (1998) obtained time-resolved photometry and spectroscopy, and obtained an orbital period of $P_{\rm orb} = 0.114$ d. Huber et al. (1998) suggested that V592 Cas appears to be a nova-like CV in the period gap. Taylor et al. (1998) reported a radial-velocity study and long-term photometry of this object, and reported a refined orbital period of 0.115063(1) d. Taylor et al. (1998) also reported the presence of superhumps with periods of 0.12228(1) and possibly 0.11193(5) d, qualifying V592 Cas as a permanent superhump system.

Here we report on the detection of short-term, coherent photometric oscillations in V592 Cas taken on 2002 October 21. The observation was performed with a 36-cm Schmidt–Cassegrain telescope and an unfiltered SX-10XE camera. The exposure time was 45 s, and the errors of a single exposures was estimated to be 0.007 mag. The zero-point calibration (approximately on the $R_{\rm c}$ system) was performed using the comparison stars by Henden and Honeycutt (1995). The raw data are publicly available in vsnet-obs 41976 and 41977.[1]

The resultant light curve is shown on Figure 1. The existence of short-period recurrent brightenings is apparent. Such strong short-term oscillations were not apparent at the time of the observations by Taylor et al. (1998).

Figure 2 shows the power spectrum of the light curve. A strong signal at a frequency of 66.6(4) d^{-1}, corresponding to a period of 0.0150(1) d, is present. There was no indication of superhumps close to a period of 0.112–0.122 d as shown by Taylor et al. (1998).

[1] http://www.kusastro.kyoto-u.ac.jp/vsnet/obs41000/msg00976.html and http://www.kusastro.kyoto-u.ac.jp/vsnet/obs41000/msg00977.html

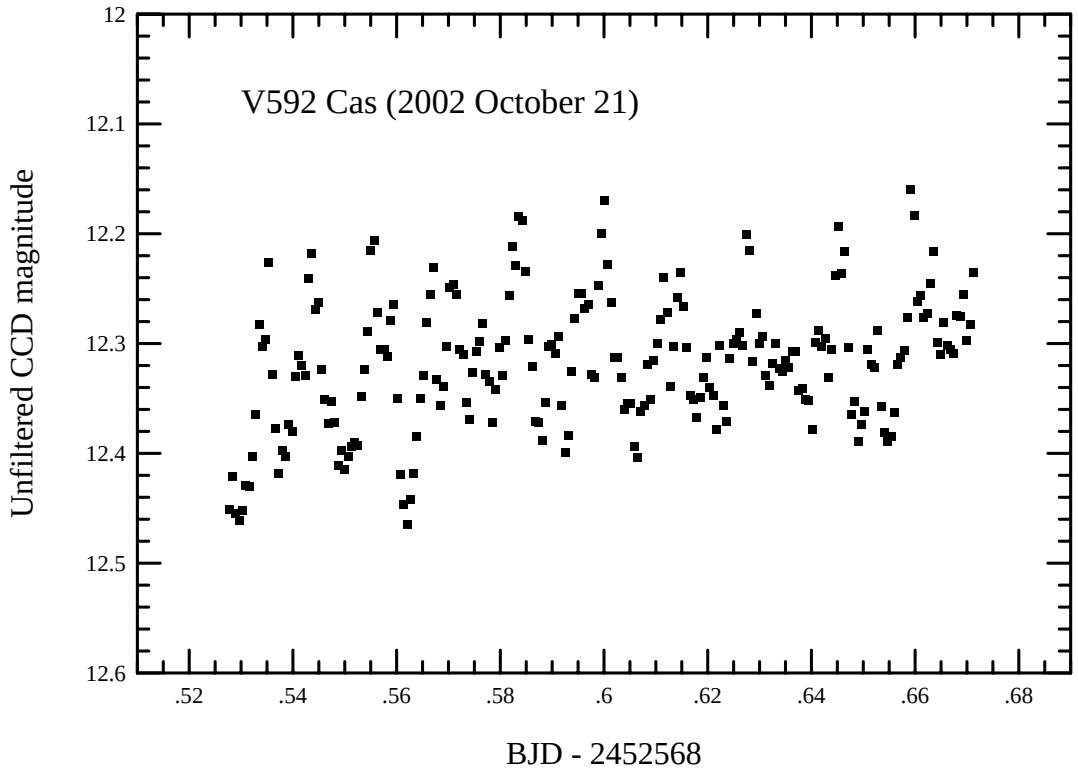

Figure 1. Light curve of V592 Cas on 2002 October 21. Short-period recurrent brightenings were observed.

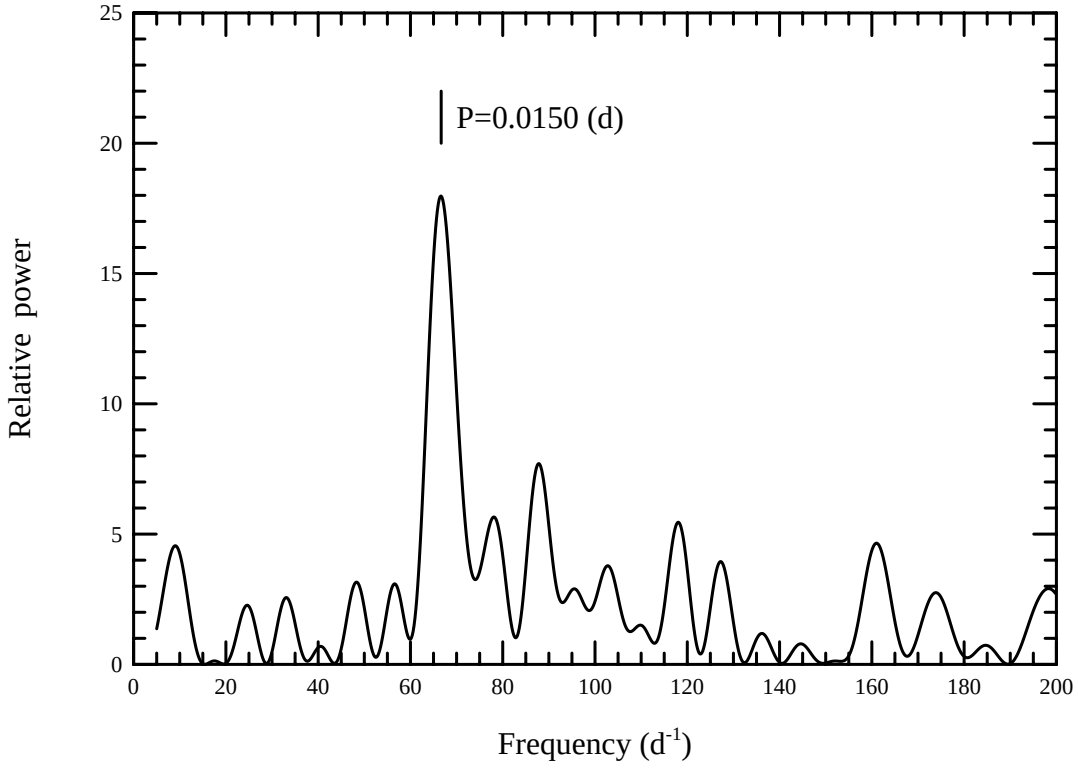

Figure 2. Power spectrum of V592 Cas on 2002 October 21.

Figure 3 shows the averaged profile of this 0.0150-d oscillation. The profile more resembles those of quasi-periodic oscillations (QPOs) rather a sinusoid. The variation looked almost coherent within the length of this observation.

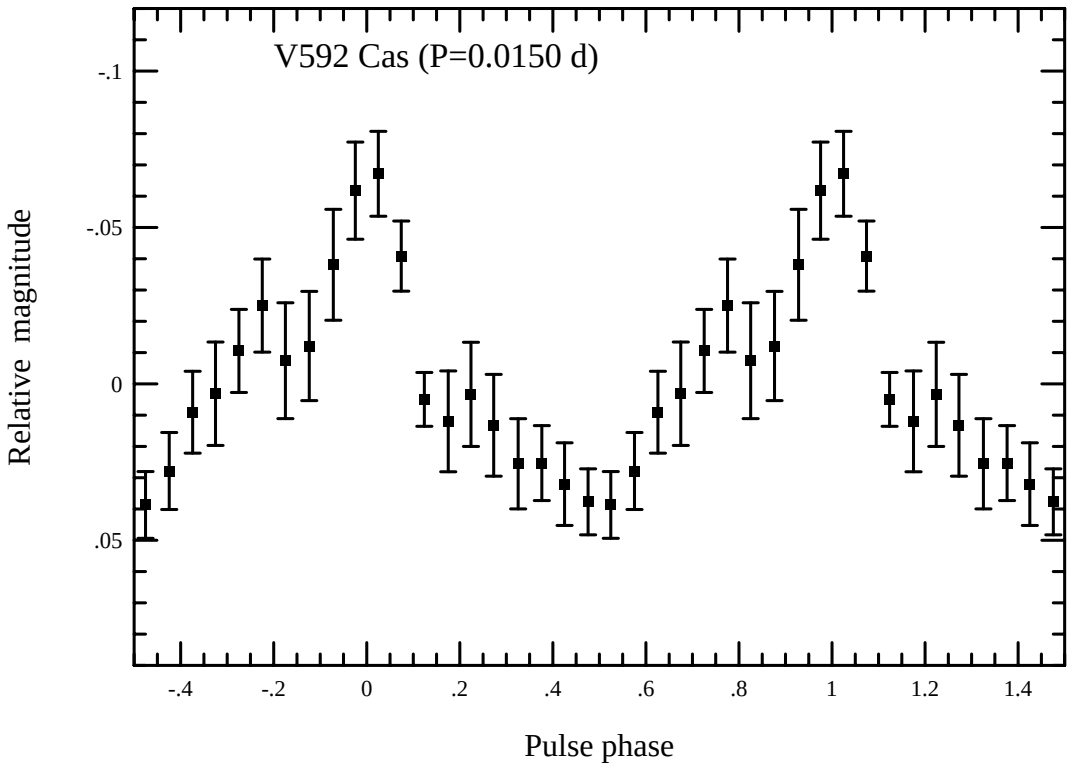

Figure 3. Averaged profile of the 0.0150-d oscillation.

From this observation and the available literature, V592 Cas appears to have two distinct states: (1) state with prominent superhumps and less prominent short-term variations (cf. Taylor et al. 1998) and (2) state with prominent short-term, seemingly coherent, variations, almost lacking superhump-type variations (this study). It is not yet clear whether these states correspond to different excitation states observed in spectroscopy (Downes et al. 1995). According to Patterson et al. (2002), short-period high-amplitude QPO-like oscillations in novalike variables may be a signature of weakly magnetized white dwarf as in intermediate polars (IPs). The presently observed ratio of $P_{\rm oscillation}/P_{\rm orb} = 0.13$, similar to those of typical equilibrium spin rates of IPs (cf. King 1993; Wu and Wickramasinghe 1991), is also suggestive of this interpretation. If this possibility is confirmed, V592 Cas may be a unique object in the period gap showing both properties of permanent superhumps and occasional IP-like, nearly coherent, photometric oscillations.

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