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SUPEROUTBURST OBSERVATION OF AQ Eri: EVIDENCE FOR AN ANOMALOUS SUPERHUMP EXCESS?

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AQ Eri is one of the relatively bright SU UMa-type dwarf novae. Thorstensen et al. (1996) reported a spectroscopic orbital period ($P_{\rm orb}$) of $0^{\rm d}.06093$, which makes AQ Eri a member of SU UMa-type dwarf novae with the shortest orbital periods. Intermediate nature between usual SU UMa-type dwarf novae and extreme WZ Sge-type systems has been proposed for dwarf novae with such periods (cf. Nogami et al. 1996). However, only little is known about superhumps of AQ Eri. No observations of its superhumps have been reported since Kato (1991), who reported a superhump period ($P_{\rm SH}$) of $0^{\rm d}.06225$. Thorstensen et al. (1996) reported that this superhump period gives a fractional superhump excess ($P_{\rm SH}/P_{\rm orb} - 1$) acceptable for a dwarf nova of this orbital period. During the superoutburst in 1992 January, the author succeeded in taking another time-resolved CCD photometry, which is far superior in quality than in Kato (1991).

The observations were done on 1992 January 4 using a CCD camera (Thomson TH 7882, 576 × 384 pixels, on-chip 3 × 3 binning adopted) attached to the Cassegrain focus of the 60-cm reflector (focal length = 4.8 m) at Ouda Station, Kyoto University (Ohtani et al. 1992). An interference filter was used which had been designed to reproduce the Johnson V band. The exposure time was 30 s. The frames were first corrected for standard de-biasing and flat fielding, and were then processed by a microcomputer-based aperture photometry package developed by the author. A total of 430 high-quality images were obtained. The magnitudes of the object were measured relative to GSC 4758.334 ($V = 10.93$, $B - V = +1.24$), whose constancy during the run was confirmed using GSC 4758.622. The observation on following nights was unfortunately hindered by bad weather. Barycentric corrections to observed times were applied before the following analysis.

Figure 1 shows the resultant light curve. Three superhumps are clearly visible with a full amplitude of $0^{\rm m}.24$. This observation confirms the SU UMa-type nature of AQ Eri. Short-period oscillations (quasi-periodic oscillation; QPOs) became stronger around superhump minima. This feature was also observed in AK Cnc (Mennickent et al. 1996), another SU UMa-type star with a short $P_{\rm orb}$. This feature may be common to superhumps of short-period systems.

Period analysis using the Phase Dispersion Minimization (PDM) method (Stellingwerf 1978) has yield a superhump period of 0.0642 ± 0.0004 d, which is remarkably longer than the previously reported value of $0^{\rm d}.06225$. The fractional superhump excess is $5.4 \pm 0.7\%$, which is remarkably larger than the typical superhump excesses (1–3%) of short-period systems. The reason of this discrepancy is not well understood. The author has checked

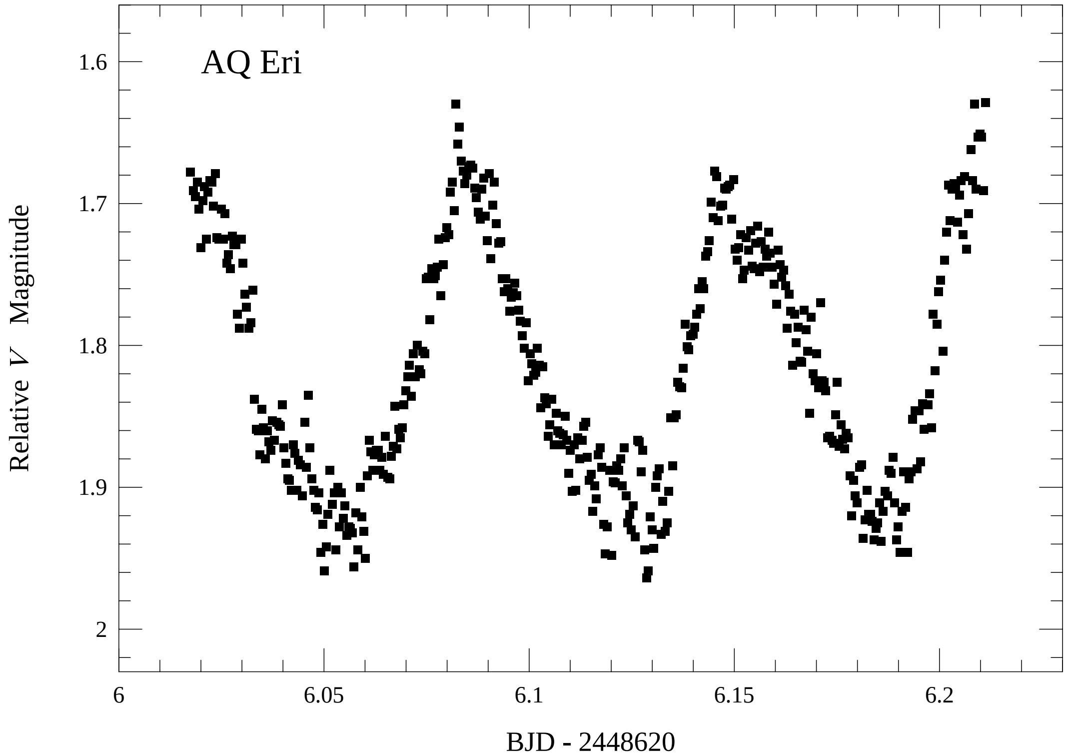

Figure 1. Light curve of AQ Eri on 1992 January 4

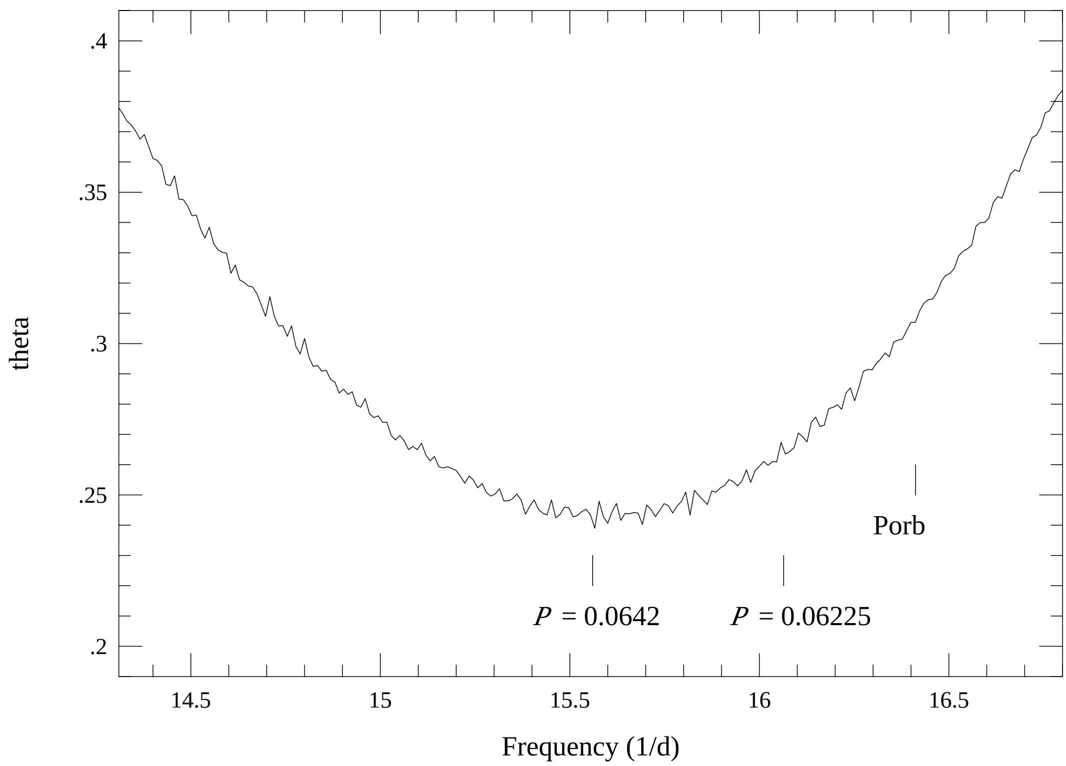

Figure 2. Periodogram of AQ Eri superhumps

the stability of the computer clock and recording system, and found no abnormalities. The seemingly abnormal period is thus most likely attributed to the superhump period itself. The relation between the observed $P_{\rm SH}$, previously observed $P_{\rm SH}$ and $P_{\rm orb}$ is shown in Figure 2. Although it may be still possible AQ Eri has an intrinsically abnormally high fractional superhump excess, such a high superhump excess may have been a transient one. Future more extensive observations during superoutbursts are thus strongly encouraged.

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