

GREAT OUTBURST OF A0535+26 RECORDED IN OPTICAL BAND IN 28/29 OCTOBER 1995

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The observations in Johnson's B filter of the great outburst of transient X-ray pulsar A0535+26, recorded in the night 28/29 October 1995 (JD2450019) from UT = 22.90 to 24.61 h are presented. The outburst consist of a great number of transitory individual pulses. The amplitude of single pulse at the peak of the burst's intensity was about 1.74. The durations of the pulses were about 10–20 s and similar to the integration time. The bottom brightness level between the pulses was stable during the event.

KEY WORDS Transient X-ray pulsar, optical variability, flares, outburst

The X-ray transient source A0535+26 (HDE 245770, V725 Tau) was first detected by the British satellite Ariel V (Rosenberg *et al.*, 1975). This Be and neutron star binary system is unusually active, as observers have noticed since its initial discovery (see, for example, Giovannelly and Graziati, 1992). The optical variability of V725 Tau was revealed by Rossiger (1976) and from that time systematic photoelectric observations of the star were begun. Lyutiy *et al.* (1989) described in detail the photometric behaviour of the system by using the authors' and all published photoelectric observations made during many years and replenishing these with information about photographic observations from 1898 in archives. Besides a slow optical variability (years) observers mention transitory optical flares with large ($\Delta V \geq 0.15$ mag) amplitudes: Rossiger (1978) in December 1977, Gnedin *et al.* (1988) in April 1983, Maslennikov (1986) in April 1985, Berdnik *et al.* (1990) in November 1986. The observers usually do not mention the durations of the flares; these are in time scales of hours, apparently.

Our observations in the nights 27/28, 28/29 October and 20/21 November 1995 were part of the Program "Monitoring of Unique Astrophysical Objects" of the Russian Ministry of Science. The observations were made with a dual channel photometer attached to the 0.8 m Ritchey–Chretien telescope at the Mount Dushak–Erekdag station of Odessa Astronomical Observatory (Dorokhov *et al.*, 1995). The integration time was 10 s in Johnson B filter. HD 37170 ($m = 8.4$ mag, A2) was used as a comparison star. Usually the average accuracy of our observations is 0.2–

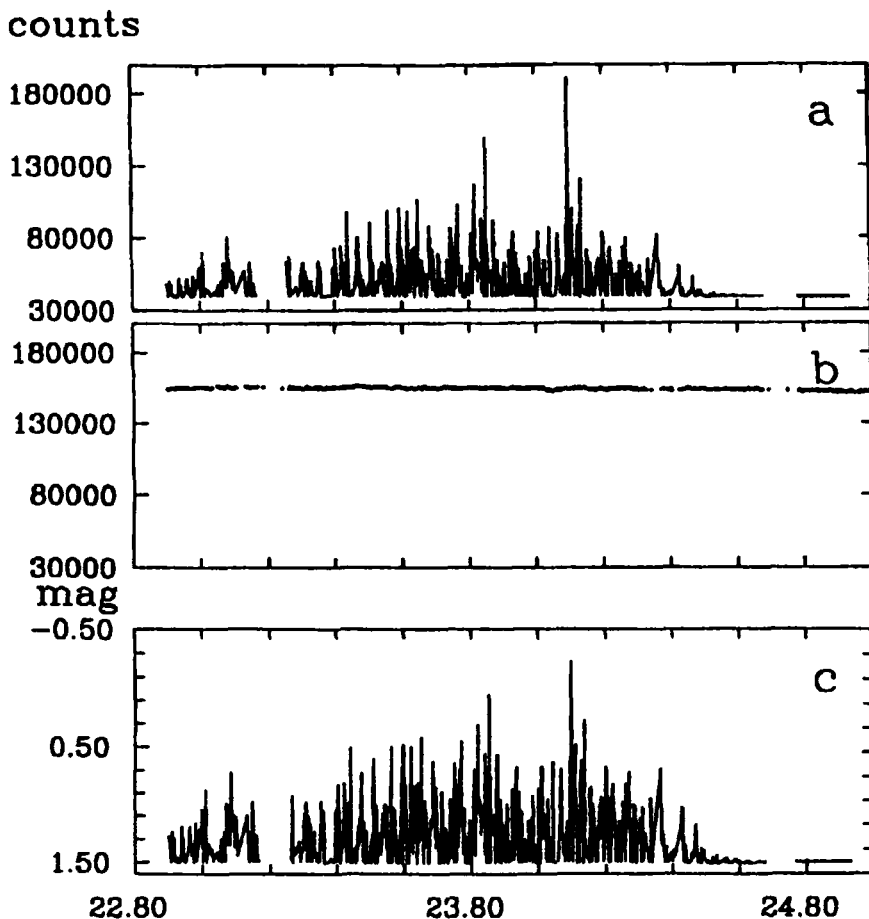


Figure 1 The data of dual-channel observations on 28/29 October 1995 in Johnson's B filter: *a*, the counts of A0535+26 in the primary channel (comparison star counts obtained in this channel for the channel reduction, is seen at UT = 23.2 and 24.7 hours); *b*, the counts of the comparison star in the secondary channel, reduced to the sensitivity of primary channel; *c*, v-c data in relative magnitudes.

0.4% for stars of 8–10 mag, but on the night of 28/29 October the transparency of the sky was particularly stable (a mean square error less than 0.001 mag).

We recorded the great outburst in the night 28/29 October 1995 (JD 2450019) from UT = 22.90 to 24.61 h. The date of the outburst is near the periastron passage of the pulsar within the error limits if the orbital parameters of Margoni *et al.* (1988) are adopted: $T_0 = 2443056 \pm 3$ days; $P = 55.73 \pm 0.31$ days.

The data of the two-channel mode are presented in Figure 1. The counts were reduced to 1 s integration time. The observations started after the outburst had begun. The outburst consists of a great number of transitory individual pulses. The intensity at the burst's peak was about five times as large as that on the bottom

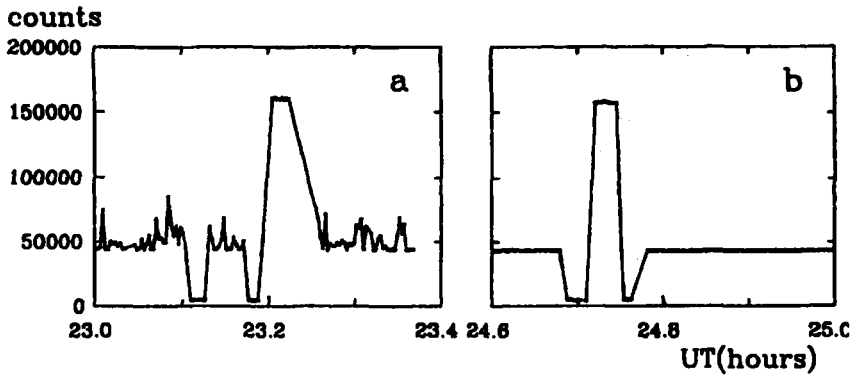


Figure 2 Two of the fragment illustrate the stability of the photometer's primary channel work (a, during the outburst; b, after the outburst). The sky background counts are seen below, and the comparison star's counts - above. The points are joined by the connected line.

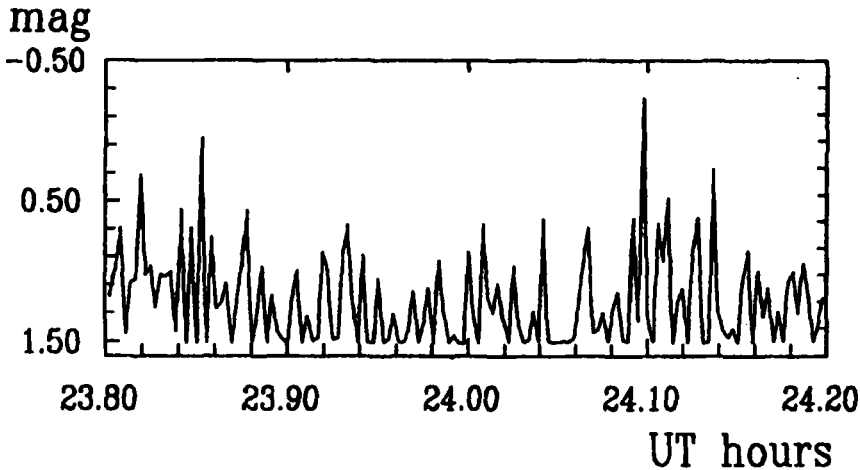


Figure 3 A fragment of the Figure 1c between two of the brightest individual pulses.

level on this night ($\Delta m = 1.74$ mag). On average A0535+26 became brighter by 0.2–0.25 mag.

In Figure 2 the stability of the primary channel work of the photometer is shown in two fragments of our observations, taken when the sky background and the comparison star for the channels reduction were observed.

The structure of the outburst is seen better in the larger time scale fragment (Figure 3). One pulse duration is nearly 10–20 s and compared with the integration time. It is interesting that Urasin and Shaimukhametov (1986) reported short-time optical flashes with amplitudes 2–3 mag and durations 0.2–0.3 s. The flashes which they observed are very much like the individual pulses of this outburst, if we take into account that their integrated times were 0.1 s and 0.05 s (by one and

two hundredths less than ours). Probably we observed the picture of merged and smoothed series of more transient pulses.

The bottom brightness level between the pulses was stable during the outburst, which testifies to the non-thermal nature of the phenomenon.

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