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THE OPTICAL COUNTERPART OF THE POSSIBLE BRIGHTEST TRANSIENT X-RAY SOURCE IN M31 IS FOUND

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Having found a nova in M31 on plates of the Baldone Schmidt telescope plate archive (Smirnova & Alksnis, 2006), which occurred to be the optical counterpart of the supersoft X-ray source [PFH2005] 191 (Pietsch et al., 2005a), we started to inspect the positions of known M31 supersoft X-ray sources on scans of other plates of M31 taken in the years 2001-2002.

An object was found at the position of the supersoft X-ray source [PFH2005] 543 (Pietsch et al., 2005a) on the plate No. 248 taken on November 12, 2001. Its coordinates R.A. = $00^{\rm h}44^{\rm m}14\overset{\rm s}{.}52$, Decl. = $+41°22'4\overset{''}{.}3$ (equinox 2000.0; estimated maximal error radius $0\overset{''}{.}7$) determined from the scanned discovery plate, on which the nova is the brightest, with respect to the positions of field stars from UCAC2, agree with those of the [PFH2005] 543 within $0\overset{''}{.}5$. So it is highly probable that the newly found object is the optical counterpart of the X-ray source [PFH2005] 543.

The X-ray source, designated as XMMU J004414.0+412204, was discovered on January 5, 2002 by Trudolyubov et al. (2002), confirmed on January 8, 2002 by Garcia et al. (2002), observed on highest luminosity level on February 6, 2002 and included in the catalog of transient X-ray sources in M31 (Williams et al., 2006) as object n1-86. Williams et al. (2006) did not exclude the possibility that the X-ray source n1-86 is in M31 and might have the highest X-ray luminosity of any transients yet observed in M31. Trudolyubov et al. (2005) did not succeed in search for optical counterparts of the X-ray source, but according to them the transient behavior of the source hints that it may be a classical nova in supersoft X-ray spectral phase.

A finding chart of the nova from the discovery plate is given in Figure 1. Times of the middle of exposures in Julian days and blue magnitudes (m_B) of the nova based on the secondary standard stars from the $BVRI$ catalogue of M31 (Magnier et al., 1992) are given in Table 1. The light curve of the nova is presented in Figure 2.

The object was first observed when it was near the outburst maximum, which evidently occurred within a day before or after our first observation. The estimated light decay rate $dB/dt > 0.2$ m/d during observation period suggests that probably the nova was very fast. Thus according to our observations the photometric behavior of the object seems to be typical for novae in M31.

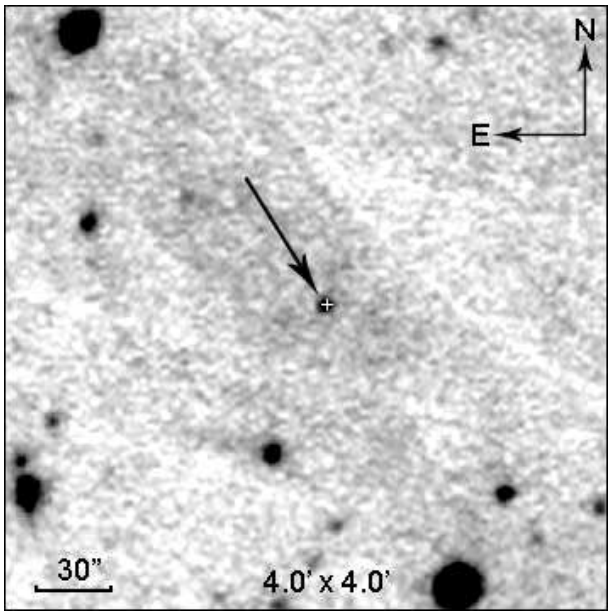

Figure 1. Finding chart for the discovered nova. The cross shows the position of the X-ray source [PFH2005] 543

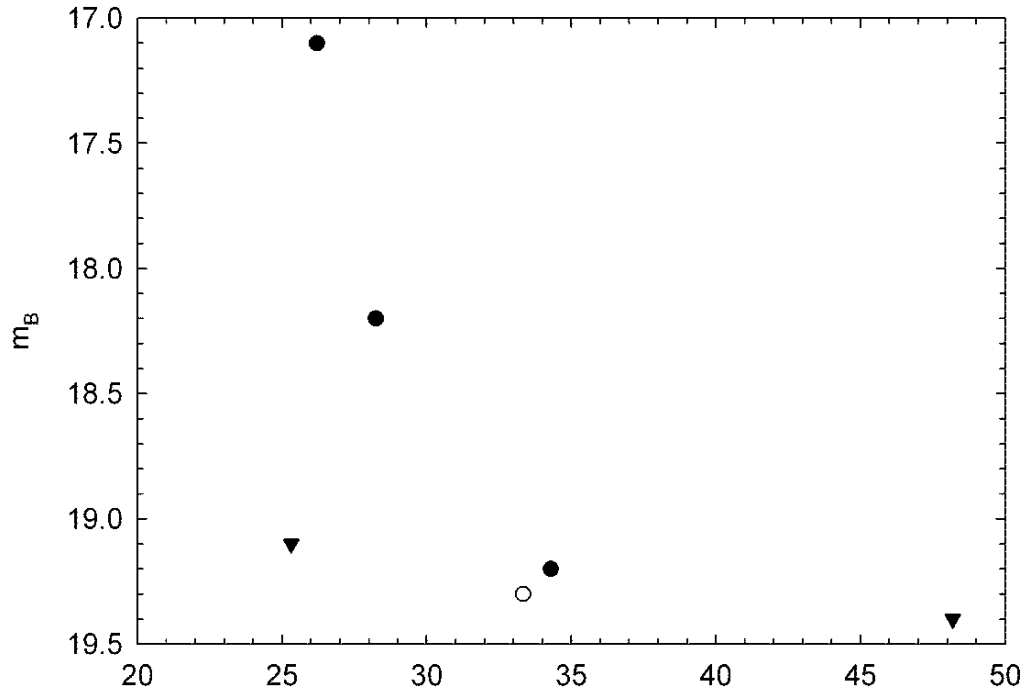

Figure 2. The light curve of the nova in M31. Filled circles: confident measurements; open circle: uncertain measurement; triangles: brightness upper limits

Table 1

JD 2452200 +	m_B mag
25.216	> 19.1
26.208	17.1
28.238	18.2
33.327	19.3:
34.292	19.2
48.188	> 19.4

Possibly because of its high X-ray luminosity the nova is also unique in another aspect: the time separation between its optical outburst and detection as supersoft X-ray source is the shortest known for novae in M31 — only 53 days, followed by WeCaPP-N2001-12 with 63 days (Pietsch et al., 2005b) and the optical counterpart of the X-ray source [PFH2005] 191 with 84 days (Smirnova & Alksnis, 2006).

Corrigendum. In the paper by Smirnova & Alksnis (2006), third paragraph from the end, instead of 1/10/2001 should be 1/10/1992. Our thanks are due to W. Pietsch for pointing out this error.

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