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X-ray rebrightening of the Be/X-ray transient Swift J0243.6+6124

ATel #11517; *A. Rouco Escorial, N. Degenaar, J. van den Eijnden, R. Wijnands (University of Amsterdam)*
on **9 Apr 2018; 11:07 UT**
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Subjects: X-ray, Binary, Neutron Star, Transient, Pulsar

Swift J0243.6+6124 is a Be/X-ray transient that was discovered in October 2017 when it started a giant, type-II outburst (Atel #10809, Atel #10822). After reaching the peak around November 5th 2017, the source luminosity started to decay slowly over ~135 days, although the decay rate increased significantly around two weeks ago.

To investigate how exactly the source would decay and potentially transit back into quiescence, we triggered a monitoring program (PI: Degenaar) on the system using the Neil Gehrels Swift observatory (Swift). During the observations the count rate, as observed using the X-ray telescope (XRT), decreased from 2.35 ± 0.11 counts/s on March 22nd 2018 to 0.60 ± 0.03 counts/s on April 1st 2018. In this observation, when the source had the lowest observed XRT count rate (April 1st 2018), the Swift/XRT spectrum is well fitted by a power-law model ($n_H = 1.6 \pm 0.3 e^{22} \text{ cm}^{-2}$ and $\Gamma = 0.85 \pm 0.15$), which gives a 0.5-10.0 keV unabsorbed X-ray flux of $5.75 \pm 0.29 e^{-11} \text{ erg/s/cm}^2$. The corresponding X-ray luminosity (L_X) is $4.30 \pm 0.22 e^{34} \text{ erg/s}$ if we assume a distance to the source of 2.5 kpc (Atel #10968) or $L_X = 1.72 \pm 0.09 e^{35} \text{ erg/s}$ if the source is placed at a distance of 5 kpc (Doroshenko et al. 2017, A&A in press, [arXiv:1710.10912](#)).

After our XRT observations on April 1st 2018, the source suddenly increased in count rate during the following observation to 5.49 ± 0.29 count/s on April 6th 2018. A similar increase in brightness can be seen from the Swift/BAT light curve of the source available at swift.gsfc.nasa.gov/results/transients/weak/SwiftJ0243.6p6124/. Since the PC mode data are strongly affected by pile-up, we only extracted the spectrum from the data obtained using the WT mode (~569 seconds of data). A power-law fit to the spectrum obtained on April 6th 2018 resulted in a photon index of 0.35 ± 0.14 ($n_H = 1.4 \pm 0.4 e^{22} \text{ cm}^{-2}$) and a 0.5-10 keV unabsorbed X-ray flux of $2.59 \pm 0.12 e^{-10} \text{ erg/s/cm}^2$ ($L_X = 1.94 \pm 0.09 e^{35} \text{ erg/s}$ or $L_X = 7.75 \pm 0.36 e^{35} \text{ erg/s}$ assuming 2.5 kpc or 5 kpc respectively). Swift monitoring observations of Swift J0243.6+6124 are scheduled every other day, but the system is becoming Sun constrained by the end of April (until early June). Observations of this source at other wavelengths are encouraged to study the nature of the rebrightening.

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We thank the Swift team for scheduling our monitoring observations of Swift J0243.6+6124.

Scaled Map Transient Analysis for Swift J0243.6+6124

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