

Swift Observations of GRB 071018

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1 Introduction

BAT triggered on GRB 071018 at 05:57:44.47 UT (trigger=294645) (Krimm, *et al.*, *GCN Circ.* 6932). This was a 320 sec image-trigger on a long burst with $T_{90} = 376 \pm 20$ sec. Because the Swift operations team was still in the process of resuming normal operations, there were no automatic follow-up observations by the XRT or UVOT. Following a commanded slew, XRT began follow-up observations at $T + 15.8$ hours. UVOT did not observe this burst. XRT detected five unidentified sources in its field of view, only one of which is within the refined BAT error circle. Our best position is the BAT location $RA(J2000) = 164.6848^\circ$ ($10h\ 58m\ 44.35s$), $Dec(J2000) = +53.8217^\circ$ ($+53^\circ 49' 18.1''$) with an error of 2.1 arcmin (90% confidence, including boresight uncertainties).

2 BAT Observation and Analysis

Using the data set from $T - 239$ to $T + 844$ sec, further analysis of BAT GRB 071018 has been performed by Swift-BAT team (Sato, *et al.*, *GCN Circ.* 6933). The BAT ground-calculated position is $RA(J2000) = 164.6848^\circ$ ($10h\ 58m\ 44.35s$), $Dec(J2000) = +53.8217^\circ$ ($+53^\circ 49' 18.1''$) ± 2.1 arcmin, (radius, systematic and statistical, 90% containment). This is based on a time interval of $T + 20$ to $T + 470$ sec and an energy interval of 14 to 100 keV, which yields a higher significance detection than the trigger interval. The partial coding was 97% (the bore sight angle was 19.9°).

The mask-weighted light curve (Fig.1) shows an elongated multi-peaked structure. The burst location came into the BAT field of view at $T - 70$ sec. and there was an initial peak at $T - 50$ sec, followed by low-level emission from $T + 20$ to $T + 80$ sec, followed by the main emission in several peaks from $T + 120$ sec to $T + 420$ sec. There is also possible emission at later times ($T + 600$ and $T + 800$ sec), although statistics are poorer for this late time since the spacecraft slewed to a new target, moving the burst nearer the edge of the field of view. $T_{90}(15 - 350keV)$ is 376 ± 20 sec (estimated error including systematics).

The time-averaged spectrum from $T + 113.1$ to $T + 417.7$ sec is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.63 ± 0.26 . The fluence in the 15-150 keV band is $1.0 \pm 0.2 \times 10^{-6}$ erg cm^{-2} . The 1-sec peak photon flux measured from $T + 124.18$ sec in the 15-150 keV band is 0.2 ± 0.1 ph cm^{-2} sec^{-1} . All the quoted errors are at the 90% confidence level.

3 XRT Observations and Analysis

Based on analysis of observing segments 1 and 2 ($T + 0.66$ day to $T + 4.15$ day), there is a total exposure of 16.06 ks. In addition to the original 2 sources reported in (Beardmore, *et al.*, *GCN Circ.* 6943), there is one other source in the original refined BAT error circle plus two more outside detected with a $snr > 3$ in the tool ximage/detect (see Table 1). The sources and the BAT error circles are shown in Figure 2. Only Source 5 is within the revised BAT error circle.

The count rate for Source 1 (originally the brightest) is shown in Figure 3. It is not clear whether or not this burst is fading.

Table 1: Possible X-Ray counterparts to GRB 071018

source	RA	declination	Err (arcsec) ^a	Src cts ^b	Bgd cts ^c	Rate (10^{-3} ct/sec) ^d	Dist (arcmin) ^e
1	164.51207	53.82223	5.6	39	2.4	1.9 - 2.7	6.1
2	164.58023	53.82442	7.7	13	2.3	0.4 - 0.9	3.7
3	164.56831	53.86937	7.7	13	2.3	0.4 - 0.9	5.0
4	164.50750	53.81067	6.3	25	2.3	1.1 - 1.7	6.3
5	164.72164	53.81401	6.2	26	2.3	1.2 - 1.8	1.4

^a Err is the 90 percent error radius, which includes a 4 arcsec systematic error added in quadrature.

^bSrc is counts in a 10 pixel radius circle.

^c Bgd is the estimated background counts in the source region (where the estimated background level was 0.00748 count/pixel).

^dRate is the 1σ count rate range estimated from the Bayesian limits method of Kraft et al. These are not corrected for PSF losses (a factor of 1.24).

^e Dist is the distance from the refined BAT position.

4 UVOT Observation and Analysis

Since the UVOT was not operating at the time of this burst, there are no UVOT observations.

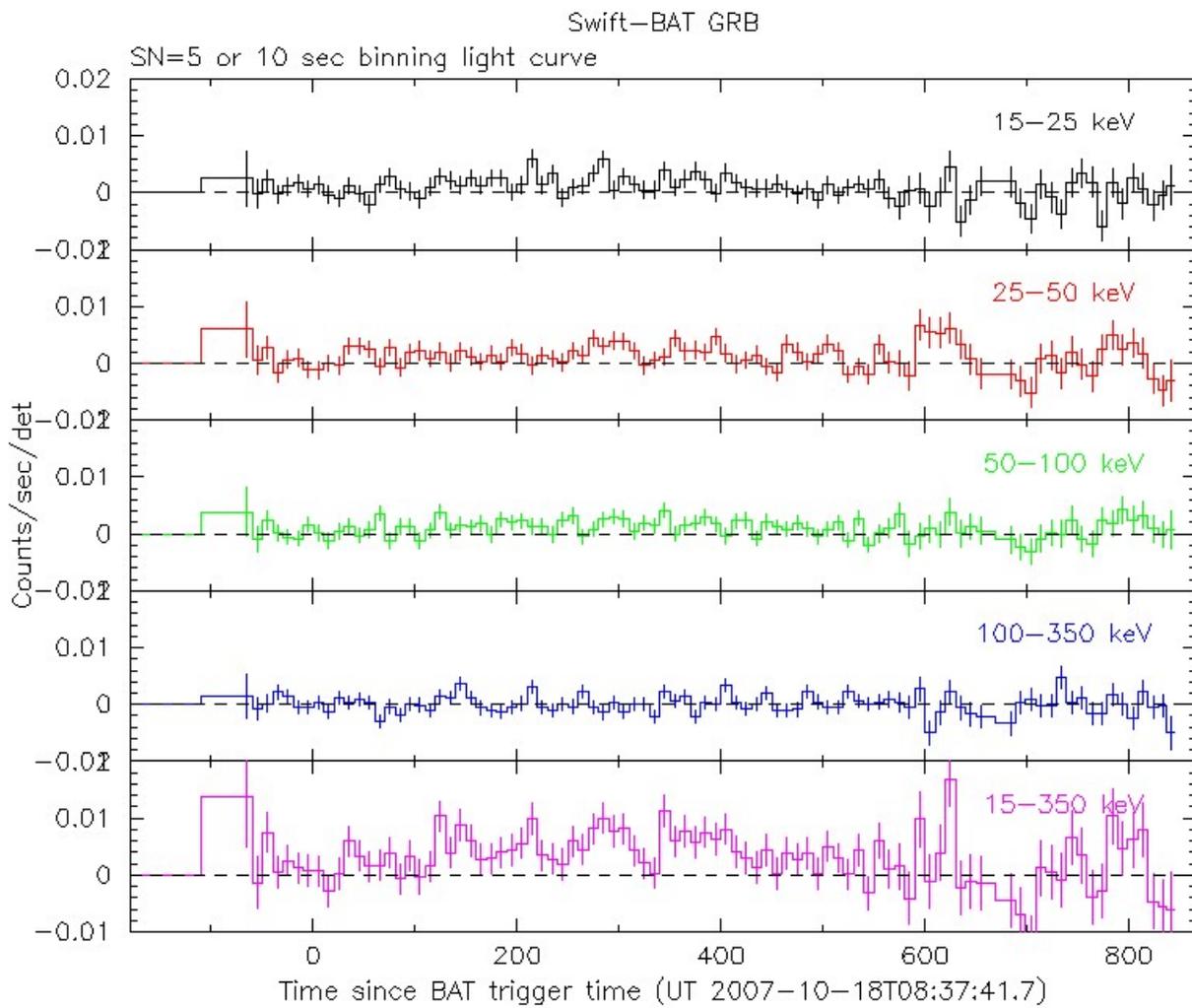


Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector (note illum-det = 0.16cm^2).

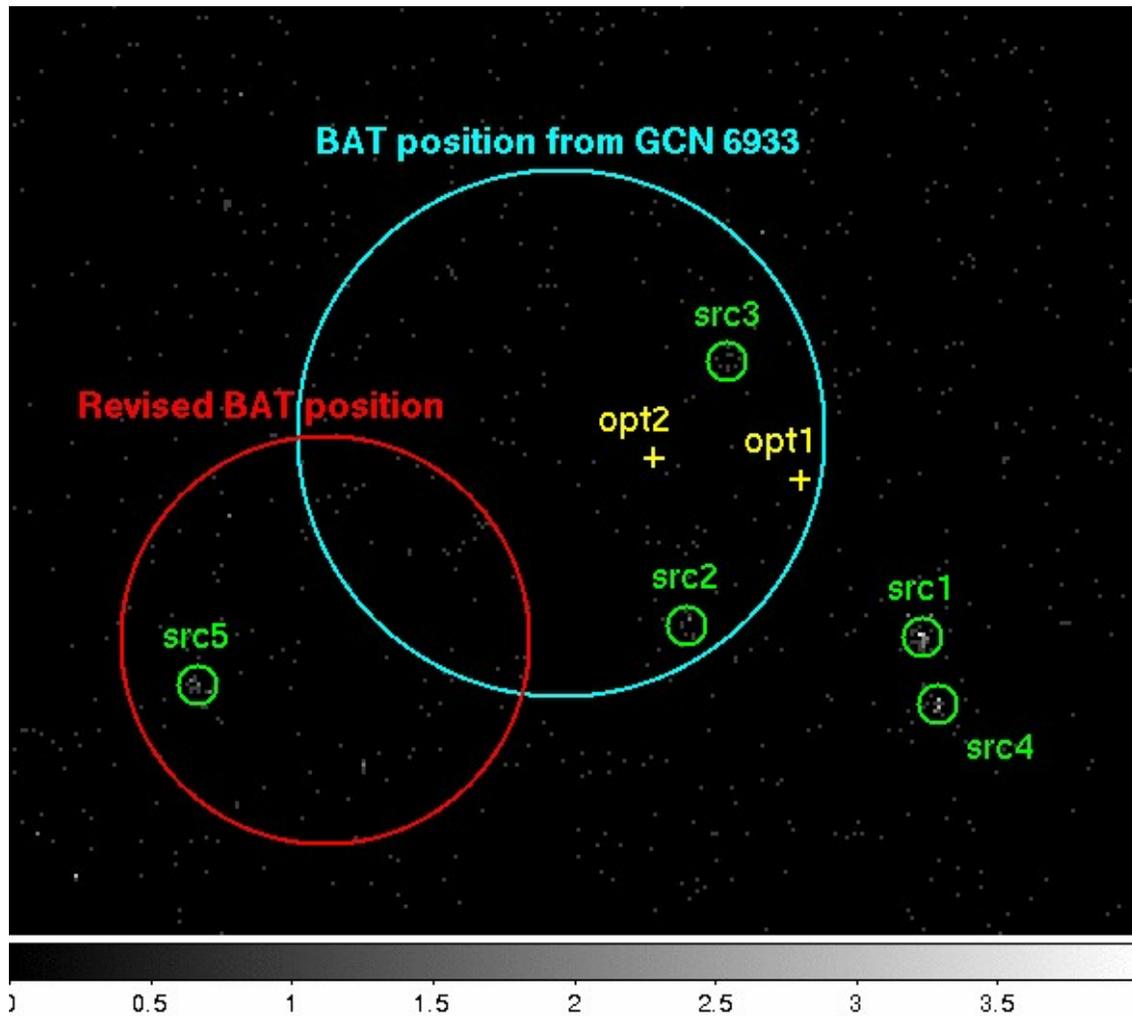


Figure 2: Sky image showing the five possible XRT counterparts in Table 1 and the original BAT location (GCN 6933) in blue and the revised location in red. Also shown are the locations of the two possible optical counterparts reported by Xin, *et al.*, *GCN Circ.* 6936.

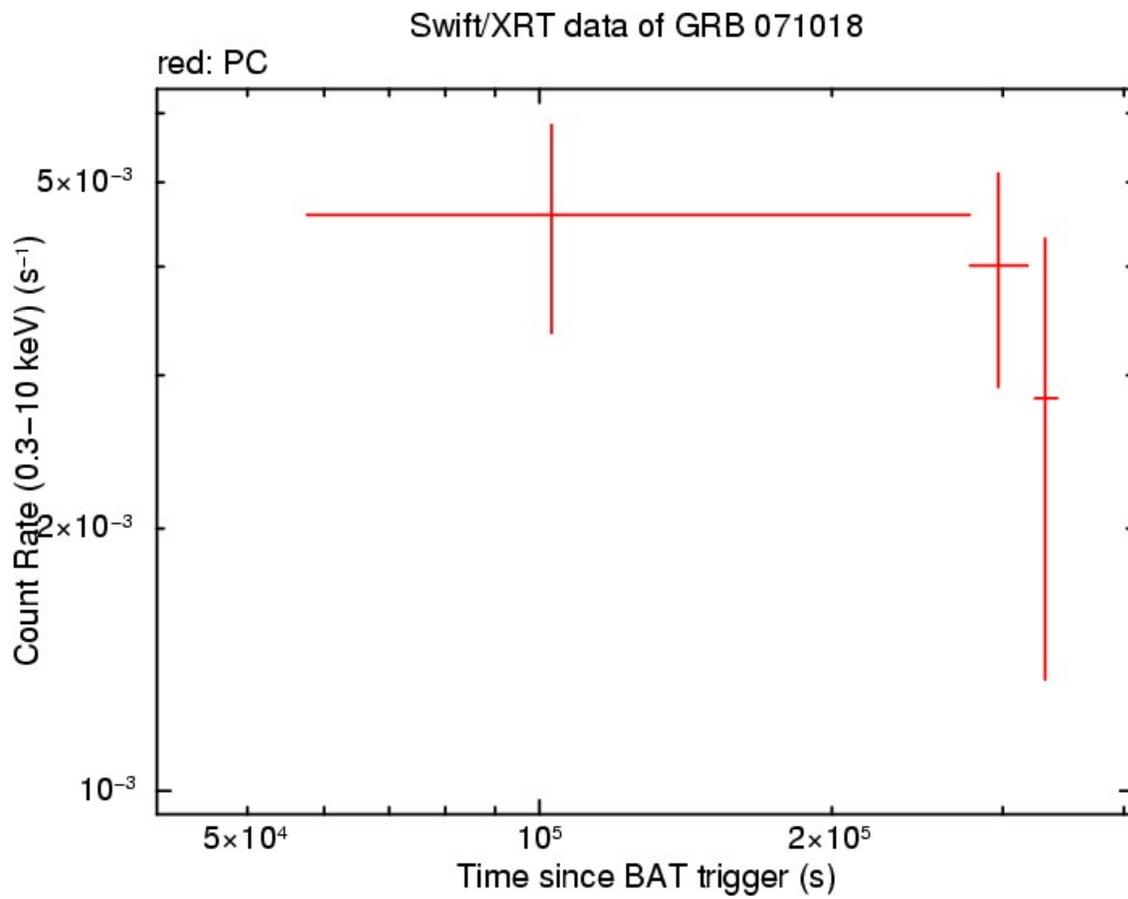


Figure 3: XRT Lightcurve. Counts/sec in the 0.3-10 keV band in the Photon Counting mode (red).