

Swift Observations of the GRB 070913

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for the Swift Team:

1. INTRODUCTION

At 00:36:43 UT, the Swift Burst Alert Telescope (BAT) triggered and located GRB 070913 (trigger=290843). Swift did not slew to the burst because automated slewing was disabled. Our best position is from the Swift XRT, which is:

RA(J2000) = 15h 15m 01.7s

Dec(J2000) = -24d 17' 34.9"

with an uncertainty of 6.5 arcsec (radius, 90 percent confidence, including boresight uncertainties). The gamma-ray light curve shows a single peak of about 4 seconds duration. The faint X-ray counterpart detected by Swift XRT is 5.7 arcsec away from the TAROT optical afterglow candidate reported by Klotz et al. (GCN 6787). Swift observations of GRB 070913 are complete.

2) BAT OBSERVATION AND ANALYSIS

The following analysis uses the data set from T-239 to T+523 sec (Markwardt, et al., GCN Circ. 6782, 6785). The BAT ground-calculated position is RA, Dec = 228.737 -24.278 deg which is:

RA(J2000) = 15h 14m 57s

Dec(J2000) = -24d 16' 42"

with an uncertainty of 1.7 arcmin, (radius, sys+stat, 90% containment). The partial coding was 51%, and the burst was 41.8 deg off-axis.

The mask-weighted light curve shows a single peak of about 4 seconds duration. T90 (15-350 keV) is 3.2±0.3 sec (estimated error including systematics).

The time-averaged spectrum from T-2.4 to T+1.2 sec is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.61±0.19. The fluence in the 15-150 keV band is 2.5±0.3 x 10⁻⁷ erg/cm². The 1-sec peak photon flux measured from T-0.34 sec in the 15-150 keV band is 1.4±0.2 ph/cm²/sec. All the quoted errors are at the 90% confidence level.

3. XRT OBSERVATION AND ANALYSIS

The Swift-XRT began observing the field of the BAT GRB at 2007-09-13 21:30 (UTC), 75.2 ks after the BAT trigger (Beardmore, et al. GCN Circ. 6789). In 8 orbits of photon counting mode data totaling 7.8 ks we find a faint, uncatalogued source inside the refined BAT error circle at RA, Dec (J2000) 228.75715, -24.29302, which is

RA(J2000) = 15h 15m 01.7s

Dec(J2000) = -24d 17' 34.9"

with an uncertainty of 6.5 arcsec (radius, 90 percent confidence, including boresight uncertainties). This candidate is labeled as "TAROT" in Figure 2, since it is 5.7 arcsec away from the TAROT optical afterglow candidate reported by Klotz et al. (GCN 6787). The source has an observed 0.3-10.0 keV count rate of (1.4±0.5) x 10⁻³ count/s for the quoted exposure.

We note the presence of a second faint X-ray source with a count rate of (1.3±0.5) x 10⁻³ count/s at RA, Dec (J2000) 228.70481, -24.21053, i.e.

RA(J2000) = 15h 14m 49.2s

Dec(J2000) = -24d 12' 37.9"

with an uncertainty of 6.6 arcsec (radius, 90 percent confidence, including boresight uncertainties). The

source is labeled as “Src #2” in Figure 2, and is 4.4 arcmin from the refined BAT position (outside the 1.7 arcmin error radius quoted above).

Based on 12ks of XRT data, Source #1 has a total of 10.7 background-subtracted counts in a 10 pixel radius extraction circle (above a background level of 4.4 counts), giving a count rate of 0.00093 ± 0.00033 ct/s (not corrected for PSF losses).

Splitting the data into 2 parts from T+75ks to T+116ks (exposure 7.8ks) and T+121ks to T+168ks (4.1ks) gives a count rate of 0.00139 ± 0.00046 ct/s for the 1st interval and a 3 sigma upper limit of 0.00205 ct/s for the 2nd.

Based on a further 3.4 ksec of data, we place a 3 sigma upper limit on the count rate of 0.0028 ct/s. Thus, while the later observations of the candidate produced only upper limits, it is difficult to determine whether it faded or not.

Source #2, just outside the BAT error circle, appears to have a constant count rate of 0.00126 ± 0.00045 ct/s and 0.00277 ± 0.00088 ct/s for the same two intervals listed above.

4. UVOT OBSERVATION AND ANALYSIS

The Swift Ultraviolet/Optical telescope (UVOT) did not observe this burst.

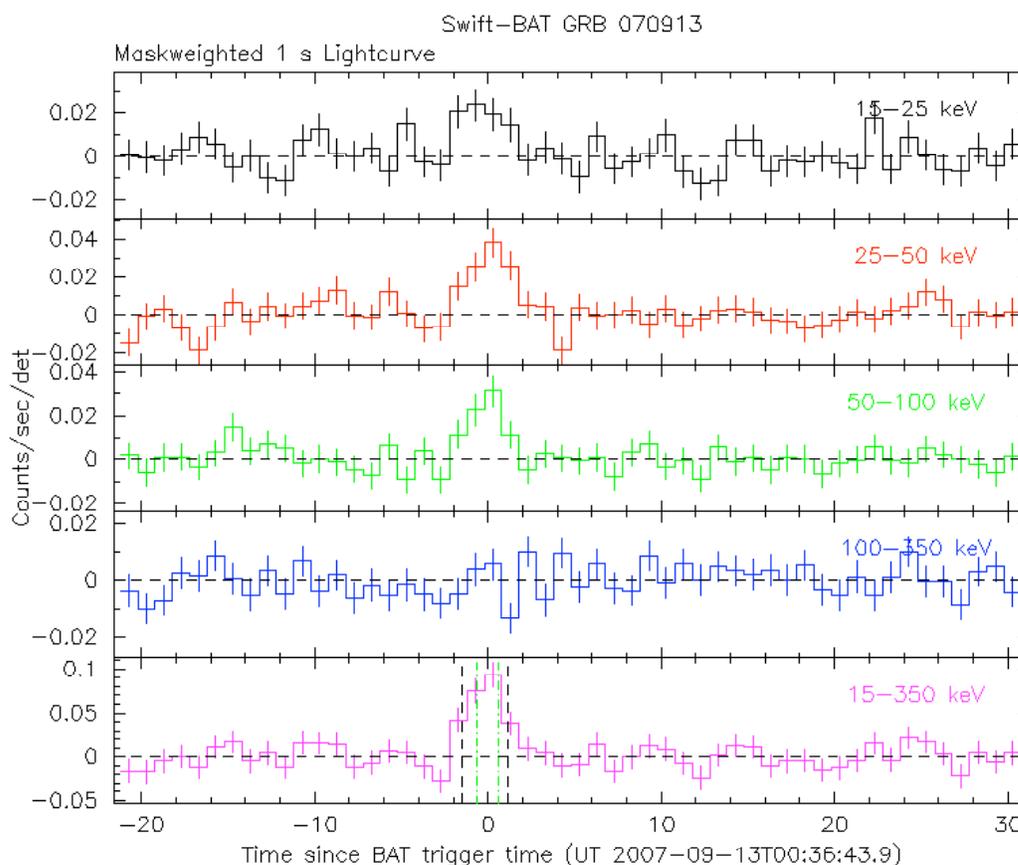


Fig.1: BAT lightcurve with 1 sec time bins. The lightcurve has 4 individual energy bands (15-25 keV, 25-50, 50-100, 100-150, starting from top), plus the total band (bottom). The vertical dashed lines indicate the T50 (green) and T90 (black) intervals.

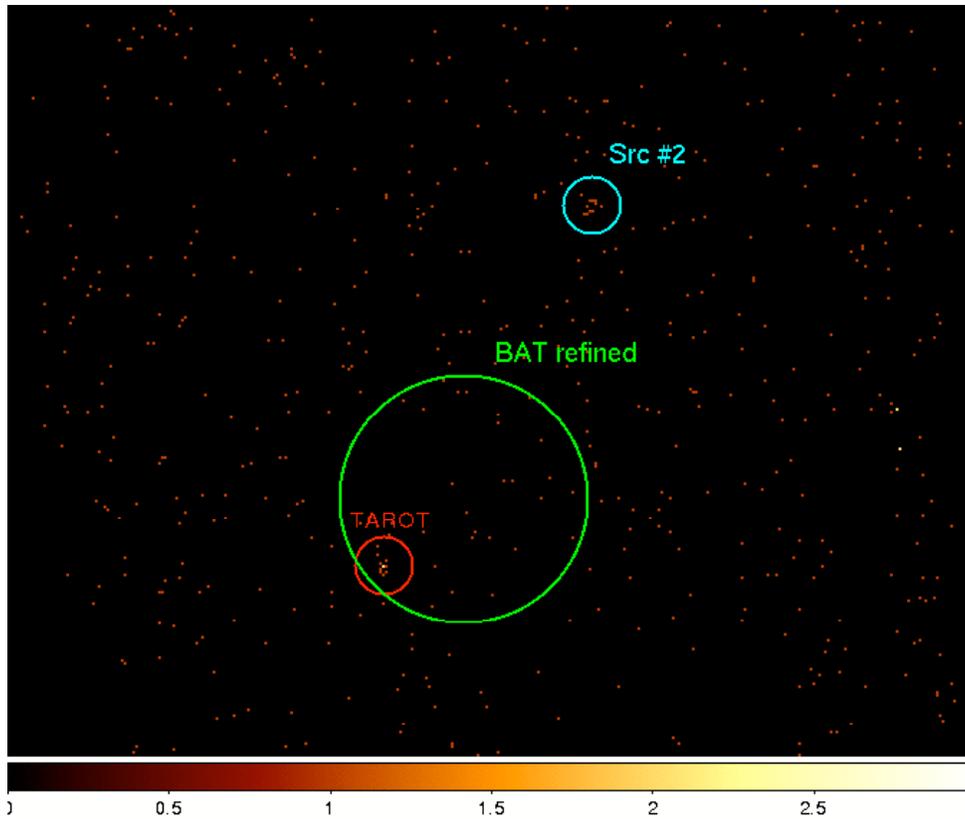


Fig. 2: Swift XRT image based on 5.6 ks of data. The refined BAT error circle is shown in green; Source #1 is shown in red (which is coincident with the reported TAROT candidate); Source #2 is shown in blue, and is outside of the BAT error circle.

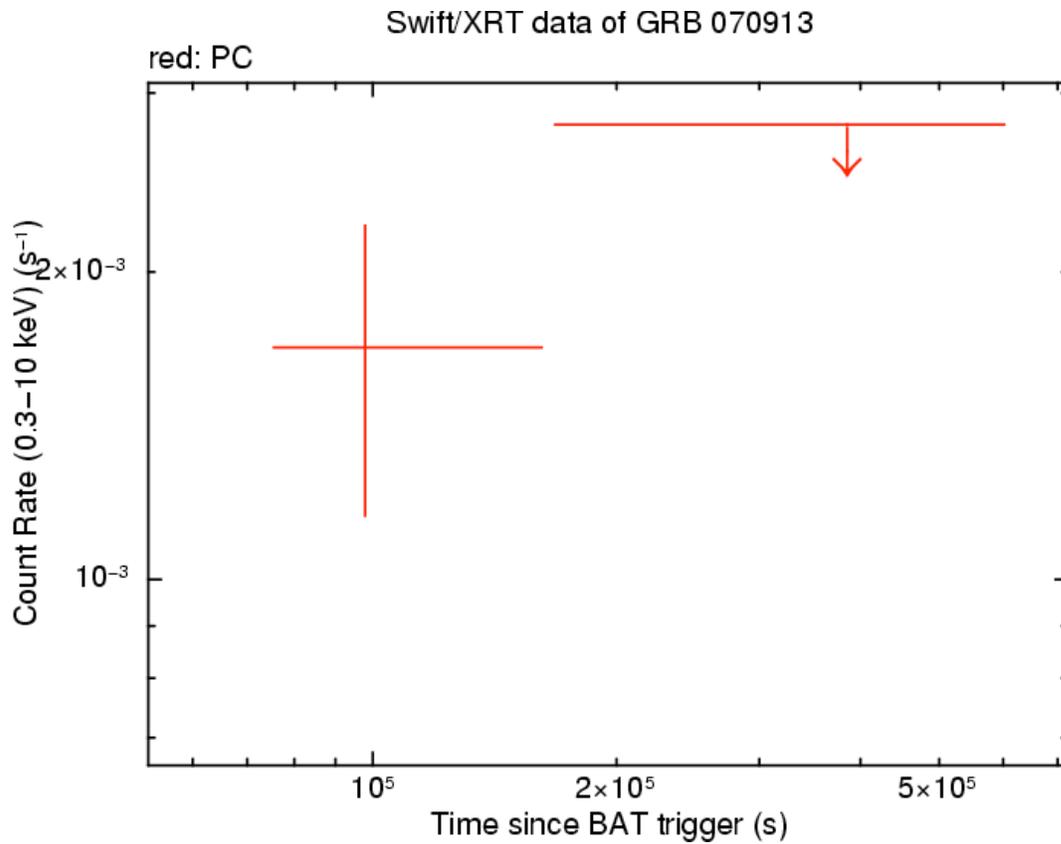


Fig. 3: Swift XRT lightcurve in count rate units of Source #1. All data were taken in Photon Counting (PC) mode. The first point represents the first 12 ksec of data, and the second point represents a 3-sigma upper limit based on 3.4 ksec of data.