

Swift Observations of GRB 070223

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1. Introduction

At 01:15:00 UT, on February 2, 2007, the Swift Burst Alert Telescope (BAT) triggered and located GRB 070223 (trigger=261664). Swift slewed immediately to the burst allowing for XRT and UVOT follow-up observations at T+110s and T+102s, respectively. Our best position is that of the XRT afterglow located at

RA (J2000) = 10h 13m 48.4s

Dec(J2000) = +43d 08' 01.1"

with a 90% confidence level uncertainty error radius of 3.9 arcsec.

2. BAT Observations and analysis

Using the data set from T-240 to T+963 sec from recent telemetry downlinks, we report further analysis of BAT GRB 070223 (trigger #261664) (Vetere, et al., GCN Circ. 6125). The BAT ground-calculated position is RA, Dec = 153.453, 43.132 deg which is

RA(J2000) = 10h 13m 48.6s

Dec(J2000) = +43d 07' 55.4"

with an uncertainty of 1.2 arcmin, (radius, sys+stat, 90% containment). The partial coding was 82%.

The mask-weighted lightcurve starts at ~T-20 sec and then rises to two main peaks at T+15 and T+35 sec with a long decaying profile out to T+150 sec. T₉₀ (15-350 keV) is 89 +/- 2 sec (estimated error including systematics).

The time-averaged spectrum from T-3.4 to T+98.5 is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.87 +/- 0.12. The fluence in the 15-150 keV band is 1.7 +/- 0.1 x 10⁻⁶ erg/cm². The 1-sec peak photon flux measured from T+34.35 sec in the 15-150 keV band is 0.7 +/- 0.1 ph/cm²/sec. All the quoted errors are at the 90% confidence level.

3. XRT Observations and analysis

We have analysed the first eleven orbits (up to 52.3 ks after the BAT trigger) of Swift XRT data for GRB 070223 (Vetere et al., GCN 6126). Using ~15.6 ks of Photon Counting (PC) mode data we find the following refined position:

RA (J2000) = 10h 13m 48.4s

Dec(J2000) = +43d 08' 01.1"

with an error radius of 3.9 arcsec (90% confidence). This is 3.3 arcsec away from XRT initial position and 3.6 arcsec from the possible optical candidate reported by A. Melandri (GCN 6127).

The WT lightcurve shows a rapid decay with a slope of $\alpha \sim 2.3$ while the PC light curve shows a slower decay with a slope of ~ 0.89 .

The WT mode spectrum can be fitted with a single power law of photon index of 1.7 +/- 0.1 and column density of (4.5 +/- 0.1)e21 cm⁻². We note the Galactic column density in the direction of the source is 1.1e20 cm⁻². The 0.3-10 keV observed flux was 6.5e-10 ergs cm⁻² s⁻¹, which corresponds to an unabsorbed flux of 9.2e-10 ergs cm⁻² s⁻¹.

4. UVOT Observations and analysis

The Swift/UVOT observed the field of GRB 070223 starting 102s after the BAT trigger (Vetere et al. 2007, GCN Circ. 6125) with the settling exposure.

We do not find any source, in any of the UVOT observations, inside of the refined XRT error circle (Vetere et al. 2007, GCN Circ. 6130).

The 3-sigma upper limits for a source inside the XRT error circle in the first exposure with the White filter, and in the coadded frames with all filters are reported in table 1.

No correction has been made for the small Galactic extinction corresponding to $E(B-V) = 0.015$ (Schlegel et al. 1998, ApJ500: 525-553, 1998).

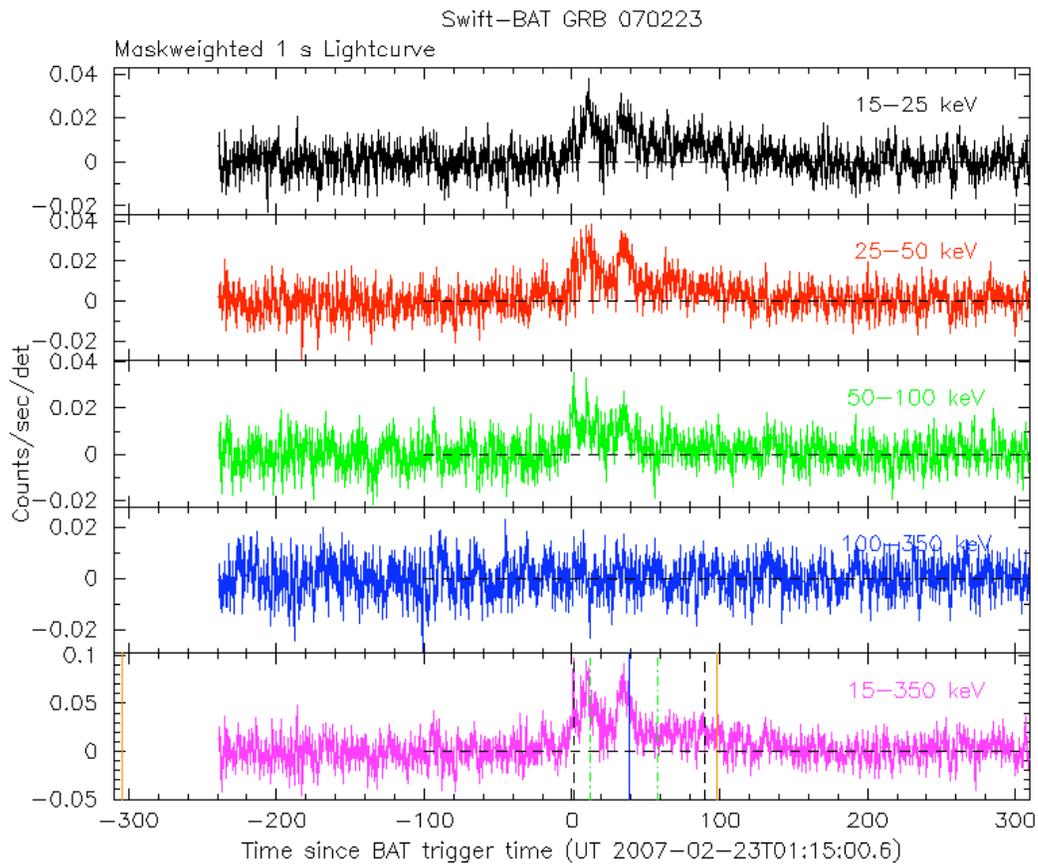


Fig.1: BAT Lightcurve. The light curve in the 4 individual plus total energy bands.

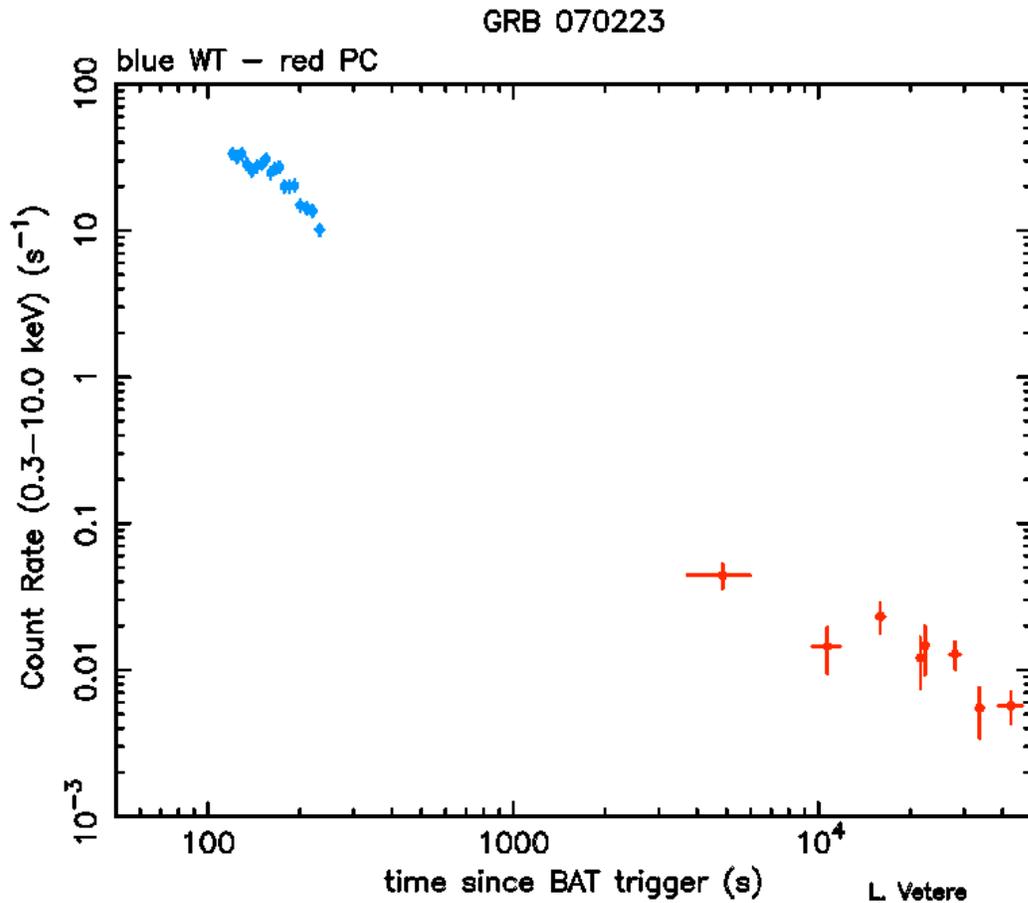


Fig. 2: XRT Lightcurve up to 52.3 ks after BAT trigger.

Filter	T Start	T End	Exp (s)	3σ U.L. mag
White	120	219	98	20.2
V	102	295	79	18.9
B	5893	6084	189	20.6
U	5688	16398	351	20.5
UVW1	3863	16234	1069	21.2
UVM2	3658	3858	197	20.1
White	120	11872	1002	21.4

Table 1: Optical afterglow magnitude upper limits from UVOT observations of GRB070223. Note that the magnitudes have not been corrected for the small Galactic extinction corresponding to $E(B-V) = 0.015$ (Schlegel et al.).