

## Swift Observation of long GRB 080623

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### 1 Introduction

BAT triggered on GRB 080623 at 10:25:28 UT (Trigger 315080) (Ukwatta, *et al.*, *GCN Circ.* 7894). This was a 0.512 sec rate-trigger on a long burst with  $T_{90} = 15 \pm 5$  sec.

Because of an Earth limb constraint, the spacecraft did not slew promptly to the BAT position, and hence there was no immediate XRT position. Narrow field instruments started observations at  $\sim T+22$  minutes, and our best position is the XRT location RA( $J2000$ ) = 237.66166 deg (15h50m38.80s), Dec( $J2000$ ) =  $-62.04919$  deg ( $-62d02'57.1''$ ) with an uncertainty of 2.4 arcsec (90% confidence, including boresight uncertainties), reported by Beardmore *et al.*, *GCN Circ.* 7898.

### 2 BAT Observation and Analysis

Using the data set from  $T - 239$  to  $T + 1390$  sec, further analysis of BAT GRB 080623 has been performed by BAT team (Baumgartner, *et al.*, *GCN Circ.* 7899). The BAT ground-calculated position is RA( $J2000$ ) = 237.667 deg (15h50m40.1s), Dec( $J2000$ ) =  $-62.044$  deg ( $-62d02'36.7''$ )  $\pm 1.4$  arcmin, (radius, systematic and statistical, 90% containment). The partial coding was 33% (the bore sight angle was 31.3 deg).

The mask-weighted light curve (Fig. 1) shows four overlapping peaks starting at  $\sim T - 1.0$  sec and ending at  $\sim T + 18.0$  sec.  $T_{90}$  (15 – 350 keV) is  $15.2 \pm 5$  sec (estimated error including systematics).

The time-averaged spectrum from  $T - 0.7$  to  $T + 16.0$  sec is best fitted by a simple power-law model. The power law index of the time-averaged spectrum is  $1.35 \pm 0.15$  ( $\chi^2 = 62.73$  for 57 d.o.f.). The fluence in the 15 – 150 keV band is  $1.0 \pm 0.1 \times 10^{-6}$  erg  $\text{cm}^{-2}$ . The 1-sec peak photon flux measured from  $T + 7.23$  sec in the 15 – 150 keV band is  $2.0 \pm 0.3$  ph/cm<sup>2</sup>/sec. All the quoted errors are at the 90% confidence level.

The results of the batgrbproduct analysis are available at [http://gcn.gsfc.nasa.gov/notices\\_s/315080/BA/](http://gcn.gsfc.nasa.gov/notices_s/315080/BA/)

### 3 XRT Observations and Analysis

The XRT team has analyzed data collected during the first three orbits of observation of GRB 080123, covering 4.3ks of Photon Counting (PC) mode data. The UVOT-enhanced XRT position is

RA( $J2000$ ) = 15h 50m 38.80s  
Dec( $J2000$ ) = -62d 02' 57.1"

with an uncertainty of 2.4 arcsec (radius, 90% confidence).

The X-ray light-curve (Fig. 2) can be fitted with a single power law with a decay of  $\alpha \sim 1.0 \pm 0.1$ . The first three orbits of PC data can be modelled with an absorbed power law, with a photon index of  $2.03 \pm 0.14$  and a total absorbing column of  $N_{\text{H}} = 0.37 \pm 0.05 \times 10^{22} \text{cm}^{-2}$ , in excess of the Galactic value of  $0.26 \times 10^{22} \text{cm}^{-2}$ . The observed (unabsorbed) flux over this time interval is  $8.05 \times 10^{-12}$  ( $1.34 \times 10^{-11}$ ) erg  $\text{cm}^{-2} \text{s}^{-1}$ .

Detailed light curves in both count rate and flux units are available in both graphical and ASCII

formats at <http://www.swift.ac.uk/xrt/curves/>

## 4 UVOT Observation and Analysis

The Swift/UVOT observed the field of GRB 080123 starting 22.15 minutes after the BAT trigger. No afterglow candidate has been found at the position of the enhanced XRT position (Beardmore *et al.*, *GCN Circ.* 7898) in the initial finding chart or subsequent summed images. The following table gives the 3 sigma upper limits in all filters.

Filter	Tstart (s)	Tstop (s)	Exposure (s)	3-Sigma UL
white	1329	1428	98.1	> 20.4
white	1559	2713	76.9	> 20.3
white	8133	8332	196.6	> 20.8
v	1436	2598	155.6	> 19.0
b	1535	2698	155.5	> 19.9
u	1510	2673	155.4	> 19.7
uvw1	1486	2648	155.5	> 19.4
uvm2	1460	2623	155.6	> 19.1
uvw2	1575	2573	136.1	> 19.3

Table 1: Magnitude limits from UVOT observations

The values quoted above are in the UVOT photometric system (Poole *et al.*, 2008, MNRAS, 383, 627). No correction has been made for the large expected extinction corresponding to E(B-V) of 0.35 mag in the direction of the burst (Schlegel *et al.*, 1998).

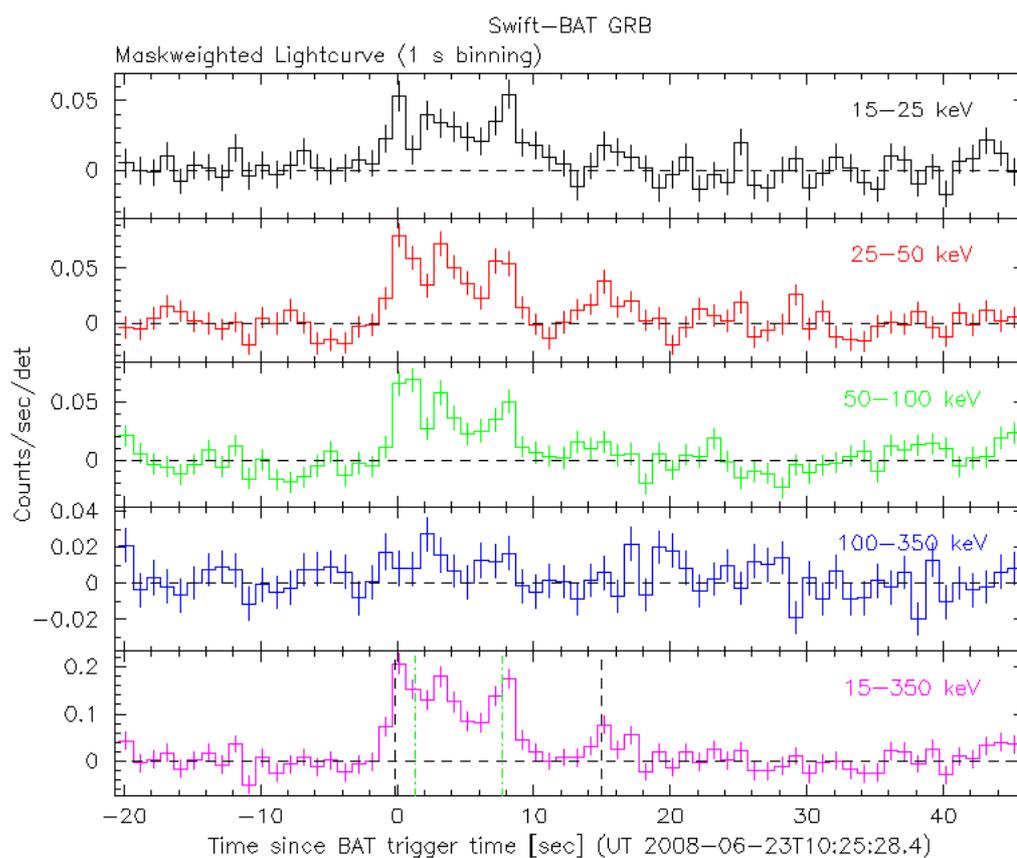


Figure 1: The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector and  $T_0$  is 10:25:28 UT.

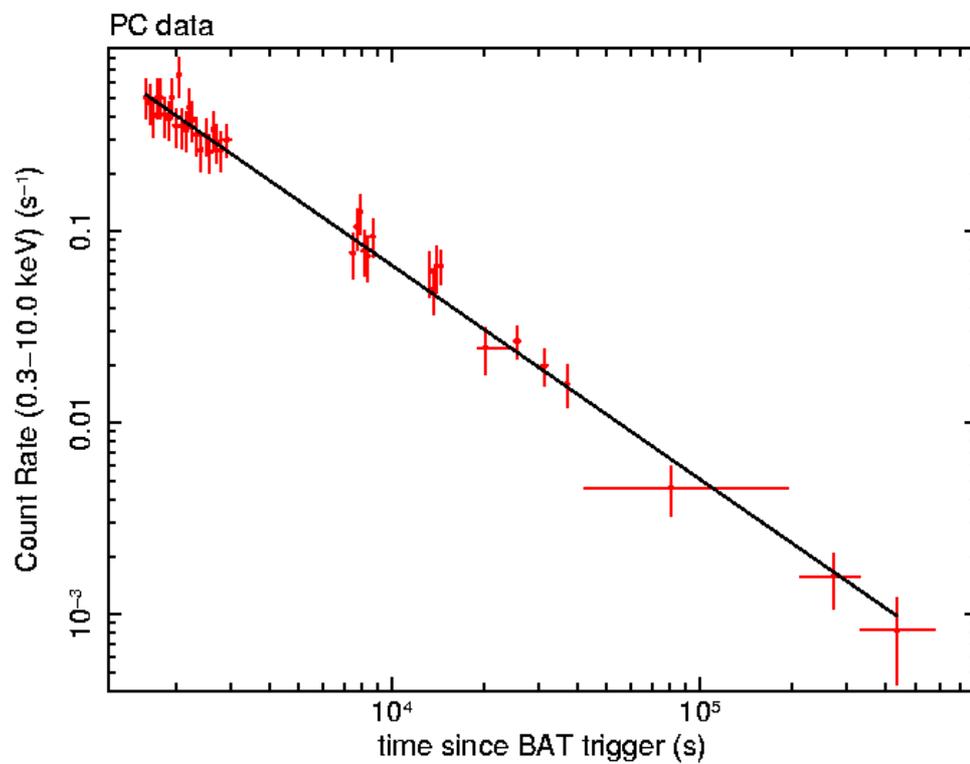


Figure 2: XRT Lightcurve. Counts/sec in the 0.3 – 10 keV band: Photon Counting mode (red). The approximate conversion is 1 count/sec =  $\sim 5.3 \times 10^{-11}$  ergs/cm<sup>2</sup>/sec.