# Swift Observations of GRB 100807A

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## 1 Introduction

At 09:13:13 UT on 2010-08-07, the Swift Burst Alert Telescope (BAT) triggered and located GRB 100807A (trigger=431128). Swift slewed immediately to the burst and found an X-ray counterpart in the XRT (Grupe et al., *GCN Circ.* 11067)

The best *Swift* position of this burst is the XRT enhanced position given in Osborne et al. (*GCN Circ.* 11070) with RA-2000 = 03h 41m 12.10s, and Dec-2000 = +67° 40′ 17.7″ with an uncertainty of 1.9″.

There were several ground-based optical/NIR follow-up observation reported on this burst. Most notably are the Palomar P60 and P200 observations by Cenko (*GCN Circ.* 11073) and Chary & Davies (*GCN Circ.* 11080), respectively, who reported on a fading afterglow in I, R, J, and H.

## 2 BAT Observation and Analysis

At 09:13:13 UT on 2010-08-07, the Swift Burst Alert Telescope (BAT) triggered and located GRB 100807A (trigger=431128, Grupe et al., *GCN Circ.* 11067). Using the data set from T-240 to T+962 s, the BAT ground-calculated position is RA, Dec = 55.283, +67.665 deg which is

RA(J2000) = 03h 41m 07.9s

Dec(J2000) = +67° 39′ 54.2″

with an uncertainty of 1.9 arcmin, (radius, sys+stat, 90% containment). The partial coding was 37% (Cummings et al. *GCN Circ.* 11069).

The mask-weighted light curve (Figure 1) shows a single peak starting at T-20 s peaking at T+0 s, and ending at T+20s. $T_{90}$ (15-350 keV) is 7.9±1.6 s (estimated error including systematics).

The time-averaged spectrum from T-6.1 to T+3.1 s is best fit by a single power law model. The power law index of the time-averaged spectrum is 2.32±0.23 ($\chi^2 = 57$ for 57 d.o.f.). For this model the total fluence in the 15-150 keV band is $3.4 \pm 0.5 \times 10^{-7}$ ergs cm$^{-2}$. The 1s peak photon flux measured from T+0.35 s in the 15-150 keV band is 1.8±0.2 photons s$^{-1}$ cm$^{-2}$. 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/431128/BA/

## 3 XRT Observations and Analysis

The XRT began observing the field of GRB 100704A at 09:14:34.4 UT, 80.8 seconds after the BAT trigger. Using 960 s of XRT Photon Counting mode data and 1 UVOT image for GRB 100807A, Osborne et al. (*GCN Circ.* 11070) found an astrometrically corrected X-ray position (using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue): RA, Dec = 55.30042, +67.67158 which is equivalent to:

RA (J2000): 03h 41m 12.10s

Dec (J2000): $+67^\circ\ 40'\ 17.7''$

with an uncertainty of $1.9''$ (radius, 90% confidence). The latest position can be viewed at http://www.swift.ac.uk/xrt_positions. Position enhancement is described by Goad et al. (2007, A&A, 476, 1401) and Evans et al. (2009, MNRAS, 397, 1177).

A spectrum formed from the WT mode data (36s exposure) can be fitted with an absorbed single power-law model with a photon spectral index of 2.12±0.22 (Grupe, *GCN Circ.* 11074). The best-fitting absorption column is consistent with the Galactic value of $3.3\times10^{21}$ cm$^{-2}$ (Kalberla et al. 2005). The PC mode spectrum may have hardened with a photon index of $\Gamma = 1.79 \pm 0.37$ The counts to observed (unabsorbed) 0.3-10 keV flux conversion factor deduced from this spectrum is $4.38\times10^{-11}$ ($7.54\times10^{-11}$) erg cm$^{-2}$ count$^{-1}$.

The $0.3 - 10\ keV$ light curve given below (Fig.2) displays an initial steep decay slope after the initial flare of $6.4^{+0.6}_{-1.9}$. The light curve of the X-ray afterglow breaks at T+173±10 s followed by a flatter decay slope of 0.82±0.08. This decay slope continued until the end of the observations on 2010-08-09.

## 4 UVOT analysis

The Swift/UVOT began settled observations of the field of GRB 100807A 90 s after the BAT trigger (Grupe et al., GCN Circ. 11067) with the finding chart in white filter. Swenson & Grupe (*GCN Circ.* 11072) reported that no optical afterglow was detected within the enhanced XRT error circle position (Osborne et al., *GCN Circ.* 11070).

$3\sigma$ upper limits for the summed images are listed in Table 1.

| Filter | $T_{\rm Start}$ | $T_{\rm stop}$ | Exposure | Mag |
|---|---|---|---|---|
| white_FC | 91 | 240 | 147 | >20.9 |
| u_FC | 304 | 553 | 246 | >20.4 |
| white | 91 | 5947 | 530 | >21.8 |
| v | 634 | 6358 | 255 | >19.6 |
| b | 559 | 7063 | 319 | >21.1 |
| u | 304 | 6973 | 659 | >21.1 |
| w1 | 683 | 6768 | 413 | >20.8 |
| m2 | 6363 | 6563 | 197 | >20.7 |
| w2 | 609 | 6153 | 255 | >20.8 |

Table 1: Magnitudes from UVOT observations of GRB 100807A. The quoted upper limits have not been corrected for the expected Galactic extinction along the line of sight of $E_{\rm B-V} = 0.81$ mag. All photometry is on the UVOT photometric system described in Poole et al. (2008, MNRAS, 383, 627).

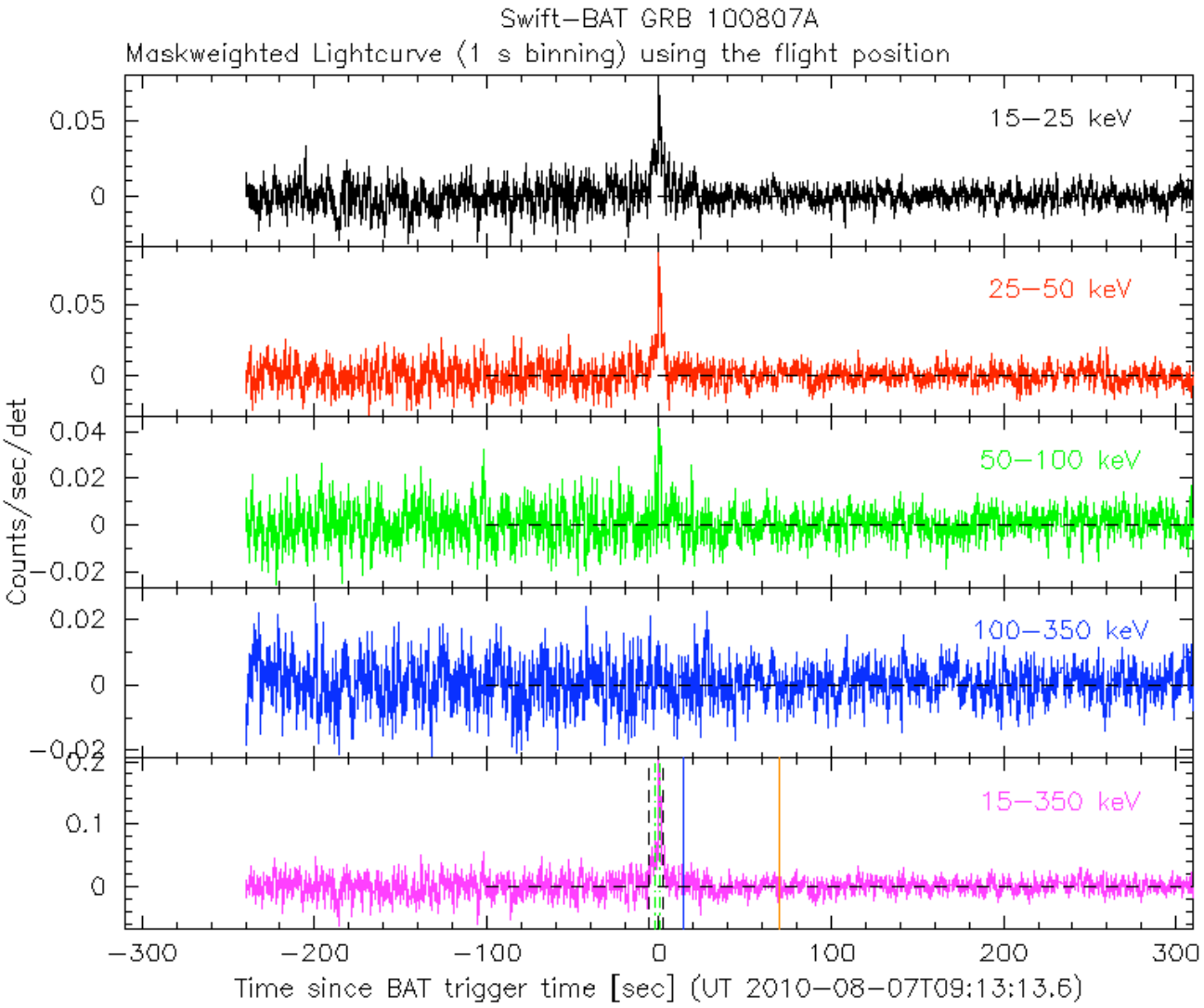


Figure 1: BAT Light curve of GRB 100807A.

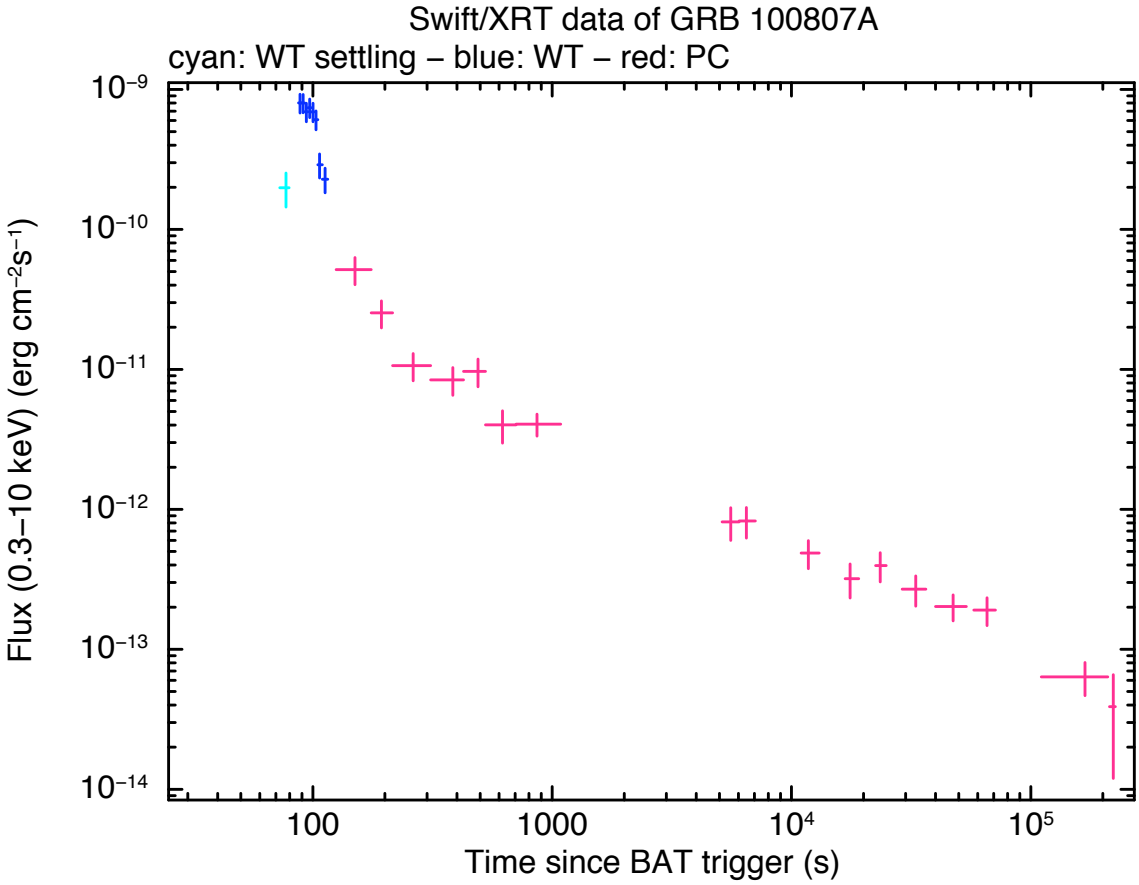


Figure 2: XRT flux light curve of GRB 100807A in the 0.3-10 keV band. The approximate conversion is 1 count $s^{-1} = \sim 4.4 \times 10^{-11}$ergs $s^{-1}$ $cm^{-2}$.