

Swift Observations of GRB 110726A

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1 Introduction

At 01:30:40 UT on 2011-07-26, the Swift Burst Alert Telescope (BAT) triggered and located GRB 110726A (trigger=458059). Swift slewed immediately to the burst and found an X-ray counterpart in the XRT (Wolf et al., *GCN Circ.* 12196)

The best *Swift* position of this burst is the XRT position given in Evans et al. (*GCN Circ.* 12200) with RA-2000 = 19h 06m 52.21s, and Dec-2000 = +56° 04' 16.4'' with an uncertainty of 1.5''.

The burst also has a redshift measurement of $z=1.036$ from Gemini North (Cucchiara et al., *GCN Circ.* 12202).

2 BAT Observation and Analysis

At 01:30:40 UT on 2011-07-26, the Swift Burst Alert Telescope (BAT) triggered and located GRB 110726A (trigger=458059, Wolf et al., *GCN Circ.* 12196). Using the data set from T-240 to T+572 s, the BAT ground-calculated position is RA, Dec = 286.713, +56.070 deg which is

$$\text{RA(J2000)} = 19\text{h } 06\text{m } 51.2\text{s}$$

$$\text{Dec(J2000)} = +56^\circ 04' 11.0''$$

with an uncertainty of 1.7 arcmin, (radius, sys+stat, 90% containment). The partial coding was 100% (Barthelmy et al. *GCN Circ.* 11902).

The mask-weighted light curve (Figure 1) shows a single peak starting at T-1s, peaking at T+2 s, and ending at T+5 s. T_{90} (15-350 keV) is 5.2 ± 1.1 s (estimated error including systematics).

The time-averaged spectrum from T-0.9 to T+5.0 s is best fit by a power law with an exponential cutoff. This fit gives a photon index of 0.64 ± 0.87 and E_{peak} of 46.5 ± 11.8 keV ($\chi^2 = 79.8$ for 56 d.o.f.). For this model the total fluence in the 15-150 keV band is $2.2 \pm 0.3 \times 10^{-7}$ erg cm^{-2} and the 1-sec peak flux measured from T+0.61 s in the 15-150 keV band is 1.0 ± 0.2 photons $\text{cm}^{-2} \text{s}^{-1}$. A fit to a simple power law gives a photon index of 1.86 ± 0.18 ($\chi^2 = 87.7$ for 57 d.o.f.). 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/458059/BA/

3 XRT Observations and Analysis

The XRT began observing the field of GRB 110726A at 01:31:38.7 UT, 58.2 seconds after the BAT trigger. Using 629 s of XRT Photon Counting mode data and 1 UVOT image for GRB 110726A, Evans et al. (*GCN Circ.* 12200) found an astrometrically corrected X-ray position (using the XRT-UVOT

alignment and matching UVOT field sources to the USNO-B1 catalogue): RA, Dec = 286.71752, +56.07123 which is equivalent to:

RA (J2000): 19h 06m 52.21s

Dec (J2000): +56° 04' 16.4"

with an uncertainty of 1.5" (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 can be fitted with an absorbed power-law with a photon spectral index of $\Gamma = 2.12^{+0.22}_{-0.21}$. The best-fitting absorption column is $1.6 \pm 0.5 \times 10^{21} \text{ cm}^{-2}$, in excess of the Galactic value of $5.6 \times 10^{20} \text{ cm}^{-2}$ (Kalberla et al. 2005). The PC mode spectrum has a photon index of $\Gamma = 2.15^{+0.12}_{-0.28}$ and a best-fitting absorption column density of $N_{\text{H}} = 9.6^{+3.9}_{-4.0} \times 10^{20} \text{ cm}^{-2}$. The counts to observed (unabsorbed) 0.3-10 keV flux conversion factor deduced from this spectrum is 3.5×10^{-11} (4.5×10^{-11}) $\text{erg cm}^{-2} \text{ count}^{-1}$.

The 0.3 – 10 keV light curve given below (Fig.2) displays a canonical light curve (as described by Nousek et al. 2006, ApJ, 642, 389). The late-time light curve (from T0+4.1 ks) can be modeled by a power-law model, with a decay slope $\alpha = 1.26^{+0.16}_{-0.15}$.

The results of the XRT-team automatic analysis are available at http://www.swift.ac.uk/xrt_products/00458059.

4 UVOT analysis

The Swift/UVOT began settled observations of the field of GRB 110726A 60 s after the BAT trigger (Wolf et al., GCN Circ. 12196) with the finding chart in white filter. Porterfield et. al. (GCN Circ. 12203) reported a fading source consistent with the XRT position (Evans et al, GCN Circ. 12200).

The preliminary detections and 3σ upper limits for the summed images are listed in Table 1.

Filter	T_{Start}	T_{stop}	Exposure	Mag
white_FC	60	210	147	17.84 ± 0.04
white	6348	6520	169	>20.85
v	602	11374	806	20.61 ± 0.27
b	528	6344	235	20.44 ± 0.22
u_FC	272	522	246	18.41 ± 0.08
u	5938	17370	1081	>21.25
w1	653	5937	216	>20.5
m2	628	12301	825	>21.1
w2	578	10448	649	>21.5

Table 1: 3σ upper limits from UVOT observations of GRB 110726A. The quoted values have not been corrected for the expected Galactic extinction along the line of sight of $E_{\text{B-V}} = 0.08$ mag. All photometry is on the UVOT photometric system described in Poole et al. (2008, MNRAS, 383, 627) and Breeveld et al. (2011, AIP Conf. Proc., Vol. 1358, 373)

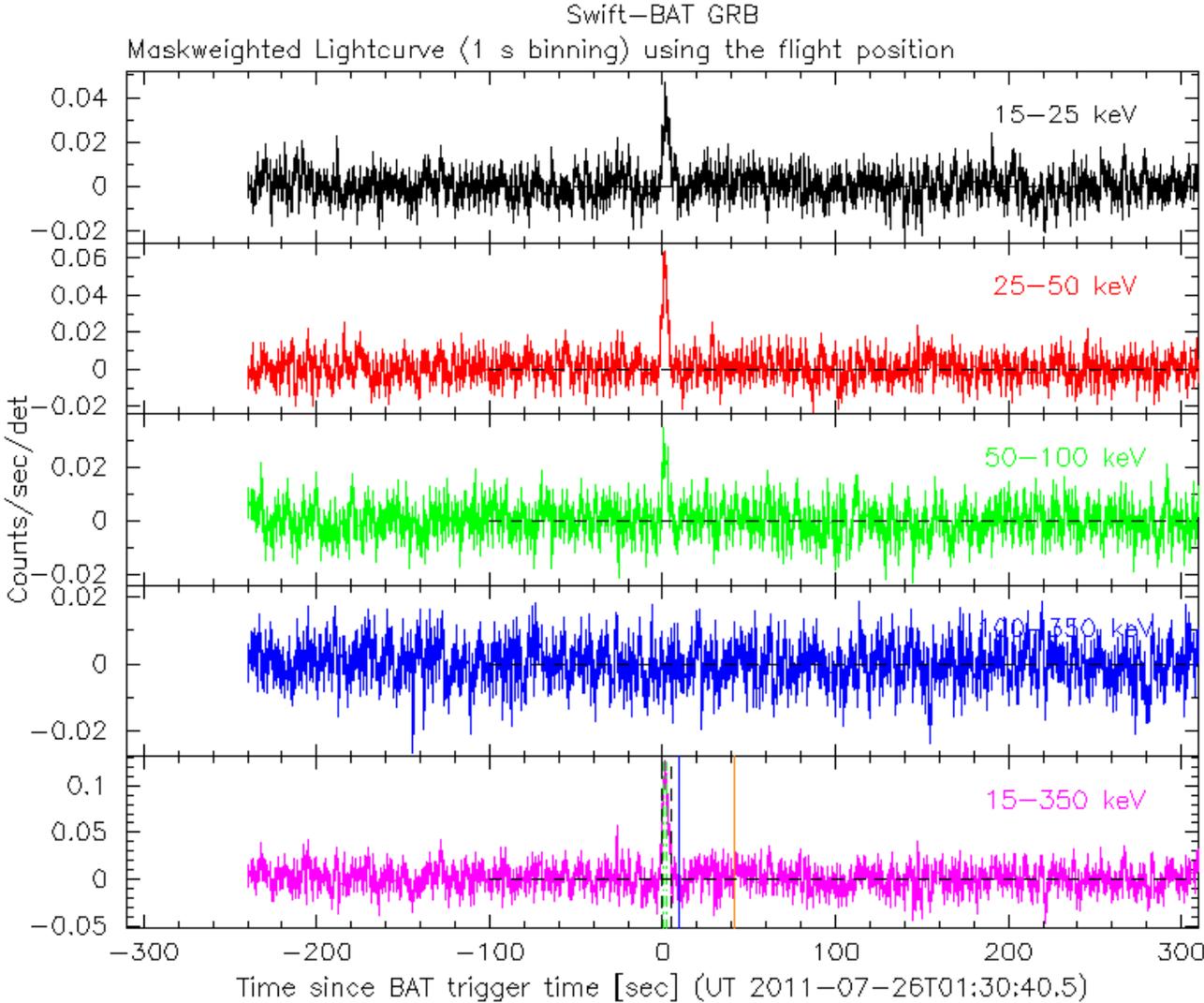


Figure 1: BAT Light curve of GRB 110726A.

