

Swift Observations of GRB 130627A

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1. Introduction

At 08:55:03 UT, the Swift Burst Alert Telescope (BAT) triggered and located GRB 130627A (trigger=559132) (Oates *et al.* GCN Circ. [14933](#)). Due to an observing constraint, Swift could not slew until ~46 minutes after the trigger. At the time of the trigger, the initial BAT position was 102° from the Sun (5.9 hours East) and 126° from the 79%-illuminated Moon.

Table 1 contains the best reported positions from Swift, and the latest XRT position can be viewed at http://www.swift.ac.uk/xrt_positions.

Table 2 is a summary of GCN Circulars about this GRB from observatories other than Swift.

Standard analysis products for this burst are available at http://gcn.gsfc.nasa.gov/swift_gnd_ana.html.

2. BAT Observations and Analysis

As reported by Sato *et al.* (GCN Circ. [14951](#)), the BAT ground-calculated position is RA, Dec = 184.415, -37.114 deg which is RA(J2000) = $12^{\text{h}}17^{\text{m}}39.7^{\text{s}}$ Dec(J2000) = $-37^\circ06'51.8''$ with an uncertainty of 2.8 arcmin, (radius, sys+stat, 90% containment). The partial coding was 20%.

The mask-weighted light curve shows a single peak starting at $\sim T-4$ s, peaking at $\sim T+2$ s, and ending at $\sim T+26$. T_{90} (15-350 keV) is 30.8 ± 12.3 s (estimated error including systematics).

The time-averaged spectrum from T-5.2 to T+33.6 s is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.84 ± 0.32 . The fluence in the 15-150 keV band is $9.1 \pm 1.9 \times 10^{-07}$ erg cm^{-2} . This fluence is larger than that of 36% of the long GRBs in the Second BAT GRB Catalog (Sakamoto *et al.* 2011). The 1-s peak photon flux measured from T+1.88 s in the 15-150 keV band is 1.8 ± 0.5 ph $\text{cm}^{-2} \text{s}^{-1}$. 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/559132/BA/.

3. XRT Observations and Analysis

Analysis of the initial XRT data was reported by Amaral-Rogers and Oates (GCN Circ. [14948](#)). We have analysed 7.3 ks of XRT data for GRB 130627A, from 3.0 ks to 34.3 ks after the BAT trigger. The data are entirely in Photon Counting (PC) mode. The enhanced XRT position for this burst was given by Osborne *et al.* (GCN. Circ [14945](#)).

The light curve (**Figure 2**) can be modeled with a power-law decay with a decay index of $\alpha=0.88$ (+0.14, -0.13).

A spectrum formed from the PC mode data can be fitted with an absorbed power-law with a photon spectral index of 2.40 (+0.31, -0.29). The best-fitting absorption column is 3.06 (+1.11, -0.98) $\times 10^{21}$ cm^{-2} , in excess of the Galactic value of 8.0×10^{20} cm^{-2} (Kalberla *et al.* 2005). The counts to observed (unabsorbed) 0.3-10 keV flux conversion factor deduced from this spectrum is 4×10^{-11} (8×10^{-11}) erg cm^{-2} count^{-1} .

A summary of the PC-mode spectrum is thus:

Total column: 3.06 (+1.11, -0.98) $\times 10^{21}$ cm^{-2}

Galactic foreground: 8.0×10^{20} cm^{-2}

Excess significance: 5.1σ
 Photon index: $2.40 (+0.31, -0.29)$

The results of the XRT team automatic analysis are available at http://www.swift.ac.uk/xrt_products/00559132.

4. UVOT Observations and Analysis

The Swift/UVOT began settled observations of the field of GRB 130627A 2979 s after the BAT trigger (Oates *et al.*, GCN Circ. 14933, GCN Circ. 14934) (Kuin and Oates GCN Circ. 14949). **Table 3** gives preliminary magnitudes using the UVOT photometric system (Breeveld *et al.* 2011, AIP Conf. Proc., 1358, 373). No correction has been made for the expected extinction in the Milky Way corresponding to a reddening of $E_{B,V}$ of 0.09 mag. in the direction of the GRB (Schlegel *et al.* 1998).

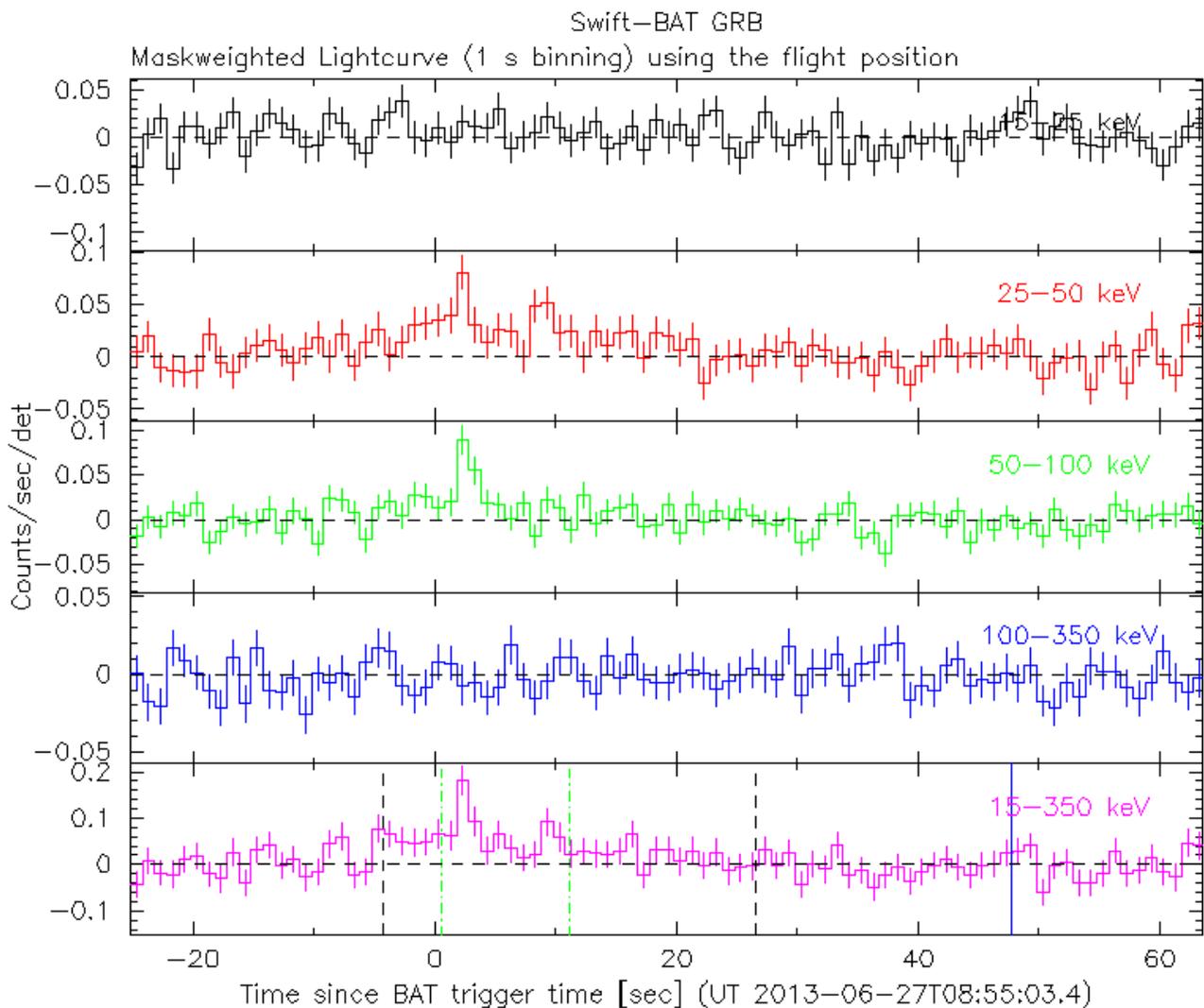


Figure 1. The BAT mask-weighted light curve in the four individual and total energy bands. The units are counts s^{-1} illuminated-detector $^{-1}$.

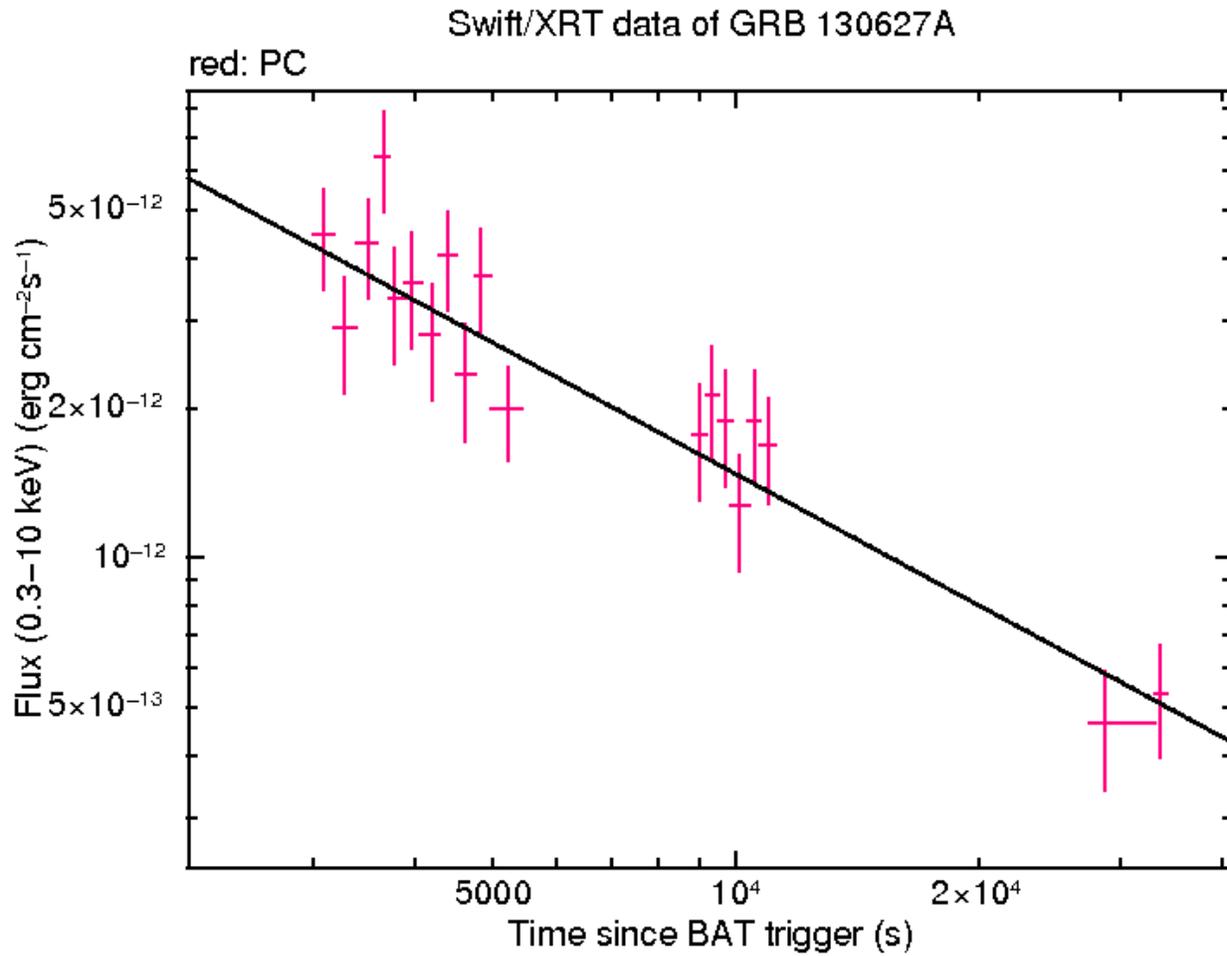


Figure 2. The XRT light curve.

RA (2000)	Dec (2000)	Error	Note	Reference
12 ^h 17 ^m 39.66 ^s	-37°05'13.2"	1.6"	XRT-enhanced	Osborne <i>et al.</i> GCN Circ. 14945
12 ^h 17 ^m 39.7 ^s	-37°06'51.8"	2.8'	BAT-refined	Sato <i>et al.</i> GCN Circ. 14951

Table 1. Positions from the Swift instruments.

Band	Authors	GCN Circ.	Subject	Observatory	Notes
Gamma-ray	Byrne	14941	Fermi GBM detection	Fermi GBM	detection

Table 2. Summary of GCN Circulars from other observatories sorted by band and then circular number.

Filter	T_{start}(s)	T_{stop}(s)	Exp(s)	Mag
white _{FC}	2979	3129	147	>20.5
white	2979	10701	1229	>22.1
v	3136	4772	393	>19.7
b	3956	9788	1125	>21.3
u	3751	5386	393	>20.5
w1	3546	5182	393	>20.4
m2	3341	4976	393	>20.4
w2	4367	11202	684	>21.2

Table 3. UVOT observations reported by Kuin and Oates (GCN Circ. [14949](#)). The start and stop times of the exposures are given in seconds since the BAT trigger. The preliminary 3- σ upper limits are given. No correction has been made for extinction in the Milky Way.

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