

Swift Observations of GRB 130725B

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1. Introduction

At 17:39:28 UT, the Swift Burst Alert Telescope (BAT) triggered and located GRB 130725B (trigger=564028) (Swenson *et al.* GCN Circ. [15029](#); Swenson GCN Circ. [15044](#)). Swift slewed immediately to the burst. **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.

Siegel and Swenson (GCN Circ. [15032](#)) reported the detection with UVOT of an optical afterglow. **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://gc.gsfc.nasa.gov/swift_gnd_ana.html.

2. BAT Observations and Analysis

As reported by Barthelmy *et al.* (GCN Circ. [15041](#)), the BAT ground-calculated position is RA, Dec = 214.233, -11.124 deg which is RA(J2000) = 14^h16^m55.9^s Dec(J2000) = -11°07'26.3" with an uncertainty of 1.2 arcmin, (radius, sys+stat, 90% containment). The partial coding was 96%.

The mask-weighted light curve (**Figure 1**) shows a single FRED burst peaking at T+1 s and decaying to baseline by about T+8 s. T₉₀ (15-350 keV) is 10.0 ± 3.6 s (estimated error including systematics).

The time-averaged spectrum from T-0.3 to T+12.8 s is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 2.23 ± 0.17. The fluence in the 15-150 keV band is 3.9 ± 0.4 × 10⁻⁷ erg cm⁻². This fluence is larger than that of 17% of the long GRBs in the Second BAT GRB Catalog (Sakamoto *et al.* 2011). The 1-s peak photon flux measured from T+0.29 s in the 15-150 keV band is 2.2 ± 0.2 ph cm⁻² s⁻¹. All the quoted errors are at the 90% confidence level.

3. XRT Observations and Analysis

Analysis of the initial XRT data was reported by Sbarufatti and Swenson (GCN Circ. [15040](#)). We have analysed 13 ks of XRT data for GRB 130725B, from 53 s to 0 s after the BAT trigger. The data comprise 273 s in Windowed Timing (WT) mode (the first 8 s were taken while Swift was slewing) with the remainder in Photon Counting (PC) mode.

The light curve (**Figure 2**) can be modelled with an initial power-law decay with an index of $\alpha=0.09$ (+0.15, -0.18), followed by a break at T+528 s to an α of 0.94 ± 0.04 .

A spectrum formed from the PC mode data can be fitted with an absorbed power-law with a photon spectral index of 1.94 (+0.16, -0.14). The best-fitting absorption column is 7.3 (+3.7, -2.2) $\times 10^{20}$ cm^{-2} , consistent with the Galactic value of 5.2×10^{20} cm^{-2} (Kalberla *et al.* 2005). The counts to observed (unabsorbed) 0.3-10 keV flux conversion factor deduced from this spectrum is 3.7×10^{-11} (4.4×10^{-11}) $\text{erg cm}^{-2} \text{count}^{-1}$.

A summary of the PC-mode spectrum is thus:

Total column: 7.3 (+3.7, -2.2) $\times 10^{20}$ cm^{-2}

Galactic foreground: 5.2×10^{20} cm^{-2}

Excess significance: $<1.6 \sigma$

Photon index: 1.94 (+0.16, -0.14)

The results of the XRT team automatic analysis are available at http://www.swift.ac.uk/xrt_products/00564028.

4. UVOT Observations and Analysis

The Swift/UVOT began settled observations of the field of GRB 130725B 72 s after the BAT trigger (Swenson *et al.* GCN Circ. [15029](#); Swenson GCN Circ. [15044](#)) (Oates and Swenson GCN Circ. [15045](#)). **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 0.061 mag. in the direction of the GRB (Schlegel *et al.* 1998).

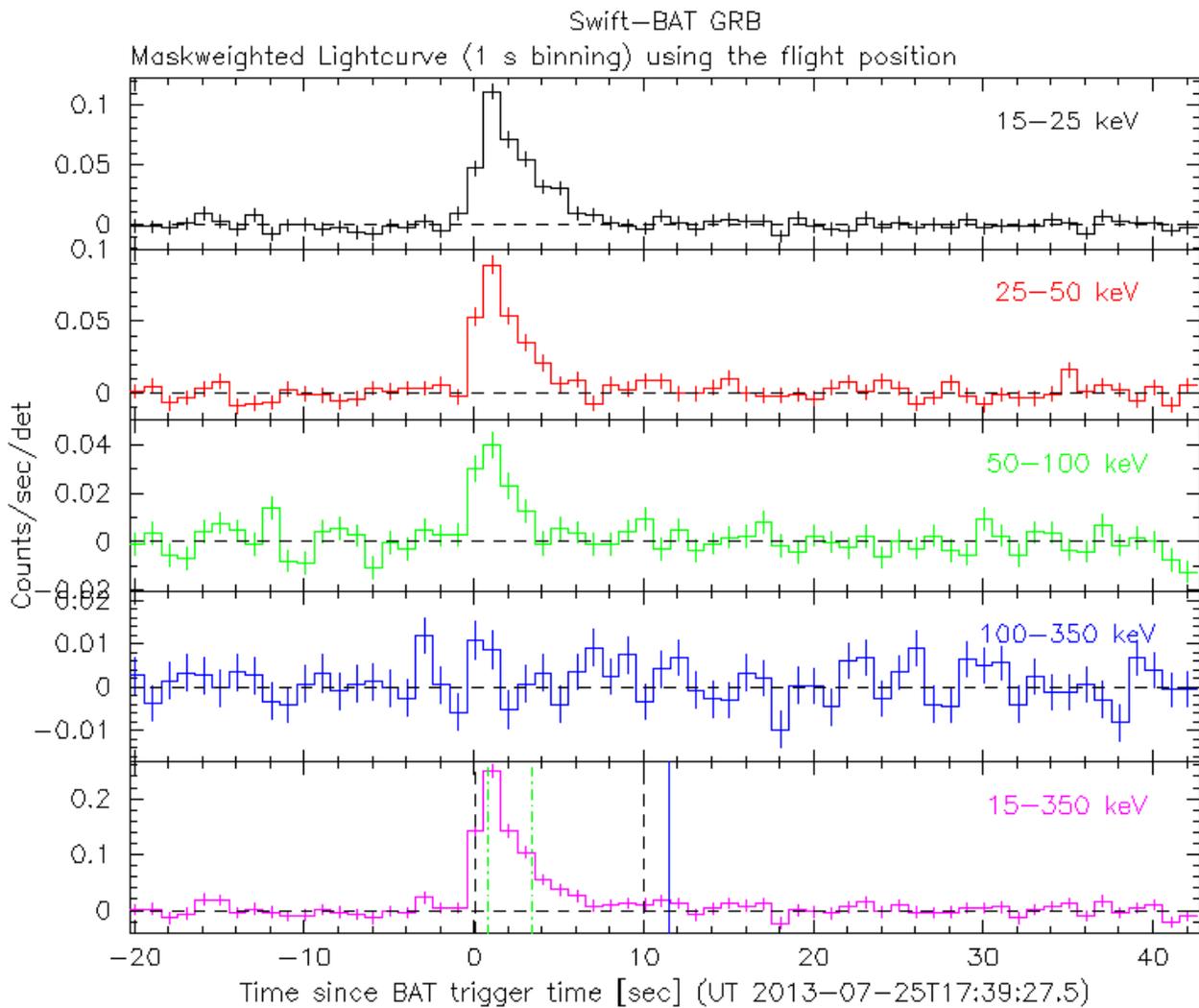


Figure 1. The BAT mask-weighted light curve in the four individual and total energy bands. The units are counts s^{-1} illuminated-detector $^{-1}$.

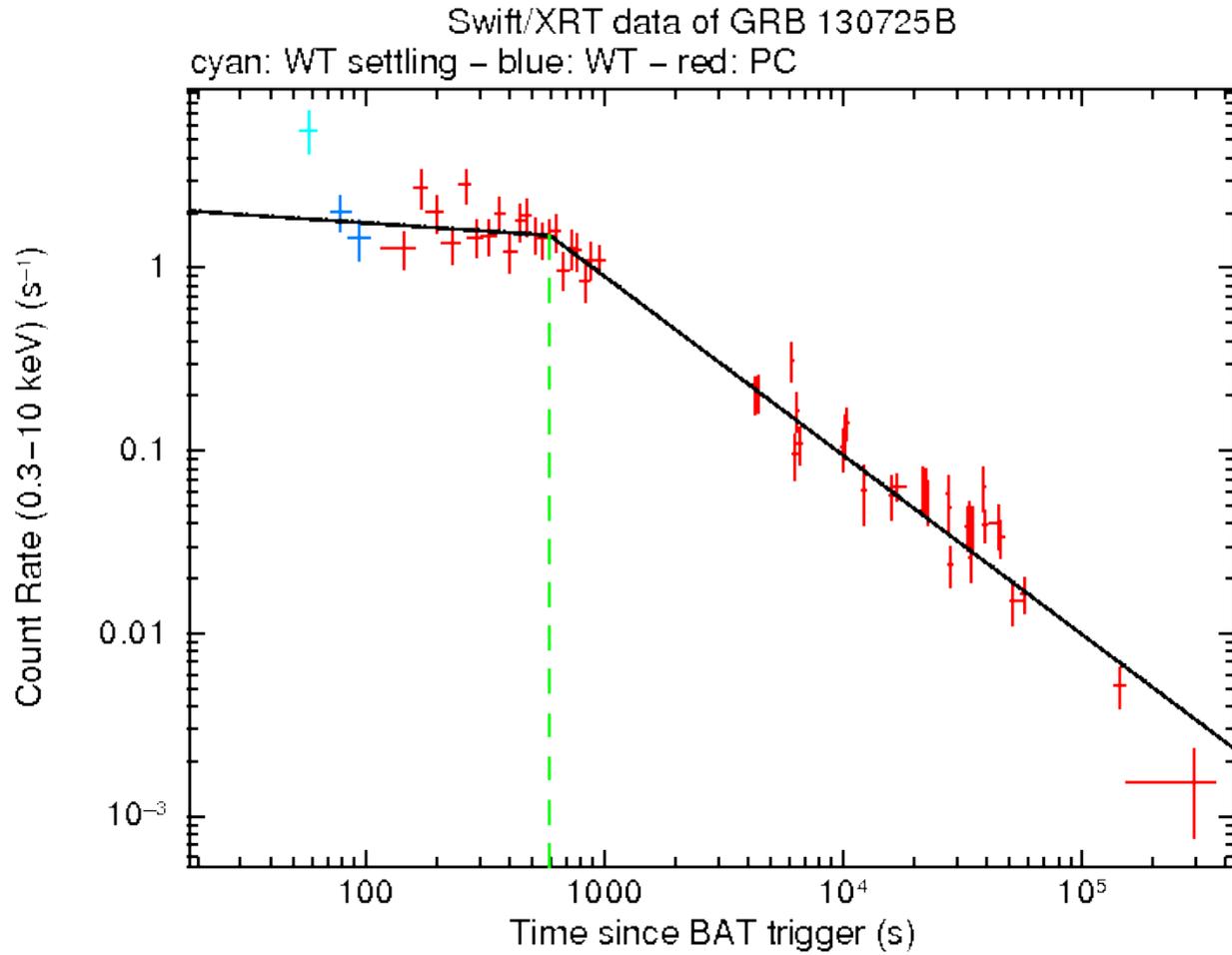


Figure 2. The XRT light curve.

RA (2000)	Dec (2000)	Error	Note	Reference
14 ^h 16 ^m 57.76 ^s	-11°07'41.8"	0.50"	UVOT-refined	Oates and Swenson GCN Circ. 15045
14 ^h 16 ^m 57.74 ^s	-11°07'42.6"	1.4"	XRT-final	UKSSDC
14 ^h 16 ^m 57.74 ^s	-11°07'42.6"	1.4"	XRT-refined	Sbarufatti and Swenson GCN Circ. 15040
14 ^h 16 ^m 55.9 ^s	-11°07'26.3"	1.2'	BAT-refined	Barthelmy <i>et al.</i> GCN Circ. 15041

Table 1. Positions from the Swift instruments.

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Band	Authors	GCN Circ.	Subject	Observatory	Notes
Optical	Tanga <i>et al.</i>	15034	GROND Detection of the Optical/NIR Afterglow	GROND	detection
Optical	Fugazza <i>et al.</i>	15039	REM-ROS2 optical observations	REM	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	72	221	147	16.67 ± 0.03
v	614	6315	252	19.16 ± 0.27
b	540	559	19	18.20 ± 0.28
u	284	534	246	17.35 ± 0.06
w1	663	6725	236	20.01 ± 0.36
m2	6320	16621	1003	>21.1
w2	4265	4465	197	>20.1

Table 3. UVOT observations reported by Oates and Swenson (GCN Circ. [15045](#)). The start and stop times of the exposures are given in seconds since the BAT trigger. The preliminary detections and 3- σ upper limits are given. No correction has been made for extinction in the Milky Way.

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