Swift Observations of GRB 130725A

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1. Introduction

At 11:37:11 UT, the Swift Burst Alert Telescope (BAT) triggered and located GRB 130725A (trigger=563980) (Zhang *et al.* GCN Circ. 15028). Swift slewed 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.

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 Ukwatta *et al.* (GCN Circ. 15031), the BAT ground-calculated position is RA, Dec = 230.060, 0.624 deg which is RA (J2000) = $15^h20^m14.4^s$ Dec(J2000) = +00°37'26.8" with an uncertainty of 2.5 arcmin, (radius, sys+stat, 90% containment). The partial coding was 39%.

The mask-weighted light curve (**Figure 1**) shows a double-peaked structure lasting from approximately T+0 to T+20 seconds. This is followed by lower-level emission out to ~T+100 seconds. The source went out of the field of view at ~T+450 seconds, following a pre-planned slew. T_{90} (15-350 keV) is 101.8 ± 20.5 s (estimated error including systematics).

The time-averaged spectrum from T-9.83 to T+103.40 s is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.60 ± 0.30. The fluence in the 15-150 keV band is $9.7 \pm 1.7 \times 10^{-7}$ erg cm^{-2}. This fluence is larger than that of 38% of the long GRBs in the Second BAT GRB Catalog (Sakamoto *et al.* 2011). The 1-s peak photon flux measured from T+3.11 s in the 15-150 keV band is 0.6 ± 0.2 ph cm^{-2} 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/563980/BA/.

3. XRT Observations and Analysis

Analysis of the initial XRT data was reported by Zhang (GCN Circ. 15042). We have analyzed 6.8 ks of XRT data for GRB 130725A, from 3.1 ks to 17.2 ks after the BAT trigger. The data are entirely in Photon Counting (PC) mode.

The light curve (**Figure 2**) can be modeled with a power-law decay with a decay index of α=0.7 (+0.4, -0.3).

A spectrum formed from the PC mode data can be fitted with an absorbed power-law with a photon spectral index of 2.5 (+0.6, -0.5). The best-fitting absorption column is 9 (+11, -5) x 10^{20} cm^{-2}, consistent with the Galactic value of 4.3 x 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 2.9 x 10^{-11}(4.5 x 10^{-11}) erg cm^{-2} count^{-1}.

A summary of the PC-mode spectrum is thus:
Total column: 9 (+11, -5) x 10^{20} cm^{-2}
Galactic foreground: 4.3 x 10^{20} cm^{-2}
Excess significance: <1.6 σ
Photon index: 2.5 (+0.6, -0.5)

The results of the XRT team automatic analysis are available at http://www.swift.ac.uk/xrt_products/00563980.

4. UVOT Observations and Analysis

The Swift/UVOT began settled observations of the field of GRB 130725A 3097 s after the BAT trigger (trigger=563980) (Oates and Zhang GCN Circ.15036). No optical afterglow consistent with the XRT position is detected in the initial UVOT exposures. **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 0.06 mag. in the direction of the GRB (Schlegel *et al.* 1998).

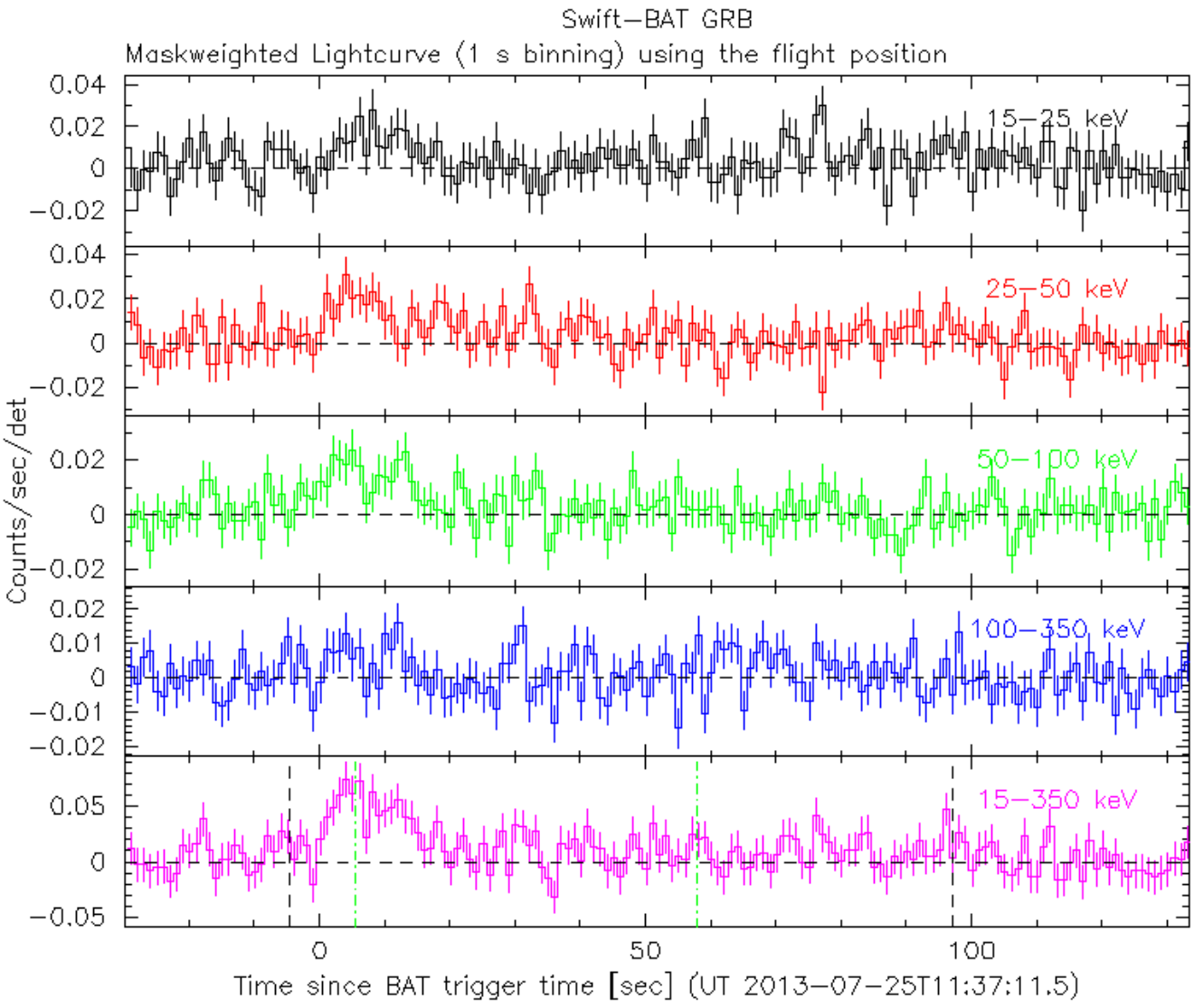

Figure 1. The BAT mask-weighted light curve in the four individual and total energy bands. The units are counts s^{-1} illuminated-detector^{-1}.

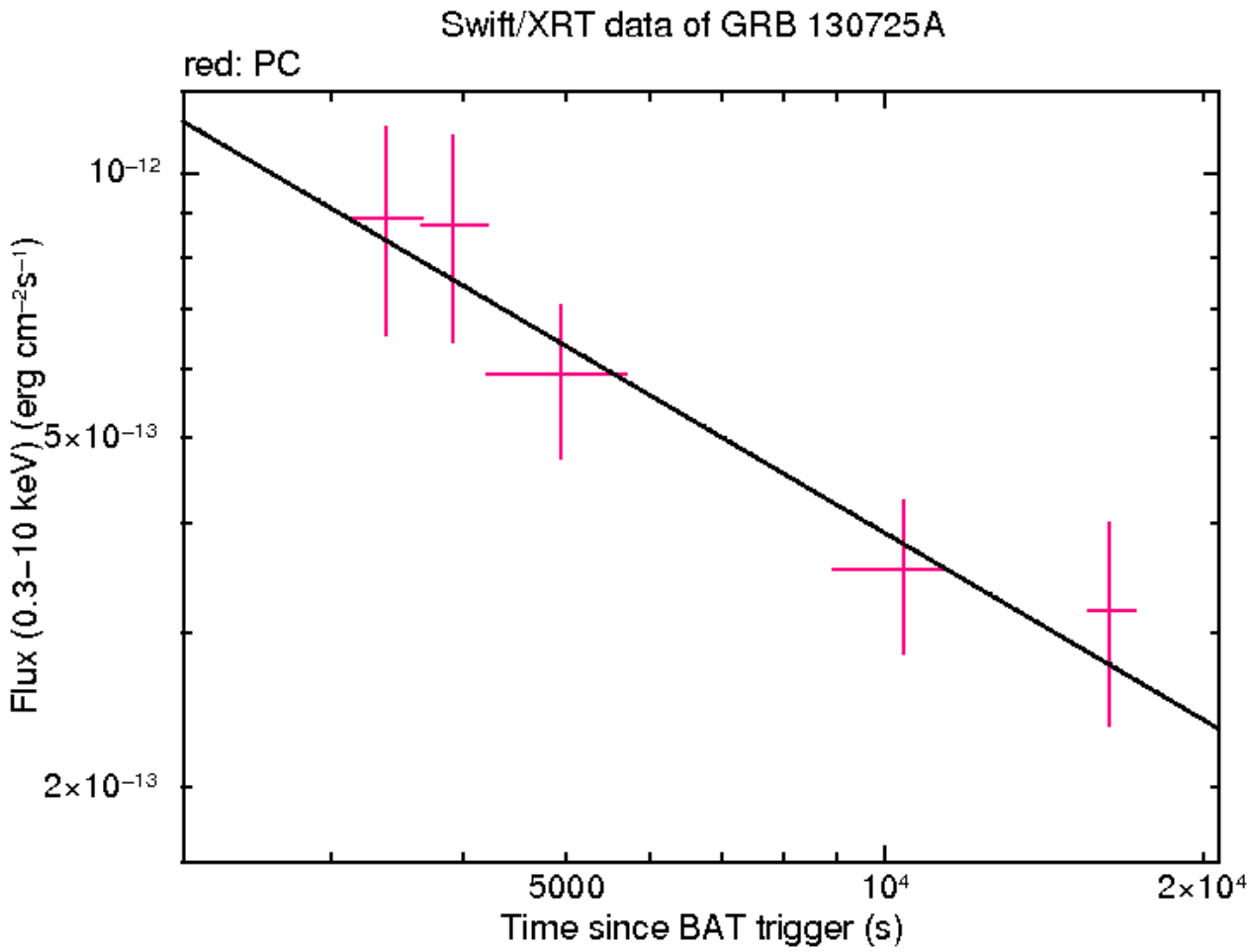

Figure 2. The XRT light curve.

RA (2000)	Dec (2000)	Error	Note	Reference
$15^h20^m07.78^s$	+00°37'39.4"	1.8"	XRT-final	UKSSDC
$15^h20^m07.78^s$	+00°37'39.4"	1.8"	XRT-refined	Zhang GCN Circ. 15042
$15^h20^m14.4^s$	+00°37'26.8"	2.5'	BAT-refined	Ukwatta *et al*. GCN Circ. 15031

Table 1. Positions from the Swift instruments.

Band	Authors	GCN Circ.	Subject	Observatory	Notes
Optical	Kuroda *et al*.	15033	MITSuME Ishigakijima Optical Observation	MITSuME Ishigakijima	detection
Optical	Virgili *et al*.	15035	Faulkes Telescope South Observations	FTS	

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
$white_{FC}$	3097	3247	147	>21.1
white	3097	4480	344	>21.0
v	3255	10746	1278	>20.4
b	4075	5690	373	>20.4
u	3870	17226	1118	>21.0
w1	3665	16476	1279	>21.0
m2	3460	11458	1089	>21.0
w2	4486	9832	1082	>21.1

Table 3. UVOT observations reported by Oates and Zhang (GCN Circ. 15036). 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.