Swift Observations of GRB 121211A

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1. Introduction

Mangano *et al.* (GCN Circ. 14057) reported the initial Swift results. At 13:47:02 UT, the Swift Burst Alert Telescope (BAT) triggered and located GRB 121211A (trigger=541200). Swift slewed immediately to the burst. **Table 1** contains the best reported positions from Swift. The latest XRT position can be viewed at http://www.swift.ac.uk/xrt_positions.

Mangano *et al.* (GCN Circ. 14057) reported the discovery with UVOT of an optical afterglow. Perley *et al.* (GCN Circ. 14059) reported a redshift of 1.023 from Keck. **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

Analysis of the BAT data was reported by Barthelmy *et al.* (GCN Circ. 14067). The BAT ground-calculated position is RA, Dec = 195.575, 30.173 deg, which is RA(J2000) = 13h 02m 18.0s Dec(J2000) = +30d 10' 24.4" with an uncertainty of 4.9 arcmin, (radius, sys+stat, 90% containment). The partial coding was 23%.

The mask-weighted light curve (**Figure 1**) shows a peak starting at ~T-5 s, peaking at ~T+2 s, and returning to baseline at ~T+5 s. Then a second set of peaks starts at ~T+20 with the main emission from T+105 to ~T+200 s. T_{90}(15-350 keV) is 182 ± 39 s (estimated error including systematics).

The time-averaged spectrum from T-0.48 to T+196.77 s is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 2.36 ± 0.26. The fluence in the 15-150 keV band is $1.3 \pm 0.2 \times 10^{-6}$ erg cm^{-2}. The 1-s peak photon flux measured from T+1.07 s in the 15-150 keV band is 1.0 ± 0.3 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/541200/BA/.

3. XRT Observations and Analysis

Analysis of the XRT data was reported by Burrows *et al.* (GCN Circ. 14061). We have analysed 29.6 ks of XRT data for GRB 121211A, from 80.4 s to 36.3 ks after the BAT trigger. The data comprise 207 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 late-time light curve (**Figure 2**) (from T0+3.9 ks) can be modelled with a power-law decay with a decay index of $\alpha=0.98 \pm 0.04$.

A spectrum formed from the WT mode data can be fitted with an absorbed power-law with a photon spectral index of 1.945 (+0.035, -0.034). The best-fitting absorption column at the redshift z=1.023 (GCN Circ. 14059) is 9.13 (+0.51, -0.48) x 10^{21} cm^{-2}, in excess of the Galactic value of 9.5 x 10^{19} cm^{-2} (Kalberla et al. 2005). The PC mode spectrum has a photon index of 2.07 (+0.12, -0.11) and a best-fitting absorption column at z=1.023 of 4.59 (+1.07, -0.99) x 10^{21} cm^{-2}. The counts to observed (unabsorbed) 0.3-10 keV flux conversion factor deduced from this spectrum is 3.5 x 10^{-11} (4.7 x 10^{-11}) erg cm^{-2} count^{-1}.

The results of the XRT team automatic analysis are available at http://www.swift.ac.uk/xrt_products/00541200.

4. UVOT Observations and Analysis

Analysis of the UVOT data was reported by Chester and Mangano (GCN Circ. 14063). The Swift/UVOT began settled observations of the field of GRB 121211A 97 s after the BAT trigger. A source consistent with the enhanced Swift-XRT position (Osborne et al. GCN Circ. 14060) 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 0.01 mag. in the direction of the GRB (Schlegel *et al.* 1998).

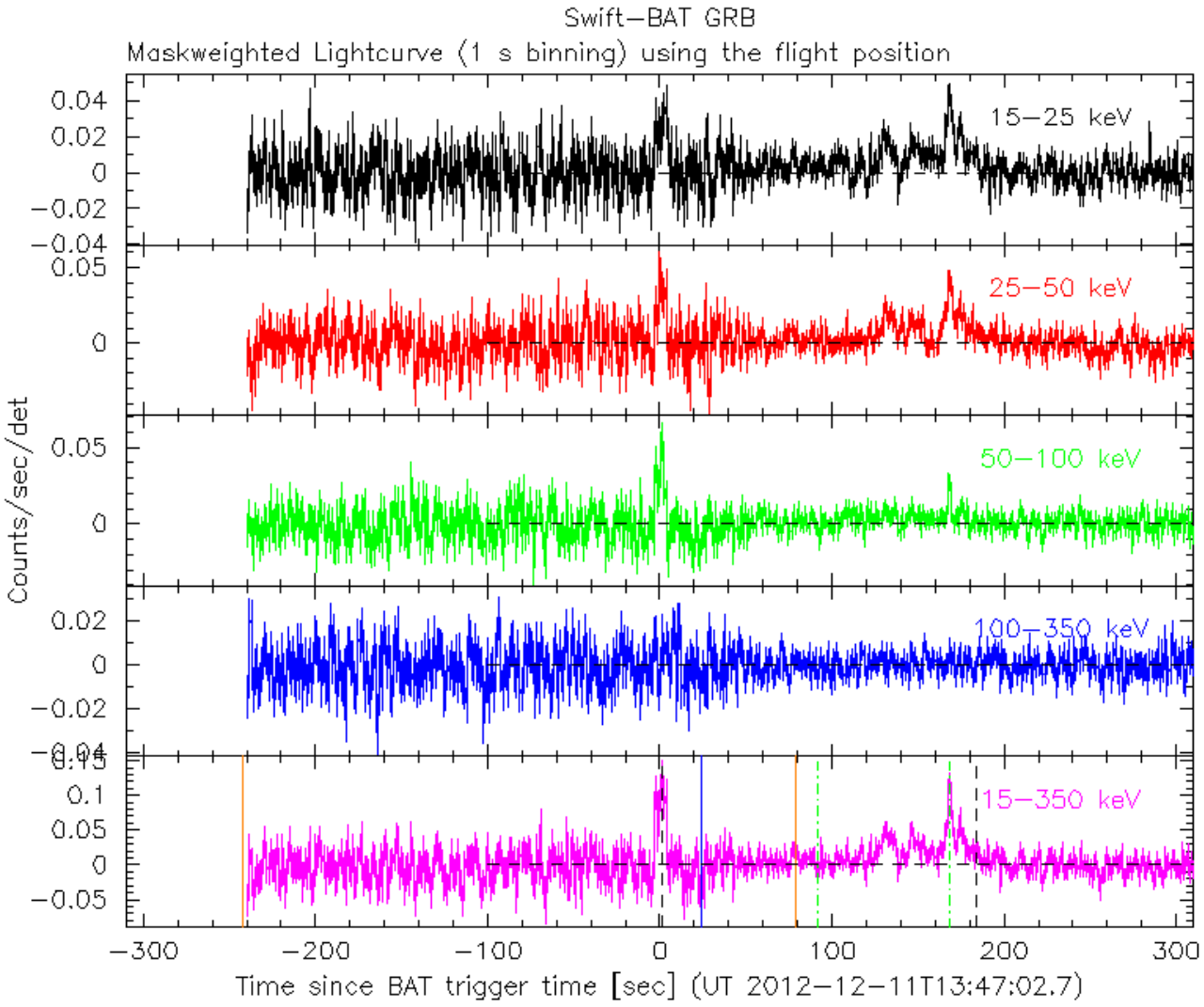

Figure 1. The BAT mask-weighted light curve in the four individual and total energy bands. The units are counts s^{-1} illuminated-detector^{-1}.

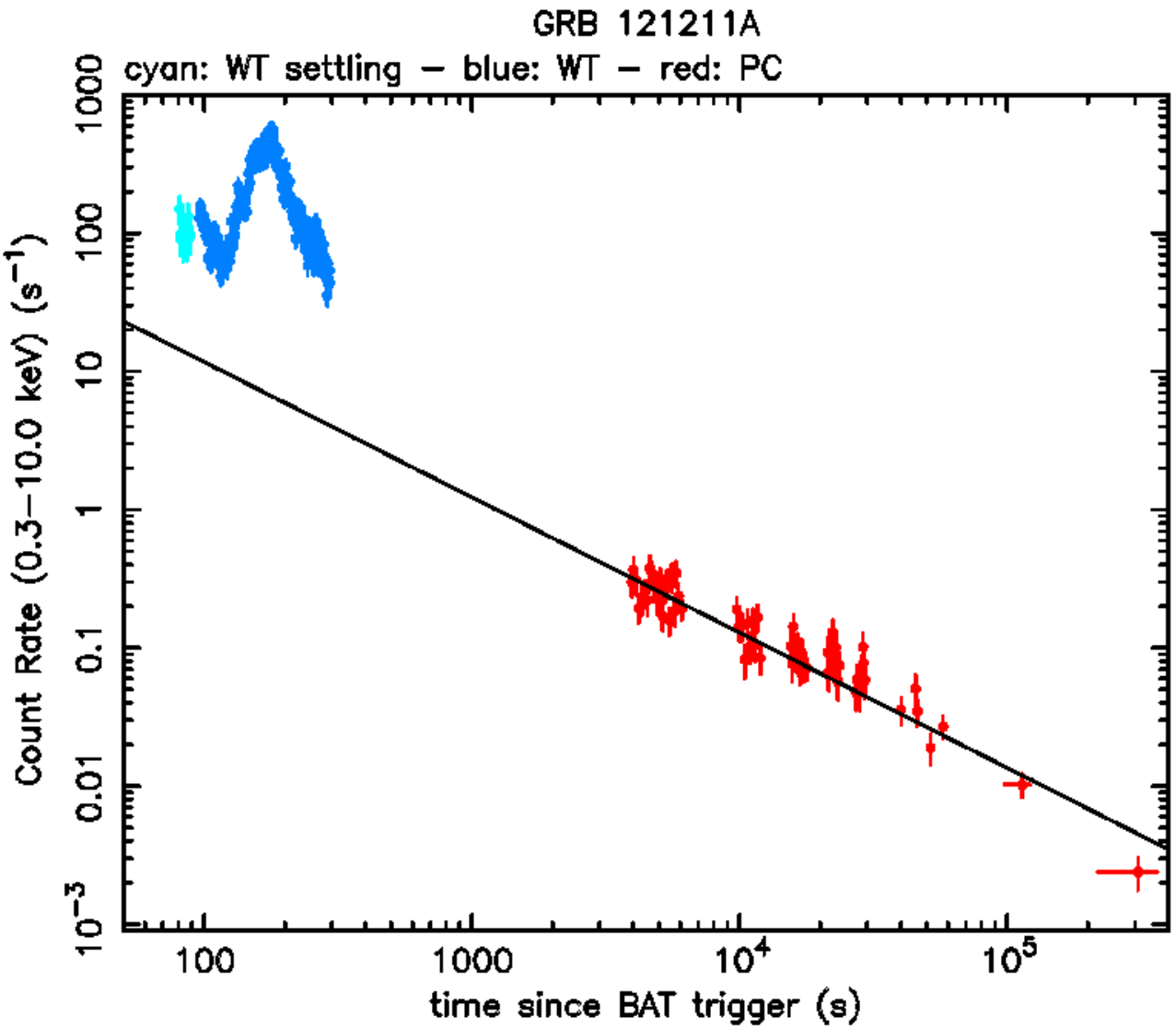

Figure 2. The XRT light curve.

RA	Dec	Error	Note	Reference
$13^h02^m07.99^s$	+30°08' 54.6"	0.52"	UVOT-refined	Chester and Mangano GCN Circ. 14063
$13^h02^m07.96^s$	+30°08' 55.3"	1.6"	XRT-enhanced	Osborne *et al.* GCN Circ. 14060
$13^h02^m18.0^s$	+30°10' 24.4"	4.9'	BAT-refined	Barthelmy *et al.* GCN Circ. 14067

Table 1. Positions from the Swift instruments.

Band	Authors	GCN Circ.	Observatory	Notes
Optical	Japelj *et al.*	14058	FTN	detection
Optical	Perley *et al.*	14059	Keck	redshift
Optical	Kuroda *et al.*	14062	MITSuME Okayama	detection
Optical	Wren *et al.*	14075	RAPTOR	upper limits
Optical	Butler *et al.*	14077	RATIR	
Optical	Butler *et al.*	14080	RATIR	

Gamma-ray	Yu	14078	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
$white_{FC}$	97	247	147	18.4 ± 0.1
white	4103	5738	393	19.9 ± 0.1
v	4514	6148	393	>19.9
b	3899	5533	393	20.4 ± 0.2
u_{FC}	255	297	41	18.3 ± 0.3
u	5128	5328	197	19.6 ± 0.2
w1	10576	11476	886	20.6 ± 0.2
m2	4718	10569	1082	20.6 ± 0.2
w2	4309	5943	393	>21.1

Table 3. UVOT Observations. 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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