Swift Observations of GRB 121028A

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1 Introduction

The Swift Burst Alert Telescope (BAT) triggered on GRB 121028A (trigger=536897) at 05:04:31 UT on 2012 October 28 (Starling et al. 2012, GCN Circ. 13913). Swift slewed immediately to the burst. The afterglow was detected with XRT. Our best position is the enhanced XRT position (Evans et al. 2012, GCN Circ. 13918): RA (J2000) = 18h 07m 35.87s Dec (J2000): $-02d\ 17'\ 36.9''$ with an uncertainty of $1.7''$ (radius, 90% containment).

2 BAT Observations and Analysis

The BAT light curve showed a single-pulse structure (Fig. 1). Using the data set from T-61 to T$+242$ s, the BAT ground-calculated position is RA, Dec = 271.903, -2.298 deg which is

RA(J2000) = 18h 07m 36.7s

Dec(J2000) = $-02d\ 17'\ 52.1''$

with an uncertainty of $1.5'$, (radius, sys+stat, 90% containment). The partial coding was 50%.

The mask-weighted light curve shows single pulse starting at $\sim$T-0.9 s, peaking at $\sim$T$+2$ s, and ending $\sim$T$+4$ s. T_{90} (15–350 keV) is 3.8 ± 0.7 s (estimated error including systematics).

The time-averaged spectrum from T-0.8 to T$+3.8$ s is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.79 ± 0.17. The fluence in the 15–150 keV band is $(3.7\pm0.4)\times10^{-7}$ erg cm^{-2}. The 1-s peak photon flux measured from T-0.01 s in the 15–150 keV band is 1.9 ± 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/536897/BA/`.

3 XRT Observations and Analysis

The XRT observed the field from 139 s to 48.76 ks after the BAT trigger for a total exposure time of 9.4 ks. The data are all in Photon Counting (PC) mode. The enhanced XRT position for this burst was given by Evans et al. (2012, GCN. Circ 13918).

The light curve can be modelled with a single power law with $\alpha = 0.87 \pm 0.07$, with a flare between T$+685$ and T$+1161$ s (Fig. 2).

A spectrum formed from the PC mode data can be fitted with an absorbed power law with a photon spectral index of $\Gamma=1.63^{+0.26}_{-0.25}$. The intrinsic absorption column at an assumed redshift of $z = 0$ is $N_{\rm H} = (2.3^{+1.7}_{-1.4}) \times 10^{21}$ cm^{-2}, while the Galactic value is 2.5×10^{21} cm^{-2} (Kalberla et al. 2005). The counts to observed (unabsorbed) 0.3–10 keV flux conversion factor deduced from the PC spectrum is 5.6×10^{-11} (7.9×10^{-11}) erg cm^{-2} count^{-1}.

The results of the XRT-team automatic analysis are available at `http://www.swift.ac.uk/xrt_products/00536897`.

4 UVOT Observations and Analysis

The Swift/UVOT began settled observations of the field of GRB 121028A 133 s after the BAT trigger. Data summed from the first and second orbits do not reveal a source at the enhanced position of the X-ray afterglow.

Upper limits (3σ) using the UVOT photometric system (Breeveld et al. 2011) are given in Table 1. The values quoted are not corrected for Galactic extinction due to the reddening of $E(B-V) = 1.41$ in the direction of the burst (Schlegel et al. 1998).

References

[1] Breeveld A.A. et al., 2011, AIP Conf. Proc., 1358, 373

[2] Kalberla P.M.W. et al., 2005, A&A, 440, 775

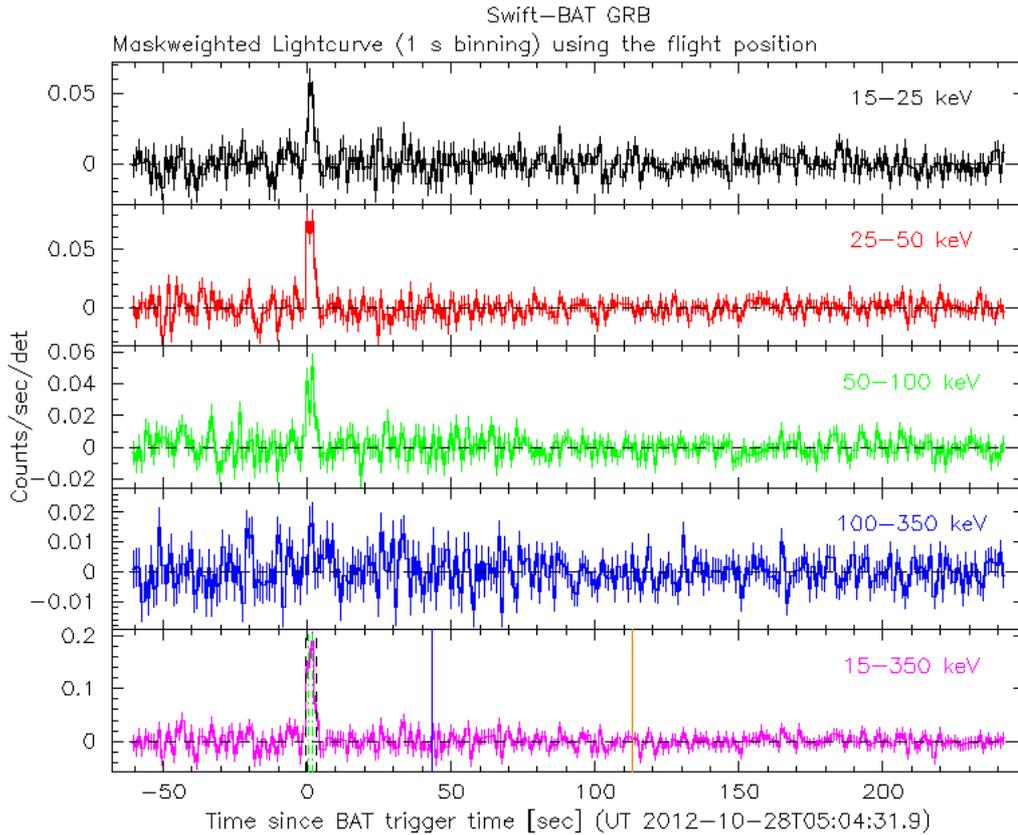[3] Schlegel D.J., Finkbeiner D.P., Davis M., 1998, ApJ, 500, 525

Figure 1: BAT maskweighted 1 s light curves in five energy bands.
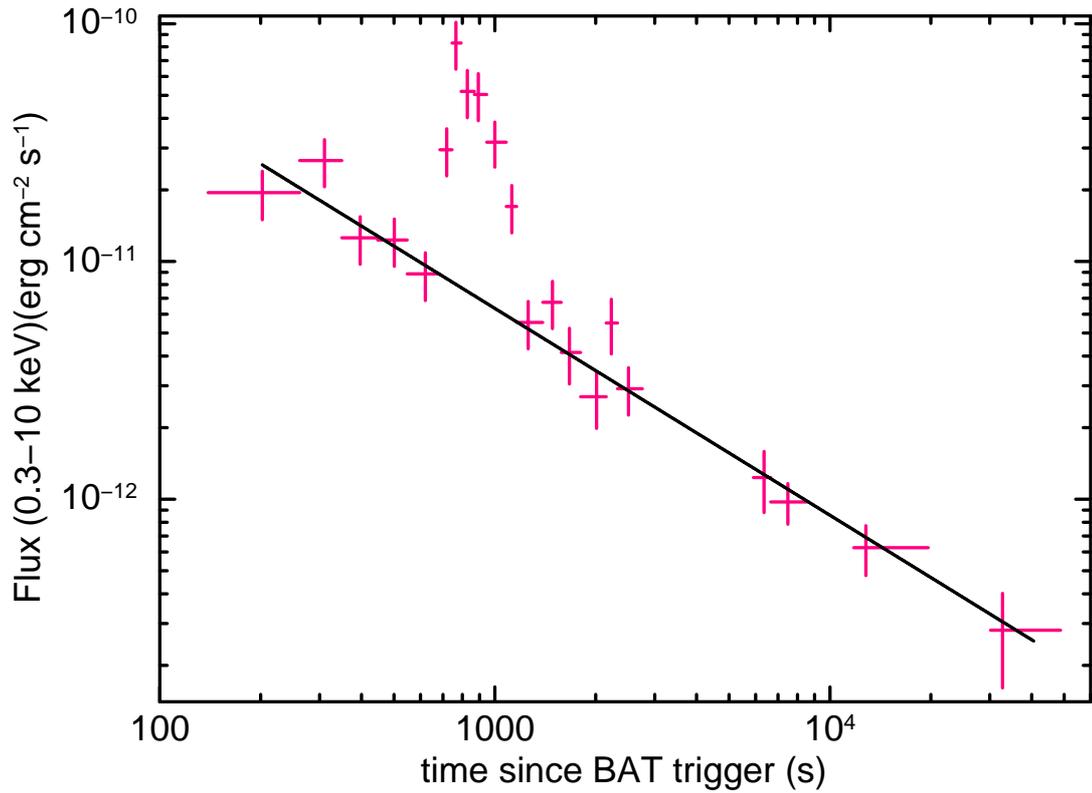
Figure 2: XRT fluxed light curve in the 0.3–10 keV band, and single power law fit with $\alpha = 0.87$. The approximate observed count rate to flux conversion is 1 count $s^{-1} = 5.6 \times 10^{-11}$ erg cm^{-2} s^{-1}, based on the time-averaged spectrum.

Filter	Start	Stop	Exposure	3σ UL
white (fc)	133	283	147	>19.96
white	877	7754	540	>21.07
v	6528	6727	196	>18.94
b	2713	2758	44	>19.10
u	345	595	245	>19.43
u	7143	7343	196	>19.68
uvw1	6938	7138	196	>19.61
uvw2	7761	7961	196	>19.90

Table 1: Upper limits (UL) from UVOT observations. Start and stop times are given in seconds since BAT trigger and exposure times in seconds. fc refers to the finding chart exposure.