

Swift Observations of GRB 061102

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0. REVISIONS

Updated the introduction to say how long *Swift* observed the burst. Updated the XRT section to include all of the XRT data. Updated Fig. 2. Updated the magnitudes in Table 1.

1. INTRODUCTION

At 01:00:31 UT The *Swift*-BAT triggered on and located GRB 061102 (trigger = 236430) (Holland et al., GCN Circ. 5776). *Swift* immediately slewed to the burst. The XRT and UVOT began observing the field at 01:02:11 UT, 100 s after the BAT trigger. Our best position for this burst is the XRT position, RA, DEC (J2000) = 09:53:37.64, -17:01:26.5. The X-ray afterglow was detected until approximately 30 hours after the BAT trigger, when *Swift* stopped observing this burst. No optical or ultraviolet afterglow was detected.

2. BAT OBSERVATION AND ANALYSIS

The BAT ground-calculated position is RA, Dec = 148.393, -17.000 deg (09:53:34.2, -17:00:00.8) (J2000) ± 2.7 arcmin, (radius, sys+stat, 90% containment). The partial coding was 100%.

The mask-weighted lightcurves (Fig. 1) show a FRED starting at T+0 and ending about T+50 sec. T90 (15–350 keV) is 17.6 ± 1 sec (estimated error including systematics).

The time-averaged spectrum from T-1.0 to T+18.9 is best fit by a simple power-law model. The power-law index of the time-averaged spectrum is 1.45 ± 0.33 . The fluence in the 15–150 keV band is $(1.9 \pm 0.4) \times 10^{-7}$ erg cm⁻². The 1-s peak photon flux measured from T+3.37 sec in the 15–150 keV band is 0.2 ± 0.1 photons cm⁻² s⁻¹. All the quoted errors are at the 90% confidence level.

3. XRT OBSERVATION AND ANALYSIS

We have analysed the *Swift* XRT data obtained for GRB 061102 (trigger 236430) until approximately 30 hours after the BAT trigger, when *Swift* stopped observing the burst. The data consist of 208 s of Windowed Timing (WT) mode data beginning at 112 s since BAT trigger and ??? s of subsequent Photon Counting (PC) mode data.

Using the PC mode data we obtain a refined position of RA, Dec (J2000) = 09:53:37.64, -17:01:26.5 with an estimated uncertainty of 4.9 arcsec (90% containment) taking into account the new TELDEF files. This location is 1.8 arcsec from the initial XRT position (Holland et al., GCN Circ. 5776) and 98.7 arcsec from the ground-calculated BAT position (Tueller et al., GCN Circ. 5777)

The lightcurve (Fig. 2) shows a steep decay over the first 400 s with a slope of $\alpha = 4.0 \pm 0.1$. At approximately 400 s the lightcurve breaks to a slope of $\alpha \approx 1$, which slowly transitions to a slope of $\alpha \approx 0.5$.

The first orbit WT-mode spectrum can be well fitted with an absorbed power law with index $\Gamma = 3.6 \pm 0.2$. The total column density required is $1.6E21$ cm⁻² which exceeds the Galactic value of $5.0E20$

cm^{-2} (Dickey & Lockman, 1990). The total flux in the 0.3–10 keV band is $1.2\text{E}-10 \text{ erg cm}^{-2} \text{ s}^{-1}$. All errors are quoted at the 90% confidence limit.

From these data we predict a count rate of $3.3\text{E}-4 \text{ counts s}^{-1}$, corresponding to a flux of approximately $8\text{E}-15 \text{ erg cm}^{-2} \text{ s}^{-1}$ at T+24 h.

4. UVOT OBSERVATION AND ANALYSIS

The *Swift*/UVOT began observing the field of GRB 061102 at 01:02:02 on 2006-11-02, 92 s after the BAT trigger. No optical afterglow was detected in any of the individual UVOT exposures, or in the coadded exposures, down to the 3-sigma limiting magnitudes listed in Table 1. The start and stop times are relative to the BAT trigger. The values quoted in Table 1 are not corrected for the expected Galactic extinction of $E_{\{B-V\}} = 0.04 \text{ mag}$ (Schlegel et al., 1998). These upper limits are slightly different from those in GCN Report 4.1 (Holland et al., 2006) because they use improved aperture corrections.

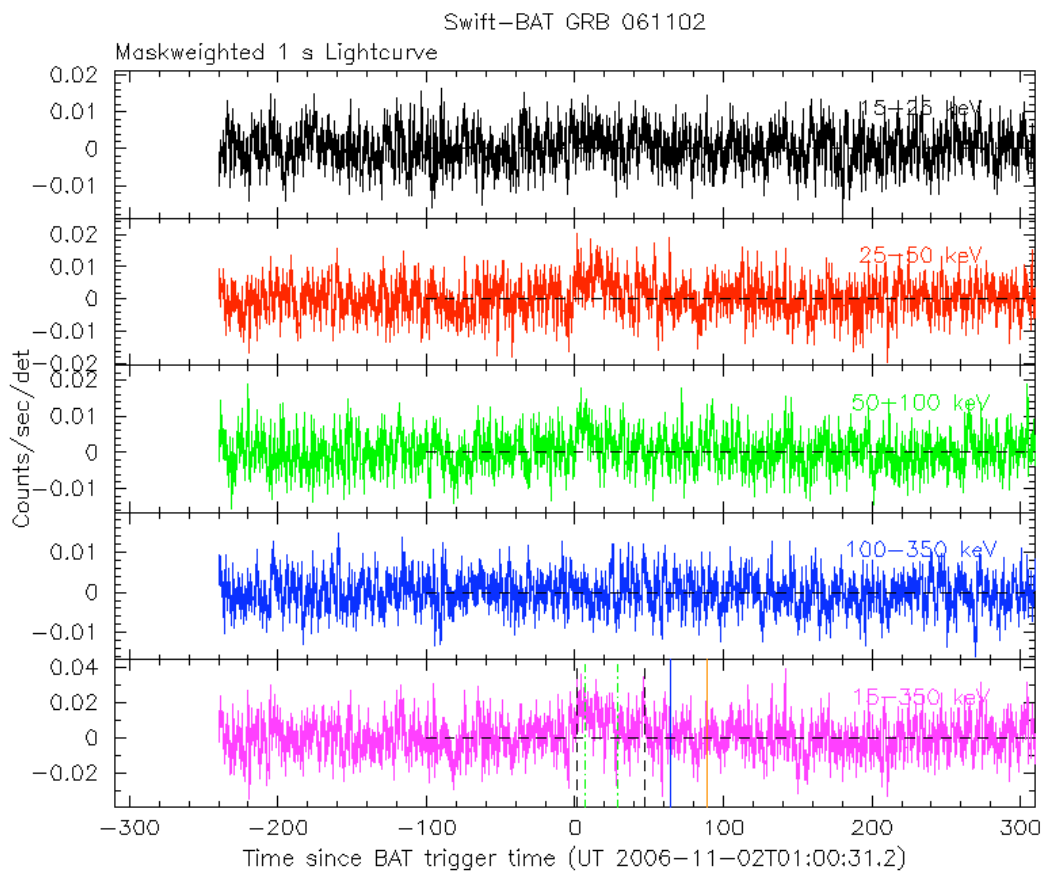


Fig.1: BAT Lightcurve. The light curve in the four individual plus total energy bands. The units are counts/s/illuminated-detector (note: illuminated-detector = 0.16 cm^{-2}) at T0 is 01:00:31.

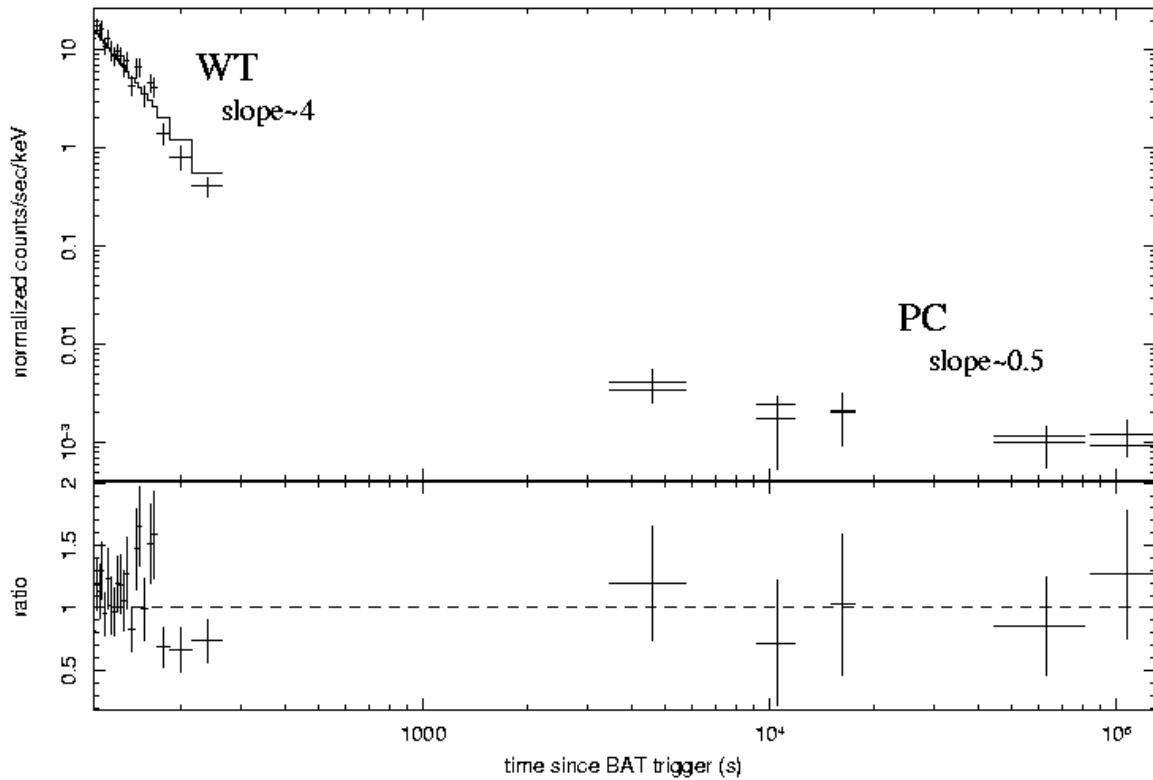


Fig. 2: XRT Lightcurve. Counts/s in the 0.3–10 keV band. The conversion factor to go from count rate to flux is $1 \text{ counts s}^{-1} = 2.4\text{E-11 erg cm}^{-2} \text{ s}^{-1}$.

Table 1: UVOT Observations.

Filter	Start	Stop	Exposure	3-sigma	Comments
(s)	(s)	(s)		Upper Limit	
White	112	209	97	20.2	Finding Chart
V	216	275	59	18.5	Finding Chart
V	216	10154	1141	20.4	Coadded Exposures
B	4078	16849	1278	21.7	Coadded Exposures
U	3873	15938	1278	21.3	Coadded Exposures
UVW1	3669	11845	1160	21.0	Coadded Exposures
UVM2	3464	11059	1279	21.4	Coadded Exposures
UVW2	4488	6061	336	20.7	Coadded Exposures
White	112	17629	1247	21.8	Coadded Exposures

References

- 1) Dickey, J. M., & Lockman, F. J., 1990, ARAA, 28, 215
- 2) Schlegel, D. J., Finkbeiner, D. P., & Davis, M., 1998, ApJ, 500, 525