Swift Observations of GRB 120211A

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1 Introduction

BAT triggered and located GRB 120211A on 2012 February 11 at 11:58:28.0 UT (Trigger 514586) (Sonbas, *et al.*, 2012, *GCN Circ.* 12920). BAT mask-weighted light curve showed two-three overlapping peaks with $T_{90} = 61.7 \pm 6.4$ *sec*. Swift slewed to this burst immediately and XRT began follow-up observations at $T + 119.5$ *sec*, and UVOT at $T + 150.0$ *sec* after the BAT trigger.

The best Swift position is that derived using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue: RA, Dec (J2000) =05h 51m 0.89s , -24d 46′ 30.8″, with an estimated uncertainty of 1.9" (radius, 90% confidence).

Upper limits were reported from ground based observations of the field of GRB 120211A starting 3.77 min after the trigger time by Faulkes Telescope (Virgili et al. *GCN Circ.* 12921), MITSUME (Yanagisava et al. *GCN Circ.* 12923, 12936, Kuroda et al. *GCN Circ.* 12929), MASTER (Yurkov et al. *GCN Circ.* 12925,), ARIES Nainitial (Kumar et al. *GCN Circ.* 12928) GROND (Elliott et al. *GCN Circ.* 12931) and LOAO (Jang et al. *GCN Circ.* 12953).

2 BAT Observation and Analysis

Using the data set from $T-240.0$ to $T+962.0$ *sec*, analysis of BAT GRB 120211A has been performed by Swift team (Ukwatta, *et al.*, *GCN Circ.* 12924). The BAT ground-calculated position is RA($J2000$) = 87.781° ($05h51m07.5s$), Dec($J2000$) = -24.795° (-24d47′43.6″) ± 2.1 $arcmin$, (radius, systematic and statistical, 90% containment). The partial coding was 64%.

The mask-weighted light curve shows two or three overlapping peaks (Fig.1) starting at $\sim T - 10$ sec peaking at $\sim$ T+42 sec, and ending at $\sim$ T+140 sec. T_{90} (15-350 keV) is 61.7± 6.4 sec (estimated error including systematics).

The time-averaged spectrum from $T - 2.34$ to $T + 64.10$ sec is best fit by a simple power law. This fit gives a power law index 1.50 ± 0.22. For this model the total fluence in the 15-150 keV band is $8.1 \pm 1.2 \times 10^{-7}$ erg cm^{-2} and the 1-sec peak flux measured from T+40.97 sec in the 15-150 keV band is 0.5 ± 0.2 ph cm^{-2} sec^{-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/514586/BA/`.

3 XRT Observations and Analysis

6.4 ks of Photon Counting (PC) data were analysed of GRB 120211A from 133 s to 87 ks after the BAT trigger. The enhanced XRT position is RA(J2000) = 05h 51m 0.91s, Dec(J2000) = -24d 46′ 31.4″ ± 1.6 (90% confidence).

The $0.3 - 10$ keV light curve (Fig.2) can be modelled with a series of power-law with an initial decay index of α =1.48 ($^{+0.34}_{-0.19}$). At T+1435 s the decay flattens to an α = -0.31 ($^{+0.38}_{-0.64}$) before breaking at T+7464 s to a final decay with α = 1.2 ($^{+0.25}_{-0.19}$).

A spectrum formed from the PC mode data can be fitted with an absorbed power-law with a photon spectral index of $1.49(^{+0.39}_{-0.36})$. The best-fitting absorption column is $6.5(^{+6.5}_{-4.8}) \times 10^{20} cm^{-2}$, in excess of

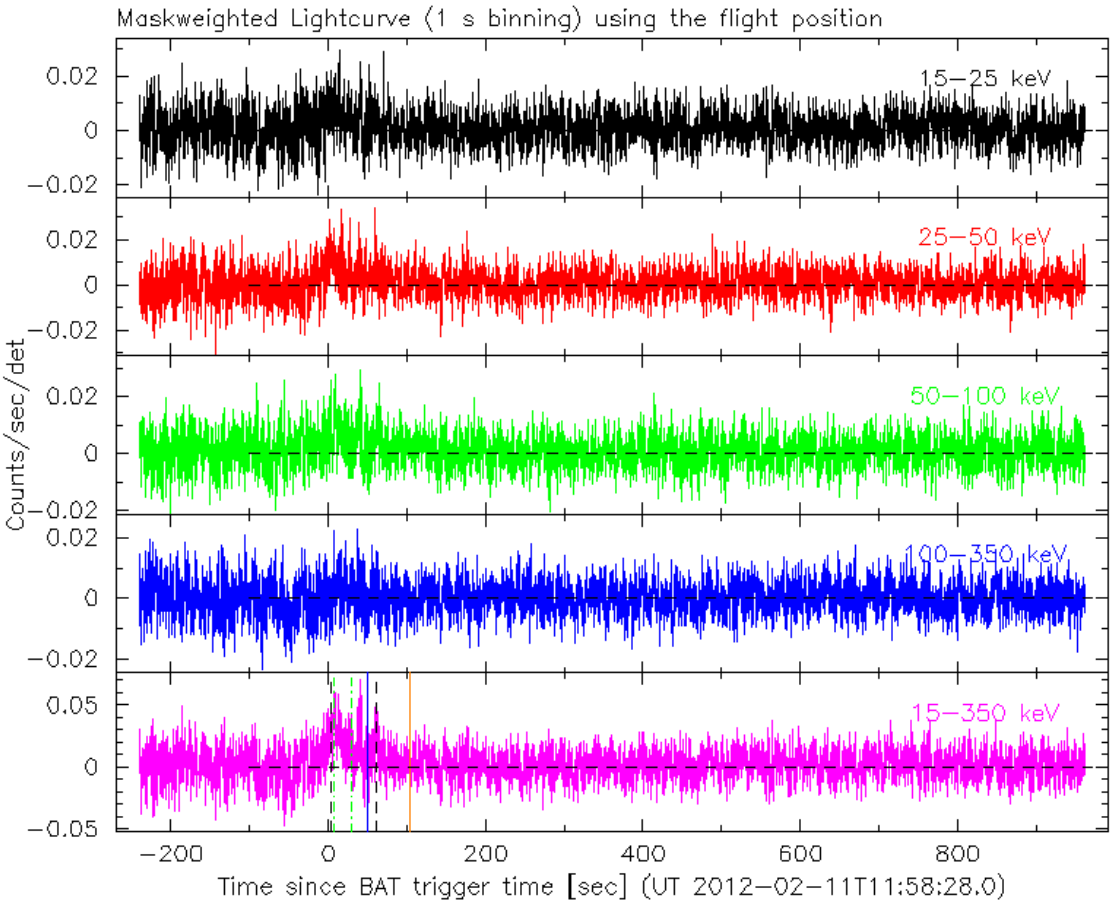

Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts $\sec^{-1}$illuminated-detector^{-1} and T_0 is 11:58:28.0 UT.

the Galactic value of $1.7 \times 10^{20} cm^{-2}$ (Kalberla et al. 2005). The counts to observed (unabsorbed) 0.3-10 keV flux conversion factor deduced from this spectrum is $5.4 \times 10^{-11} erg\ cm^{-2}\ count^{-1}$.

The results of the XRT-team automatic analysis are available at
`http://www.swift.ac.uk/xrt products/00514586`.

4 UVOT Observation and Analysis

The Swift/UVOT began settled observations of the field of GRB 120211A, 123 s after the BAT trigger (Sonbas *et al.*, *GCN Circ.* 12920).

No optical afterglow consistent with the XRT position (Goad et al., *GCN Circ.* 12922) is detected in the initial UVOT exposures. Preliminary 3-sigma upper limits using the UVOT photometric system (Breeveld et al. 2011, AIP Conf. Proc. 1358, 373) for the first finding chart (FC) exposure and subsequent exposures are shown in the Table 1.

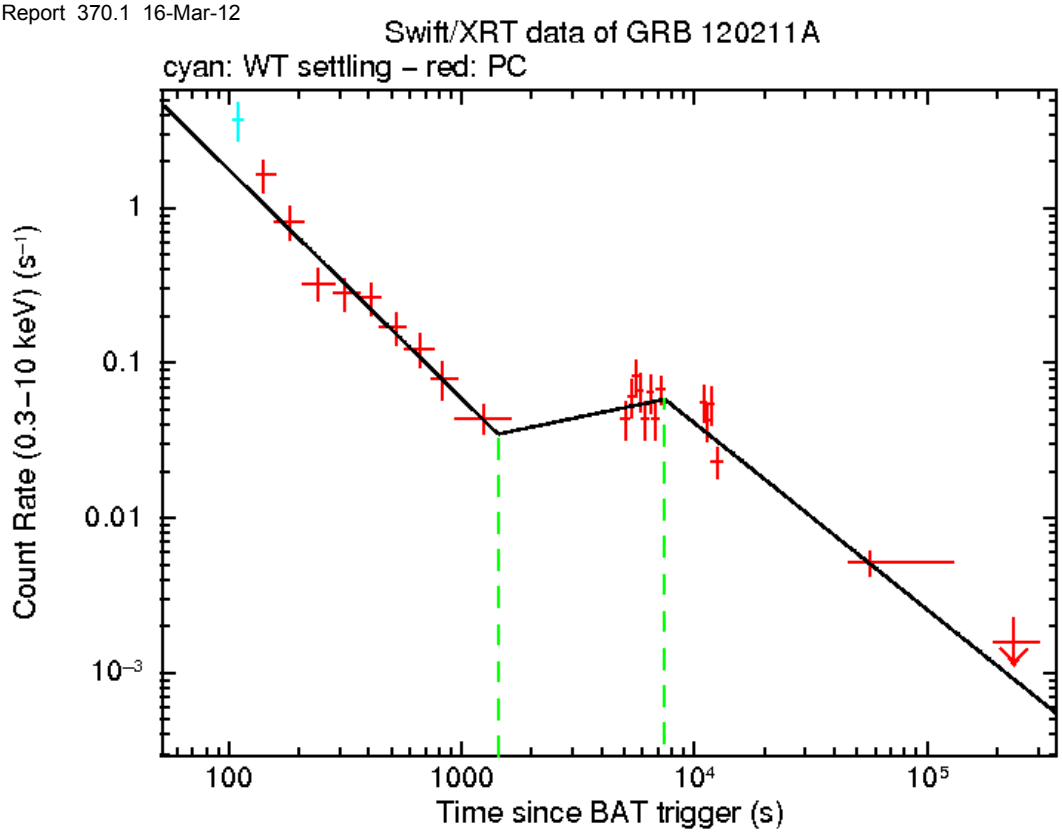

Figure 2: XRT Lightcurve in the 0.3-10 keV band: Window Timing mode (cyan), Photon Counting mode (red). The conversion factor for this burst is 1 count $= 5.4 \times 10^{-11}$ $erg\ cm^{-2}$.

References

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

[2] Elliott, J. et al. 2012, GCN Circ. 12931 Goad Goad, M. R. et al. 2012, GCN Circ. 12922

[3] Jang, M. et al. 2012, GCN Circ. 12953

[4] Kalberla, P. M. et al. 2005, AA 440, 775

[5] Kumar, B. et al. 2012, GCN Circ. 12928

[6] Virgili, F. J. et al. 2012, GCN Circ. 12921

[7] Yanagisava, K. et al. 2012 GCN Circ. 12923

[8] Yanagisava, K. et al. 2012 GCN Circ. 12936

[9] Yurkov, V. et al. 2012 GCN Circ. 12925

[10] Sonbas, E. et al. 2011, GCN Circ. 12920

Filter	T_{Start}	T_{Stop}	Exposure (s)	Mag.
WHITE-FC	123	273	147	> 21.1
u-FC	281	531	246	>20.9
WHITE	123	1528	392	>21.6
v	612	1577	117	>19.7
b	537	1503	97	>20.3
u	281	1478	324	>20.9
w1	662	1626	117	>20.2
m2	637	1602	117	>21.1
w2	588	1553	117	>20.0

Table 1: Magnitude limits from UVOT observations . The magnitudes in the table are not corrected for the Galactic extinction due to the reddening of E(B-V) = 0.03 in the direction of the burst (Schlegel et al. 1998).