

Swift Report on GRB 090621B

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1 Introduction

At 22:07:25 UT, the Swift Burst Alert Telescope (BAT) triggered and located the short-hard GRB 090621B (trigger=355359; Curran *et al.* *GCN Circ.* 9545). The BAT light curve (Figure 1) shows a single spike with a duration less than 128 millisecond. The peak count rate was ~ 7000 counts/sec (15-350 keV), at ~ 0 sec after the trigger. This burst was also detected by the Fermi GBM (Goldstein *et al.* *GCN Circ.* 9562).

Swift slewed immediately to the burst and the narrow field instruments started observing 56 seconds after the BAT trigger. The XRT produced a refined position of RA, Dec = 313.47049, 69.02845, which is equivalent to

RA (J2000) = 20:53:52.92

Dec(J2000) = +69:01:42.4

with an uncertainty of 4.0 arcsec (radius, 90% confidence Beardmore *et al.* *GCN Circ.* 9550). Neither UVOT, nor ground based observations, detected any credible afterglow candidate at the XRT position.

2 BAT Observation and Analysis

The analysis of BAT GRB 090621B has been performed by the Swift team, using the data set from T-239 to T+963 sec (Krimm *et al.*, *GCN Circ.* 9551). The BAT ground-calculated position is RA, Dec = 313.455, 69.034 which is

RA(J2000) = 20:53:49.3

Dec(J2000) = 69:02:02.9

with an uncertainty of 1.7 arcmin, (radius, systematic and statistical, 90% containment). The partial coding was 69%

The mask-weighted light curve (Figure 1) shows a single peak starting a $\sim T+0$ sec and ending at $\sim T+0.2$ sec. There is a 2.5σ hint of extended emission from $\sim T+150$ to $\sim T+240$ sec. T_{90} (15-350 keV) is 0.14 ± 0.04 sec (estimated error including systematics).

The time-averaged spectrum from T-0.028 to T+0.148 sec is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 0.82 ± 0.23 . The fluence in the 15-150 keV band is $7.0 \pm 1.0 \times 10^{-8}$ erg cm^{-2} . The 1-sec peak photon flux measured from T-0.44 sec in the 15-150 keV band is 3.9 ± 0.5 ph $\text{cm}^{-2} \text{sec}^{-1}$. 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/355359/BA/

3 XRT Observations and Analysis

The XRT began observing the field of GRB 090621B at 22:08:36UT, 70.7 seconds after the BAT trigger, and found a faint uncatalogued X-ray source. Using 10.0 ks of XRT Photon Counting mode data, the Swift team found a refined X-ray position of RA, Dec = 313.47049, 69.02845, which is equivalent to

RA (J2000) = 20:53:52.92

Dec(J2000) = +69:01:42.4

with an uncertainty of 4.0 arcsec (radius, 90% confidence; Beardmore *et al.* *GCN Circ.* 9550).

The X-ray light-curve (Figure 2) shows a faint, fading source with a decay index of $\alpha = 0.61 \pm 0.19$. The PC mode spectrum from T+80 s to T+17.1 ks can be fit by an absorbed powerlaw with a photon index of $\Gamma = 1.47 \pm 0.66$, assuming a Galactic column density of $1.9 \times 10^{21} \text{cm}^{-2}$ (Kalberla

et al. 2005) in the direction of the burst. The observed (unabsorbed) counts to flux conversion is 3.1×10^{-11} (2.5×10^{-10}) $\text{erg cm}^{-2} \text{count}^{-1}$.

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

4 UVOT Observation and Analysis

The UVOT began settled observations of the field of GRB 090621B 76 s after the BAT trigger. No optical afterglow consistent with the XRT position was detected in the UVOT exposures (Curran *et al.*, *GCN Circ.* 9552). The 3σ upper limits in the UVOT photometric system (Poole, *et al.*, 2008) for the first white finding chart (FC) exposure and subsequent co-added exposures, using a 4" aperture, are given in Table 1.

Filter	T _{start} (s)	T _{stop} (s)	Exp(s)	Mag
wh (FC)	76	226	150	>21.13
wh	568	18173	1221	>22.29
v	618	10774	1142	>20.67
b	544	23952	1986	>21.88
u	289	29731	2675	>21.77
uw1	668	29017	2882	>21.63
um2	643	28110	2006	>21.32
uw2	594	6589	432	>20.50

Table 1: 3σ limits using the UVOT photometric system (Poole, *et al.*, 2008) from UVOT observations. The values quoted above are not corrected for the expected Galactic extinction corresponding to a reddening of $E(B-V) = 0.44$ mag in the direction of the burst (Schlegel, Finkbeiner & Davis, 1998).

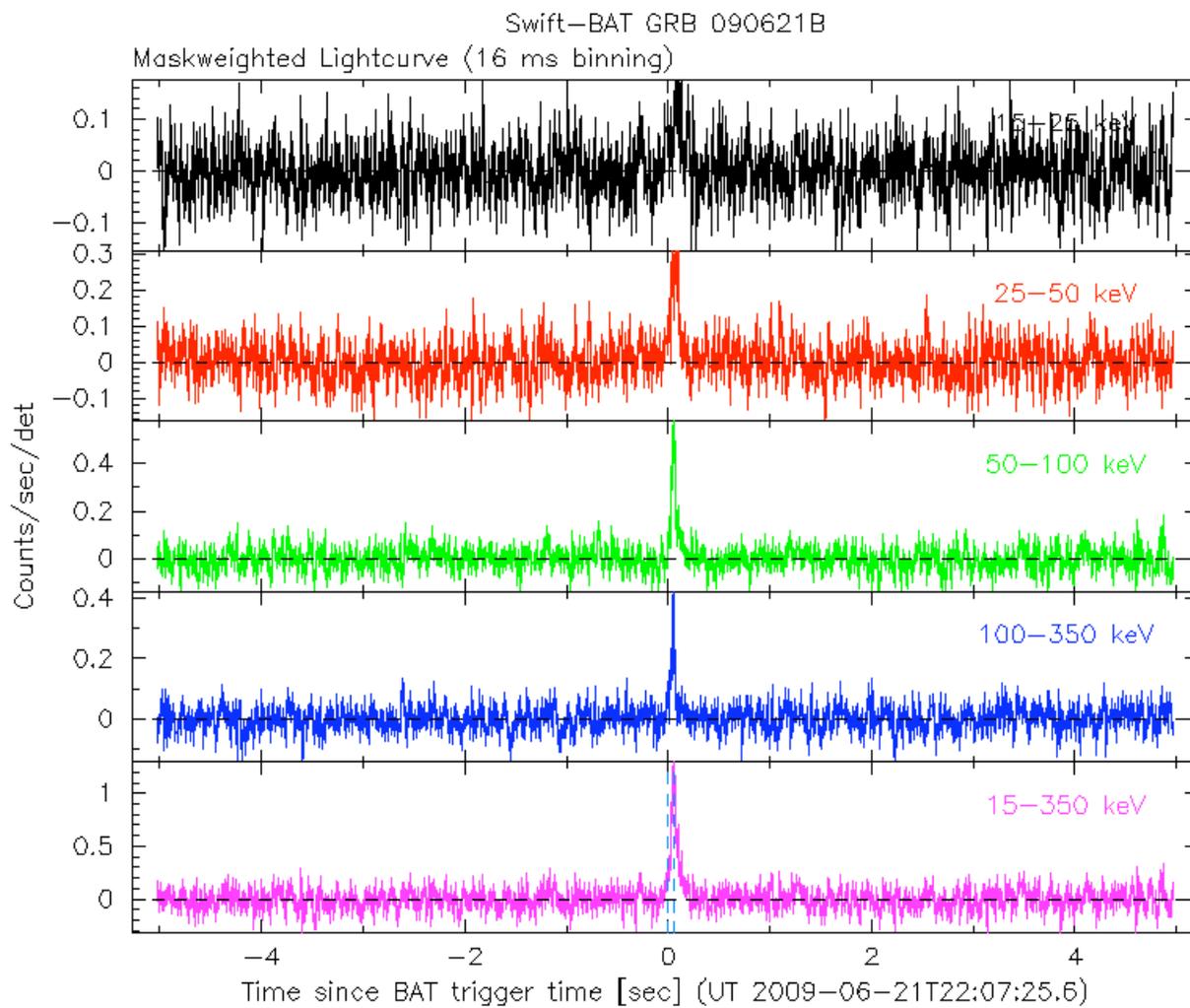


Figure 1: The BAT mask-weighted light curve in the 4 individual plus total energy bands with units of counts/sec/illuminated-detector.

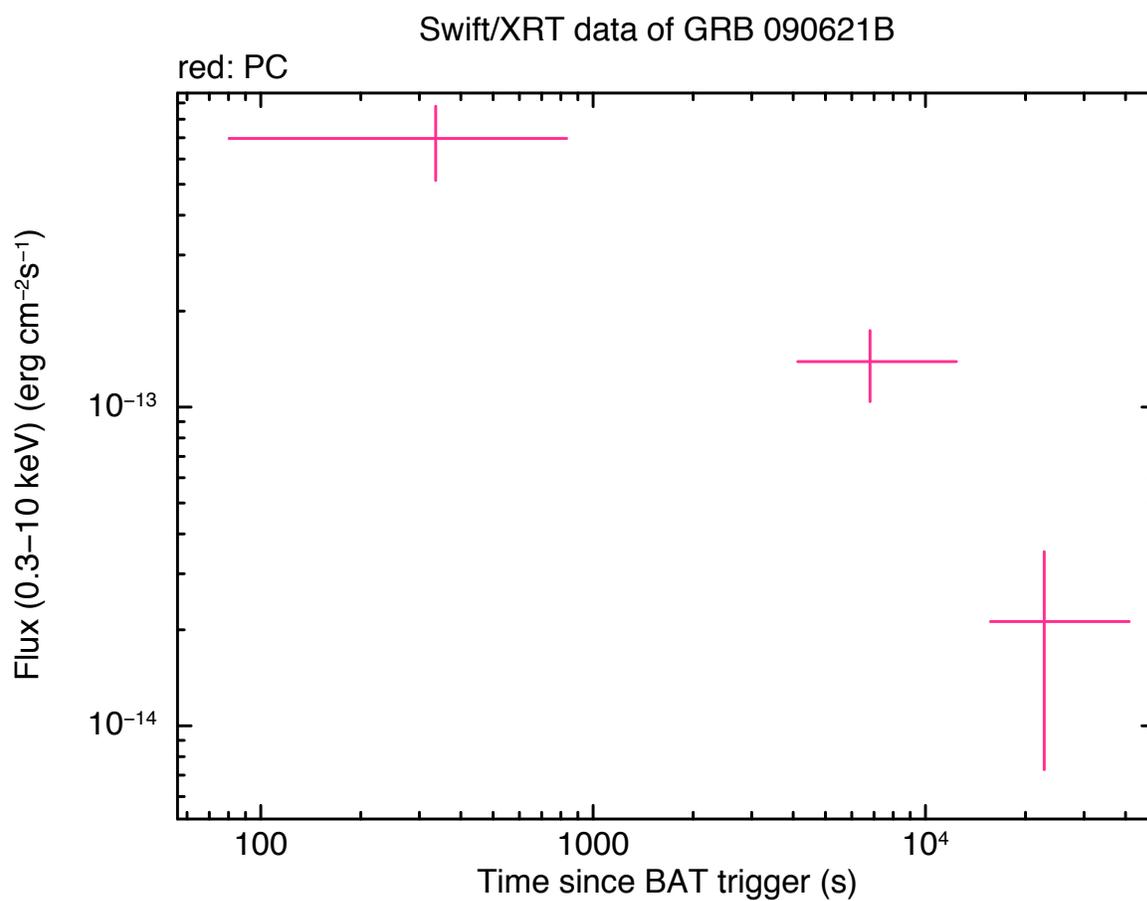


Figure 2: XRT light curve in the 0.3-10 keV band. The counts to observed (unabsorbed) flux conversion factor is 3.1×10^{-11} (2.5×10^{-10}) $\text{erg cm}^{-2} \text{count}^{-1}$.