Swift Observation of the short GRB 080905A

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1 Introduction

BAT triggered on the short GRB 080905A at 11:58:54 UT (Trigger 323870) (Pagani, *et al.*, *GCN Circ.* 8180), a burst with $T_{90} = 1.0 \pm 0.1$ *sec*. *Swift* slewed immediately to the burst. The XRT detected the afterglow in observations starting 113 *sec* after the trigger. The UVOT did not detect the optical afterglow (Brown, *et al.*, *GCN Circ.* 8208). The optical afterglow was detected in observations by the VLT (A. de Ugarte Postigo,*et al.*, *GCN Circ.* 8195). The burst was also deteced by the *INTEGRAL* SPI Anti-Coincidence System (Beckmann, private communication, the light curve can be found at http://isdc.unige.ch/Soft/ibas/results/triggers/spiacs/2008-09/2008-09-05T11-58-55.1415-08806-00007-0.png) and by the *Fermi GBM* (Bissaldi, *et al.*, *GCN Circ.* 8204). Our best position is the UVOT-enhanced Swift-XRT position of RA, Dec(J2000) = 287.67390, -18.88022 (Evans, *et al.*, *GCN Circ.* 8203), consistent with the optical counterpart position (A. de Ugarte Postigo,*et al.*, *GCN Circ.* 8195).

2 BAT Observation and Analysis

Using the data set from $T - 239$ to $T + 963$ *sec*, further analysis of BAT GRB 080905A has been performed by the *Swift* team (Cummings, *et al.*, *GCN Circ.* 8187). The BAT ground-calculated position is RA($J2000$) = $287.663deg$ ($19h10m39.1s$), Dec($J2000$) = $-18.865deg$ ($-18d51'55.4''$) $\pm$ 2.1 $arcmin$, (radius, systematic and statistical, 90% containment). The partial coding was 56%.

The mask-weighted light curve (Fig.1) shows three peaks; the first two are partially overlapping, starting at $\sim T - 0.0$ *sec* and ending at $\sim T + 0.4$ *sec*. The third peak starts at $\sim T + 0.6$ *sec* and ends at $\sim T + 1.3$ *sec*. $T_{90}(15 - 350keV)$ is 1.0 ± 0.1 *sec* (estimated error including systematics).

The time-averaged spectrum from $T + 0.0$ to $T + 1.1$ *sec* is best fitted by a simple power law model. This fit gives a photon index of 0.85 ± 0.24. For this model the total fluence in the $15 - 150$ keV band is $(1.4 \pm 0.2) \times 10^{-7} ergs/cm^2$, and the 1-sec peak flux measured from $T + 0.04$ *sec* in the $15 - 150$ keV band is 1.3 ± 0.2 $ph/cm^2/sec$. All the quoted errors are at the 90% confidence level considering the statistical and usual systematic effects.

The results of the batgrbproduct analysis are available at http://gcn.gsfc.nasa.gov/notices_s/323870/BA/

3 XRT Observation and Analysis

The UVOT-enhanced X-ray position of GRB 080905A is RA($J2000$) = $287.67390deg$ ($19h10m41.74s$), Dec($J2000$) = -18.88022 $deg(-18d52'48.8'')$ (radius, 90% confidence) (Evans, *et al.*, *GCN Circ.* 8203).

The $0.3 - 10$ keV light curve (Fig.2) shows an initial count rate of ~ 5 counts/sec for the first 100 seconds of observations, followed by a steep decay and a shallower phase. The decaying light curve can be fit with a broken power-law with an initial slope of 4.6 ± 2.0, a break at $\sim T + 400$ *sec* and a later decay index of $0.8^{+1.8}_{-0.7}$. The afterglow is no longer detected in a following ~ 11 ks long observation centered at $T + 65$ ks.

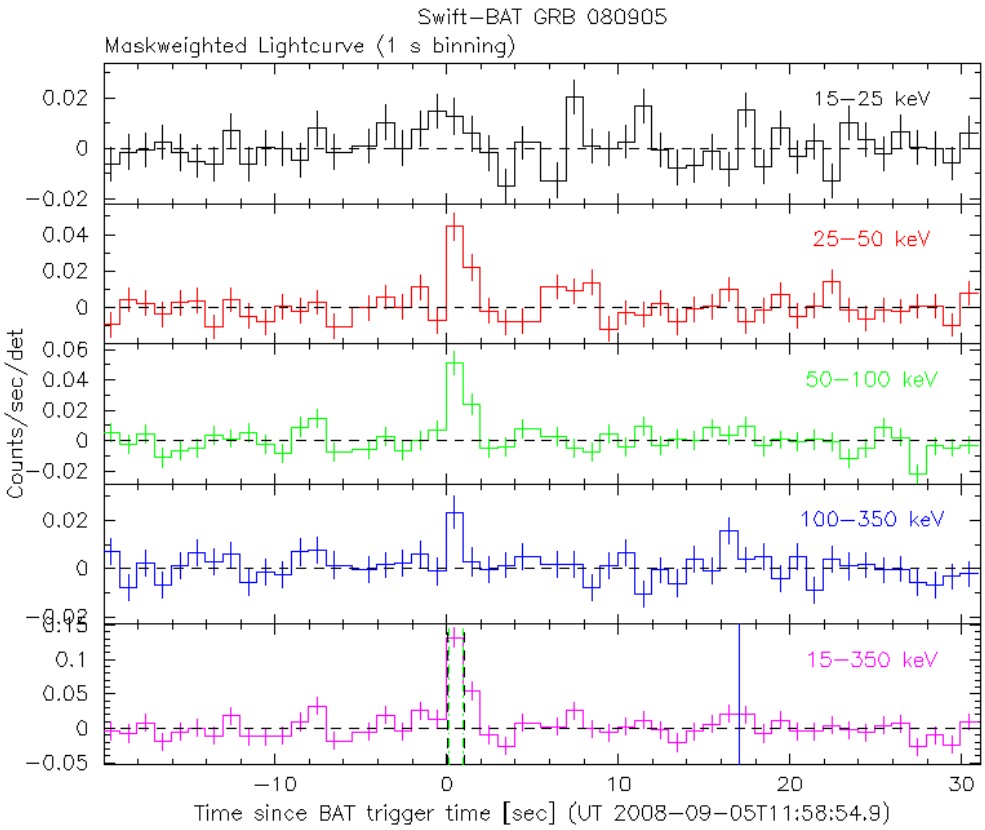

Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector and T_0 is 11:58:54.9 UT.

The X-ray spectrum of the first orbit of Photon Counting mode data from $T+128$ *sec* to $T+1136$ *sec* can be well fitted by an absorbed power law with spectral index 1.3 ± 0.3 and absorption consistent with the Galactic value along the line of sight of $9\times10^{20} cm^{-2}$ in that direction. The average absorbed flux over $0.3-10$ *keV* for this spectrum is 2.9×10^{-9} $ergs/cm^2/sec$, which corresponds to an unabsorbed flux of 3.1×10^{-9} $ergs/cm^2/sec$.

4 UVOT Observation and Analysis

The UVOT observed the field of GRB 080905A starting 114 seconds after the BAT trigger (Pagani, *et al.*, *GCN Circ.* 8180). We do not detect any source in the revised XRT error circle (Evans, *et al.*, *GCN Circ.* 8203) including the faint optical afterglow seen by Malesani, *et al.*, (*GCN Circ.* 8190) in any of the UVOT filters down to the 3σ upper limits reported in Table 1. These values are on the UVOT Photometric System described in Poole et al. (2008, *MNRAS*, 383,627). These values are not corrected for the Galactic extinction in the direction of the burst corresponding to a reddening of $E_{B-V}=0.14$ *mag* (Schlegel, *et al.*, *ApJ.* 500:525-553, 1998).

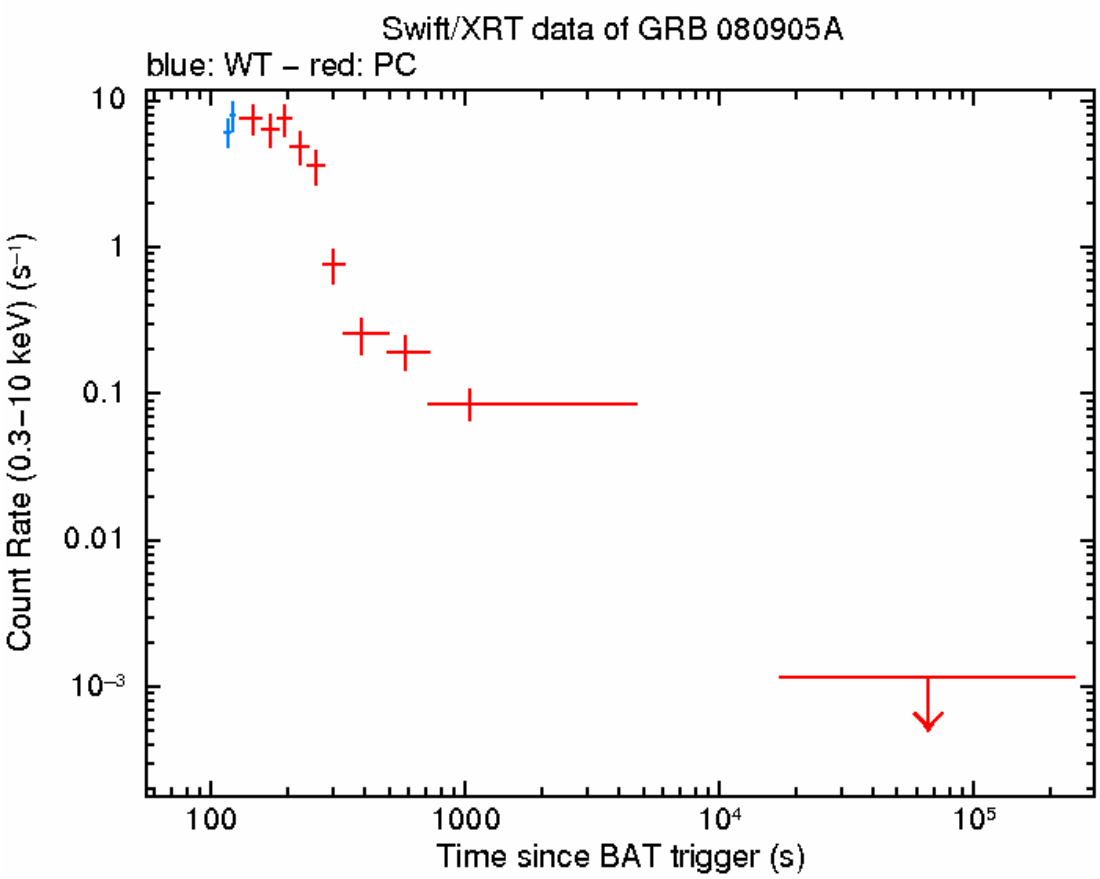

Figure 2: XRT Lightcurve. Counts/sec in the 0.3-10 keV band: Window Timing mode (blue), Photon Counting mode (red). The approximate conversion is 1 count/sec = $\sim 6.0 \times 10^{-11}$ $ergs/cm^2/sec$.

Filter	T_{start}	T_{stop}	Exposure	Mag
White	114	970	198	> 21.3
V	220	1250	1014	> 20.6
B	700	865	15	> 18.9
U	675	850	39	> 19.2
UVW1	651	825	39	> 18.8
UVM2	626	4520	95	> 19.2
UVW2	730	750	19	> 18.1

Table 1: Upper limits from UVOT observations