Swift Observations of GRB 080714

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1   Introduction

The Swift BAT triggered on and located GRB 080714 at 17:52:56 UT (trigger=316910) (Perri et al., GCN Circ. 7978). Swift slewed immediately to the burst and XRT and UVOT observations of the field started 80 and 90 seconds after the trigger, respectively. Our best position is the UVOT location at RA(J2000)= 188.1060 deg, Dec(J2000)= −60.2779 deg, RA(J2000)= $12^{\rm h}32^{\rm m}25.44^{\rm s}$, Dec(J2000)= $-60^{\rm d}$ 16' 40.4", with an error radius of 0.8 arcsec (90% confidence).

The burst was also detected by Konus-Wind (Golenetskii et al., GCN Circ. 7983) and INTEGRAL/SPI-ACS (Beckmann, private communication). The optical/NIR afterglow was detected from the ground by GROND (Kruehler et al., GCN Circ. 7984).

2   BAT Observations and Analysis

Using the data set from T-240 to T+963 sec (Barthelmy et al. GCN Circ. 7979), the BAT ground-calculated position is RA(J2000)= 188.104 deg, Dec(J2000)= −60.274 deg, RA(J2000)= $12^{\rm h}32^{\rm m}24.9^{\rm s}$, Dec(J2000)= $-60^{\rm d}$ 16' 28.2", with an uncertainty of 1.0 arcmin, (radius, sys+stat, 90% containment). The partial coding was 43%.

The mask-weighted light curve (Figure 1) shows a single peak with a rise time of about 3 seconds and an exponential decay with a time constant of about 10 seconds. T_{90} (15–350 keV) is 33 ± 9 sec (estimated error including systematics).

The time-averaged spectrum from T-3.6 to T+50.3 sec is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.52 ± 0.08. The fluence in the 15–150 keV band is $(2.5 \pm 0.1) \times 10^{-6}$ erg cm^{-2}. The 1-sec peak photon flux measured from T-0.37 sec in the 15–150 keV band is 4.2 ± 0.3 ph cm^{-2} sec^{-1}. All the quoted errors are at the 90% confidence level.

3   XRT Observations and Analysis

Swift-XRT began observing the field of GRB 080714 at 17:54:16 UT, 80 seconds after the BAT trigger (Stratta et al., GCN Circ. 7981).

Using all the XRT available data, we find an astrometrically corrected X-ray position (using the XRT-UVOT alignment with 4736 seconds of overlapping time and matching UVOT field sources to the USNO-B1 catalogue): RA(J2000)= 188.10601 deg, Dec(J2000)= −60.27775 deg, which is RA(J2000)= $12^{\rm h}32^{\rm m}25.44^{\rm s}$, Dec(J2000)= $-60^{\rm d}$ 16' 39.9", with an uncertainty of 2.3 arcsec, (radius, 90% confidence) (Goad et al., GCN Circ. 7980).

The 0.3–10 keV light curve (Figure 2) from T+88s up to ∼T+300s shows an initial 40 seconds long flat segment followed by an increasingly steepening decay. Starting from T+300s up to ∼T+5.2 days (Photon Counting data) the light curve can be fit with a power law model with a best fit slope of $\alpha = -1.00 \pm 0.03$.

The Windowed Timing X-ray spectrum (0.3–10 keV) from T+88s up to ∼T+300s is well fit by an absorbed power-law model with a photon index $\Gamma = 1.14 \pm 0.05$ and a total column density of N$_H$ = $(0.3 \pm 0.1) \times 10^{22}$ cm^{-2}. The average observed 0.3–10 keV flux for this spectrum is $(3.4 \pm 0.2) \times 10^{-10}$

erg cm^{-2} s^{-1}. We note the Galactic column density in the direction of the source is 5.4×10^{21} cm^{-2}. All the quoted errors are at the 90% confidence level.

4 UVOT Observation and Analysis

The UVOT observed the field of GRB 080714 starting 90s after the BAT trigger (Marshall & Perri, GCN 7982).

The burst is in a crowded field only 2.5 degrees from the Galactic Plane. The afterglow is seen to decay in the white and V filters, while is not detected in any other filters. The corresponding magnitudes and 3-sigma upper limits are listed in Table 1. The values quoted are not corrected for the predicted large, but uncertain, Galactic extinction in the direction of the burst (Schlegel et al. 1998).
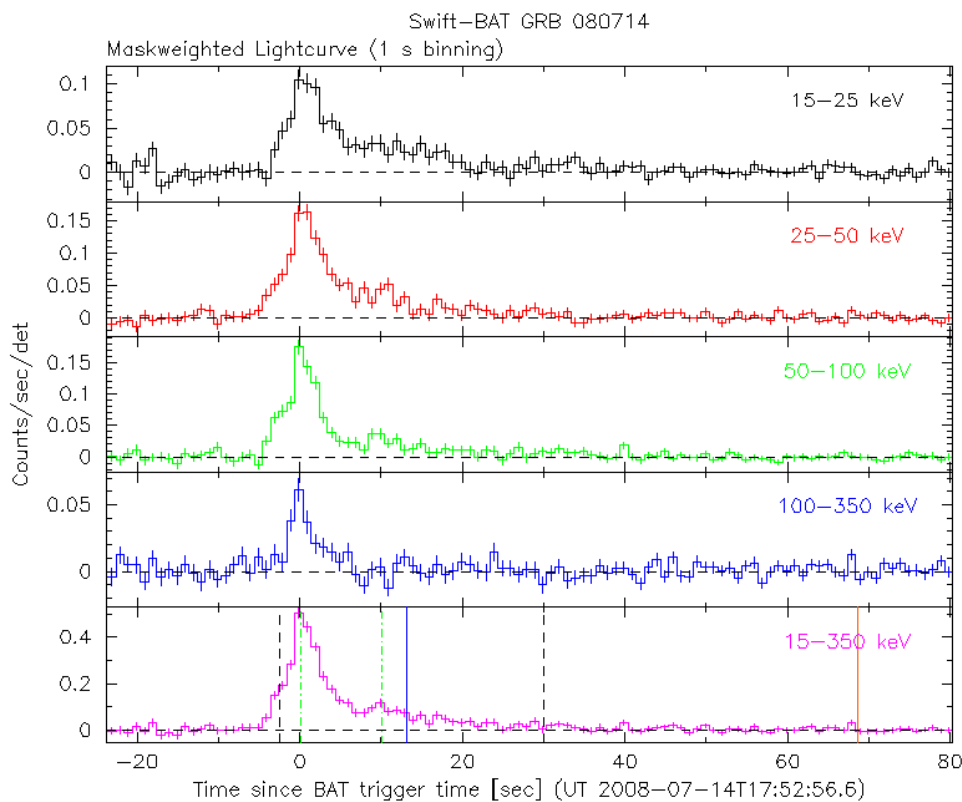

Figure 1: BAT light-curve. The mask-weighted light curve in the 4 individual plus total energy bands. Green dotted line: T$_{50}$, Black dotted line: T$_{90}$. Blue: Slew start, Orange: Slew end Time. The units are counts s^{-1} illuminated-detector^{-1} (note illum-det = 0.16 cm^2) and T_0 is 2008-07-14 17:52:56 UT.
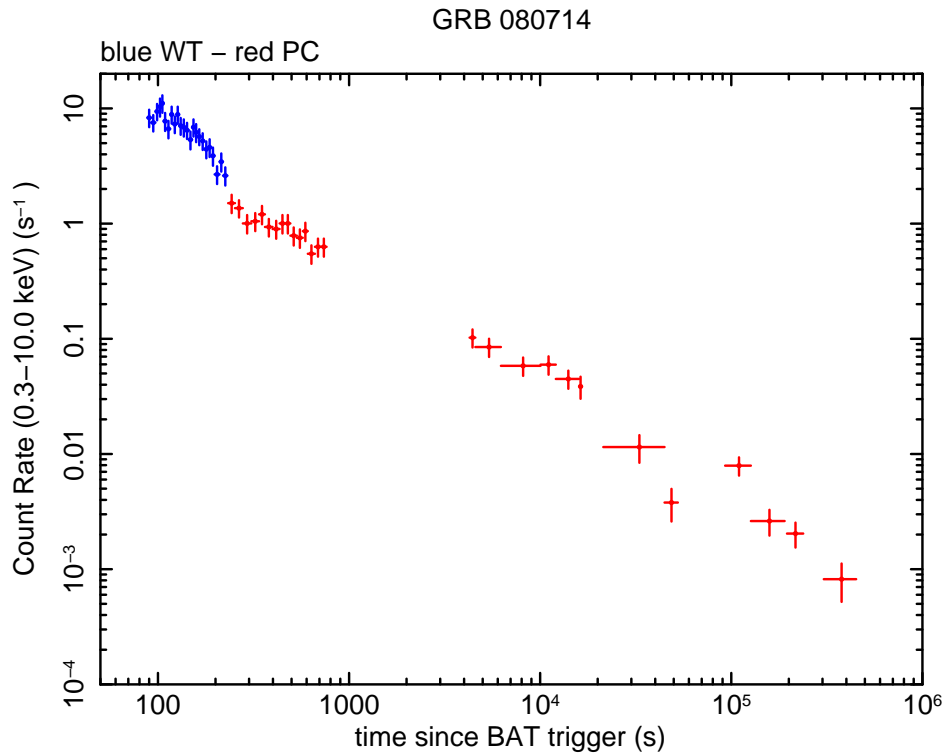
Figure 2: XRT light-curve. Count rates in the 0.3–10 keV band taken in Windowed Timing (blue) and Photon Counting (red) modes are plotted. The approximate conversion of the 0.3–10 keV observed flux is 1 count/sec $\sim 8.3 \times 10^{-11}$ erg cm^{-2} s^{-1}.

Filter	T_start (s)	T_stop (s)	Exp (s)	Mag
White	90	189	98	20.2 ± 0.2
White	4290	4489	197	> 20.7
V	197	596	393	19.1 ± 0.2
V	5896	6095	197	> 19.7
B	677	4284	206	> 20.2
U	652	12382	1137	> 20.7
UVW1	628	6505	236	> 19.7
UVM2	602	6300	236	> 19.9
UVW2	707	16498	1007	> 20.8

Table 1: Magnitude and 3-sigma upper limits from UVOT observations.