Swift Observations of GRB 100807A

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1 Introduction

At 09:13:13 UT on 2010-08-07, the Swift Burst Alert Telescope (BAT) triggered and located GRB 100807A (trigger=431128). Swift slewed immediately to the burst and found an X-ray counterpart in the XRT (Grupe et al., GCN Circ. 11067).

The best Swift position of this burst is the XRT enhanced position given in Osborne et al. (GCN Circ. 11070) with RA-2000 = 03h 41m 12.10s, and Dec-2000 = +67° 40′ 17.7″ with an uncertainty of 1.9″.

There were several ground-based optical/NIR follow-up observation reported on this burst. Most notably are the Palomar P60 and P200 observations by Cenko (GCN Circ. 11073) and Chary & Davies (GCN Circ. 11080), respectively, who reported on a fading afterglow in I, R, J, and H.

2 BAT Observation and Analysis

At 09:13:13 UT on 2010-08-07, the Swift Burst Alert Telescope (BAT) triggered and located GRB 100807A (trigger=431128, Grupe et al., GCN Circ. 11067). Using the data set from T-240 to T+962 s, the BAT ground-calculated position is RA, Dec = 55.283, +67.665 deg which is RA(J2000) = 03h 41m 07.9s
Dec(J2000) = +67° 39′ 54.2″

with an uncertainty of 1.9 arcmin, (radius, sys+stat, 90% containment). The partial coding was 37% (Cummings et al. GCN Circ. 11069).

The mask-weighted light curve (Figure 1) shows a single peak starting at T-20 s peaking at T+0 s, and ending at T+20 s. $T_{90}$ (15-350 keV) is 7.9±1.6 s (estimated error including systematics).

The time-averaged spectrum from T-6.1 to T+3.1 s is best fit by a single power law model. The power law index of the time-averaged spectrum is 2.32±0.23 ($\chi^2 = 57$ for 57 d.o.f.). For this model the total fluence in the 15-150 keV band is $3.4 \pm 0.5 \times 10^{-7}$ ergs cm$^{-2}$. The 1s peak photon flux measured from T+0.35 s in the 15-150 keV band is $1.8 \pm 0.2$ photons s$^{-1}$ cm$^{-2}$. All the quoted errors are at the 90% confidence level.

The results of the batgrbproduct analysis are available at http://gcn.gsfc.nasa.gov/notice_s/431128/BA/
3 XRT Observations and Analysis

The XRT began observing the field of GRB 100704A at 09:14:34.4 UT, 80.8 seconds after the BAT trigger. Using 960 s of XRT Photon Counting mode data and 1 UVOT image for GRB 100807A, Osborne et al. (GCN Circ. 11070) found an astrometrically corrected X-ray position (using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue): RA, Dec = 55.30042, +67.67158 which is equivalent to:

RA (J2000): 03h 41m 12.10s
Dec (J2000): +67° 40′ 17.7″


A spectrum formed from the WT mode data (36s exposure) can be fitted with an absorbed single power-law model with a photon spectral index of 2.12±0.22 (Grupe, GCN Circ. 11074). The best-fitting absorption column is consistent with the Galactic value of 3.3×10^{21} cm^{-2} (Kalberla et al. 2005). The PC mode spectrum may have hardened with a photon index of \Gamma = 1.79±0.37 The counts to observed (unabsorbed) 0.3-10 keV flux conversion factor deduced from this spectrum is 4.38×10^{-11} (7.54×10^{-11}) erg cm^{-2} count^{-1}.

The 0.3 – 10 keV light curve given below (Fig.2) displays an initial steep decay slope after the initial flare of 6.4^{+0.6}_{-1.9}. The light curve of the X-ray afterglow breaks at T+173±10 s followed by a flatter decay slope of 0.82±0.08. This decay slope continued until the end of the observations on 2010-08-09.

4 UVOT analysis

The Swift/UVOT began settled observations of the field of GRB 100807A 90 s after the BAT trigger (Grupe et al., GCN Circ. 11067) with the finding chart in white filter. Swenson & Grupe (GCN Circ. 11072) reported that no optical afterglow was detected within the enhanced XRT error circle position (Osborne et al., GCN Circ. 11070).

3\sigma upper limits for the summed images are listed in Table 1.
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Table 1: Magnitudes from UVOT observations of GRB 100807A. The quoted upper limits have not been corrected for the expected Galactic extinction along the line of sight of $E_{B-V} = 0.81$ mag. All photometry is on the UVOT photometric system described in Poole et al. (2008, MNRAS, 383, 627).
Figure 1: BAT Light curve of GRB 100807A.
Swift/XRT data of GRB 100807A

cyan: WT settling – blue: WT – red: PC

Figure 2: XRT flux light curve of GRB 100807A in the 0.3-10 keV band. The approximate conversion is 1 count s$^{-1} = \sim 4.4 \times 10^{-11}$ ergs s$^{-1}$ cm$^{-2}$. 