Swift Observation of GRB 070621
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Team

1 Introduction

BAT triggered on GRB 070621 at 23:17:39.85 UT (Trigger 282808) (Sbarufatti, et al., GCN Circ.
6560). This was a 1.024 sec rate-trigger on a long burst with $T_{90} = 33$ sec. Swift slewed to this
burst immediately and XRT began follow-up observations at $T + 111$ sec, and UVOT at $T + 120$ sec.
Our best position is the UVOT-enhanced XRT location RA(J2000) = 323.79225 deg (21$^h$35$^m$10.14$^s$),
Dec(J2000) = $-24.8175$ deg ($-24^d49'03.1''$) with an error radius of 2.0 arcsec (90% confidence, in-
cluding boresight uncertainties). No optical counterpart was detected by UVOT. Malesani et al.(GCN
Circ. 6565) reported a possibly extended source near the location of GRB 070621, but its position
falls outside the XRT refined error circle.

2 BAT Observation and Analysis

Using the data set from $T - 240$ to $T + 962$ sec, further analysis of BAT GRB 070621 has been
performed by the Swift team (Fenimore, et al., GCN Circ. 6571). The BAT ground-calculated position
is RA(J2000) = 323.806 deg (21$^h$35$^m$13.5$^s$), Dec(J2000) = $-24.809$ deg ($-24^d48'32''$) ± 1.0 arcmin,
(radius, systematic and statistical, 90% containment). The partial coding was 31%.

The mask-weighted light curves (Fig.1) show several overlapping peaks starting at $\sim T - 20$ and
ending at $\sim T + 40$ sec. There is a low-significance bump ($\sim 3\sigma$) from $T + 70$sec to $T + 105$ sec.
$T_{90}(15 - 350keV)$ is 33.3 ± 1.0 sec (estimated error including systematics).

The time-averaged spectrum from $T - 5.2$ to $T + 36.4$ sec is best fitted by a simple power law model.
This fit gives a photon index of 1.57 ± 0.06. For this model the total fluence in the 15 − 150 keV band
is $(4.3\pm0.1) \times 10^{-6}$ ergs/cm$^2$ and the 1-sec peak flux measured from $T + 21.56$ sec in the 15 − 150 keV
band is $2.3 \pm 0.3$ ph/cm$^2$/sec. All the quoted errors are at the 90% confidence level.

3 XRT Observations and Analysis

Using 746 sec of overlapping data in XRT Photon Counting mode and UVOT V-band we obtained a re-
fined position of RA(J2000) = 323.79225 deg (21$^h$35$^m$10.14$^s$), Dec(J2000) = $-24.8175$ deg ($-24^d49'03.1''$) ±
2.0 arcsec (90% confidence radius, including boresight uncertainties). This position is within 4.8 arcsec
of the initial XRT position.

The 0.3 − 10 keV light curve (Fig.2) shows an initial steep decline with a slope of 3.8 ± 0.1, followed
by a shallow slope of 0.91 ± 0.04, beginning at $T + 380$ ± 10 sec.

The first two segments of the X-ray lightcurve up to $T + 5ks$ (150 sec in Window Timing mode, 1.3
ksec in Photon Counting mode) can be modeled with a single absorbed power-law with photon index
of 2.5 ± 0.3. The $N_H$ column density is $(4.4 \pm 0.9) \times 10^{21}$ cm$^{-2}$, significantly in excess with respect to
the galactic value in the direction of the burst, $3.5 \times 10^{20}$ cm$^{-2}$. The average observed (unabsorbed)
flux over 0.3 − 10 keV for this spectrum is $8.4 \times 10^{-10}$ (2.2 × $10^{-9}$) ergs/cm$^2$/sec for the WT part
and $1.4 \times 10^{-11}$ (3.6 × $10^{-11}$) ergs/cm$^2$/sec for the PC part.
4 UVOT Observation and Analysis

The UVOT began observing the field of GRB 070621 at 23:19:39.85 UT, 120 sec after the initial BAT trigger (Holland et al., GCN Circ. 6573). No new source was detected within the XRT error circle in the white and V finding exposures, or in the co-added images in any filter down to 3-sigma magnitude. Upper limits are summarized in Table 1. These upper limits are not corrected for the Galactic extinction corresponding to a reddening of $E_{B-V} = 0.05$ mag.

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Table 1: Magnitude limits from UVOT observations.

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 23:17:39.85 UT.
Figure 2: XRT Lightcurve. Flux (ergs/cm$^2$/sec) in the 0.3-10 keV band: Window Timing mode (blue), Photon Counting mode (red). The approximate conversion is 1 count/sec = $\sim 8.6 \times 10^{-11}$ ergs/cm$^2$/sec.