Swift Observation of GRB 071117

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1 Introduction

BAT triggered on GRB 071117 at 15:06:46 UT (Trigger 296805) (Ukwatta, et al., GCN Circ. 7098). This was a 1.024 sec rate-trigger on a long burst with $T_{90} = 6.6 \pm 1.8$ sec.

Because of an Earth limb constraint, the spacecraft did not slew promptly to the BAT position, and hence there was no immediate XRT position. Narrow field instruments started observations at $\sim T + 43$ minutes, and our best position is the XRT location RA($J2000$) = 335.04579 deg (22h20m10.99s), Dec($J2000$) = $-63.44278$ deg ($-63d26'34.0''$) with an error of 3.8 arcsec (90% confidence, including boresight uncertainties), reported by Guidorzi et al., GCN Circ. 7103.

2 BAT Observation and Analysis

Using the data set from $T - 119$ to $T + 183$ sec, further analysis of BAT GRB 071117 has been performed by Swift team (Krimm, et al., GCN Circ. 7102). The BAT ground-calculated position is RA($J2000$) = 335.026 deg (22h20m06.3s), Dec($J2000$) = $-63.442$ deg ($-63d26'31''$) ± 1.0 arcmin, (radius, systematic and statistical, 90% containment). The partial coding was 53% (the bore sight angle was 39.40 deg).

The mask-weighted light curve (Fig. 1) shows a single FRED-like peak starting at $\sim T - 0.5$ sec, peaking at $\sim T + 0.5$ sec, and decaying away out to $\sim T + 15$ sec. T90 (15-350 keV) is 6.6 ± 1.8 sec (estimated error including systematics).

The time-averaged spectrum from $T - 0.4$ to $T + 13.9$ sec is best fitted by a simple power-law model. The power law index of the time-averaged spectrum is 1.57 ± 0.06 ($\chi^2 = 34.93$ for 57 d.o.f.). The fluence in the 15 – 150 keV band is $2.4 \pm 0.1 \times 10^{-6}$ erg cm$^2$. The 1-sec peak photon flux measured from $T + 0.02$ sec in the 15 – 150 keV band is 11.3 ± 0.4 ph/cm$^2$/sec. All the quoted errors are at the 90% confidence level.

The spectral lags for this burst are, $634^{+47}_{-40}$ ms for the 50 – 100 to 15 – 25 keV bands, $168^{+18}_{-20}$ ms for the 50 – 100 to 25 – 50 keV bands, $573^{+38}_{-38}$ ms for the 100 – 350 to 25 – 50 keV bands, and $999^{+49}_{-66}$ ms for the 100 – 350 to 15 – 25 keV bands.

3 XRT Observations and Analysis

Swift XRT observed the GRB 071117 beginning 2.8 ks after the BAT trigger. In 4.4 ks of Photon Counting mode data spanning 2.8-14.7 ks after the trigger the position of the X-ray afterglow is RA($J2000$) = 335.04579 deg, Dec =$-63.44278$ deg, which corresponds to

RA($J2000$) = 22h 20m 10.99s
Dec($J2000$) = $-63d 26' 34.0''$

with error circle of radius 3.8 arcsec (90%, including boresight uncertainties). This lies 3.6 arcsec from the previous XRT position (Romano et al., GCN Circ. 7100) and 32 arcsec from the BAT refined position (Krimm et al., GCN Circ 7102).
The X-ray light curve (Fig. 2) up to $T + 57$ ks can be fit with a broken power law. Fit parameters are given by $\alpha_1 = 0.1 \pm 0.1$, $t_{\text{break}} = 9.1^{+2.6}_{-2.2}$ ks and $\alpha_2 = 1.1 \pm 0.2$ ($\chi^2 = 28.2$ for 21 d.o.f.).

The Photon Counting spectrum can be modelled with an absorbed power-law, with a photon index of $2.2^{+0.4}_{-0.3}$ and a total absorbing column of $N_H = (2.3^{+0.5}_{-0.4}) \times 10^{21}$ cm$^{-2}$. The Galactic value is $2.3 \times 10^{20}$ cm$^{-2}$ in the direction of the burst. The $0.3 - 10$ keV observed (unabsorbed) flux during this time is $3.0 \times 10^{-12}(5.0 \times 10^{-12})$ erg cm$^{-2}$ s$^{-1}$. Uncertainties are given at 90% confidence.

## 4 UVOT Observation and Analysis

UVOT took a finding chart exposure of 100 seconds with the White (160-650 nm) filter starting 2852 seconds after the BAT trigger. No afterglow candidate has been found in the initial data products. The $2.7' \times 2.7'$ sub-image covers 100% of the XRT error circle. The typical 3-sigma upper limit has been about 18.5 mag. The $8' \times 8'$ region for the list of sources generated on-board covers 100% of the XRT error circle. The list of sources is typically complete to about 18 mag. No correction has been made for the extinction of $E(B-V) = 0.024$ (Vanden et al., GCN Circ. 7099).

Figure 1: The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector and $T_0$ is 15:06:46 UT.
Figure 2: XRT Lightcurve. Counts/sec in the 0.3-10 keV band: Photon Counting mode (red). The approximate conversion is 1 count/sec = \( \sim 6.0 \times 10^{-11} \) ergs/cm\(^2\)/sec.)