Swift Observation of GRB 071117

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1 Changes

Change the BAT light curve to show more structure (Fig. 1). There had been a correction to the XRT light curve (Fig. 2) due the presence of dead pixel column (Guidorzi, *et al.*, *GCN Circ.* 7115). Information about possible red-shift measurement is added to the introduction section. XRT and UVOT sections are also updated.

2 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) = 335.04336 deg (22h20m10.41s), Dec(J2000) = -63.44278 deg (-63d$26'34.0''$) with an error of 3.8 arcsec (90% confidence, including boresight uncertainties), reported by Guidorzi *et al.*, *GCN Circ.* 7115.

There was a possible red-shift measurement of 1.331 reported by Jakobsson *et al.*, *GCN Circ.* 7117.

3 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 (-63d$26'31''$) ± 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/cm2/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.

4   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($J2000$) = -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).

XRT team has recalculated the XRT refined position of GRB 071117 (Guidorzi et al., *GCN Circ.* 7100) by excluding the first orbit data, which were affected by the presence of a dead pixel column. In 8.3 ks of Photon Counting mode data spanning 8.7-28 ks after the trigger the position of the X-ray afterglow is RA($J2000$) = 335.04336 deg, Dec($J2000$) = -63.44278 deg, which corresponds to

RA(J2000) = 22h 20m 10.41s
Dec(J2000)= -63d 26' 34.0"

with error circle of radius 3.8 arcsec (90%, including boresight uncertainties). The optical afterglow reported by Bloom et al. (*GCN Circ.* 7110) now lies 1.5 arcsec away from the new XRT centroid.

The X-ray light curve (Fig. 2) up to $T + 57$ ks can be fit with a simple power law. Fit parameter is given by $\alpha = 1.0 \pm 0.1$ ($\chi^2 = 26.0$ for 29 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 NH = $(2.3^{+0.9}_{-0.8})10^{21}$cm^{-2}. The Galactic value is 2.3×10^{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.

5   UVOT Observation and Analysis

The Swift/UVOT observed the field of GRB 071117 48 minutes after the BAT trigger, once the Earth had come out of observing constraint. No new source is found in any of the UVOT observations in either single or co-added exposures in any filter down to 3-sigma magnitude. Upper limits are summarized in Table 1 (Oates *et al.*, *GCN Circ.* 7112, Vanden *et al.*, *GCN Circ.* 7099).

Filter	Tstart (s)	Tstop (s)	Exposure (s)	3-Sigma UL
V	2960	44497	1608	> 21.2
B	3779	61600	3125	> 22.5
U	3574	56599	3075	> 22.2
UVW1	3369	55834	4154	> 22.4
UVM2	3164	32613	2368	> 21.8
UVW2	4190	62783	2227	> 22.1
WHITE	2852	62512	1812	> 22.9

Table 1: Magnitude limits from UVOT observations

The values quoted above are not corrected for the expected Galactic extinction corresponding to a reddening of E(B-V) = 0.024 mag in the direction of the GRB (Schlegel *et al.*, 1998).
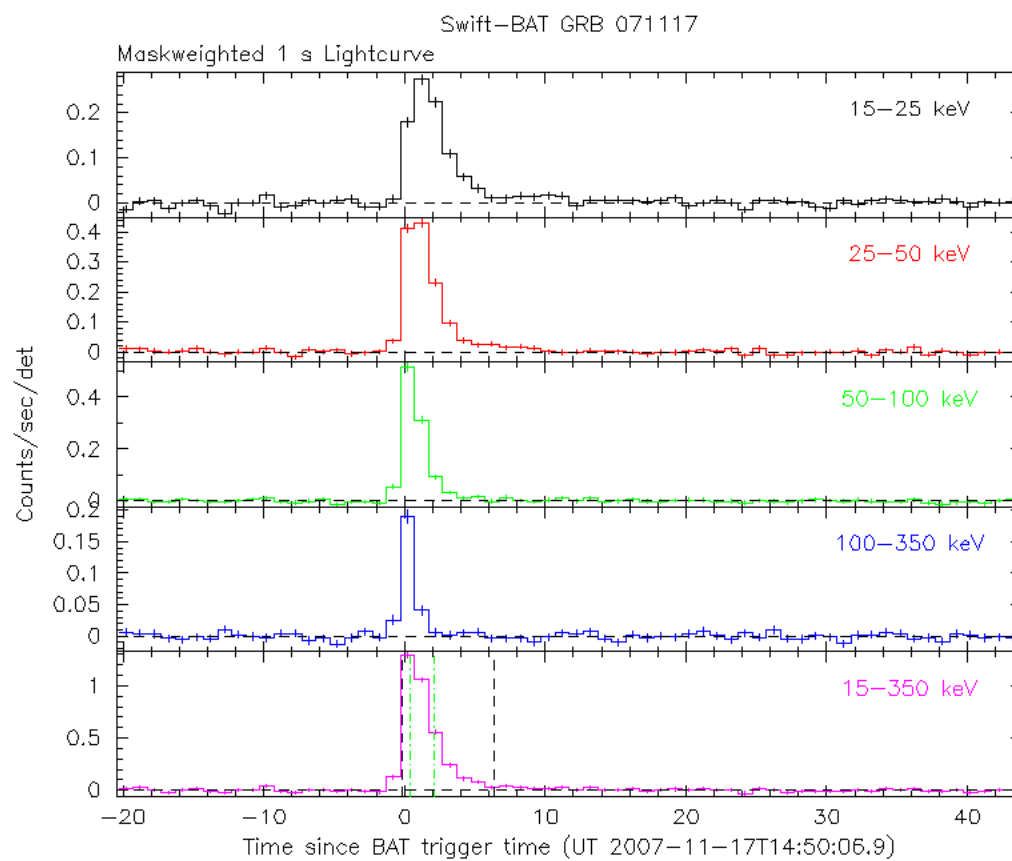
Figure 1: The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector and T_0 is 15:06:46 UT.
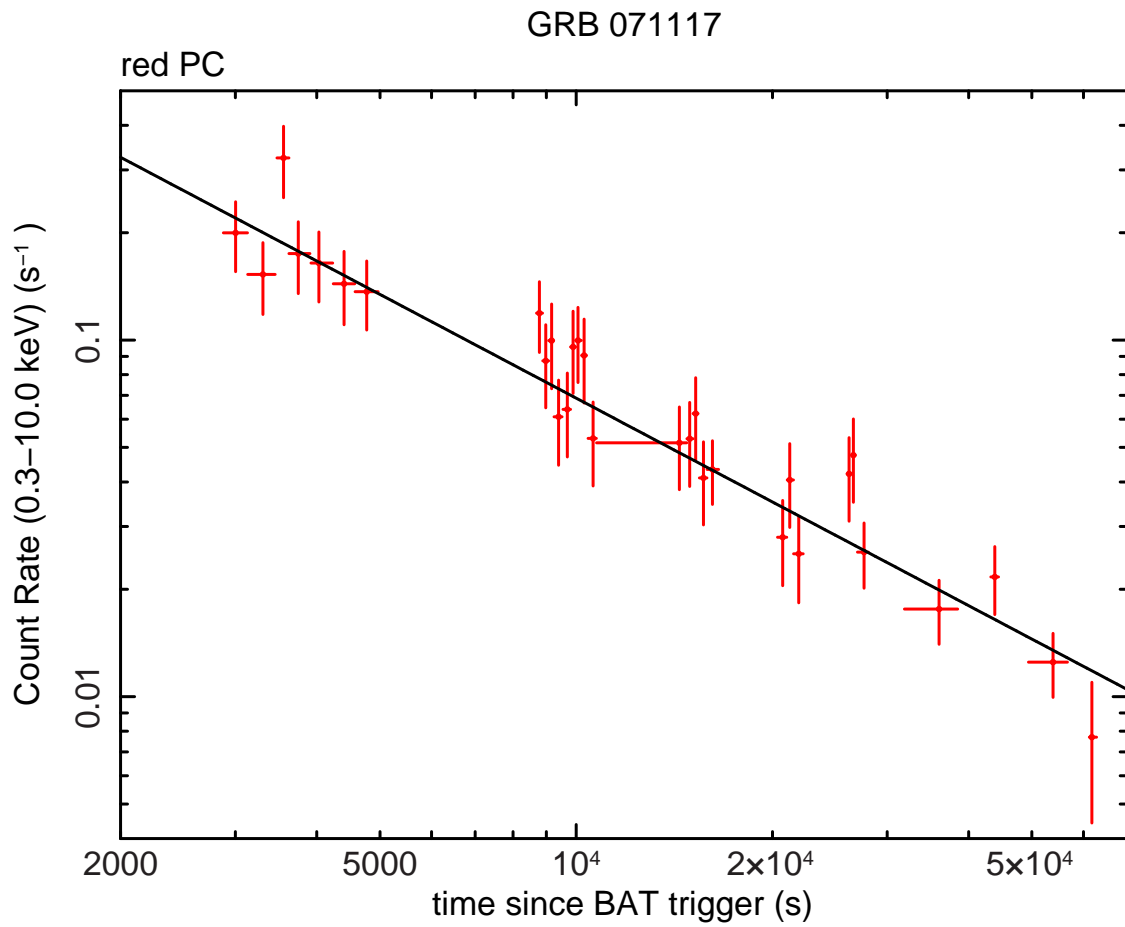
Figure 2: XRT Lightcurve. Counts/sec in the 0.3-10 keV band: Photon Counting mode (red). The approximate conversion is 1 count/sec = $\sim 6.0 \times 10^{-11}$ ergs/cm^2/sec.)