

## Swift Observation of GRB 071001

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### 1 Introduction

BAT triggered on GRB 071001 at 16:31:48.1 UT (Trigger 292826) (De Pasquale et al., *GCN Circ.* 6832). This was a  $\sim 1500$  sec rate-trigger with significance of 12.8 on long burst with  $T_{90} = 58.5 \pm 1.0$  sec. Swift slewed to this burst immediately and XRT began follow-up observations at  $T + 83$  s. Ground follow-up of this burst with the Faulkes Telescope South (Bersier, et al., *GCN Circ.* 6833) did not find any new source in the XRT error circle. The magnitude limit is  $R > 19.5$ .

### 2 BAT Observation and Analysis

Using the data set from  $T - 119$  to  $T + 183$  sec, further analysis of BAT GRB 071001 has been performed by Swift team (Stamatikos, et al., *GCN Circ.* 6834. The BAT ground-calculated position is  $RA(J2000) = 149.707$  deg (09h58m49.7s),  $Dec(J2000) = -59.763$  deg ( $-59d45'48''$ )  $\pm 2$  arcmin, (radius, systematic and statistical, 90% containment). The partial coding was 85%.

The masked-weighted light curves (Fig.1) starts at trigger time  $\sim T+0$  s with a peak with substructures that returns to background at about  $T + 20$  s, following by another peak lasting until  $\sim T + 60$  s.  $T_{90}$  (15 – 350 keV) is  $58.5 \pm 1.0$  s (estimated error including systematics).

The time-averaged spectrum from  $T - 1.6$  to  $T + 64.7$  sec is best fitted by a simple power law model. This fit gives a photon index of  $1.62 \pm 0.17$ , ( $\chi^2 = 50.05$  for 57 d.o.f.). For this model the total fluence in the 15 – 150 keV band is  $(7.7 \pm 0.8) \times 10^{-7}$  ergs  $\text{cm}^{-2}$  and the 1-sec peak flux measured from  $T - 48.1$  s in the 15 – 150 keV band is  $0.9 \pm 0.1$  ph  $\text{cm}^{-2} \text{sec}^{-1}$ . All the quoted errors are at the 90% confidence level.

### 3 XRT Observations and Analysis

XRT observations suffered from temporary problem with loss of star tracking. Using all the data that did not show this problem, it was possible to obtain a refined XRT position,  $RA(J2000) = 149.7336$  deg (09h58m56.07s),  $Dec(J2000) = -59.7818$  deg ( $-59d46'54.5''$ )  $\pm 6$  arcsec (90% confidence). This is 83 arcsec of the initial BAT position and 6.2 arcsec from the initial XRT position (De Pasquale, et al. *GCN Circ.* 6682).

The 0.3 – 10 keV light curve (Fig.2) shows an initial steep decay, on the tail of the last peak detected by BAT, followed by a much slower decay. A fit of the lightcurve with a broken powerlaw provides the following parameters: first decay index  $\alpha_1 = -3.0 \pm 0.2$ , break time  $t_b = 311_{-35}^{+47}$  s, second decay index  $\alpha_2 = -0.2 \pm 0.1$  (all errors at 90% C.L.). The spectral analysis has been performed for the data during the steep decay phase. By fitting a powerlaw plus absorption model, we derive a photon index  $\Gamma = 2.9 \pm 0.3$  for the WT data, taken between 90 and 120 s after the trigger, and  $\Gamma = 2.2 + 0.5$  for the PC data, taken between 145 and 200 s after the trigger. Thus there is an indication that the spectrum becomes harder during the late steep decay, but caution is needed, because of the issues in the XRT follow up observations. The initial flux at the beginning of XRT observations was  $\sim 5 \times 10^{-9}$  erg/cm<sup>2</sup>/s (0.3-10 keV). No absorption in excess of the Galactic one,  $N_H = 7.6 \times 10^{21}$ , is required.

## 4 UVOT Observations and Analysis

*Swift* is still in the process of returning to normal operations, thus there no UVOT observations for this burst.

## 5 Ground based observations

The only ground optical observations of GRB071001 was performed at Faulkes South Telescope, starting at 16:34:50 UT, 3 minutes after the trigger, and it last 1 hour. However, no optical counterpart was detected. The 3 sigma upper limit in the R band for any new source in the XRT error circle is  $R > 19.5$  (*GCN Circ.* 6833). We note that the conditions were unfavourable, because the burst was relatively close to the Sun (about 60 degrees) and a bright source was present near the XRT counterpart position.

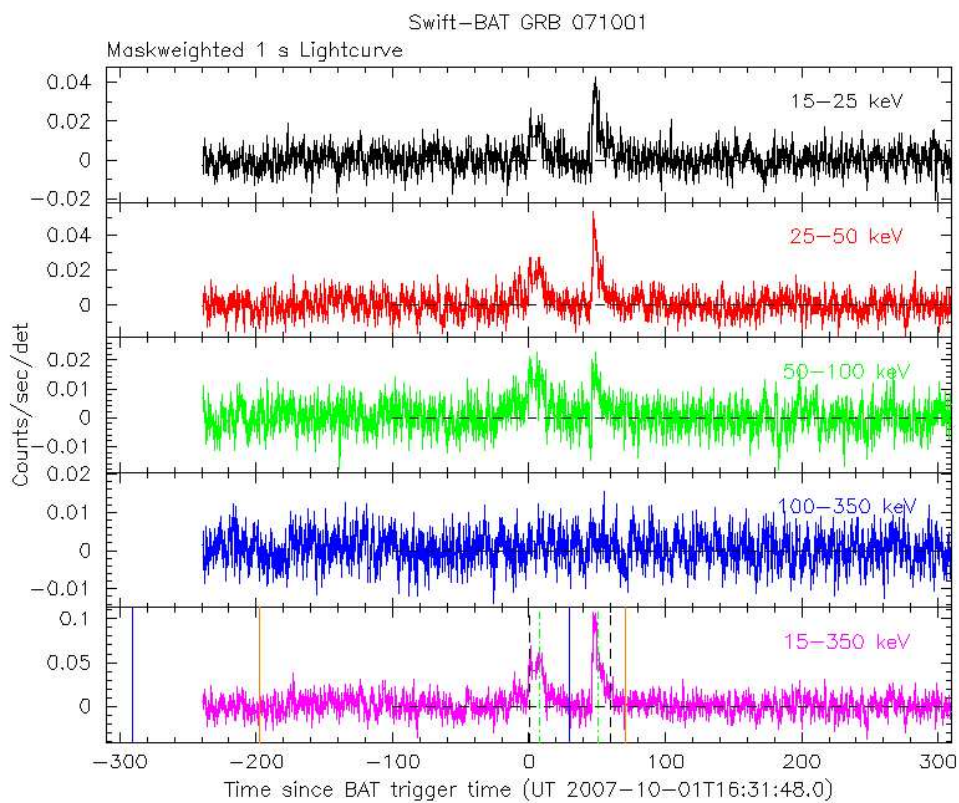


Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector and  $T = 0$  is 16 : 31 : 48.1 UT.

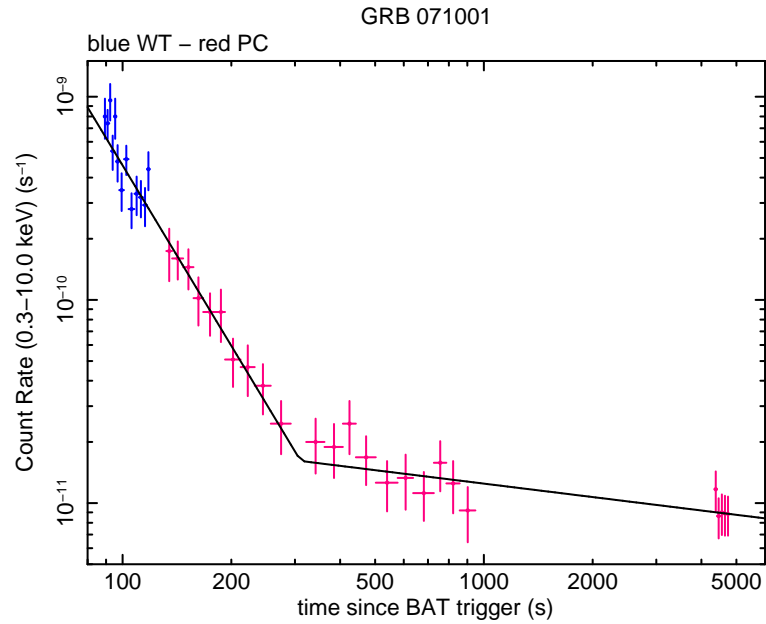


Figure 2: XRT Lightcurve. Counts/sec in the 0.3 – 10 keV band: Window Timing mode (blue), Photon Counting mode (red). The approximate conversion of the absorbed flux is 1 count/sec =  $4 \times 10^{-11}$  ergs cm<sup>-2</sup> sec<sup>-1</sup>.