

Swift Observation of GRB 071003

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1 Revisions

XRT section has been updated to include the final X-ray position, refined temporal and spectral analysis, and the XRT light curve has also updated (Fig. 2), and now includes the full set of *Swift* observations.

2 Introduction

BAT triggered on GRB 071003 at 07:40:55 UT (Trigger 292934) (Schady, et al., *GCN Circ.* 6837). This was a 1.024 sec rate-trigger with a significance of 105.73σ on long burst with $T_{90} = 150 \pm 10$ sec. At the time of this burst *Swift* was in the process of returning to normal operations, and automatic slewing to GRBs was disabled outside of business hours (US EDT). Our best position is the XRT location $\text{RA}(J2000) = 301.85102$ deg ($20h07m24.25s$), $\text{Dec}(J2000) = 10.94688$ deg ($10d56'48.8''$) with an error of 5.7 arcsec. Independent spectroscopic follow-up observations set a lower limit on the redshift of $z > 1.100$ (Perley, et al., *GCN Circ.* 6850) and $z > 0.937$ (Fugazza, et al., *GCN Circ.* 6851).

GRB 071003 was also detected by INTEGRAL/SPI-ACS (private communication; Volker Beckmann), showing the same, bright multi-peak structure as observed with the BAT, and it also triggered Konus-Wind (Golenetskii, et al., *GCN Circ.* 6849). The peak energy value as measured by Konus-Wind is $E_p = 799_{-100}^{+124}$ (Golenetskii, et al., *GCN Circ.* 6849).

3 BAT Observation and Analysis

Using the data set from $T - 7.6$ to $T + 167.4$ sec, the BAT ground-calculated position is $\text{RA}(J2000) = 301.857$ deg ($20h07m25.8s$), $\text{Dec}(J2000) = 10.954$ deg ($10d57'16''$) ± 1.0 arcmin, (radius, systematic and statistical, 90% containment) (Ukwatta, et al., *GCN Circ.* 6842). The partial coding was 34%.

The masked-weighted light curves (Fig.1) shows a strong first peak with multiple overlapping sub-peaks starting at trigger time $\sim T - 20$ sec, peaking at $T + 0$ sec, and ending at $\sim T + 55$ sec. The second, much weaker peak starts at $\sim T + 130$ sec, peaks at $\sim T + 145$ sec, and ends at $\sim T + 220$ sec. T_{90} (15 – 350 keV) is 150 ± 10 sec (estimated error including systematics).

The time-averaged spectrum of $T - 7.6$ to $T + 167.4$ sec is best fitted by a simple power law model. This fit gives a photon index of 1.36 ± 0.07 , ($\chi^2 = 49.26$ for 57 d.o.f.). For this model the total fluence in the 15 – 150 keV band is $(8.3 \pm 0.3) \times 10^{-6}$ erg cm^{-2} and the 1-sec peak flux measured from $T + 0.37$ sec in the 15 – 150 keV band is 6.3 ± 0.4 ph $\text{cm}^{-2} \text{sec}^{-1}$. All the quoted errors are at the 90% confidence level.

4 XRT Observations and Analysis

The XRT began observations of GRB 071003 22 ks after the BAT trigger and detected a bright X-ray source. Using 29.9 ks of Photon Counting (PC) mode data, the refined XRT position is $\text{RA}(J2000) = 301.85090$ deg ($20h07m24.22s$), $\text{Dec}(J2000) = 10.94722$ deg ($10d56'50.0''$) ± 5.5 arcsec (90% confidence, including boresight uncertainties)(Starling, et al., *GCN Circ.* 6855). This position is 1.3 arcsec away

from the initial XRT position (Starling, et al. *GCN Circ.* 6845) and 2.3 arcsec from the optical afterglow position (Li, *GCN Circ.* 6838).

The 0.3 – 10 keV light curve (Fig.2) goes out to 6.8×10^5 s after the BAT trigger and is best fit with a broken power law with initial decay slope of $\alpha_1 = 0.9 \pm 0.3$, $T_{bk} = 3.7_{-0.7}^{+0.6} \times 10^4$ s, and $\alpha_2 = 1.8 \pm 0.1$.

The time-averaged spectrum can be modelled with a power law of photon index $\Gamma = 2.1 \pm 0.2$ with fixed Galactic absorption of $N_H = 1.4 \times 10^{21}$ cm $^{-2}$. When allowing for intrinsic absorption at $z = 1.1$ (Perley, et al., *GCN Circ.* 6850) the column density at the GRB host galaxy is consistent with zero. The mean observed (unabsorbed) 0.3–10 keV flux at 7.4 ks after the BAT trigger was 7×10^{-13} (1×10^{-12}) erg cm $^{-2}$ sec $^{-1}$.

5 UVOT Observation and Analysis

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

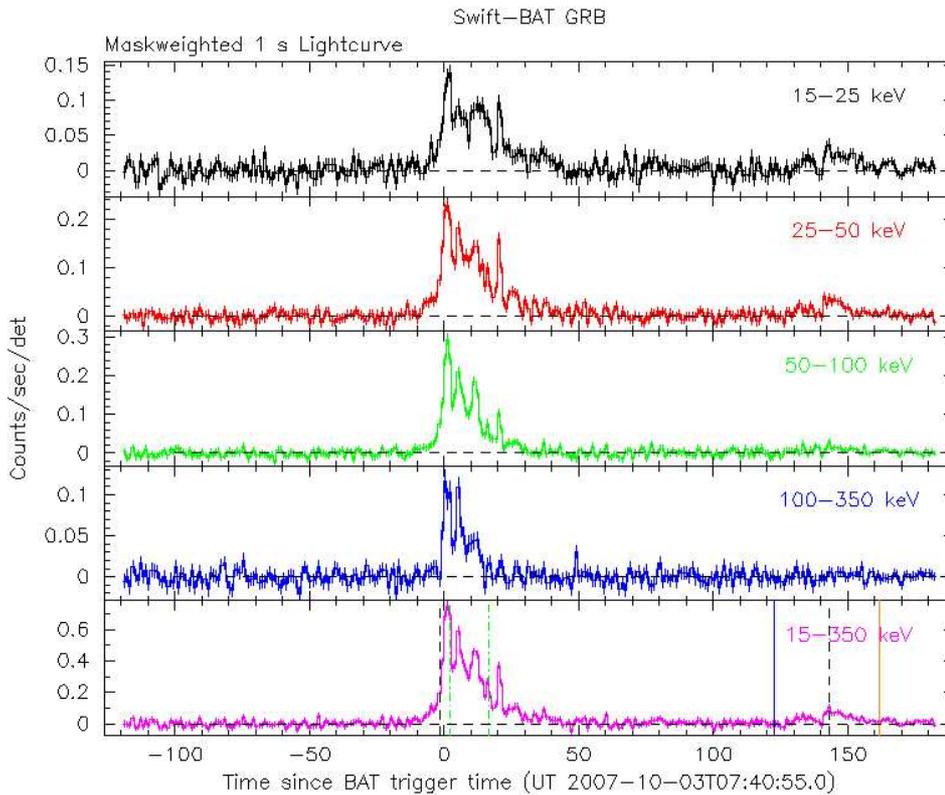


Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector and T is 07:40:55.0 UT.

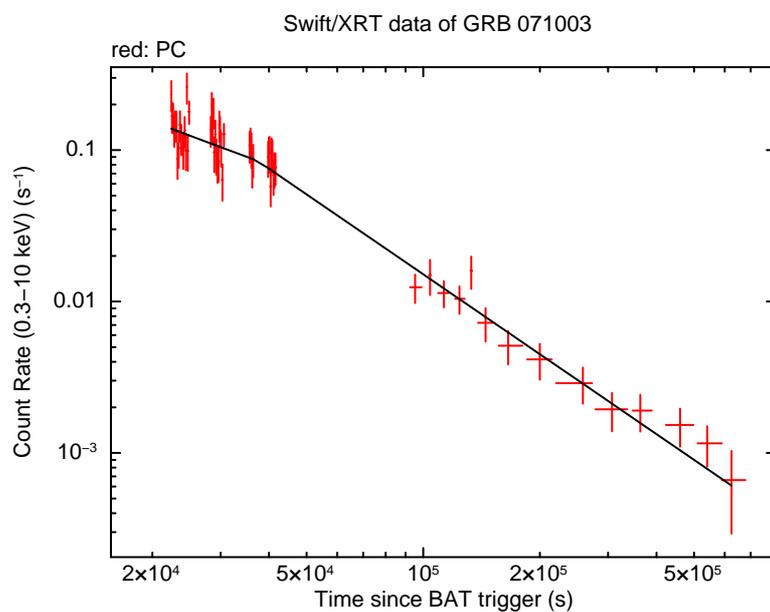


Figure 2: XRT Light curve. Counts/sec in the 0.3 – 10 keV band taken in Photon Counting mode (red). The broken power law fit is shown in black, and has an initial decay slope of $\alpha = 0.9 \pm 0.3$, a break at $T_{bk} = 3.7^{+0.6}_{-0.7} \times 10^4$ s, and $\alpha_2 = 1.8 \pm 0.1$. The approximate conversion of the absorbed flux is 1 count/sec 4.7×10^{-11} erg cm⁻² sec⁻¹.