Swift Observation of GRB 070227

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1 Introduction

BAT triggered on GRB 070227 at 22:21:58.9 UT (Trigger 262347) (Pagani, *et al.*, *GCN Circ.* 6156). This was a rate-trigger on a burst with $T_{90} = 7 \pm 2$ *sec*. The burst was not found automatically onboard, because a planned slew terminated the trigger prematurely. The burst was found later in ground analysis and a target of opportunity was uploaded at 13:45 UT on February 28th. XRT and UVOT began follow-up observations at $T + 56$ *ksec*. Our best position is the XRT location RA($J2000$) = $120.5805deg$ ($08h02m19.33s$), Dec($J2000$) = $-46.3135deg$ ($-46d18'48.7''$) with an error of 4.0 arcsec (90% confidence, including boresight uncertainties).

2 BAT Observation and Analysis

Using the data set from $T - 2.0$ to $T + 8.1$ *sec*, further analysis of BAT GRB 070227 has been performed by Swift team (Barbier, *et al.*, *GCN Circ.* 6158). The BAT ground-calculated position is RA($J2000$) = $120.566deg$ ($08h02m16s$), Dec($J2000$) = $-46.305deg$ ($-46d18'17''$) $\pm$ 2.5 *arcmin*, (radius, systematic and statistical, 90% containment). The partial coding was 3%.

The masked-weighted light curves (Fig.1) had two weak overlapping peaks with spectral evolution. The larger peak was at $T + 1$ *sec* and the smaller at $T + 6$ *sec*. There is no additional strong emission at times later than $T + 8$ *sec*, but we cannot rule out weak emission. $T_{90}(15 - 350keV)$ is 7 ± 2 *sec* (estimated error including systematics).

The time-averaged spectrum from $T + 0.0$ to $T + 8.0$ *sec* is best fitted by a simple power law model. This fit gives a photon index of 1.54 ± 0.27, ($\chi^2 = 52.5$ for 57 d.o.f.). For this model the total fluence in the $15 - 150$ *keV* band is $(1.6 \pm 0.2) \times 10^{-06} ergs/cm^2$ and the 1-sec peak flux measured from $T + 0.00$ *sec* in the $15 - 150$ *keV* band is 2.7 ± 0.4 $ph/cm^2/sec$. All the quoted errors are at the 90% confidence level considering the statistical and usual systematic effects. However, because of the extreme partial coding of this burst, and particularly the reduced sensitivity to low energy photons at the edge of the FOV, we expect an extra systematic uncertainty contribution of about 10%.

3 XRT Observations and Analysis

Using the data from $T + 56$ *ksec* to $T + 386$ *ksec* of GRB 070227 (39 *ksec* in Photon Counting mode), the refined XRT position is RA($J2000$) = $120.5805deg$ ($08h02m19.33s$), Dec($J2000$) = -46.3135 *deg* ($-46d18'48.7''$) $\pm$ 4.0 *arcsec* (90% confidence, including boresight uncertainties). This position is within 0.7 *arcsec* of the initial XRT position, Pagani *et al.*, *GCN Circ.* 6157.

The $0.3 - 10$ *keV* light curve (Fig.2) shows an initial flat phase ending at about $T + 80$ *ksec* followed by a decay that can be fitted with a power law with slope of 0.9 ± 0.2.

The X-ray lightcurve can be modeled with an absorbed power-law, using C–statistics due to the low number of afterglow events, with spectral index of $2.9^{+0.8}_{-0.5}$. The NH column density is $(0.57^{+0.26}_{-0.18}) \times$

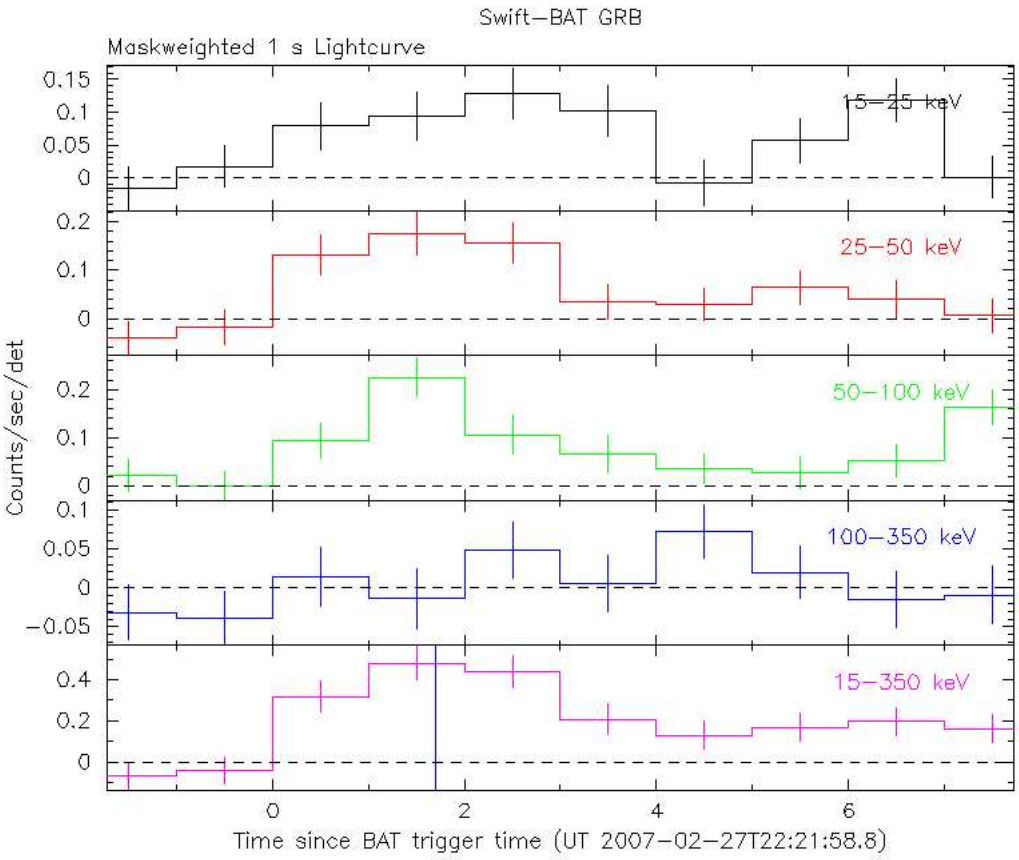

Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector and T_0 is 22:21:58.9 UT.

$10^{22} cm^{-2}$ in excess of the Galactic value of $0.31 \times 10^{22} cm^{-2}$. The average unabsorbed flux over $0.3 - 10\ keV$ for this spectrum (spanning a time of $T+56\ ksec$ to $T+386\ ksec$) is $3.6 \times 10^{-13}\ ergs/cm^2/sec$.

4 UVOT Observation and Analysis

The UVOT began observing the field of GRB 070227 56 *ksec* after the initial BAT trigger (Pandey *et al.*, *GCN Circ.* 6160). No new source was detected within the XRT error circle 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 Galactic extinction E(B-V) = 0.34 mag Schlegel *et al.*, *ApJ.500:525-553, 1998.*

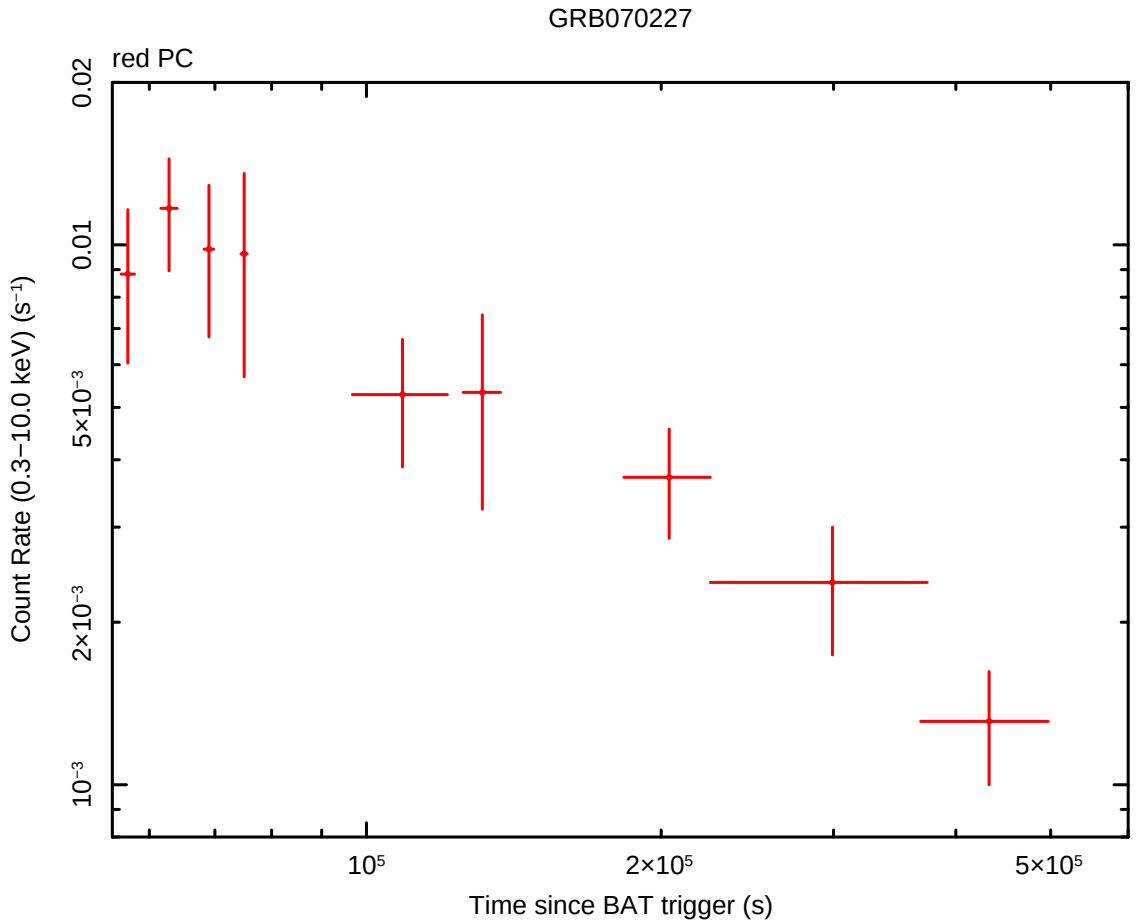

Figure 2: XRT Lightcurve. Counts/sec in the 0.3-10 keV band: Photon Counting mode. The approximate conversion is 1 count/sec = $\sim 8.8 \times 10^{-11}$ $ergs/cm^2/sec$.

Filter	Start	Stop	Exposure	3-Sigma UL
V	56680	57586	885	20.90
B	63392	64113	702	21.58
U	62480	63386	885	21.31
UVW1	61573	62473	886	21.17
UVM2	57592	58329	726	21.34
UVW2	55773	56673	886	21.04

Table 1: Magnitude limits from UVOT observations