# Swift Observations of GRB 060927

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## 1. INTRODUCTION

BAT triggered on GRB 060927 at 14:07:35 UT (Trigger 231362) (Barbier, et al., GCN Circ. 5627). This was a 256-msec rate-trigger on a long burst (T_90 of 23 sec) to which Swift slewed immediately. XRT began follow-up observations at T+65 sec, and UVOT at T+100 sec. Our best position is the XRT location RA,Dec(J2000)=329.5508,+5.3645 deg with an error of 6" (90% confidence, including boresight uncertainties).

## 2. BAT OBSERVATION AND ANALYSIS

Using the data set from T-240 to T+362 sec, we report further analysis of BAT GRB 060927 (Barbier, et al., GCN Circ. 5627). The BAT ground-calculated position is RA,Dec = 329.547,+5.369 deg {21h 58m 11.3s,+5d 22' 9.4"} (J2000) ± 0.8 arcmin, (radius, sys+stat, 90% containment). The partial coding was 82% (the bore sight angle was 16.6 deg).

The masked-weighted light curves (Fig 1) starts at T-2 sec with two overlapping peaks, and returns to background at T+9 sec. The third peak starts at T+15 sec and ends at T+24 sec. T_90 (15-350 keV) is 22.6 ± 0.3 sec (estimated error including systematics).

The time-averaged spectrum from T-1.0 to T+23.8 sec is best fit by a power law with an exponential cutoff. This fit gives a photon index 0.93 ±- 0.38, and Epeak of 71.7 ± 17.6 keV (chi squared is 64.6 for 56 d.o.f.). For this model the total fluence in the 15-150 keV band is$1.1 \pm 0.1 \times 10^{-6}$ erg/cm$^2$ and the 1-sec peak flux measured from T+0.17 sec in the 15-150 keV band is $2.8 \pm 0.2$ ph/cm$^2$/sec. A fit to a simple power law gives a photon index of 1.65 ± 0.08 (chi squared 77.5 for 57 d.o.f.). All the quoted errors are at the 90% confidence level.

## 3. XRT OBSERVATION AND ANALYSIS

Using the data from the first three orbits of XRT data of GRB 060927 (4 ks in Photon Counting mode), the refined XRT position is RA,Dec(J2000) = 21h 58m 12.2s, +05d 21' 52.2" with an error of 6" (90% confidence, including boresight uncertainties). This position is within 1.8" of the initial XRT position, and 4.6" from the optical afterglow candidate, reported in GCN Circ. 5629 (Schaefer et al.).

The 0.2-10 keV light curve (Fig 2) shows a break at 4 ks after the trigger. The decay before the break is 0.7 steepening to 1.4 at later times. The spectrum can be modeled with an absorbed power-law with a spectral index of 1.96±0.2 and a column density of $8\pm3 \times 10^{20}$ cm$^{-2}$. The Galactic absorption in this direction is $5.2 \times 10^{20}$ cm$^{-2}$.

The average unabsorbed flux for the first three orbits is $5.6 \times 10^{-12}$ ergs cm$^{-2}$s$^{-1}$.

## 4. UVOT OBSERVATION AND ANALYSIS

The UVOT began observing the field of GRB 0609027 at 14:08:45 on 2006-09-27, 51s after the BAT trigger (Barbier et al., GCN Circ 5627). No new source was detected within the XRT error circle in the V band 10s settling exposure or in coadded images in any filter down to the following 3-sigma magnitude upper limits:

| Filter | Start | End | Exposure | 3-sigma UL |
|---|---|---|---|---|
| V | 51 | 60 | 10 | 18.0 |
| V | 175 | 10273 | 1302 | 19.73 |
| B | 4197 | 5829 | 393 | 20.93 |
| U | 3992 | 5624 | 393 | 20.52 |
| UVW1 | 3788 | 11355 | 561 | 21.44 |
| UVM2 | 3583 | 11177 | 1279 | 20.42 |
| UVW2 | 4606 | 6182 | 338 | 19.84 |
| WHITE | 70 | 6033 | 491 | 19.65 |

These upper limits are not corrected for Galactic extinction E(B-V) = 0.062.

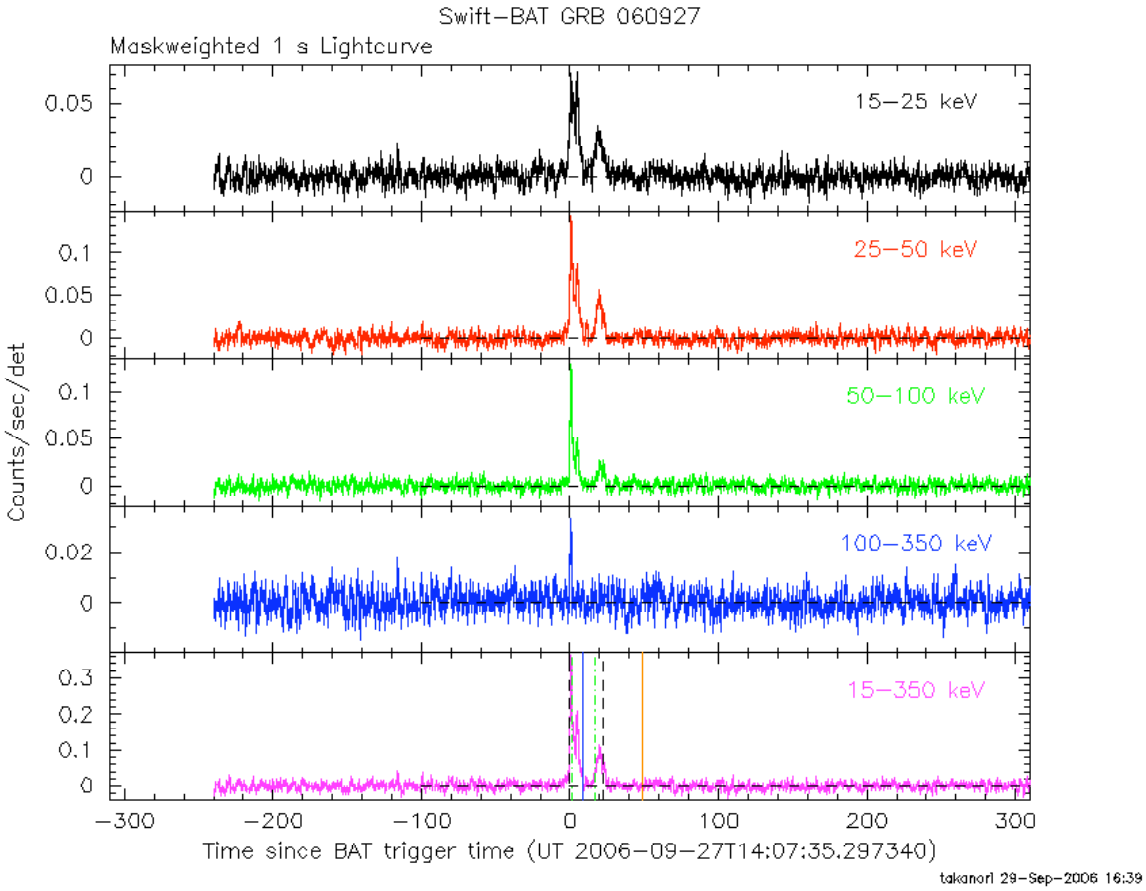


Fig.1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated_detector (note illum_det = 0.16 $cm^2$) and T_zero is 14:07:35UT.

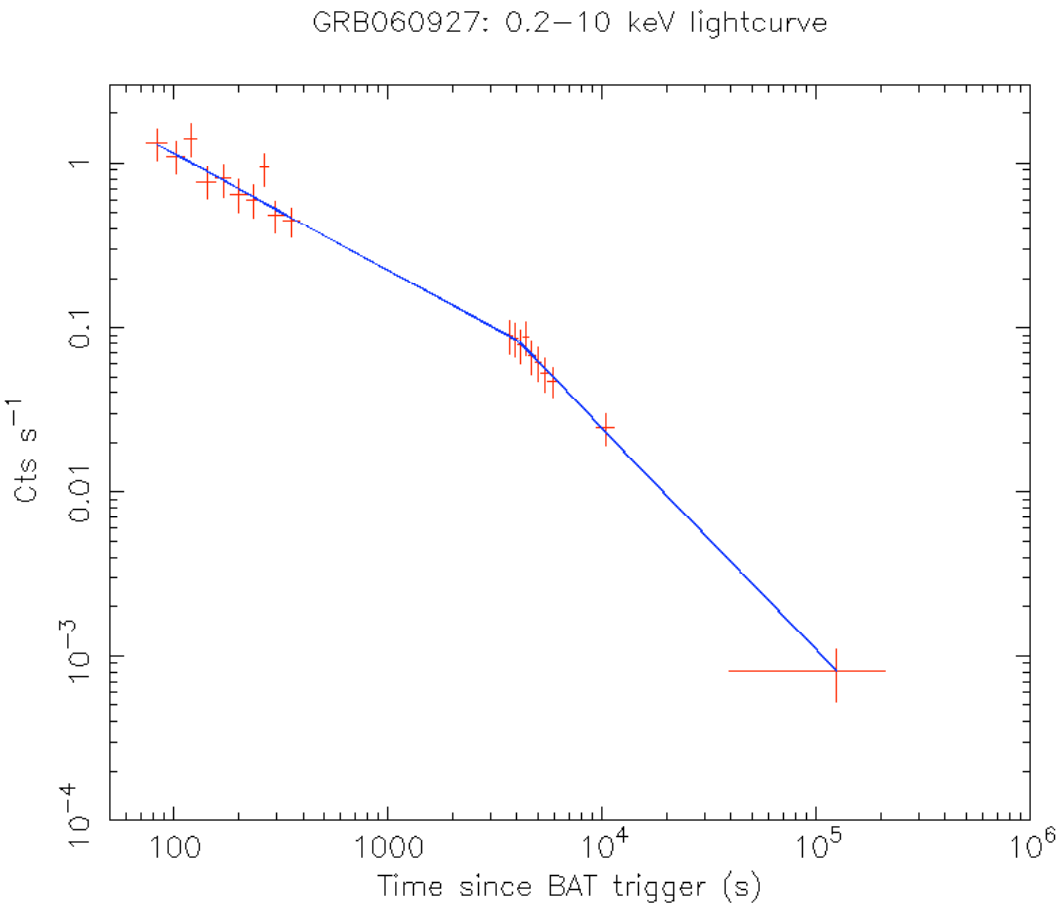


Fig. 2: XRT Lightcurve. . Counts/sec in the 0.2-10 keV band in Photon Counting mode. The approximate conversion is 1 count/sec = ~5. x $10^{-11}$ ergs cm$^{-2}$s$^{-1}$.