

Swift Observations of GRB 061002

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1. INTRODUCTION

BAT triggered on GRB 061002 at 01:03:29 UT (Trigger=231974) (Cannizzo, et al., GCN Circ. 5676). This was a 8.192-sec rate trigger on a burst with a T90 of 17.6 sec. Swift slewed immediately to this burst, and the XRT & UVOT began making follow-up observations. Our best position is the XRT location: RA,Dec(J2000) = 220.3470,+48.7418 deg with an estimated uncertainty of 7.5 arcsec.

2. BAT OBSERVATION AND ANALYSIS

Using the data set from T-239 to T+303 sec from the recent telemetry downlink, we report further analysis of BAT GRB 061002. The BAT ground-calculated position is RA,Dec = 220.356, 48.726 deg {14h 41m 25.4s, 48d 43' 32.0"} (J2000) ± 1.7 arcmin, (radius, sys+stat, 90% containment). The partial coding was 39% (46.1 deg off the bore sight).

The mask-weighted lightcurve (Fig 1) has a single roughly triangular shaped peak starting at T-10 sec, peaking at T+10 sec, and ending at T+60 sec. T90 (15-350 keV) is 17.6 ± 1 sec (estimated error including systematics).

The time-averaged spectrum from T-2.3 to T+16.9 is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.76 ± 0.21 . The fluence in the 15-150 keV band is $6.8 \pm 0.8 \times 10^{-7}$ erg/cm². The 1-sec peak photon flux measured from T-1.38 sec in the 15-150 keV band is 0.81 ± 0.25 ph/cm²/sec. All the quoted errors are at the 90% confidence level.

3. XRT OBSERVATION AND ANALYSIS

XRT began follow-up observations at T+132 s.

We have analyzed the first 3 orbits of GRB 061002 data obtained by the Swift-XRT. Using the 4.5 ks of Photon Counting data from the second and third orbits (the first orbit of data was entirely in Windowed Timing mode), we find a refined position is RA,Dec(J2000) = 14 41 23.29,+48 44 30.5 with an estimated uncertainty of 7.5 arcsec (90% confidence, including boresight uncertainties). This lies 7.8 arcsec from the initial XRT position given by Cannizzo et al. in GCN Circ. 5675, and 60.7 arcsec from the ground-calculated BAT position (GCN Circ. 5678; Hullinger et al.).

The X-ray light-curve (Fig 2) shows a break from a steep decay slope of $\alpha_1 = 2.97 \pm 0.31$ to $\alpha_2 = 1.25 \pm 0.12$ at about 304 seconds after the trigger.

The Windowed Timing spectrum can be modeled by a power-law with a column density in excess of the Galactic value in that direction. The fit parameters are: $\Gamma = 2.19 +0.36/-0.31$ and $NH_{\text{excess}} = (1.5 +0.8/-0.7) \times 10^{21}$ cm⁻² (in addition to $NH_{\text{Galactic}} = 2.07 \times 10^{20}$ cm⁻²). The mean observed (unabsorbed) flux over this first orbit (138-1345s after the burst) was found to be 1.24×10^{-11} (1.90×10^{-11}) ergs cm⁻²s⁻¹.

4. UVOT OBSERVATION AND ANALYSIS

The Swift/UVOT began taking data on 2006-10-02, 128 s after the burst (Cannizzo et al., GCN 5676), discounting the 10s settling image. At the position of the XRT error circle (Page et al., GCN 5681) there are no new sources. In the summed UVOT images we obtain the following 3 sigma upper limits:

| Filter | T_range(s) | Exp(s) | 3-sig UL (mag) |
|--------|------------|--------|----------------|
| v | 129-7107 | 1283 | 20.32 |
| b | 607-6697 | 412 | 20.63 |
| u | 582-12911 | 1095 | 20.87 |
| w1 | 559-12244 | 1337 | 21.11 |
| m2 | 534-11337 | 1354 | 21.41 |
| w2 | 622-6902 | 432 | 21.19 |

These magnitudes are not corrected for the expected extinction of $E(B-V)=0.046$.

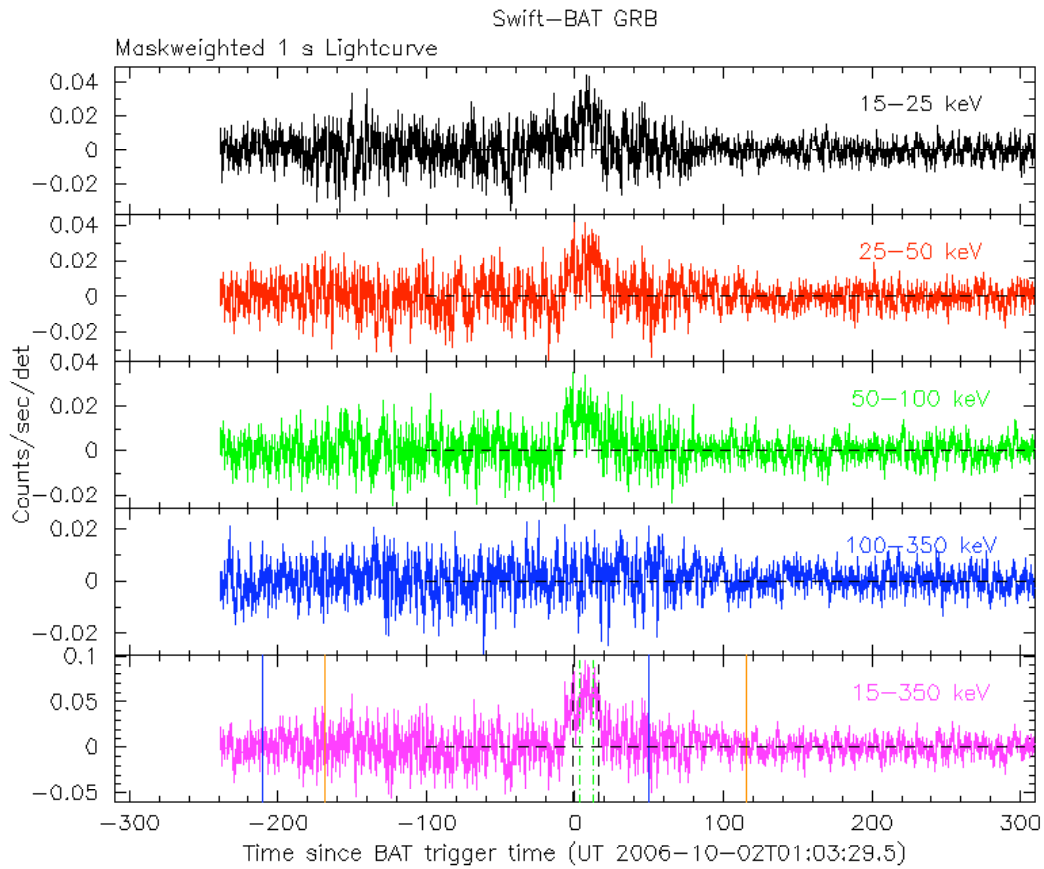


Fig.1: BAT Lightcurve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated_detector (note illum_det = 0.16 cm²) and T_zero is 01:03:29 UT.

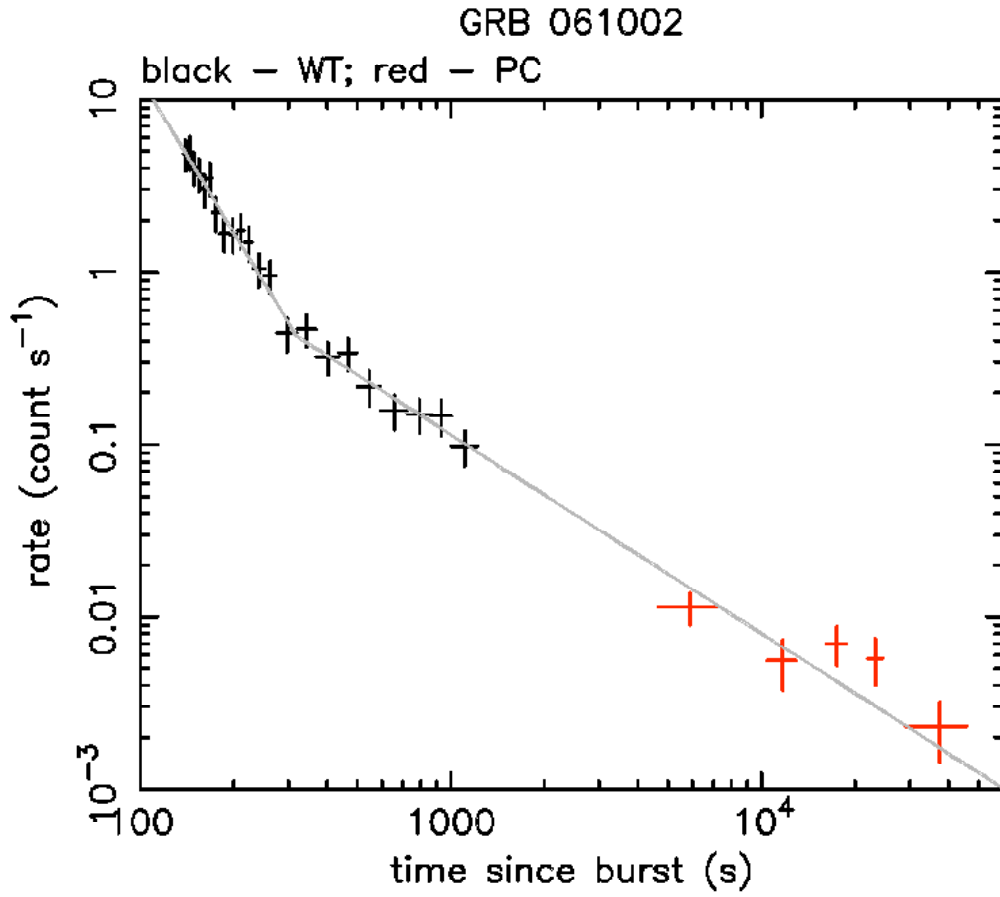


Fig. 2: XRT Lightcurve. There is a break from a steep decay slope of $\alpha_1 = 2.97 \pm 0.31$ to $\alpha_2 = 1.25 \pm 0.12$ at about 304 seconds after the trigger.