

Swift Observations of GRB 061007

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1. INTRODUCTION

BAT triggered on GRB 061007 at 10:08:08 UT (Trigger 232683) (Schady, et al., GCN Circ. 5707). The BAT observations show that the duration of the burst $T_{90}(15-350\text{keV}) = 75 \pm 5$ sec. The XRT began follow-up observations at T+80 sec, and UVOT at T+80 sec, discounting the 10sec settling image. Our best position is the UVOT location RA(J2000) = 03h05m19.6s, Dec(J2000) = 50d30'02.4" with an error of 0.5 arcsec.

A spectroscopic redshift has been measured for this GRB with $z=1.261$ (Osip, et al., GCN Circ. 5715).

2. BAT OBSERVATIONS AND ANALYSIS

Using the data set from T-58.0 to T+962.0 sec, further analysis of BAT GRB 061007 has been performed by Swift team (Markwardt, et al., GCN Circ. 5713). The lightcurve (Fig 1) shows three large peaks, each with several seconds rise and fall and a roughly flat top, and each including several subpeaks. The first lasts from T-5 to T+15, the second from T+23 to T+40, and the third from T+40 to T+65 sec. There is a smaller peak starting at T+75, rising to a flat top from T+78 to T+80 and then declining with a very long roughly exponential decay. Emission is weakly detectable until around T+900 sec. The masked-weighted BAT light curves are shown in Fig.1. The BAT ground-calculated position is RA(J2000) = 03h05m11.8s, Dec(J2000) = 50d29'47.4", (radius, systematic and statistical, 90% containment).

The time-averaged spectrum from T-4.1 to T+231.8 sec is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.13 ± 0.03 . The fluence in the 15-150 keV band is $(4.5 \pm 0.1) \times 10^5$ ergs cm^{-2} . The 1-sec peak photon flux measured from T+45.14 sec in the 15-150 keV band is 15.3 ± 0.4 ph $\text{cm}^{-2}\text{s}^{-1}$. All the quoted errors are at the 90% confidence level.

3. XRT OBSERVATIONS AND ANALYSIS

Using the data from the first three orbits of XRT data of GRB 061004 (5.2 ksec in Photon Counting mode), the refined XRT position is RA(J2000) = 03h05m19.1s, Dec(J2000) = 50d30'01.5" (90% confidence, including boresight uncertainties). This position is within 3.8 arcsec of the initial XRT position, and 4.0 arcsec from the UVOT position by Schady et al., GCN Circ. 5707.

The 0.3-10 keV light curve (Fig 2) shows an initial rapid decline with a slope of 1.6 ± 0.1 . There is no signature of any break in the XRT light curve till the last epoch of observations.

A power-law fit to the WT spectrum gives a photon index of 2.1 ± 0.2 and a column density is $(1.4 \pm 0.2) \times 10^{21}$ cm^{-2} . We note the galactic hydrogen column density in the direction of the burst is 2.13×10^{20} cm^{-2} . The 0.2-10.0 keV observed mean flux during WT observation is (1.5×10^{-9}) ergs $\text{cm}^{-2}\text{s}^{-1}$, which corresponds to an unabsorbed flux of (2.2×10^{-9}) ergs $\text{cm}^{-2}\text{s}^{-1}$.

4. UVOT OBSERVATIONS AND ANALYSIS

The UVOT began observing the field of GRB 061007 80s after the BAT trigger (Schady et al., GCN 5707), discounting the 10s settling image. The afterglow reported by Ryko & Rujopakarn, GCN Circ. 5707, is clearly detected in all six UVOT filters, and decaying rapidly with a decay index of 1.6. Observations taken ~15 hours after the burst does not reveal any source down to

limiting magnitude tabulated below along with the first orbit observations, summarized in Table 1. While band afterglow lightcurve is shown in Fig.3. The refined position of the afterglow is RA(J2000) = 03h05m19.6s, Dec(J2000) = 50d30'02.4". These values are not corrected for Galactic extinction $E(B-V) = 0.021$ mag.

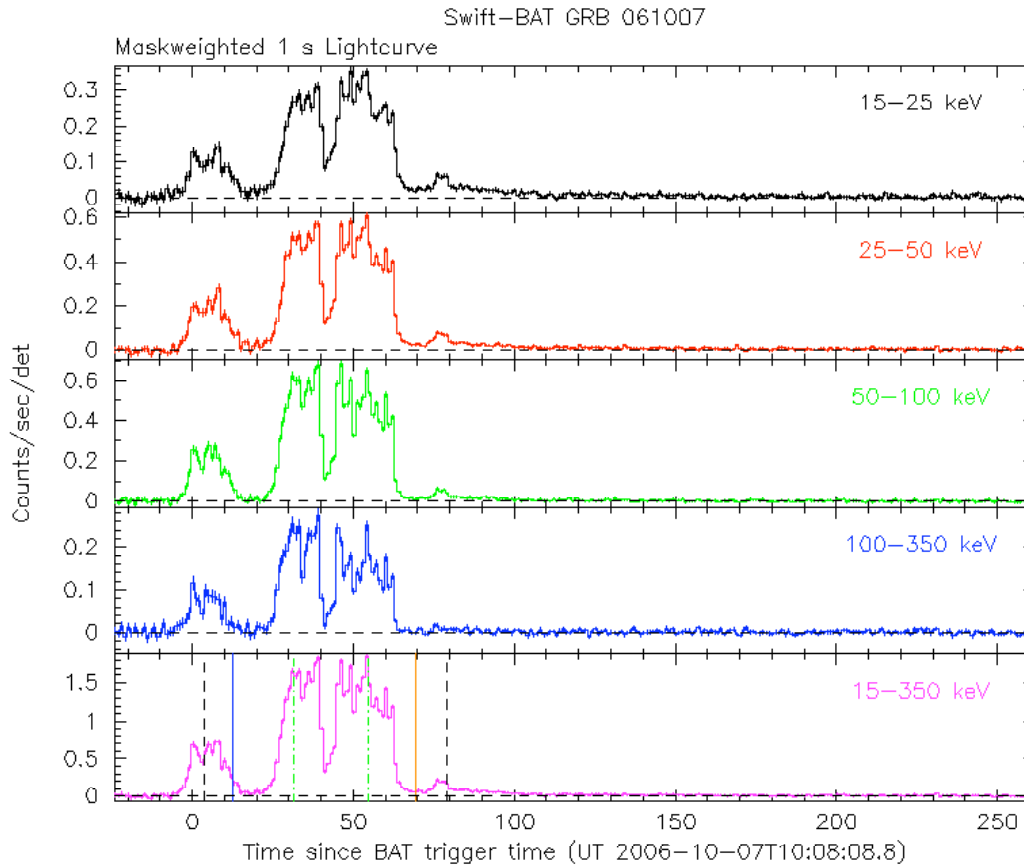


Fig.1: BAT Lightcurve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector (note illum-det = 0:16cm²) and T₀ is 10:08:08 UT.

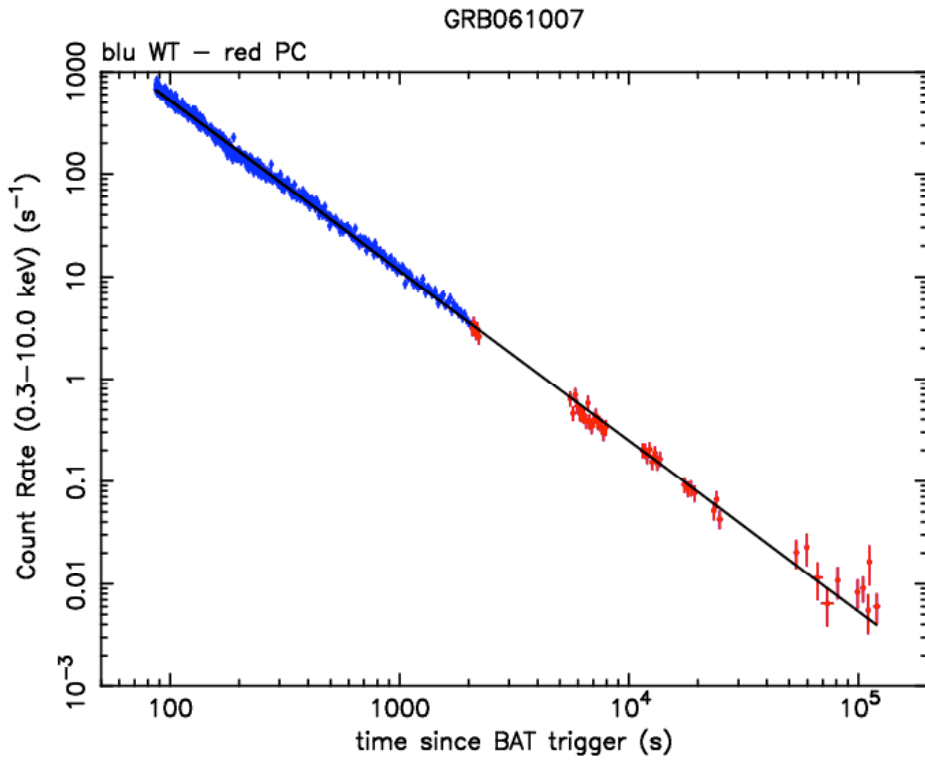


Fig. 2: XRT Lightcurve. Counts/sec in the 0.3-10 keV band: Window Timing mode (blue), Photon Counting mode (red). The approximate conversion is 1 count/s = $\sim 5 \times 10^{-11}$ ergs cm⁻²s⁻¹.

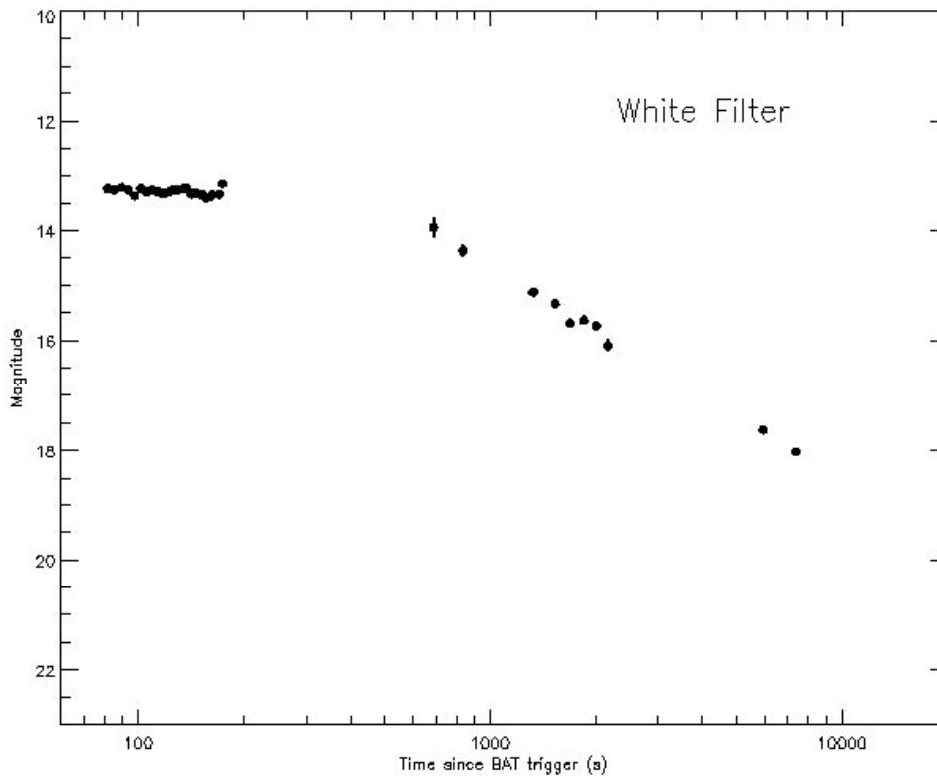


Fig. 3: UVOT White filter afterglow lightcurve. Early time data suffers from coincidence-loss problem.

Table 1: UVOT Observations

Filter	T_range (s)	Exposure (s)	Mag
V	395	393	12.84±0.01
V	6397	197	17.93±0.01
B	678	10	14.42±0.08
B	5783	197	18.30±0.08
U	657	19	14.13±0.05
U	5578	197	17.77±0.07
UVW1	635	19	14.89±0.08
UVW1	6807	197	19.29±0.31
UVM2	611	19	16.10±0.15
UVM2	6602	197	20.30±0.69 (1 sigma)
UVW2	711	19	14.89±0.08
UVW2	14813	1279	20.96±0.36 (1 sigma)