Swift Observation of GRB 061021

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1   Introduction

At 15:39:07 UT, the Swift Burst Alert Telescope (BAT) triggered and located GRB 061021 (trigger=234905). Swift slewed immediately to the burst. The XRT and UVOT began observing the field at 15:40:20 UT, 73 seconds after the BAT trigger.

2   BAT Observation and Analysis

The BAT ground-calculated position is RA,Dec = 145.146, -21.953 deg 9h 40m 35.0s, -21d 57' 10.4" (J2000) +- 0.6 arcmin, (radius, sys+stat, 90% containment). The partial coding was 64%. The mask-weighted lightcurve shows a cusp-like peak starting at T+0 sec, peaking at T+2.6 sec, and exponetially tailling off to background at T+90 sec. T90 (15-350 keV) is 46 +- 1 sec (estimated error including systematics). The time-averaged spectrum from T-0.0 to T+59.9 is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.31 +- 0.06. The fluence in the 15-150 keV band is $3.0 +- 0.1 \times 10^{-6}$ erg/cm2. The 1-sec peak photon flux measured from T+2.44 sec in the 15-150 keV band is 6.1 +- 0.3 ph/cm2/sec. All the quoted errors are at the 90% confidence level.

3   XRT Observations and Analysis

The data of the first 3 orbits consist of 189 s in Windowed Timing (WT) mode, starting 78 seconds after the BAT trigger and 5.5 ks in Photon Counting (PC) mode. Using PC data we obtain a refined position of: RA(J2000) = 09h 40m 35.87s Dec(J2000)= -21d 57' 07.2" with an estimated uncertainty radius of 5 arcsec (90% containment). This location is 3.8 arcseconds from the UVOT position (GCN 5745). The light-curve, initially, shows a steep decay (alpha1=2.1+/-0.1) up to a break at tbreak=368+/-20.s. After the break, the afterglow shows a shallow decay (alpha2=0.55+/-0.03) up to the end of the third orbit (t=12.5 ks). At this point the observed count rate was 2.2 counts per second, corresponding to an unabsorbed flux of 1.4E-11 erg/cm2/sec. The spectrum formed from all the WT data can be modelled with a power-law of photon index Gamma = 1.88 +/- 0.07, with an absorbing column of NH = (3.4 +/- 0.8)E20 cm-2 consistent with the Galactic value of 4.20E20 cm-2. The spectrum formed from the PC data can be modelled with a power-law of photon index Gamma = 1.96 +/- 0.08. All errors are quoted at 90% confidence level.

4   UVOT Observation and Analysis

An optical counterpart was detected in the White filter (160-650 nm) at a position (RA,Dec) = (09:40:36.12, -21:57:05.4) (J2000) with a 90% confidence interval of 0.6 arcsec. The early photometry results are given for the UVOT filters below where start is the time, in seconds, since the BAT trigger. The quoted errors do not include the 0.1 mag systematic uncertainty in the photometric zero points.

Filter	Start	Exposure	Mag	Err
V	187	275	16.76	0.06
	5403	197	18.86	0.22
B	4789	197	19.15	0.13
	6221	197	19.33	0.19
U	4584	197	18.18	0.12
	6016	197	18.48	0.13
UVW1	4379	197	17.94	0.35
	5812	197	18.41	0.17
UVM2	4175	197	17.63	0.17
	5607	197	17.89	0.20
UVW2	5198	197	18.02	0.21
White	81	98	15.09	0.07
	4993	197	18.05	0.08
	6425	25	18.37	0.25

Table 1: Magnitudes from UVOT observations The values quoted above are not corrected for the expected Galactic extinction of $E_{B-V} = 0.06$ mag (Schlegel et al. 1998).
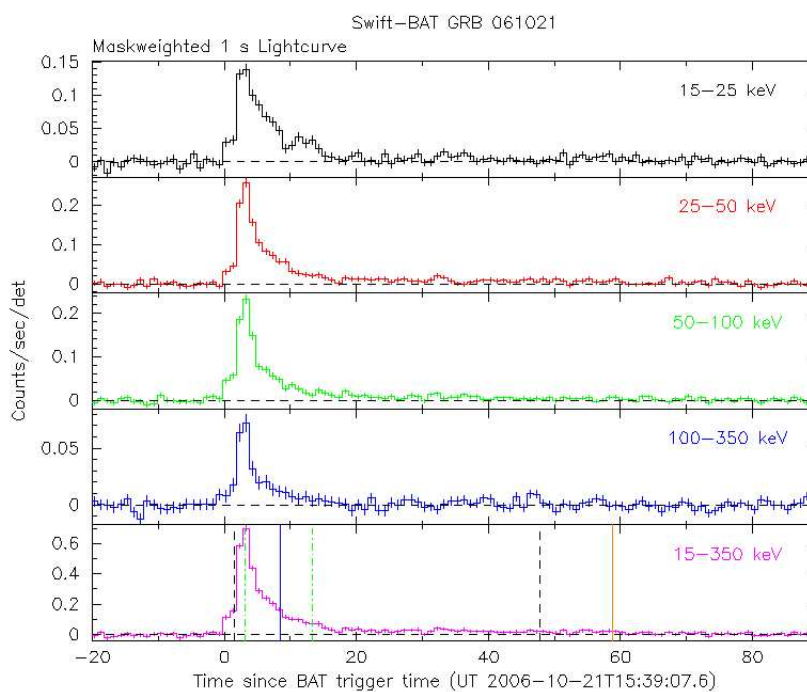

Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector (note illum-det = 0.16 cm^2) and T_0 is 15:39:07 UT.
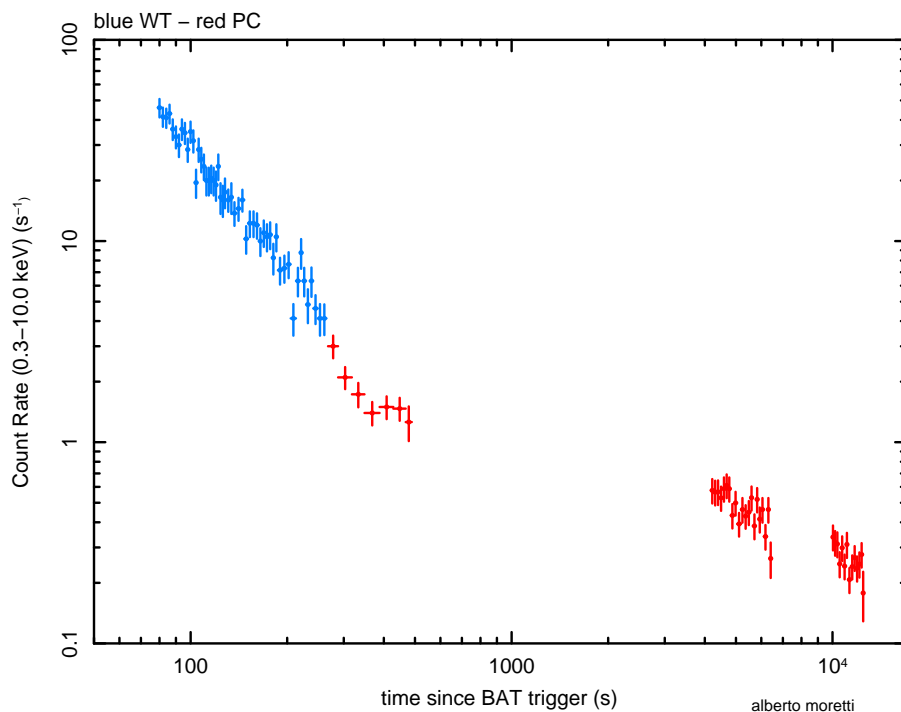
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Figure 2: XRT Lightcurve. Counts/sec in the 0.3-10 keV band: Window Timing mode (blue), Photon Counting mode (red). The approximate conversion is 1 count/sec $\sim 6.4 \times 10^{-11}\ erg\ cm^{-2}\ sec^{-1}$.
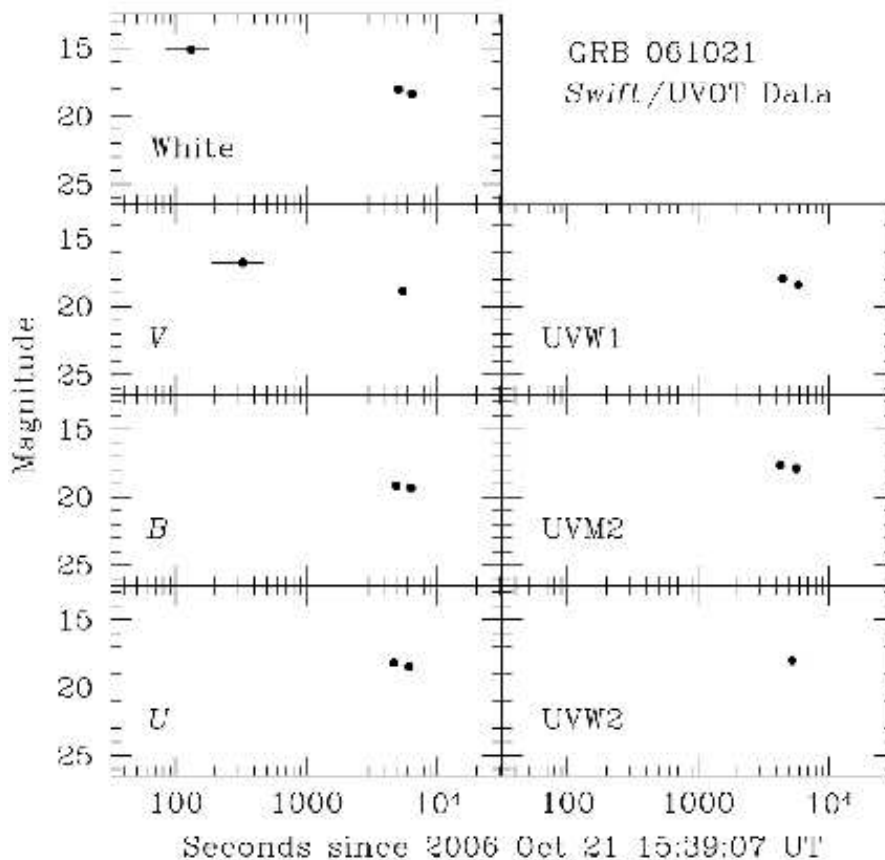

Figure 3: UVOT Lightcurve.