

Swift Observations of GRB 080303

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1. INTRODUCTION

At 09:10:35 UT, the Swift Burst Alert Telescope (BAT) triggered and located GRB 080303 (trigger=304549) (Sakamoto et al., GCN Circ. 7351). Swift slewed immediately to the burst. The BAT light curve showed a FRED-like structure with T₉₀ duration of 67 ± 20 sec. The XRT began observing the field at 09:11:47.7 UT, 72.4 seconds after the BAT trigger. Using promptly downlinked data we find a bright, fading, uncatalogued X-ray source. UVOT took a finding chart exposure of 100 seconds with the White (160-650 nm) filter starting 80 seconds after the BAT trigger. There is an afterglow at R.A. (J2000) = 112.0589 deg. (07h28m14.14s), Dec. (J2000) = -70.2338 deg. (-70d14m01.7s) with a 1-sigma error radius of about 0.6 arc sec.

The REM telescope (D'Avanzo et al., GCN Circ. 7350), Mt. John's 1-m telescope (Gilmore et al., GCN Circ. 7352), the 2-m Faulkes Telescope South (Gomboc et al., GCN Circ. 7353), the PROMPT telescope (Schubel et al. GCN Circ. 7358) detected the optical/IR afterglow. No redshift has been reported for this burst.

2. BAT OBSERVATION AND ANALYSIS

Using the data set from T-240 to T+962 sec, further analysis of BAT GRB 080303 has been performed (Sakamoto et al. GCN Circ. 7359). The BAT ground-calculated position is R.A. (J2000) = 112.019 deg. (7h 28m 4.6s), Dec. (J2000) = -70.231 deg (-70d13m53s) with an uncertainty of 1.6 arcmin, (radius, sys+stat, 90% containment). The partial coding was 80%.

The mask-weighted light curve shows a FRED-like peak T-1 sec, peaking at T+0.5 sec, and ending at T+20 sec (Fig 1). There is also an extended emission until T+~90 sec. T₉₀ (15-350 keV) is 67 ± 20 sec (estimated error including systematics).

The time-averaged spectrum from T-0.2 to T+73.2 sec is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.54 ± 0.25. The fluence in the 15-150 keV band is 6.6 ± 1.0 × 10⁻⁷ erg/cm². The 1-sec peak photon flux measured from T+0.06 sec in the 15-150 keV band is 1.4 ± 0.2 ph/cm²/sec. All the quoted errors are at the 90% confidence level.

3. XRT OBSERVATION AND ANALYSIS

Using 1194 s of overlapping XRT Photon Counting mode and UVOT data for GRB 080303, an astrometrically corrected X-ray position (using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue) is R.A. (J2000) = 112.0599 deg. (07h28m14.16s), Dec. (J2000) = -70.23431 deg. (-70d14m3.5s) with an uncertainty of 1.7 arcsec (radius, 90% confidence).

The light curve can be fitted by three component power-law: a initial decay slope of 1.6 and a break at T+2800 sec, a shallow decay slope of 0.6 and a break at T+71600 sec, and a last slope of 1.1 (Fig 2).

The spectrum formed from all the WT data can be modeled with a power-law of photon index $\Gamma = 1.88 \pm 0.12$, with an absorbing column of $N_H = (1.32 \pm 0.03)e^{21} \text{ cm}^{-2}$, consistent with respect to the Galactic value of $1.26e^{21} \text{ cm}^{-2}$. The spectrum formed from the PC data can be modeled with a power-law of photon index $\Gamma = 1.81 \pm 0.17$, with an absorbing column of $N_H = (5.72 \pm 4.77)e^{20} \text{ cm}^{-2}$.

4. UVOT OBSERVATION AND ANALYSIS

The Swift/UVOT observed the burst GRB080303 starting with the finding chart exposure in white, 81s after the BAT trigger. The afterglow is detected at the enhanced XRT position (Evans et al. GCN circ 7356) in all filters except uvm2. In white it is detectable until at least 6600s after the trigger (Table 1). The brightness increases until about 700s after the burst, then fades with an estimated temporal slope in the v filter of $\alpha=0.9$ (Fig 3).

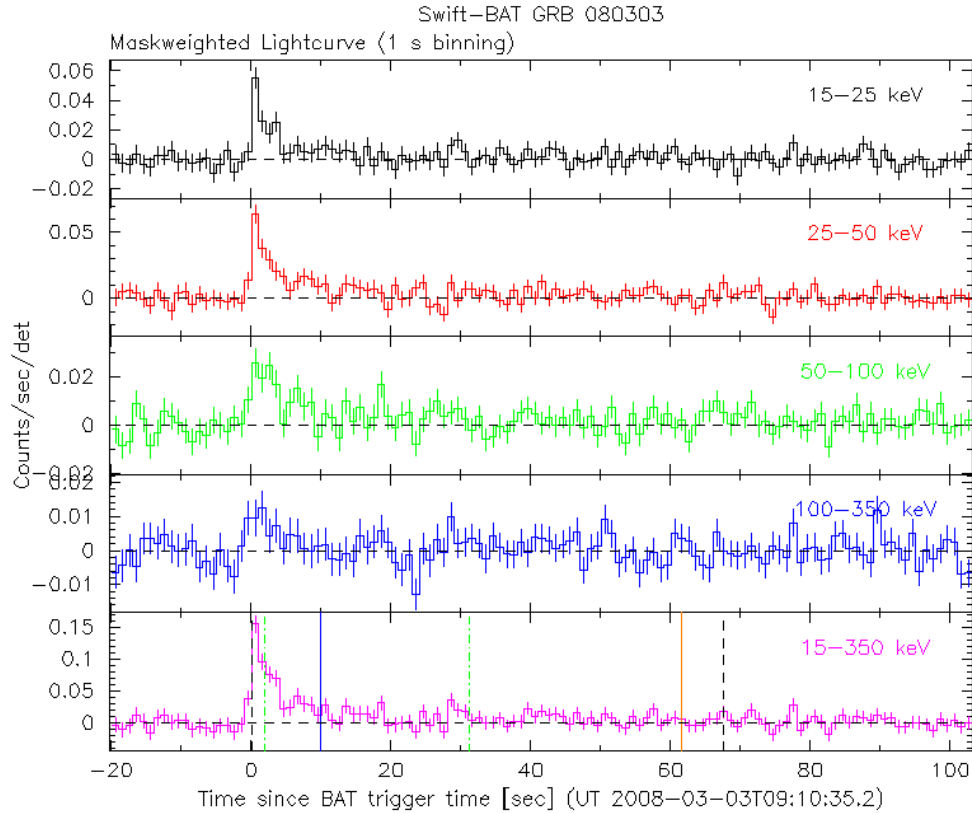


Fig.1: BAT Lightcurve. The light curve in the 4 individual plus total energy bands. The units are counts/sec/number of illuminated-detectors. T₀ (BAT trigger time) is 9:10:35.27 UT.

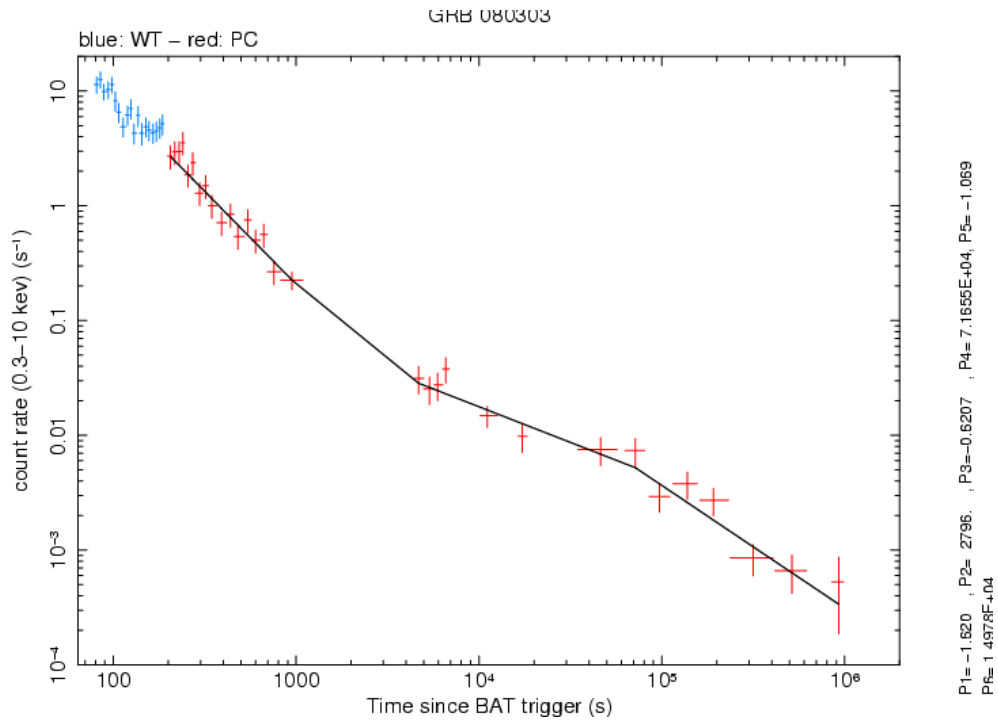


Fig 2: XRT light curve in the 0.3-10 keV: Window Timing (WT) mode (blue) and Photon Counting (PC) mode (red). The approximate conversion factor to absorbed flux is 1 count/sec = $4.8e-11$ erg/cm²/s in WT mode and 1 count/sec = $5.7e-11$ erg/cm²/s in PC mode.

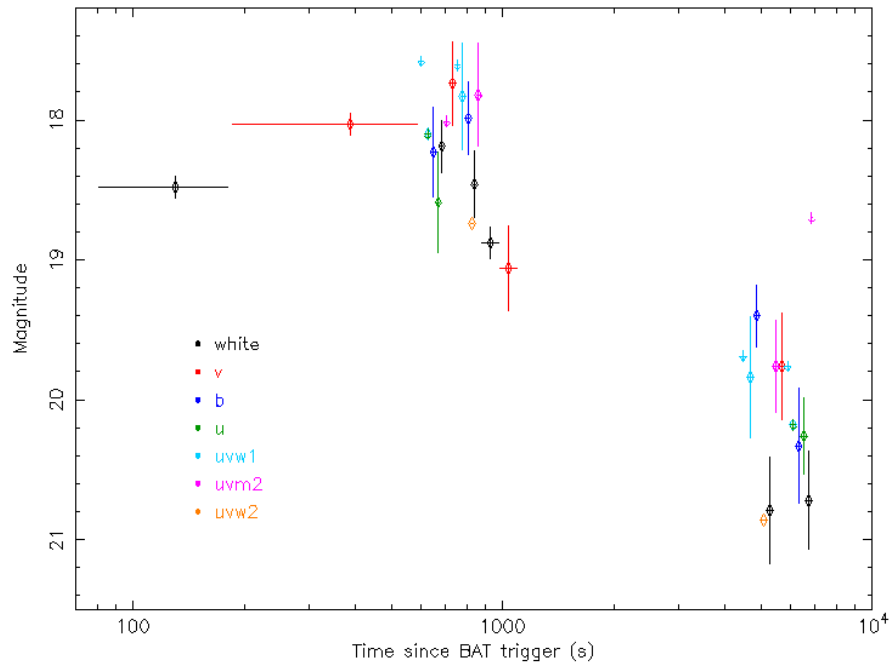


Fig. 3: UVOT light curve with different filters.

Table 1: UVOT Observations. The values quoted above are not corrected for the expected Galactic extinction corresponding to a reddening of $E(B-V)=0.192$ mag in the direction of the burst (Schlegel et al. 1998).

Filter	Tstart(s)	Tstop(s)	Exp(s)	Mag	error(mags)
white	81	180	99.8	18.48	0.08
	682	691	9.8	18.19	0.19
	836	845	9.8	18.46	0.24
	880	979	99.8	18.88	0.11
	5195	5394	199.8	20.79	0.38
	6632	6831	199.8	20.72	0.35
v	187	586	399.8	18.03	0.08
	722	741	19.8	17.74	0.3
	987	1095	108.1	19.06	0.3
	5607	5806	199.8	19.76	0.38
b	667	676	9.8	18.59	0.36
	821	830	9.7	> 18.74	
	4991	5190	199.8	> 20.86	
u	6427	6626	199.8	20.26	0.27
	42	661	19.8	18.23	0.32
	797	816	19.8	17.99	0.26
	4785	4984	199.8	19.4	0.22
uvw1	6221	6420	199.8	20.33	0.41
	618	637	19.8	> 18.1	
	771	790	19.7	17.83	0.38
	4581	4780	199.8	19.84	0.43
uvm2	6016	6215	199.8	> 20.18	
	593	612	19.8	> 17.58	
	746	765	19.8	> 17.61	
	4375	4574	199.8	> 19.69	
uvw2	5811	6010	199.8	> 19.76	
	698	717	19.8	> 18.01	
	851	870	19.8	17.82	0.37
	5401	5600	199.7	19.76	0.33
	6838	6875	37.6	> 18.7	