

Swift Observation of GRB 080919

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1 Introduction

At 00:05:13 UT, the Swift Burst Alert Telescope (BAT) triggered and located the short GRB 080919 (trigger=325268, Preger et al., GCN Circ. 8270). The light curve showed a 750 msec peak followed by a weaker ~ 400 msec peak. The peak count rate was ~ 3300 counts/sec (15-350 keV), at 0 sec after the trigger. T₉₀ (15-350 keV) is 0.6 ± 0.1 sec (estimated error including systematics). Swift slewed immediately, and the narrow field instruments were on target 70.8 seconds later. The best Swift position is that determined from the XRT detection of the afterglow at RA(J2000)= 265.223958 deg, Dec(J2000)= -42.368667 deg, RA(J2000)= 17^h40^m53.75^s, Dec(J2000)= -42^d 22' 07.2", with a 90% confidence interval of 2.0 arcsec (Preger et al., GCN Circ. 8276). We note that this GRB lies near the direction of the Galactic Bulge (long, lat = 348.03, -6.26). Covino et al. (GCN Circ. 8271) reported the detection of a source consistent with the position of the XRT transient (RA(J2000)=17^h40^m53.778^s, DEC(J2000)=-42^d : 22'07.36", 0.4" from the XRT position) and already present in the 2MASS catalogue with the robotic REM telescope located at La Silla (Chile). The source intensity remained constant within the REM ~ 30 min observation. For these reasons it is very unlikely that this source is the NIR counterpart of GRB 080919.

2 BAT Observation and Analysis

Using the data set from T-239 to T+963 s the BAT ground calculated position is (Baumgartner et al., GCN Circ. 8275): RA(J2000)= 265.221 deg, DEC(J2000)= -42.375 deg, RA(J2000)= 17^h40^m53.0^s, Dec(J2000)= -42^d 22' 29.5", with an uncertainty of 1.9 arcmin, (radius, sys+stat, 90% containment). The partial coding was 99%.

The mask-weighted light curve (Figure 1) shows a broad peak of approximately 750 msec duration starting at T+0 followed immediately by a weaker ~ 400 msec peak seen mostly below 50 keV. T₉₀ (15-350 keV) is 0.6 ± 0.1 sec (estimated error including systematics).

The time-averaged spectrum from T+0.1 to T+0.8 sec is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.10 ± 0.26 . The fluence in the 15-150 keV band is $7.2 \pm 1.1 \times 10^{-8}$ erg cm⁻². The 1-sec peak photon flux measured from T-0.08 sec in the 15-150 keV band is 1.2 ± 0.2 ph cm⁻² sec⁻¹. All the quoted errors are at the 90% confidence level.

3 XRT Observations and Analysis

The refined XRT position is RA(J2000)= 265.223958 deg, Dec(J2000)= -42.368667 deg, RA(J2000)= 17^h40^m53.75^s, Dec(J2000)= -42^d 22' 07.2", with a 90% confidence interval of 2 arcsec (Preger et al., GCN Circ. 8276).

The X-ray light curve from T+74 s to T+25 ks shows a fading behavior. At T+200 s the data show a 200 s long flare peaking at T+240 s. Excluding the flare, the light curve can be well modelled with a simple power law, with best fit decay index $\alpha = 2.3 \pm 0.2$.

A 4.5 ks exposure PC spectrum from T+100 s to T+7811 s can be fit with an absorbed power-law with a photon index of 2.0 ± 0.5 and a column density of $(3.9 \pm 2.8) \times 10^{21}$ cm⁻² in addition to the Galactic column density value in the direction of the burst (2.6×10^{21} cm⁻², Kalberla et al. 2005)

4 UVOT Observation and Analysis

The Swift/UVOT started observing GRB 080919 82 s after the BAT trigger (Immler et al. CGN Circ. 8277). The source detected by REM (Covino et al. GCN 8271) was detected in all optical and in the uvw1 filter and showed no signs of fading over a period of 25 ks after the trigger (Table 1). The reported upper limits have not been corrected for the expected Galactic extinction along the line of sight of $E(B - V) = 0.49$ mag (Schlegel et al. 1998). It was the only optical source detected within the XRT error circle.

The lack of fading suggests that the optical source is either the (low redshift) host galaxy of the burst, the counterpart to a Galactic transient, or an unrelated source along the line of sight within the crowded region in the Galactic bulge.

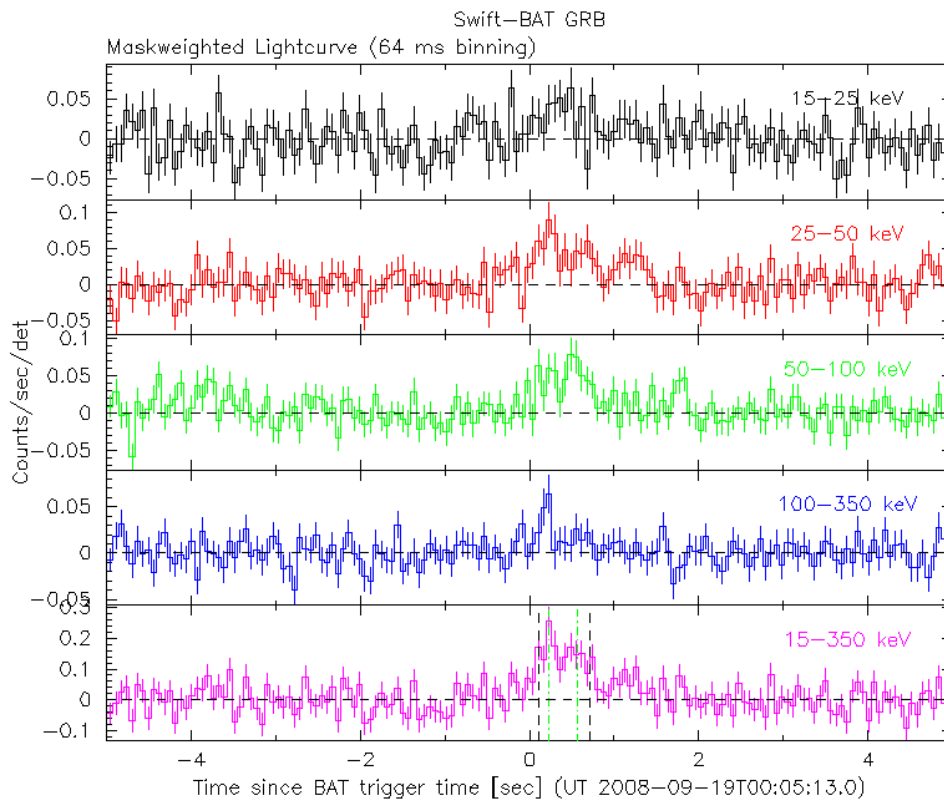


Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. Green dotted line: T50, Black dotted line: T90. The units are counts s^{-1} illuminated-detector $^{-1}$ (note illum-det = 0.16 cm 2) and T_0 is 2008-09-19 00:05:13 UT.

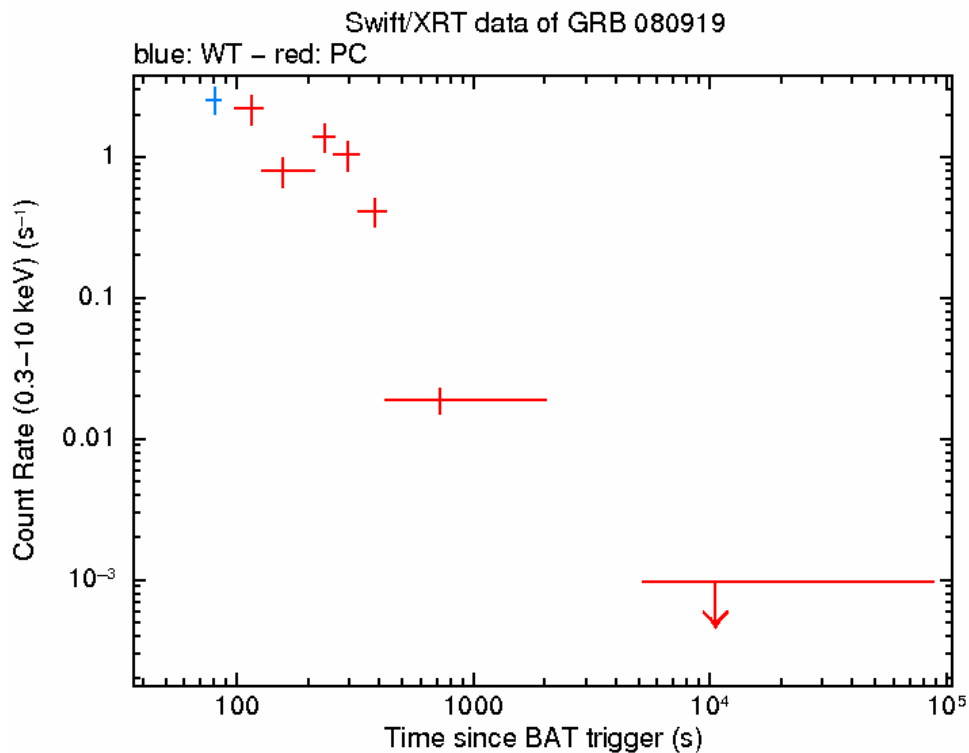


Figure 2: XRT Lightcurve. Counts s^{-1} in the 0.3-10 keV band: Window Timing mode (blue), Photon Counting mode (red). The approximate conversion is $1 \text{ count s}^{-1} \sim 4.8 \times 10^{-11} \text{ erg cm}^{-2} \text{ s}^{-1}$.

Filter	T_start (s)	T_stop (s)	Exp (s)	3-sigma UL mag
White	82	18561	2203	18.4 ± 0.1
V	188	23441	2766	17.2 ± 0.1
B	670	17648	1375	18.3 ± 0.1
U	645	7509	510	19.6 ± 0.3
UVW1	620	25158	1301	20.4 ± 0.5
UWM2	594	24347	1278	>20.4
UVW2	701	19375	1809	>20.8

Table 1: Magnitude limits from UVOT observations.