

## Swift Observations of GRB 070219

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### 1. INTRODUCTION

BAT triggered on and located GRB 070219 at 01:10:16 UT (trigger=261132; Sakamoto et al., GCN Circ. 6104). The BAT light curve of the prompt emission shows a weak fast rise exponential decay shape of the duration of  $\sim 25$  sec. Swift slewed immediately to the burst. XRT began follow-up observations at T+82 sec, and UVOT at T+68 sec (including the spacecraft settling exposure in V). A weak X-ray source was found at R.A. (J2000) = 17h 20m 45.99s (260.1916 deg.) and Dec. (J2000) = 69d 22' 10.6" (69.3696 deg.). No optical afterglow candidate was found in the UVOT data within the XRT error circle.

### 2) BAT OBSERVATION AND ANALYSIS

Using the data set from T-240 to T+499 sec from the recent telemetry downlink, we report further analysis of BAT GRB 070219 (trigger #261132) (Sakamoto, et al., GCN Circ. 6104). The BAT ground-calculated position is RA, Dec = 260.219, 69.345 deg which is R.A. (J2000) = 17h 20m 52.6s and Dec. (J2000) = 69d 20' 41.4" with an uncertainty of 1.9 arcmin, (radius, sys+stat, 90% containment). The partial coding was 92%.

The mask-weighted lightcurve shows a weak FRED-like bump from T-4 to T+20 sec. T90 (15-350 keV) is  $17 \pm 1$  sec (estimated error including systematics).

The time-averaged spectrum from T-1.5 to T+17.7 is best fit by a simple power-law model. The power law index of the time-averaged spectrum is  $1.8 \pm 0.2$ . The fluence in the 15-150 keV band is  $3.2 \pm 0.4 \times 10^{-7}$  erg  $\text{cm}^{-2}$ . The 1-sec peak photon flux measured from T+1.31 sec in the 15-150 keV band is  $0.7 \pm 0.1$  ph  $\text{cm}^{-2}$   $\text{s}^{-1}$ . All the quoted errors are at the 90% confidence level.

### 3. XRT OBSERVATION AND ANALYSIS

Using  $\sim 6$  ks of Photon Counting (PC) mode data we find the following astrometrically corrected XRT refined position (by matching the UVOT images with the USNO-B1 catalogue): R.A. (J2000) = 17h 20m 45.99s and Dec.(J2000) = +69d 22' 10.6" with an error radius of 3.6 arcseconds (90% confidence).

The full lightcurve up to 255 ksec after the BAT trigger appears to follow the canonical three-phase decay. It decays with  $\alpha_1 \sim -1.8$ , breaking at  $T_{\text{bk}_1} \sim 440$  s to  $\alpha_2 \sim -0.3$  and breaking again at  $T_{\text{bk}_2} \sim 39000$  s to a slope of  $\alpha_3 \sim -1.7$ . The parameters are not well constrained.

The PC mode spectrum is not tightly constrained, but can be fitted with a single power law of photon index  $\Gamma = 2$  and a total absorbing column at  $z = 0$  of  $N_{\text{H}} = 1.3 \times 10^{21}$   $\text{cm}^{-2}$ , in excess of the Galactic value of  $4.1 \times 10^{20}$   $\text{cm}^{-2}$ . The 0.3-10 keV observed (unabsorbed) flux is  $9 \times 10^{-13}$  ( $1.2 \times 10^{-12}$ ) erg  $\text{cm}^{-2}$   $\text{s}^{-1}$ .

### 4. UVOT OBSERVATION AND ANALYSIS

UVOT does not find any source, in any of the UVOT observations, inside the XRT error circle. The 3-sigma upper limits for the co-added frames are shown in table 1. The values quoted in the table are not corrected for the expected Galactic extinction corresponding to a reddening of  $E(B-V) = 0.035$  towards the direction of the burst (Schlegel et al. 1998).

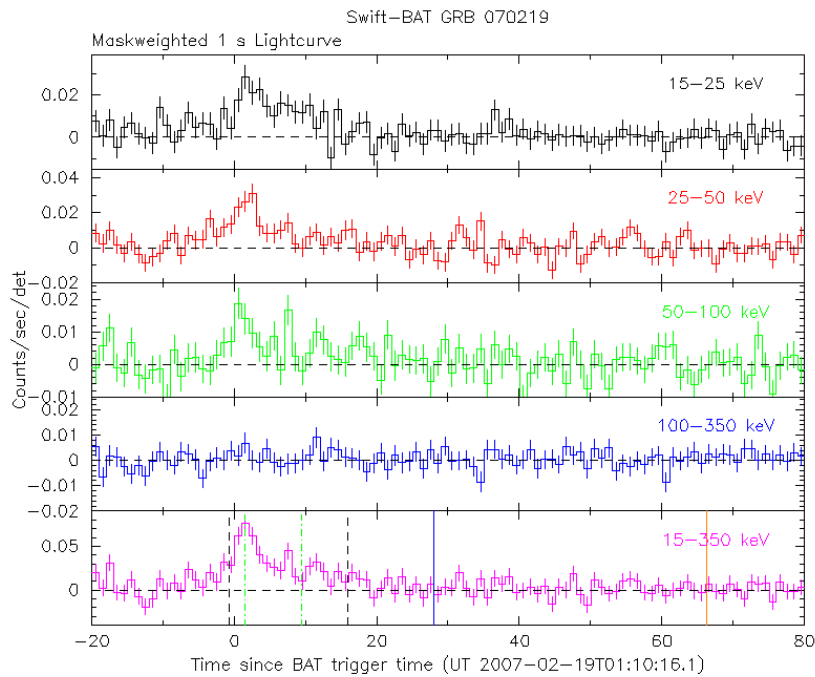


Fig.1: BAT Lightcurve. The light curve in the 4 individual plus total energy bands. The green and black dotted lines bracket the T50 and T90 intervals. The blue and orange solid lines are the start and the end, respectively, of the slew to the burst. The units are counts/sec/illuminated-detector and the BAT T0 is 01:10:16.1 UT.

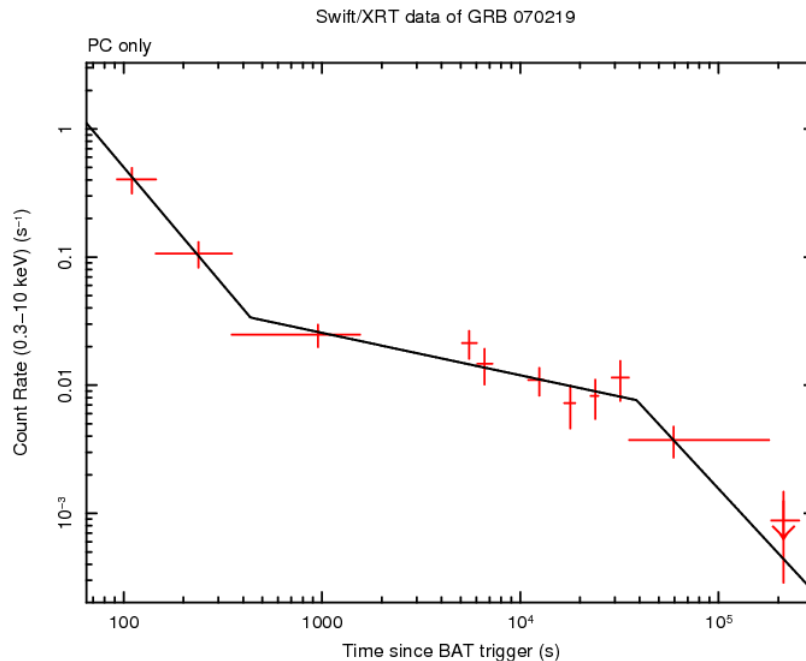


Fig. 2: XRT Lightcurve up to 255 msec after the BAT trigger. Only the PC mode data are used in the analysis. The approximate conversion factor is 1 count/sec (0.3-10 keV)  $\sim 4.8 \times 10^{-11}$  erg/cm<sup>2</sup>/s (0.3-10 keV).

Table 1: UVOT Observations.

Filter	T_start(s)	T_stop(s)	Expo(s)	Mag(3-sigma UL)
V	68	18502	2032	20.3
B	670	6909	432	20.4
U	646	13201	980	20.4
UVW1	622	12659	1160	21.0
UVM2	598	18983	1627	21.5
UVW2	698	17588	1356	21.5
White	87	7114	618	20.7