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 ~25 sec. Swift slewed immediately to the burst. XRT began follow-up observations at T+82 sec, and UVOT at T+87 sec. XRT found the weak X-ray source at R.A. (J2000) = 17h 20m 45.99s (260.1916 deg.) and Dec. (J2000) = 69d 22' 10.6" (69.3696 deg.). UVOT found no afterglow candidate within the XRT position.

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 +- 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 +- 0.2. The fluence in the 15-150 keV band is 3.2 +- 0.4 x 10^-07 erg/cm2. The 1-sec peak photon flux measured from T+1.31 sec in the 15-150 keV band is 0.7 +- 0.1 ph/cm2/sec. All the quoted errors are at the 90% confidence level.

3. XRT OBSERVATION AND ANALYSIS

The first four orbits (up to 18.8 ks after the BAT trigger) of Swift XRT data for the faint X-ray afterglow have been analyzed. Using ~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 lightcurve appears to follow the canonical three-phase decay. It decays with alpha_1~−2.2, breaking at T_bk_1~330 s to alpha_2~−0.3 and breaking again at T_bk_2~9200 s to a slope of alpha_3~−1.5.

The PC mode spectrum, summed over all the data collected thus far, 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_H = 1.3 x 10^21 cm^-2, in excess of the Galactic value of 4.1 x 10^20 cm^-2. The 0.3-10 keV observed (unabsorbed) flux is 9 x 10^-13 (1.2 x 10^-12) erg/cm2/s.

4. UVOT OBSERVATION AND ANALYSIS

UVOT does not found 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).
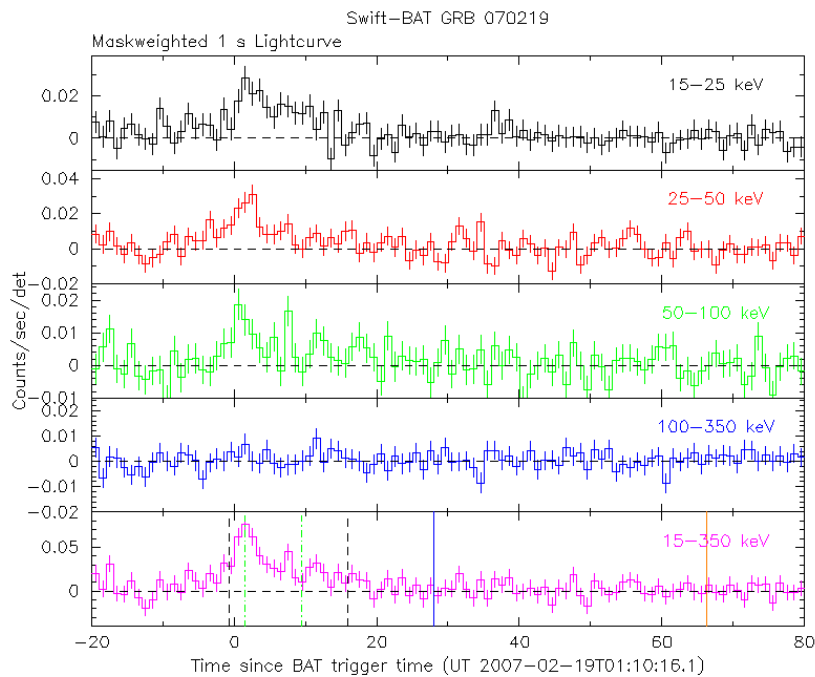
Fig.1: BAT Lightcurve.   The light curve in the 4 individual plus total energy bands.   The green and black dotted lines bracket the T50 and T90 intervals.   The blue and orange solid lines are the start and the end, respectively, of the slew to the burst.   The units are counts/sec/illuminated-detector and the BAT T0 is 01:10:16.1 UT.
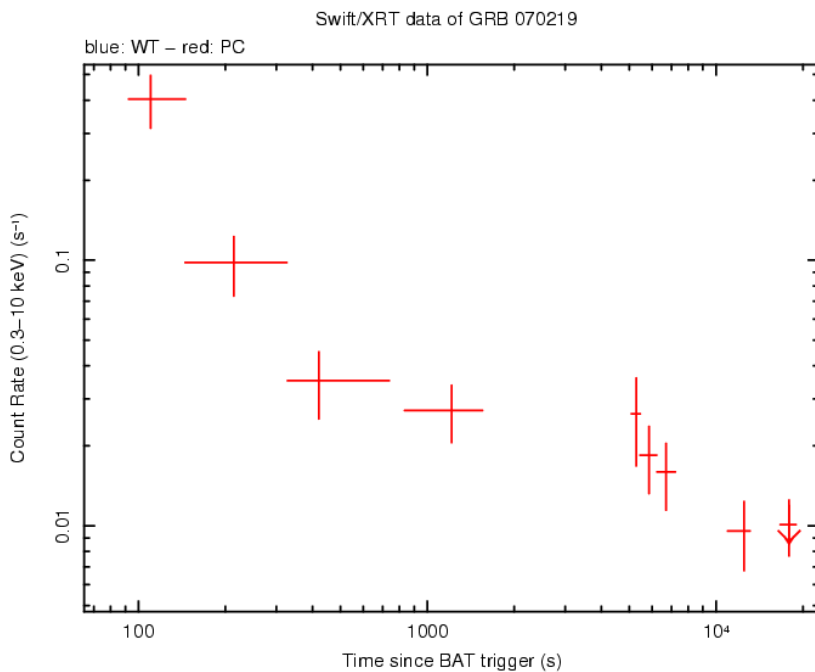

Fig. 2: XRT Lightcurve.   Counts/sec in the 0.3-10 keV band.   Only the PC mode data are used in the analysis.   The approximate conversion factor is 1 count/sec (0.3-10 keV) ~ 4.8 x 10^11 erg/cm2/s (0.3-10 keV).

Table 1: UVOT Observations.

Filter	T_start(s)	T_stop	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