Swift Observations of the Short GRB 070429B

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for the Swift Team:

1. INTRODUCTION

At 03:09:04 UT, the Swift Burst Alert Telescope (BAT) triggered and located GRB 070429B (trigger=277582). Swift slewed to the burst following a 165 second delay due to the Earth-limb constraint. This was a short burst, with duration of about 500 msec. Our best position is from the XRT, which is:
RA(J2000) = 21d 52m 03.82s
DEC(J2000) = -38d 49' 42.2"
with an uncertainty of 5.1 arcsec (radius, 90% containment). A possible optical counterpart has been reported by Cucchiara et al (GCN #6368).

2) BAT OBSERVATION AND ANALYSIS

The following analysis uses the data set from T-240 to T+963 sec (Tueller et al. GCN #6365). The BAT ground-calculated position is RA, Dec = 328.006, -38.857 deg which is
RA(J2000) = 21h 52m 1.4s
Dec(J2000) = -38d 51' 24.8"
with an uncertainty of 1.8 arcmin, (radius, sys+stat, 90% containment). The partial coding was 66%, and the burst was 25.4 deg off-axis.

The mask-weighted lightcurve shows 3 or 4 overlapping peaks starting at ~T-0.2s sec and ending at ~T+0.5 sec (Figure 1). T90 (15-350 keV) is 0.5 ± 0.1 sec (estimated error including systematics).

The time-averaged spectrum from T-0.2 to T+0.3 is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.71 ± 0.23. The fluence in the 15-150 keV band is $6.3 \pm 1.0 \times 10^{-8}$ erg/cm2. The 1-sec peak photon flux measured from T-0.45 sec in the 15-150 keV band is 1.8 ± 0.2 ph/cm2/sec. All the quoted errors are at the 90% confidence level.

3. XRT OBSERVATION AND ANALYSIS

We have analysed eight orbits of Swift XRT data (Beardmore et al., GCN #6360), which has a total photon counting mode exposure of 14.4 ks. Due to a delayed slew because of an Earth-limb constraint, the XRT arrived on the source 244s after the BAT trigger. The tentative X-ray counterpart identified in GCN #6358 is clearly detected in the first orbit of data, and is absent thereafter. The refined XRT position from 2.4ks of data in the first orbit is
RA, DEC (J2000) = 328.0159, -38.8284
which is
RA(J2000) = 21d 52m 03.82s
DEC(J2000) = -38d 49' 42.2"
with an uncertainty of 5.1 arcsec (radius, 90% containment). This is 61 arcsec from the initial BAT position and 6.2 arcsec from the initial X-ray position reported in GCN 6358.

An XRT light curve created from the first orbit of data, binned with a minimum of 10 counts/bin, reveals a decaying source (Figure 2). A power-law fit yields a poorly constrained decay slope of 0.94±0.47.

The X-ray spectrum from the first orbit (covering 254 to 2691 seconds after the BAT trigger), modeled with an absorbed power-law and fit using Cash statistics, gives a photon index of $2.5^{+1.3}_{-1.2}$. An upper limit of 5.9×10^{21} cm^{-2} on the column density was found, compared with the Galactic value of 1.8×10^{20} cm^{-2} in

this direction. The absorbed (unabsorbed) 0.3-10.0keV flux for this spectrum was 5.9 x 10^{-13} (1.1 x 10^{-12}) ergs cm^{-2} s^{-1}.

4. UVOT OBSERVATION AND ANALYSIS

Swift/UVOT observed the field of GRB 070429B starting 297s after the BAT trigger (GCN #6366). No new source is detected within the refined XRT position in any of the UVOT filters, in either single or co-added exposures. The 3-sigma upper limits for the co-added exposures in each filter are shown in Table 1.

The upper limits reported in Table 1 are uncorrected for the estimated Galactic reddening of E(B-V) = 0.03 mag.

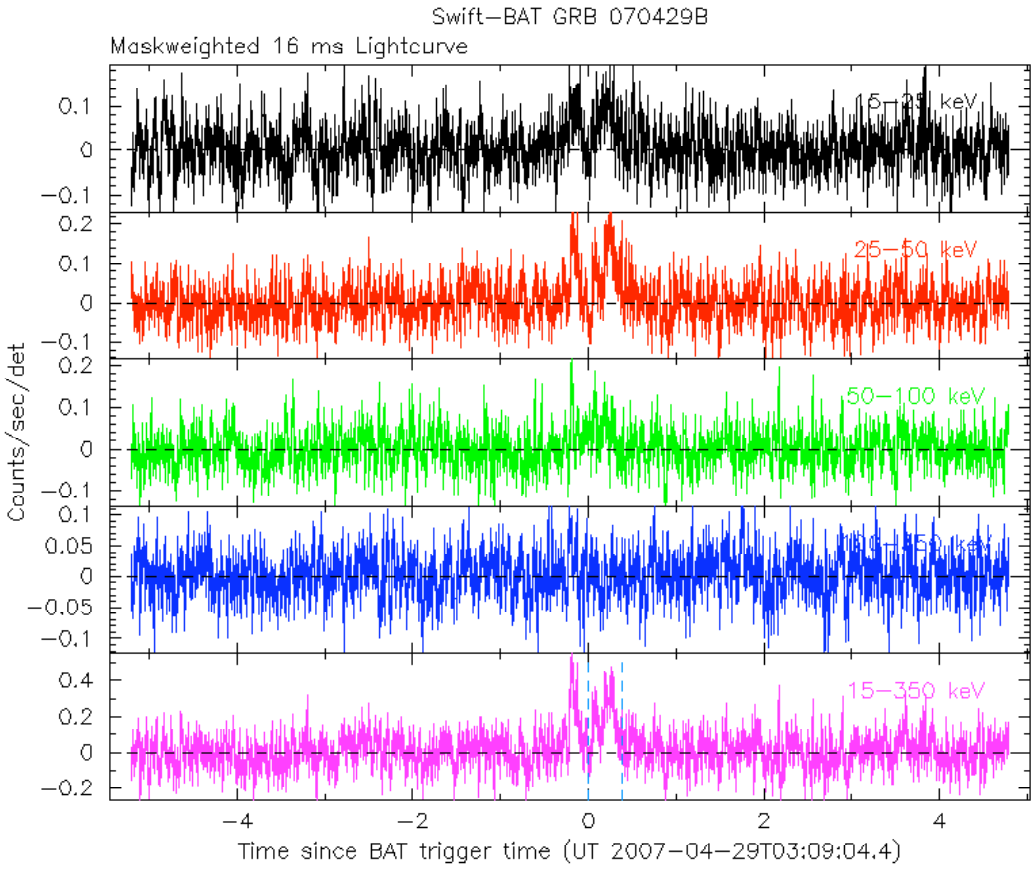

Fig.1: BAT Lightcurve with 16 msec time bins. The lightcurve has 4 individual energy bands (15-25 keV, 25-50, 50-100, 100-150, starting from top), plus the total band (bottom). The vertical dashed lines indicate the on-board discovery image interval.

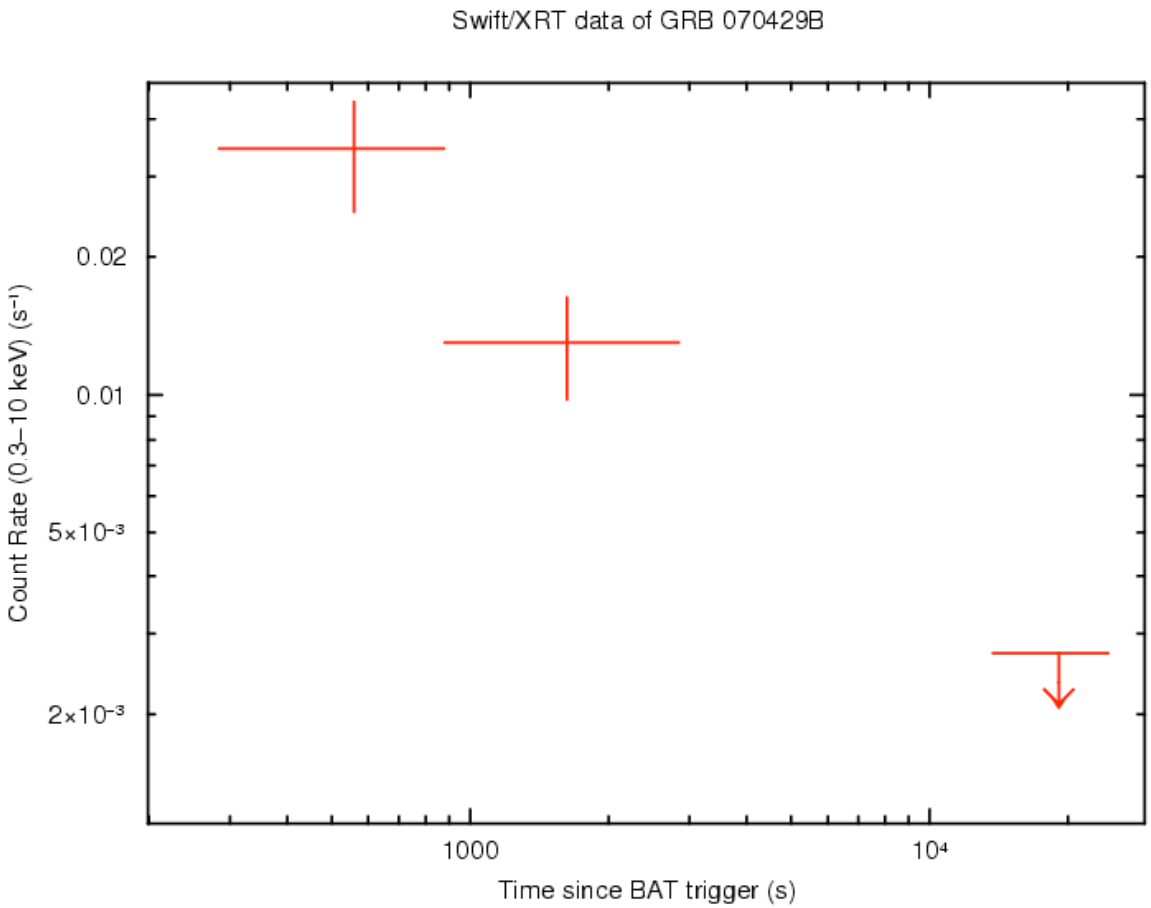

Fig. 2: Swift XRT Lightcurve. All data were taken in Photon Counting (PC) mode. The approximate conversion is 1 count/sec = 9 x 10^{-11} erg/cm^2/sec.

Table 1: UVOT Upper Limits.

Filter	T_mid(s)	Expo(s)	Mag (3-σ UL)
WHITE	1009	302	19.68
V	1489	605	19.64
B	1812	184	19.83
U	2092	392	19.80
UVW1	1625	253	19.31
UVM2	1601	253	19.48
UVW2	1682	214	19.63

(T_mid is the weighted center time of the co-added images.)