Swift Observation of GRB 140129A

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1 Introduction

At 03:23:59 UT, the *Swift* Burst Alert Telescope (BAT) triggered and located GRB 140129A (trigger=585128). *Swift* slewed immediately to the burst. The best *Swift* position is the UVOT position reported in Swenson *et al.*, *GCN Circ.* 15768.

2 BAT Observation and Analysis

Using the data set from $T-239$ to $T+963$ s from the recent telemetry downlink, further analysis of BAT GRB 140129A (Melandri *et al.*, *GCN Circ.* 15760) has been performed by the *Swift* team (Markwardt *et al.*, *GCN Circ.* 15769). The BAT ground-calculated position is RA(J2000) = 37.851 deg ($02^h\ 31^m\ 24.2^s$), Dec(J2000) = -1.594 deg ($-01^\circ\ 35'\ 40.1''$) $\pm$ 2.2 arcmin (radius, sys+stat, 90% containment). The partial coding was 57%.

The mask-weighted light curve (Fig. 1) shows a single peak structure which starts at $\sim T+1.2$ s, peaks at $\sim T+2.5$ s, and ends at $\sim T+4.6$ s. T_{90} (15-350 keV) is 2.99 ± 0.79 s (estimated error including systematics).

The time-averaged spectrum from $T+1.25$ to $T+4.62$ s is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 2.08 ± 0.33. The fluence in the 15-150 keV band is $(1.3\pm0.3)\times10^{-7}$ $ergs/cm^2$. The 1-sec peak photon flux measured from $T+1.91$ s in the 15-150 keV band is (0.9 ± 0.2) $ph/cm^2/sec$. All the quoted errors are at the 90% confidence level.

3 XRT Observation and Analysis

We have analysed the XRT data for GRB 140129A (Melandri *et al.*, *GCN Circ.* 15760; Stroh *et al.*, *GCN Circ.* 15760), from 99 s to $\sim$ 19.2 ks after the BAT trigger. The XRT position (Evans *et al.*, *GCN Circ.* 15764) for this burst is RA(J2000) = 37.891 deg ($02^h\ 31^m\ 33.82^s$), Dec(J2000) = -1.595 deg ($-01^\circ\ 35'\ 43.6''$) $\pm$ 1.6 arcsec (radius, 90% confidence).

The light curve (Fig. 2) can be modelled with a power-law decay with a decay index of $\alpha=0.91\pm0.03$.

A spectrum formed from the PC mode data can be fitted with an absorbed power-law with a photon spectral index of $1.94^{+0.24}_{-0.23}$. The best-fitting absorption column is $6.0^{+6.0}_{-5.0}\times10^{20}$ cm^{-2}, consistent with the Galactic value of 2.6×10^{20} cm^{-2} (Kalberla et al. 2005). The counts to observed (unabsorbed) 0.3-10 keV flux conversion factor deduced from this spectrum is $4.0\times10^{-11}(5.0\times10^{-11})$ $erg\ cm^{-2}\ count^{-1}$.

4 UVOT Observation and Analysis

The UVOT began settled observations of the field of GRB 140129A $\sim$ 117 s after the BAT trigger (Melandri *et al.*, *GCN Circ.* 15760). A source consistent with the XRT position was detected in the UVOT exposures at

RA (J2000) = $02^h\ 31^m\ 33.78^s$ = 37.89076 (deg.)
Dec (J2000) = $-01^\circ\ 35'\ 43.4''$ = -1.59539 (deg.)

with an estimated uncertainty of 0.50 arcsec. (radius, 90% confidence).

The 3-σ upper limits and detections using the UVOT photometric system (Breeveld et al. 2011, AIP Conf. Proc. 1358, 373) for the the early exposures are:

Filter	T_{start} (s)	T_{stop} (s)	Exp (s)	Mag
white	117	267	147	16.51 ± 0.03
v	605	1250	78	18.69 ± 0.24
b	531	551	20	17.76 ± 0.14
u	275	525	246	16.98 ± 0.04
w1	654	17641	1357	20.77 ± 0.22
m2	5292	13449	1054	>21.2
w2	753	11858	1102	>22.0

Table 1: 3σ upper limits and detections from early UVOT observations (Swenson & Melandri, *GCN Circ.* 15768). The values quoted above are not corrected for the Galactic extinction due to the reddening of $E_{(B-V)} = 0.03$ in the direction of the burst (Schlegel et al. 1998).

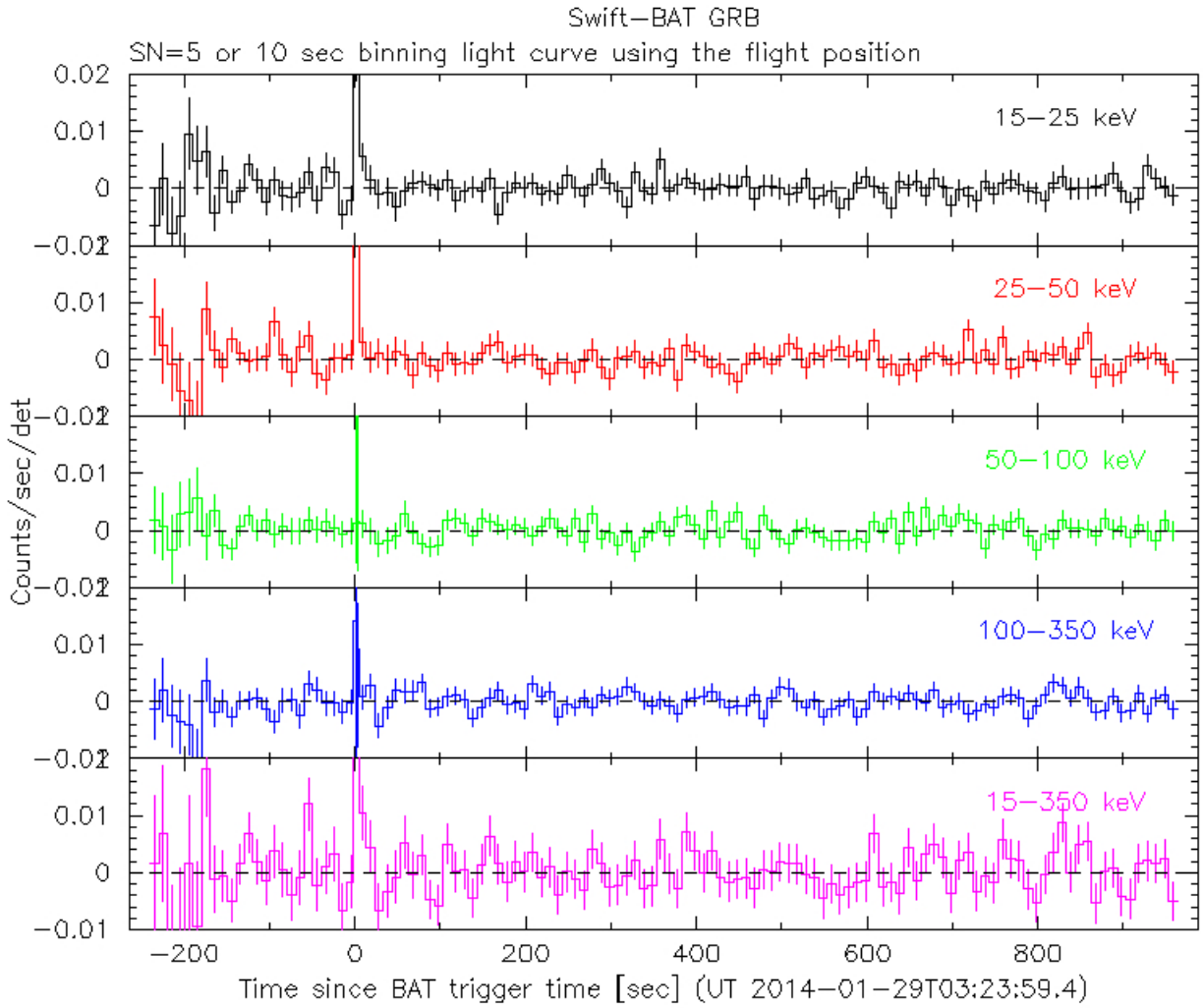

Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands (15 - 25, 25 - 50, 50 - 100, 100 - 350 and 15 - 350 keV).

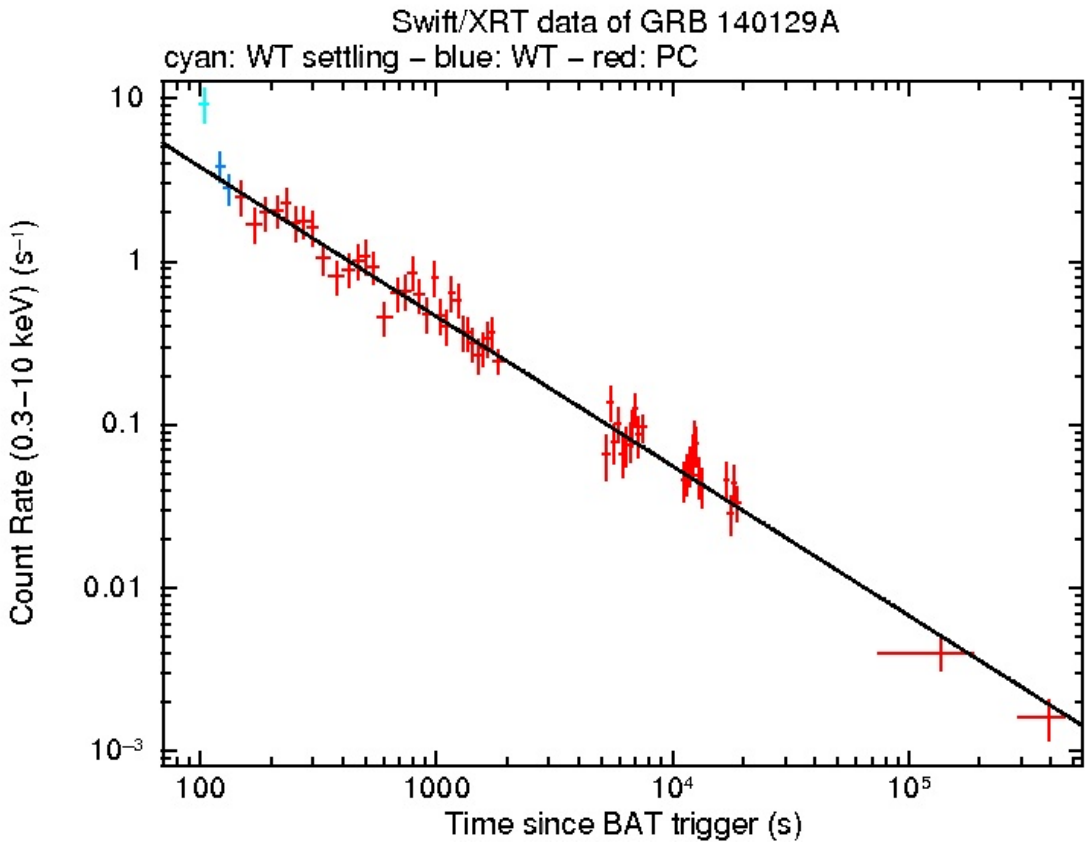

Figure 2: XRT data of GRB 140129A from the *Swift*-XRT light curve repository (Evans et al., 2009, MNRAS, 397, 1177).