# Swift Observation of GRB 111109A

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## 1 Introduction

BAT triggered on the long GRB 111109A at 02:57:46 UT (Trigger 507342) (Pagani, *et al.*, *GCN Circ.* 12548), a burst with $T_{90} = 13.0 \pm 3.2$ *sec*. *Swift* slewed to the burst at T+50 minutes due to an observing constraint. The XRT detected the afterglow in observations starting 3.1 *ksec* after the trigger. The UVOT did not detect the optical afterglow (Holland, *et al.*, *GCN Circ.* 12552). Our best position is the XRT location RA($J2000$) = $118.20360deg$ ($07h52m48.86s$), Dec($J2000$) = $-41.58450$ *deg* ($-41d35'04.2''$) $\pm 1.8$ *arcsec* (radius, 90% confidence, including boresight uncertainties).

## 2 BAT Observation and Analysis

Using the data set from $T - 240$ to $T + 645$ *sec*, further analysis of BAT GRB 111109A has been performed by the *Swift* team (Baumgartner, *et al.*, *GCN Circ.* 12551). The BAT ground-calculated position is RA($J2000$) = $118.248deg$ ($07h52m59.5s$), Dec($J2000$) = $-41.588deg$ ($-41d35'18.3''$) $\pm$ 1.9 *arcmin* (radius, systematic and statistical, 90% containment). The partial coding was 91%.

The mask-weighted light curve (Fig.1) shows a couple of overlapping peaks starting at T-5 sec, peaking at T+2 sec, and ending at T+20 sec. There is a hint of possible precursor activity ($\sim 2\ \sigma$) at T-110 sec. We note that the burst location went out of the BAT FoV at $\sim T + 120$ *sec* (a slew due to an observing constraint). $T_{90}(15 - 350keV)$ is $13.0 \pm 3.2$ *sec* (estimated error including systematics).

The time-averaged spectrum from $T - 5.60$ to $T + 8.40$ *sec* is best fitted by a simple power-law model. The power law index of the time-averaged spectrum is $1.86 \pm 0.26$. For this model the total fluence in the $15 - 150$ *keV* band is $(2.4 \pm 0.4) \times 10^{-7} ergs/cm^2$, and the 1-sec peak flux measured from $T + 1.40$ *sec* in the $15 - 150$ *keV* band is $0.5 \pm 0.1$ $ph/cm^2/sec$. All the quoted errors are at the 90% confidence level considering the statistical and usual systematic effects.

The results of the batgrbproduct analysis are available at:
http://gcn.gsfc.nasa.gov/notices_s/507342/BA/

## 3 XRT Observation and Analysis

Using 2557 s of XRT Photon Counting mode data and 1 UVOT image for GRB 111109A, we find an astrometrically corrected X-ray position (using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue): RA($J2000$) = $118.20360deg$ ($07h52m48.86s$), Dec($J2000$) = $-41.58450$ *deg* ($-41d35'04.2''$) $\pm 1.8$ *arcsec* (radius, 90% confidence) (Beardmore, *et al.*, *GCN Circ.* 12550).

The $0.3 - 10$ *keV* light curve (Fig.2) can be modeled by a power-law decay with index of $0.6 \pm 0.1$.

The X-ray spectrum formed from the Photon Counting mode data from $T + 3.1$ *ksec* to $T + 33$ *ksec* can be fitted with an absorbed power-law with a photon spectral index of $2.99 \pm 0.76$ and a best-fitting absorption column consistent with the Galactic value of $3.2 \times 10^{21} cm^{-2}$ in that direction (Kalberla et al.

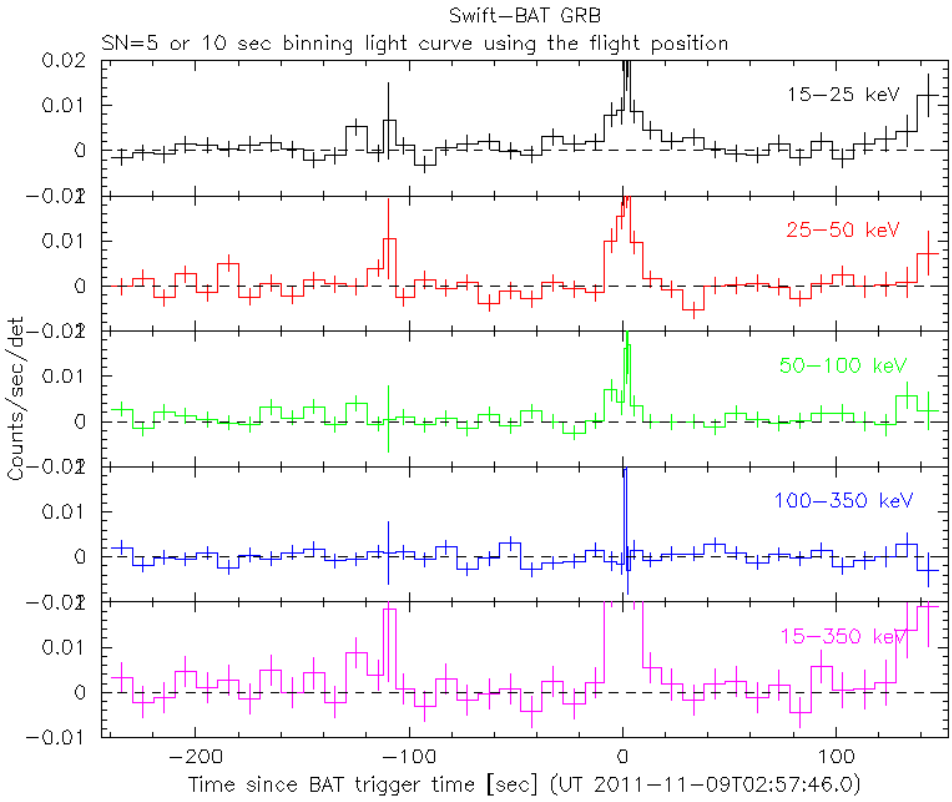


Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector and $T_0$ is 02:57:46.0 UT.

2005). The average absorbed flux over $0.3-10\ keV$ for the PC spectrum is $3.7\times10^{-13}\ ergs/cm^2/sec$, which corresponds to an unabsorbed flux of $1.8\times10^{-12}\ ergs/cm^2/sec$.

## 4 UVOT Observation and Analysis

The Swift/UVOT observed the field of GRB 111109A starting 3.1 *ksec* after the BAT trigger (Holland, *et al.*, *GCN Circ.* 12552). The USNO-B1.0 source 0484-0114145 is seen in the UVOT-enhanced XRT error circle. UVOT photometry shows no evidence for variability during the UVOT observations.

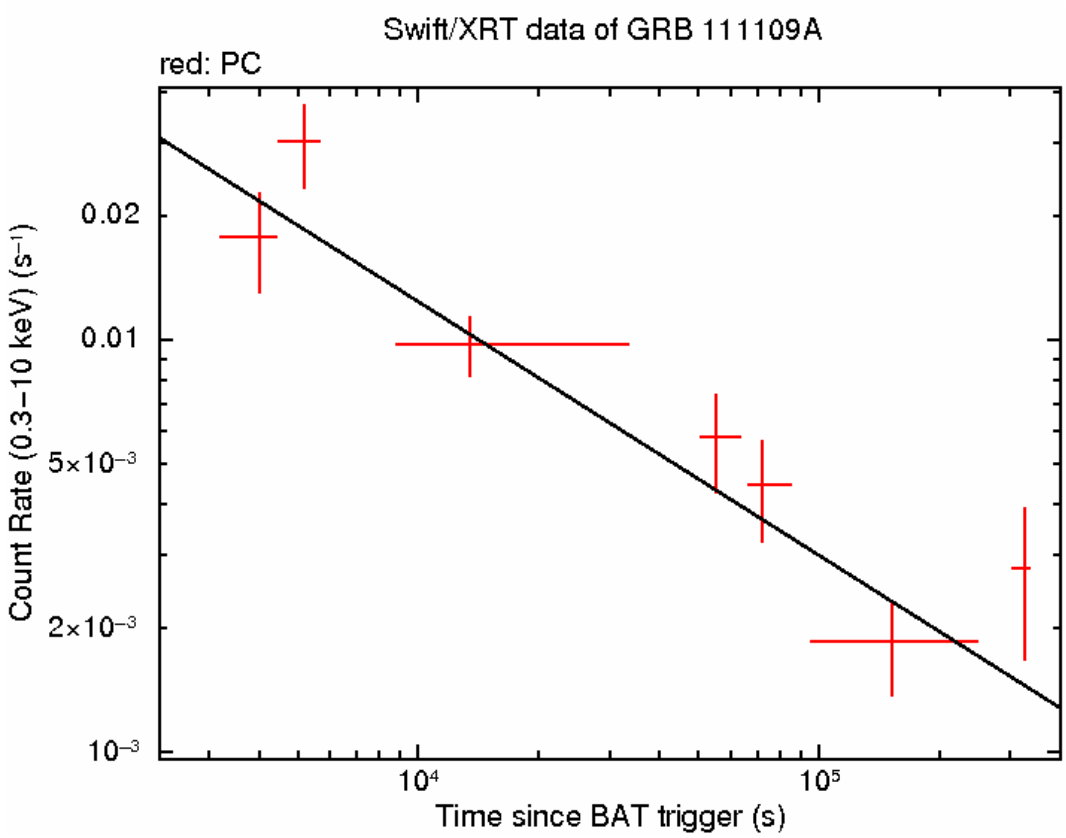


Figure 2: XRT Lightcurve. Counts/sec in the 0.3-10 keV band. The approximate conversion is 1 count/sec $= \sim 3.1 \times 10^{-11}$ $ergs/cm^2/sec$.