Swift Observation of GRB 071112C

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1 Introduction

At T=18:32:57 UT, the Swift Burst Alert Telescope (BAT) triggered and located GRB 071112C (trigger=296504, Perri et al., GCN Circ. 7059). Because of the unusually short time between detection of GRB 071112C with GRB 071112B (Perri, et al., GCN Circ. 7058), only a partial BAT data set for the burst was available at the time of this report.

Swift slewed immediately, and the narrow field instruments were on target about 90 seconds later. The best Swift position is that determined from the UVOT detection of the afterglow at RA(J2000)= 39.2122 deg, Dec(J2000)= +28.3713 deg, RA(J2000)= $02^{\rm h}36^{\rm m}50.93^{\rm s}$, Dec(J2000)= $+28^{\rm d}$ 22' 16.7", with a 1-sigma error radius of about 0.5 arc sec (Perri et al., GCN Circ. 7059).

Several ground-based facilities reported the detection of a bright optical afterglow.

A spectroscopic redshift was measured from the afterglow emission at z=0.823 (P. Jakobsson, GCN Circ. 7076).

2 BAT Observation and Analysis

The following analysis is performed on a partial BAT data set, from T-122 to T+10 sec, and is based on BAT survey data rather than "event" data. No BAT event data were created for this burst. In particular, the fluence quoted below does not include the tail of the peak, though it appears to include about 80% of the total fluence. The T_{90} period and the 1-second peak photon flux are a little more uncertain than usual as well, and the quoted errors have been increased to reflect this.

The BAT ground-calculated position is RA (J2000) = 39.218 deg, Dec(J2000) = +28.368 deg, RA (J2000)= 02^h 36^m 52.3^s, Dec(J2000) = $+28^{\rm d}$ $22'$ 04" with an uncertainty of 1.0 arcmin (radius, 90% containment). The burst was in the fully-coded field of view.

The burst light curve morphology consisted of a single FRED peak. The measured T_{90} (15-350 keV) is 15 ± 2 sec (estimated error including systematics).

Assuming a power law spectral model, the spectral index of the time-averaged spectrum is 1.09 ± 0.07.

The fluence for the period T-122 to T+10 seconds (including about 80% of the total fluence) in the 15-150 keV band is $(3.0 \pm 0.4) \times 10^{-6}$ erg cm^{-2}. The 1-sec peak photon flux measured from T+0 sec in the 15-150 keV band is 8 ± 1 ph cm^{-2} sec. All the quoted errors are at the 90% confidence level.

3 XRT Observation and Analysis

Using 625 s of overlapping XRT Photon Counting mode and UVOT V-band data, an astrometrically corrected X-ray position (using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue) has been obtained at RA(J2000) = 39.21220 deg, Dec(J2000) = 28.37102 deg which is equivalent to RA (J2000) = 02^h 36^m 50.93^s, Dec (J2000) = $+28^{\rm d}$ $22'$ 15.7" with an uncertainty of 1.7 arcsec (radius, 90% confidence). This is 1.0 arcsec from the UVOT position (Perri et al, GCN Circ. 7059).

From the first 7 orbits of Swift-XRT data of GRB 071112C (281 s in Windowed Timing mode and 29.1 ks in Photon Counting mode) the bright 0.3-10 keV light curve (Figure 2) can be fit by a simple

power-law, with a decay index of $\alpha = 1.35 \pm 0.1$. Between about T+400s and T+1100s, the data show a deviation from the model, indicating a smooth re-brightening.

The WT data (91-372 seconds from trigger) can be modeled as an absorbed power-law, with photon index of $\Gamma = 1.7 \pm 0.1$ and a total absorbing column density consistent with the Galactic value of $N_H = 7.4 \times 10^{20}$ cm^{-2} (Dickey & Lockmann 1990). The 0.3-10 keV observed (unabsorbed) flux during this time is $4.4(4.9) \times 10^{-10}$ erg cm^{-2} s^{-1}.

Detailed light curves in both count rate and flux units are available in both graphical and ASCII formats at http://www.swift.ac.uk/xrt_curves/.

4 UVOT Observation and Analysis

The Swift/UVOT observed the burst GRB 071121C (Perri et al., GCN Circ. 7059) starting with the finding chart exposure in white, 92 seconds after the BAT trigger. The afterglow is detected at the UVOT position given in Perri et al. (GCN Circ. 7059) in White, V, B, U and UVW1. The afterglow decreases with an estimated temporal slope in the V-band filter of 1.28. The UVOT magnitudes and upper limits from single exposures or co-added exposures are given in Table 1. The quoted values are not corrected for the expected Galactic extinction corresponding to a reddening of $E_{B-V} = 0.119$ mag in the direction of the burst (Schlegel et al. 1998).

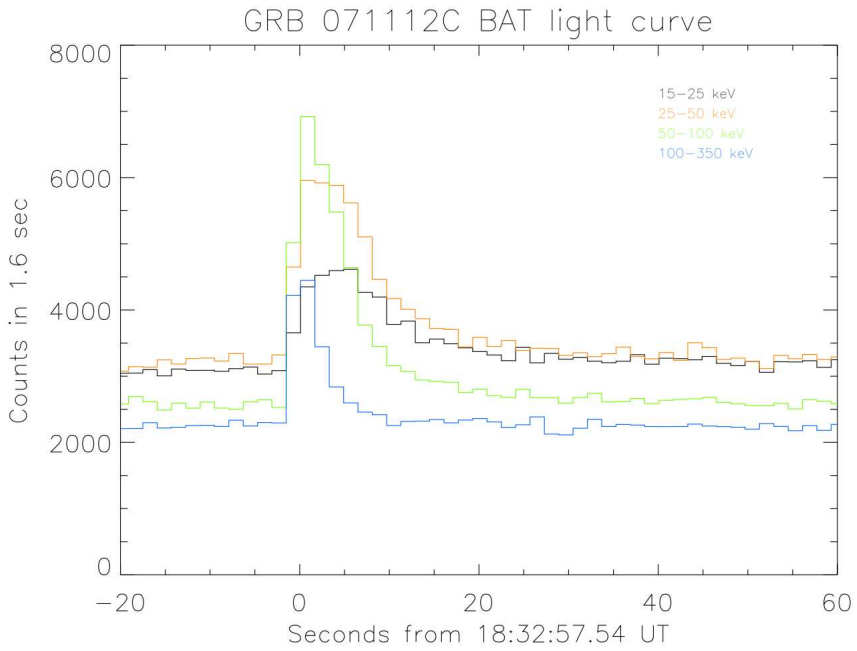

Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual energy bands.

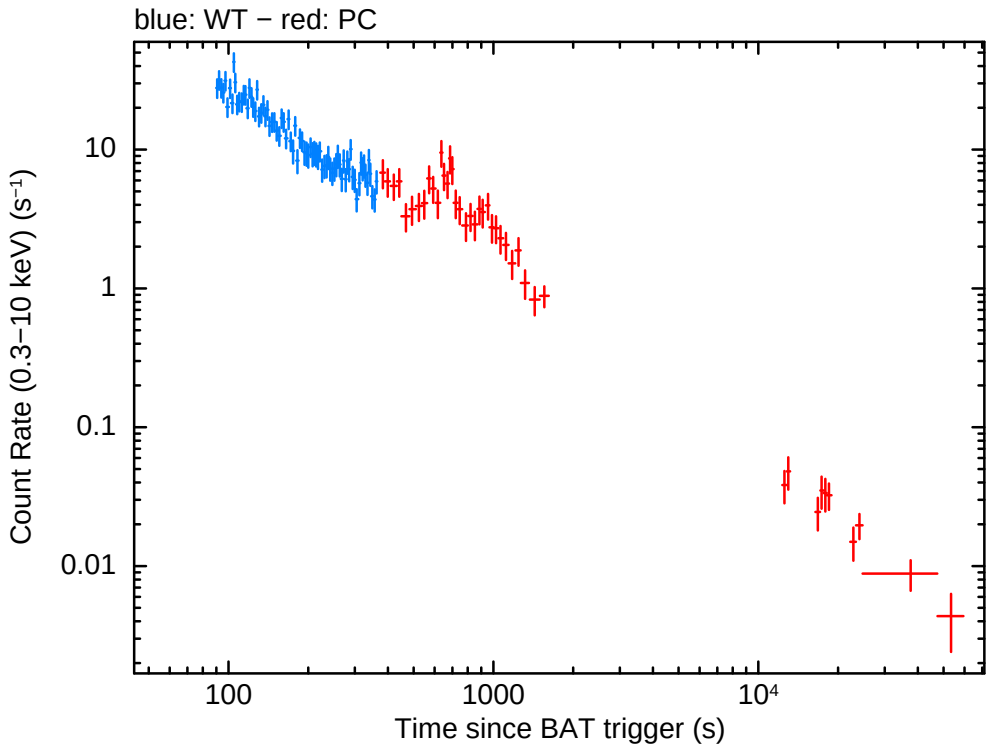

Figure 2: XRT Lightcurve. Count s^{-1} in the 0.3-10 keV band: Window Timing mode (blue), Photon Counting mode (red). The approximate conversion is 1 count $s^{-1} \sim 4.5 \times 10^{-11}$ erg cm^{-2} s^{-1}.

Filter	T_start (s)	T_stop (s)	Exp (s)	mag
White	92	192	98	17.39 ± 0.03
	859	958	98	19.0 ± 0.1
V	198	597	393	17.9 ± 0.4
	965	1364	393	19.3 ± 0.3
B	679	689	10	18.3 ± 0.4
	1444	1626	39	19.7 ± 0.5 (2.0σ)
U	654	674	19	17.8 ± 0.3
	1419	1601	39	19.3 ± 0.5 (2.0σ)
UVW1	630	649	19	17.7 ± 0.3
	1394	1576	39	19.0 ± 0.5 (2.3σ)
UVM2	605	1552	78	≥ 20.5
UVW2	708	1663	55	≥ 20.6

Table 1: magnitudes and upper limits from UVOT observations.