

1 Introduction

The Swift BAT triggered on and located GRB 121031A at 22:50:30 UT (trigger=537195) (D'Elia et al., GCN Circ. 13934). Swift slewed immediately to the burst. XRT and UVOT observations of the field started 61.9 and 70 seconds after the trigger, respectively. The best Swift position is the XRT localization at RA(J2000)= 170.77019 deg, Dec(J2000)= -3.51704 deg, RA(J2000)= 11^h23^m4.85^s, Dec(J2000)= -03^d 31' 01.3", with an error radius of 1.4 arcsec (90% confidence).

The optical afterglow was not detected by UVOT. No ground based facilities reported the detection of the optical afterglow, possibly due to a very small sun angle (46.3°). The XRT position is 1.4 arcminutes from the galaxy 2MASX J11225935-0331287, at redshift 0.1126, which has a nominal radius of 0.3 arcminutes according to NED.

2 BAT Observations and Analysis

Using the data set from $T - 61$ to $T + 243$ s (Barthelmy et al., GCN Circ. 13936), the BAT ground-calculated position is RA, Dec(J2000) = 170.772, -3.513 deg, which is RA(J2000) = 11^h23^m05.2^s Dec(J2000) = -03^d30'47.7" with an uncertainty of 1.0 arcmin, (radius, sys+stat, 90% containment). The partial coding was 100%.

The light curve (Figure 1) shows a FRED-like profile with a couple of smaller peaks superposed. It starts at $\sim T - 10$ s rising to a maximum at $\sim T + 4$ s and end at $\sim T + 100$ s. T_{90} (15 - 350 keV) is 62.5 ± 25.1 s (estimated error including systematics).

The time-averaged spectrum from $T - 2.64$ to $T + 98.31$ s is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.59 ± 0.07 . The fluence in the 15 - 150 keV band is $(3.1 \pm 0.1) \times 10^{-6}$ erg/cm². The 1-sec peak photon flux measured from $T + 4.10$ s in the 15 - 150 keV band is 2.2 ± 0.2 ph/cm²/s. All the quoted errors are at the 90% confidence level.

With an additional data set from $T - 240$ to $T - 61$ s an earlier peak was discovered at $T - 190$ s (Cummings et al., GCN Circ. 13949). The earlier peak occurred during a pre-planned slew maneuver, and its time interval was not covered by the data available at the time the first analysis was produced. The second peak is a FRED about 60 seconds long as seen in BAT. There was a small peak at $T - 50$ s of about 5 s duration. For the entire burst, T_{90} (15 - 350 keV) was 226 ± 19 s (estimated error including systematics).

The results of the batgrbproduct analysis are available at http://gcn.gsfc.nasa.gov/notices_s/537195/BA/

3 XRT Observations and Analysis

Swift-XRT began observing the field of GRB 121031A at 22:51:32 UT, 61.9 seconds after the BAT trigger (D'Elia et al., GCN Circ. 13934, Evans, GCN Circ. 13935, D'Elia, GCN Circ. 13946).

Using 4059 s of XRT Photon Counting mode data and 5 UVOT images for GRB 121031A, the astrometrically corrected X-ray position (using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue): RA(J2000)= 170.77019 deg, Dec(J2000)= -3.51704 deg,

We analyzed 9.2 ks of XRT data for GRB 121031A (D'Elia, GCN Circ 13946), from 68 s to 22.6 ks after the BAT trigger. The data comprise 276 s in Windowed Timing (WT) mode with the remainder in Photon Counting (PC) mode. The enhanced XRT position for this burst was given by Evans (GCN Circ. 13935).

The 0.3–10 keV late time ($T > 8 \times 10^3$ s) light curve (Figure 2) can be modelled with a power-law decay with a decay index of $\alpha_1 = 1.13 \pm 0.18$.

A spectrum formed from the PC mode data can be fitted with an absorbed power-law with a photon spectral index of $\Gamma = 2.33 \pm 0.10$ and a best-fitting absorption column of $N_H = 5.2 \pm 0.4 \times 10^{21}$ cm⁻², in excess of the Galactic value of $N_H = 4.0 \times 10^{20}$ cm⁻² (Kalberla et al. 2005). The counts to observed (unabsorbed) 0.3–10 keV flux conversion factor deduced from the PC spectrum is 3.9×10^{-11} (9.1×10^{-11}) erg cm⁻² count⁻¹.

All the quoted errors are at the 90% confidence level.

4 UVOT Observation and Analysis

The UVOT observed the field of GRB 121031A settling 70 s after the BAT trigger (Oates & D'Elia, GCN Circ. 13947).

No optical afterglow consistent with the enhanced XRT position (Evans, GCN Circ. 13935) is detected in the initial UVOT exposures. Preliminary 3-sigma upper limits for detecting a source in the finding charts and in the following exposures are listed in Table 1. The quoted upper limits have not been corrected for the expected Galactic extinction along the line of sight corresponding to a reddening of $E_{(B-V)} = 0.05$ mag (Schlegel, et al., 1998, ApJS, 500, 525). All photometry is on the UVOT photometric system described in Breeveld et al. (2011, AIP Conf. Proc. 1358, 373).

Filter	T_start (s)	T_stop (s)	Exp (s)	Mag
white (fc)	70	220	147	> 19.9
white	5366	7002	393	> 20.5
v	5776	11730	787	> 19.4
b	5161	18152	492	> 20.0
u	16939	17239	295	> 19.5
uvw1	4751	16932	1279	> 20.5
m2	4545	22572	1870	> 21.1
uvw2	5572	11120	1082	> 20.8

Table 1: 3-sigma upper limits from UVOT observations.

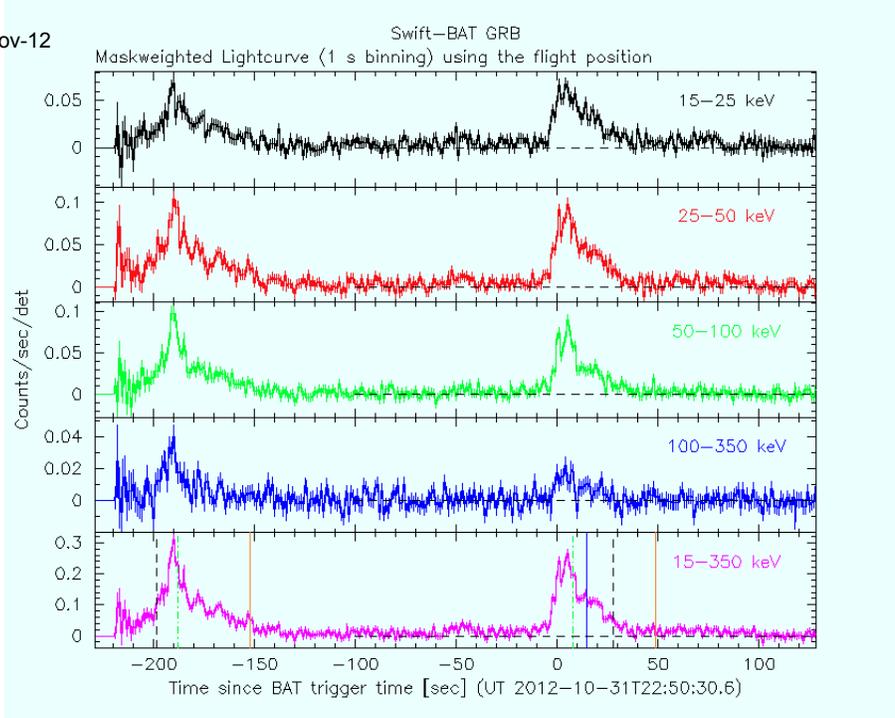


Figure 1: BAT light-curve. The mask-weighted light curve in the 4 individual plus total energy bands. Green dashed lines: T_{90} . Black: Slew start/stop. The units are counts s^{-1} illuminated-detector $^{-1}$ (note illum-det = 0.16 cm^2).

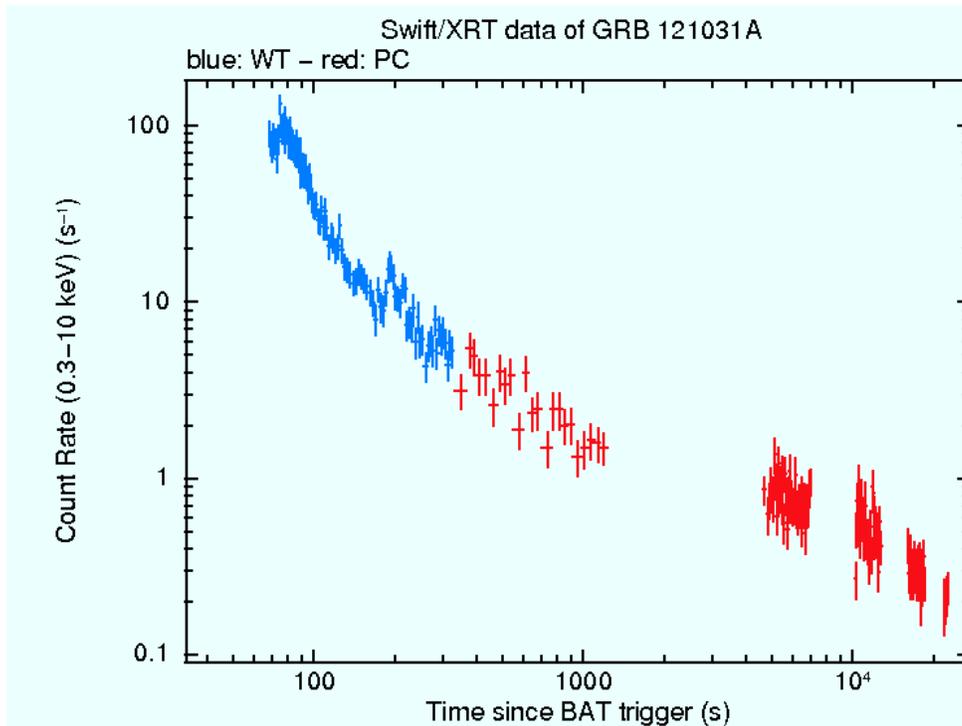


Figure 2: XRT Light curve. Count rate in the 0.3 - 10 keV band is plotted with Window Timing (WT) Settling data in light blue, WT mode data in blue and Photon Counting (PC) mode data in red. The approximate conversion is $1 \text{ count/s} \sim 9.9 \times 10^{-11} \text{ erg cm}^{-2} \text{ s}^{-1}$.