Swift Observations of GRB 101201A

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1 Introduction

GRB 101201A was discovered during the ground analysis of BAT data. The burst was detected by Swift-BAT at 10:01:48 (triggers 439595-6, Cummings *et al.*, *GCN Circ.* 11429) and at 10:01:49.74 UT by Fermi GBM (trigger 312890511, Foley, *GCN Circ.* 11434). After the detection, Swift began a Target of Opportunity observation to locate the X-ray and optical afterglow of the burst. XRT and UVOT began follow up observations at $T+51.2$ ks (about 14 h after the burst). Our best position is enhanced XRT position (using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue): RA(J2000) = 1.96750 *deg* (00^h 07^m 52.21^s) Dec(J2000) = -16.18540 *deg* (-16^d $11'$ $07.4"$) with an uncertainty of 1.9 arcsec (radius, 90% confidence, Mangano *et al.*, *GCN Circ.* 11433).

The field of GRB 101201A has been observed in the Optical/NIR with GROND mounted at the 2.2 m MPI/ESO telescope at La Silla Observatory (Chile). The position of the GROND optical counterpart has been published in Guelbenzu *et al.*, *GCN Circ.* 11430.

2 BAT Observation and Analysis

At 10:01:48, Swift-BAT detected GRB 101201A (BAT triggers 439595-6, Fermi GBM 312890511). There was no source found onboard. A strong source was found in ground analysis at RA(J2000) = 1.955 *deg* (00^h 07^m 49^s) Dec(J2000) = -16.196 *deg* (-16^d 11^m 46^s) with an estimated uncertainty radius of 2 arcmin (90% containment). This point is 1.8 degrees from the GBM position, within the GBM error circle. It was about 3% coded. The burst was about 50 seconds long, with 3 overlapping peaks. The available BAT event-by-event data cover most of the second peak.

3 XRT Observations and Analysis

The whole Swift-XRT dataset for GRB 101201A (triggers 439595-6, Cummings *et al.*, *GCN Circ.* 11429), consists of 5 ks of data from 51.2 ks to 69.7 ks after the BAT trigger. The data are entirely in Photon Counting (PC) mode. Using 3879 s of PC mode data and 3 UVOT images, we find an enhanced XRT position (using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue): RA(J2000), Dec(J2000) = 1.96750, -16.18540 which is equivalent to:

RA(J2000) = 00^h 07^m 52.21^s
Dec(J2000) = -16^d $11'$ $07.4"$

with an uncertainty of 1.9 arcsec (radius, 90% confidence, Mangano *et al.*, *GCN Circ.* 11433).

The $0.3-10$ keV XRT light curve (Fig.1) can be modelled with a power-law decay with a decay index of 2.04 ± 0.6.

A spectrum formed from the PC mode data can be fitted with an absorbed power-law with a photon spectral index of $2.4^{+0.7}_{-0.6}$. The best-fitting absorption column is $8^{+14}_{-6} \times 10^{20}$ cm^{-2}, consistent with the Galactic value of 2.2×10^{20} cm^{-2} (Kalberla *et al.*, 2005). The counts to observed (unabsorbed) $0.3-10$ keV flux conversion factor deduced from this spectrum is 3.2×10^{-11} (4.6×10^{-11}) erg cm^{-2} s^{-1}.

The results of the XRT-team automatic analysis are available at
http://www.swift.ac.uk/xrt_products/00020152.

4   UVOT Observation and Analysis

The Swift/UVOT began observations of the field of GRB101201A approximately 14 hours after the
BAT detection (Cummings *et al.*, *GCN Circ.* 11429). UVOT observations confirm the uncataloged
source reported in Guelbenzu *et al.*, *GCN Circ.* 11430 and find evidence of fading (Siegel *et al.*, *GCN
Circ.* 11431).

Magnitudes for the white, u, and v optimally co-added exposures are given in the following Table 1
where T_{start} and T_{stop} are the start and stop time of the observation.

Filter	T_{start}(s)	T_{stop}(s)	Exp(s)	Magnitude
white	52065	52087	21	20.01±0.38
white	57847	58387	531	20.26±0.1
white	63689	64500	798	20.25±0.09
white	69470	69677	204	20.46±0.18
white	104535	105176	631	21.27±0.2
white	109884	110733	836	20.92±0.13
white	116554	116975	415	21.6±0.32
u	51218	52058	827	19.60±0.13
u	57000	57840	826	19.97±0.17
u	62871	63682	798	19.73±0.14
u	68654	69464	797	20.19±0.2
u	103888	104525	631	20.66±0.28
u	109029	109878	835	20.38±0.24
u	114809	115057	243	>20.00
u	116126	116548	415	>20.86
u (last two summed)	114809	116548	658	>20.87
v	64507	64566	58	>18.98
v (summed)	105183	117249	1826	20.81 ± 0.31

Table 1: Magnitudes from UVOT observations

The above magnitudes are not corrected for the Galactic extinction corresponding to a reddening of
E(B-V) = 0.05 (Schlegel et al., 1998, ApJS, 500, 525). The photometry is on the UVOT photometric
system described in Poole et al. (2008, MNRAS, 383, 627).

The uvot light curves normalized together are shown in figure 2. The overall power-law decay has a
slope of 1.45±0.15.
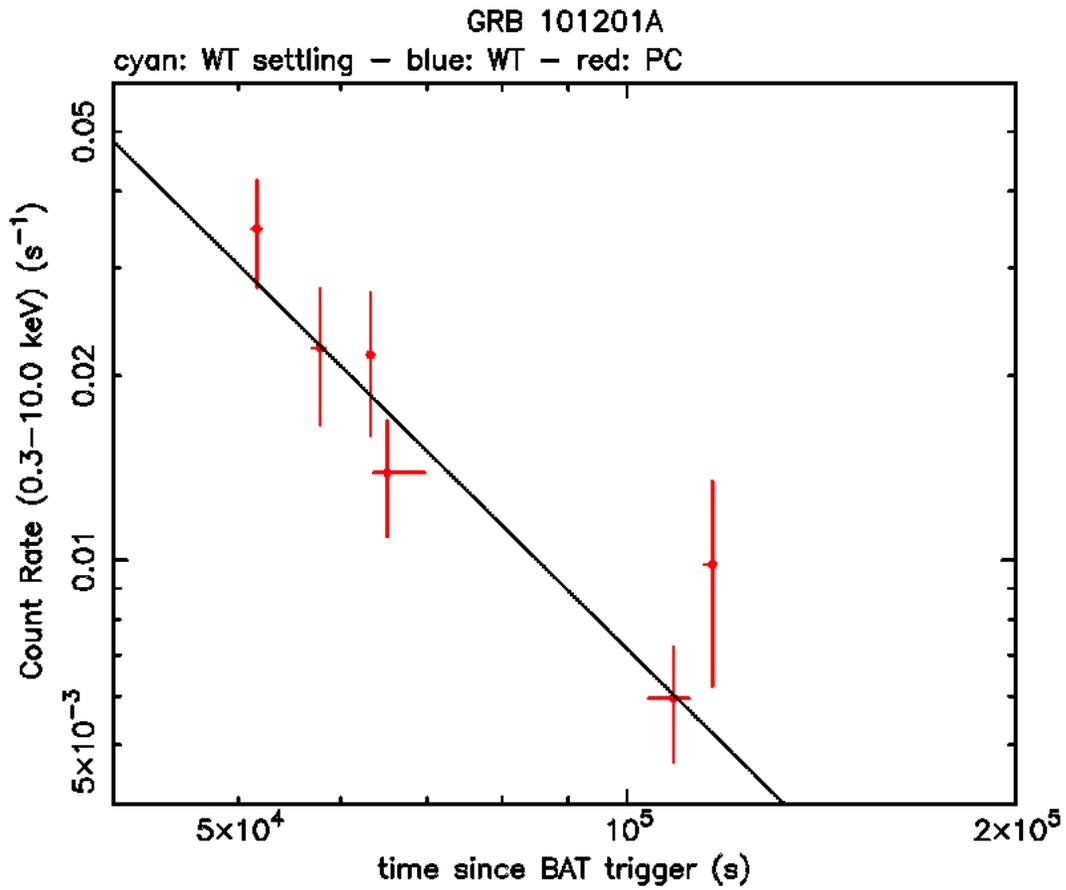
Figure 1: XRT Light curve. Counts/s in the $0.3-10$ keV band in Photon Counting mode (red). The approximate conversion is 1 count/s $= \sim 4.6 \times 10^{-11}$ erg cm^{-2} s^{-1}.
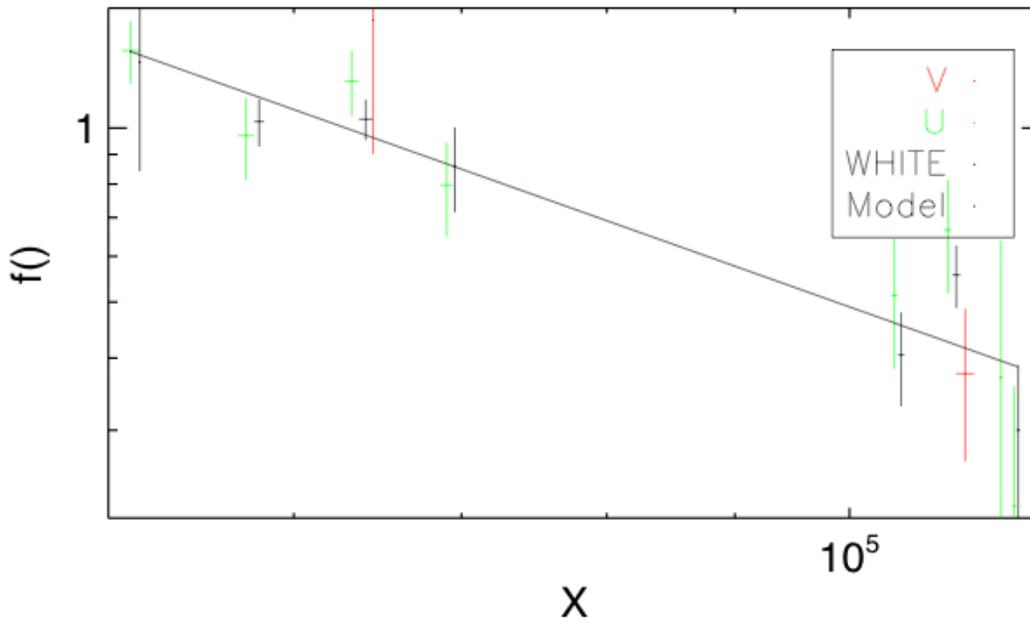
Figure 2: UVOT light curves. Upper limits from Table 1 are not included.