Swift Observation of GRB 081011

D. Grupe (PSU), P. Schady (MSSL-UCL), T. Sakamoto (NASA/UMBC), E.A. Hoversten (PSU), P.A. Evens (U Leicester), F.E. Marshall (NASA/GSFC), J.A. Kennea (PSU), S. Holland (NASA/GSFC), S. D. Barthelmy (GSFC), D.N. Burrows (PSU), P. Roming (PSU), and N. Gehrels (NASA/GSFC) for the Swift Team

1 Introduction

At 00:28:50 UT on 2008 October 11, the Swift Burst Alert Telescope (BAT) triggered on GRB 081011 (Grupe et al. *GCN Circ.* 8355). *Swift* slewed promptly and the *Swift* XRT and UVOT began observing the field of GRB 081011 94 s after the burst. Because the X-ray source was outside the inner 200x200 pixel XRT window, the X-ray afterglow was not detected initially. The best *Swift* position of the afterglow is from the UVOT at RA (J2000) =14h 4m 22.627s, Dec (J2000) = +33°32′37.12"

2 BAT Observation and Analysis

At 00:28:50 UT on 2008 October 11, the Swift BAT triggered on GRB 081011 (trigger #331332). The BAT ground-calculated position is RA, Dec = 220.363, +33.548 deg (Sakamoto et al. *GCN Circ.* 8357), which is

RA(J2000) = 14h 41m 27.2s

Dec(J2000) = +33°32′54.4″

with an uncertainty of 2.3′ (radius, 90% containment, including systematic uncertainty). The partial coding was 100%. The mask-weighted light curve shows two peaks around T+2 and T+9s. There is a hint of weak extended emission until T+60s. T_{90} (15-350 keV) is 9±2 s (estimated error including systematics).

The time-averaged spectrum from T-0.9 to T+9.0 s is best fit by a single power-law model. The photon index of the time-averaged spectrum is Γ=1.47±0.28 (χ^2/ν=63/57). The fluence in the 15-150 keV band is $(1.6\pm0.3)\times10^{-7}$ ergs cm^{-2}. The 1s peak photon flux measured from T+1.06 s in the 15-150 keV band is (0.4±0.1) photons cm^{-2} s^{-1}. A The results of the batgrbproduct analysis are available at http://gcn.gsfc.nasa.gov/notices_s/331332/BA/

3 XRT Observations and Analysis

The XRT began observing the field of GRB 081011 at 00:30:24.4 UT, 93.3 seconds after the BAT trigger. In the ground-processed data, XRT found a fading, uncatalogued X-ray source. The enhanced *Swift*-XRT position as reported by Goad al. (*GCN Circ.* 8380) is RA (J2000) = 220.34404, Dec (J2000) = +33.54332 which is equivalent to:

RA (J2000): 14h 41m 22.57s

Dec (J2000): +33° 32′ 35.9″

with an uncertainty of 1.5″ (radius, 90% confidence). This position is 5.3″ away from the initial XRT position given in Kennea & Grupe (*GCN Circ.* 8358), consistent with that position.

The $0.3 - 10$ keV light curve (Fig.2) starts at a level of 7×10^{-11} ergs s^{-1} cm^{-2} (1.8 XRT counts s^{-1}) with an initial decay slope of α_1=1.20$\pm$0.23. The light curve breaks at about T+4$\pm$2ks and flattens to α_2=0.24$\pm$0.17. Due to the proximity to the sun constraint, it was decided to cancel the observations of this burst after the first day.

As reported by Grupe (*GCN Circ.* 8385), the XRT Photon Counting mode data can be modeled by an absorbed single power-law with photon index $\Gamma = 2.04 \pm 0.13$ and an absorbing column density consistent with the Galactic value (1.04×10^{20} cm^{-2}; Kalberla et al. 2005).

4   UVOT analysis

UVOT took a finding chart exposure of 150 s in White starting 98 s after the BAT trigger. The analysis of the full UVOT data set (Schady & Grupe, *GCN Circ.* 8359) shows an the optical afterglow detected in the UVOT White, b, and u filters. The position of this source in the coadded b filter is

RA (J2000) = 14h 41m 22.627s

Dec (J2000) = +33° 32′ 37.12″

corresponding to RA-2000=220.34428, Dec-2000=+33.54364 with an estimated 90% confidence radius of 0.9″. This position is consistent with the position of the X-ray afterglow. The detection in u suggests a redshift z<~3.8. The magnitudes and 3σ upper limits in the UVOT photometric system (Poole et al. 2008, MNRAS, 383, 627) for detecting the source are listed in Table 1. No correction has been made for the expected extinction corresponding to E(B-V) of 0.01 (Schlegel et al., 1998).
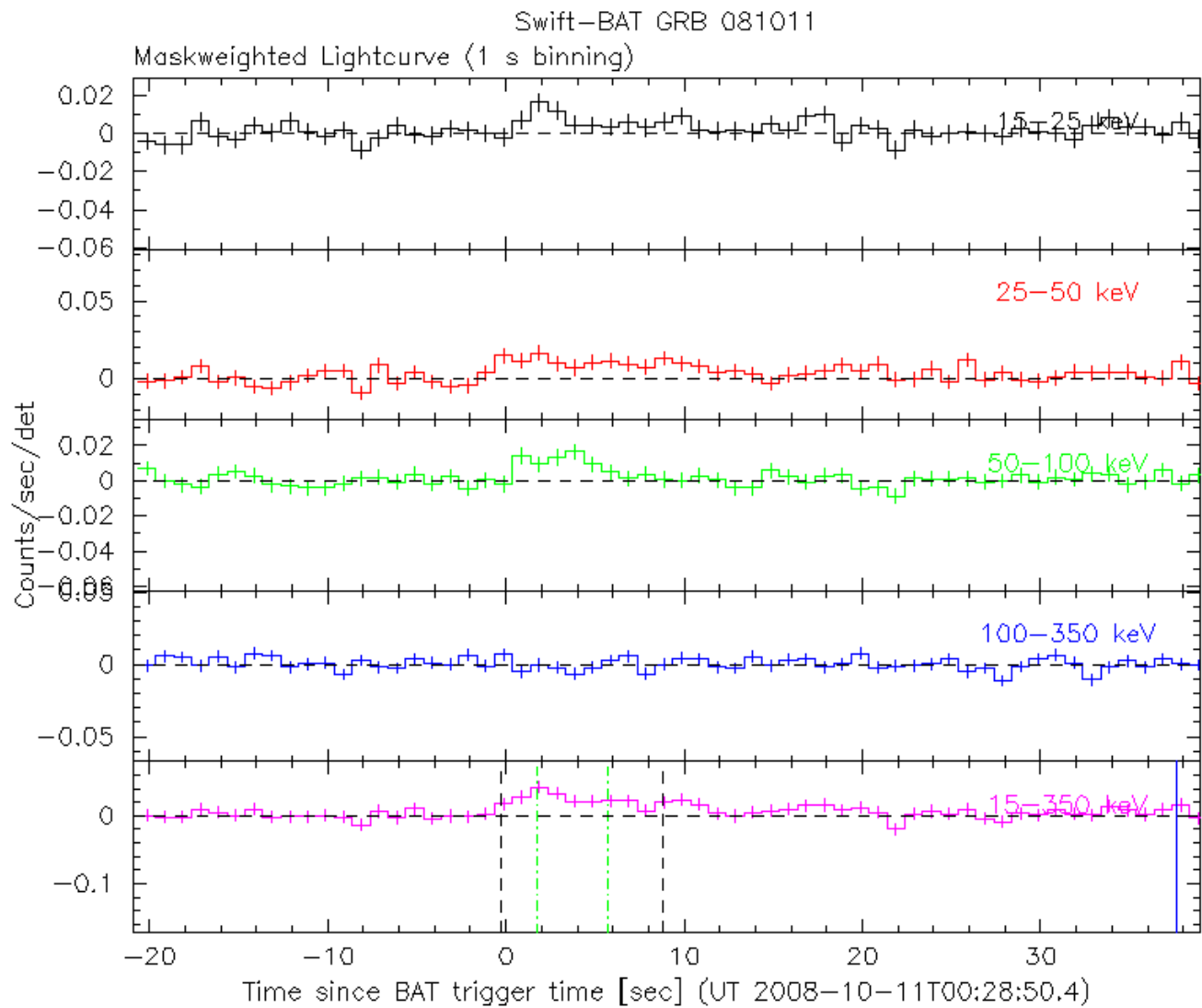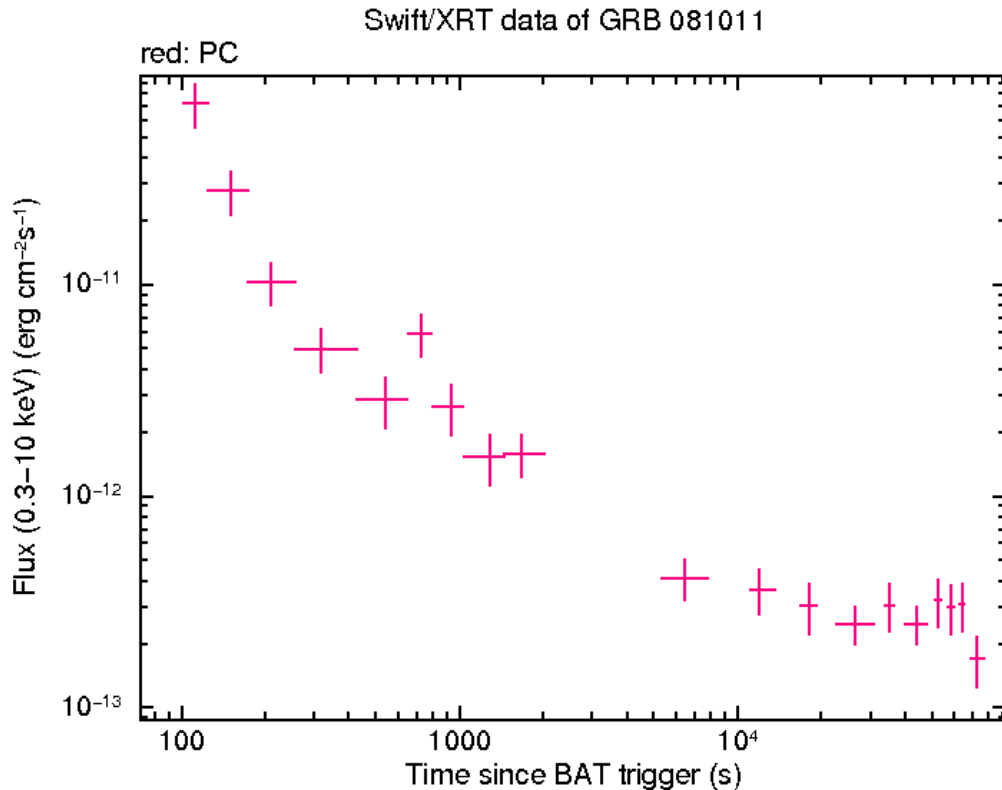
Figure 1: BAT Light curves of GRB 081011.

Figure 2: XRT flux light curve in the 0.3-10 keV band. The approximate conversion is 1 count s^{-1} = $\sim 2.2 \times 10^{-11}$ $ergs$ $s^{-1}cm^{-2}$ for an observed flux.

Filter	T_{Start}	T_{stop}	Exposure	Mag
white (FC)	99	249	145.8	19.25±0.08
white	537	1878	283.5	2033±0.13
u (FC)	297	507	245.8	18.62±0.10
u	660	2003	155.6	19.91>0.30
v	586	7371	548.8	>20.29
b	512	6756	351.4	21.13±0.39
uvw1	636	7781	548.8	>20.96
uvm2	611	7576	548.9	>20.74
uvw2	562	7167	548.8	>21.06

Table 1: Magnitude from UVOT observations of GRB 081011