

Swift Observation of GRB 080320

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1 Introduction

At 04:27:38 UT on 2008 March 20, the Swift Burst Alert Telescope (BAT) triggered on GRB 080320 (Grupe et al. *GCN Circ.* 7473). The *Swift* XRT and UVOT began observing the field of GRB 080320 171 s after the burst. The burst was clearly detected in the XRT. The best *Swift* position of the afterglow is the XRT position at RA-2000 = 11h50m56.46s , Dec-2000 = +57°09'26.8".

2 BAT Observation and Analysis

At 04:37:38 UT on 2008 March 20, the Swift BAT triggered on GRB 080320 (trigger #306858). The BAT ground-calculated position is RA, Dec = 177.763, +57.162 deg (McLean et al. *GCN Circ.* 7505), which is

$$\text{RA(J2000)} = 11\text{h } 51\text{m } 03.1\text{s}$$

$$\text{Dec(J2000)} = +57^\circ 09' 42.6''$$

with an uncertainty of 1.8' (radius, 90% containment, including systematic uncertainty). The partial coding was 93%. The mask-weighted light curve shows a FRED peak starting at T-5 s, peaking at T+0, and ending at T+35 s. There a possible (3σ) precursor peak at T-55 s with a width of about 5 s. T_{90} (15-350 keV) is 14 ± 2 s (estimated error including systematics).

The time-averaged spectrum from T-1.7 to T+13.8 s is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.70 ± 0.22 . The fluence in the 15-150 keV band is $(2.7 \pm 0.4) \times 10^{-7}$ ergs cm^{-2} . The 1s peak photon flux measured from T-0.15 s in the 15-150 keV band is (0.6 ± 0.1) photons $\text{cm}^{-2} \text{s}^{-1}$. All the quoted errors are at the 90% confidence level. The results of the batgrbproduct analysis are available at http://gcn.gsfc.nasa.gov/notices_s/306858/BA/

3 XRT Observations and Analysis

The XRT began observing the field of GRB 080320 at 04:40:29.4 UT, 171 seconds after the BAT trigger. XRT found a fading, uncatalogued X-ray source. The enhanced *Swift*-XRT position as reported by Goad al. (*GCN Circ.* 7479) is RA-2000 = 177.73526, Dec-2000 = +57.15746 which is equivalent to:

$$\text{RA (J2000): } 11\text{h } 50\text{m } 56.46\text{s}$$

$$\text{Dec (J2000): } +57^\circ 09' 26.8''$$

with an uncertainty of 1.7" (radius, 90% confidence).

The 0.3 – 10 keV light curve (Fig.2) starts with three flares up to 12 counts s^{-1} . The afterglow

decays very fast and started to flatten at the end of the first orbit about 1000 s after the burst with a decay slope $\alpha = 0.70_{-0.04}^{+0.05}$. After this plateau phase the light curve breaks again at 95 ± 10 ks and continues to decay with $\alpha = 1.24_{-0.08}^{+0.09}$.

As reported by Grupe (*GCN Circ.* 7494), the XRT Photon Counting mode data can be modeled by an absorbed power-law with photon index $\Gamma = 1.96 \pm 0.20$ and a free-fit absorbing column of $N_{\text{H}} = (6.9 + 4.0)^{20} \text{ cm}^{-2}$ which is slightly in excess of the Galactic value ($1.35 \times 10^{20} \text{ cm}^{-2}$; Kalberla et al. 2005).

4 UVOT analysis

UVOT took a finding chart exposure of 100 seconds with the White (160-650 nm) filter starting 177 s after the BAT trigger. No afterglow candidate has been found in the initial data products. The $2.7' \times 2.7'$ sub-image covers 25% of the BAT error circle but does not overlap the XRT error circle. The typical 3-sigma upper limit has been about 18.5 mag. The $8' \times 8'$ region for the list of sources generated on-board covers 100% of the BAT error circle. The list of sources is typically complete to about 18 mag. No correction has been made for the expected extinction corresponding to $E(B-V)$ of 0.01.

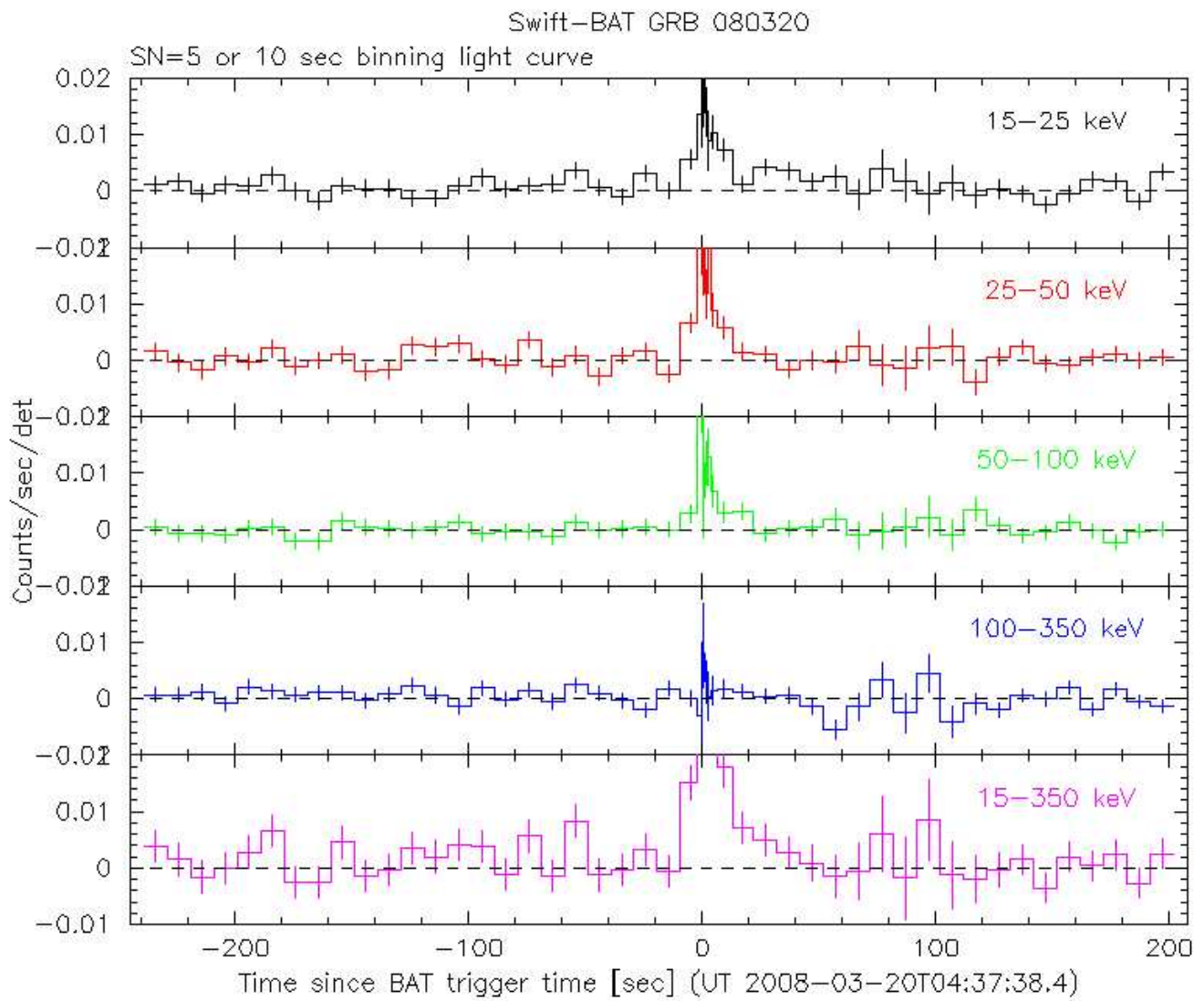


Figure 1: BAT Light curves of GRB 080320.

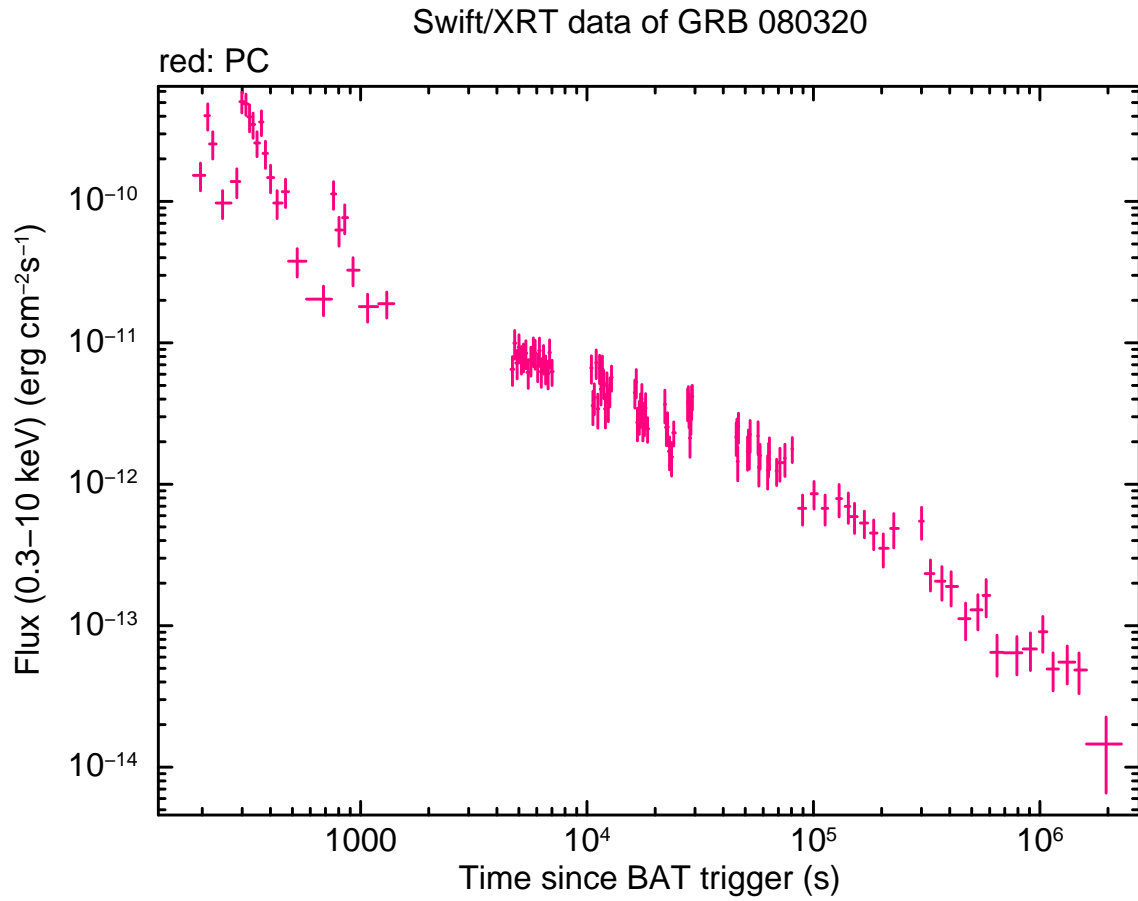


Figure 2: XRT flux light curve in the 0.3-10 keV band. The approximate conversion is $1 \text{ count s}^{-1} = \sim 4.22 \times 10^{-11} \text{ ergs s}^{-1} \text{ cm}^{-2}$ for an unabsorbed flux corrected for photon pileup (Grupe et al. *GCN Circ.* 7494)