

## Swift Observation of Possible GRB 080315

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### 1 Introduction

BAT triggered on the possible GRB 080315 at 02:25:01 UT (Trigger 306323; Page et al., GCN Circ. 7416). This was a 64 second image trigger and, although Swift slewed immediately to the burst, no XRT or UVOT source was identified onboard. Considering the entire  $\sim 25$  ks observation, there is a possible XRT counterpart, but, with the limited statistics, it is not possible to determine whether the source is fading. Thus, the best certain position is that from BAT ground analysis:  $RA(J2000) = 10^h 20^m 29.8^s$ ,  $Dec(J2000) = +41^\circ 42' 3.6''$  with an error radius of 3.3 arcmin (90% confidence, systematic+statistical).

It is unusual, but not unprecedented, for there to be no XRT detection of a Swift-detected long burst. Among previous BAT triggers of long GRBs with prompt slews, XRT finds an afterglow approximately 98% of the time. Given the possible XRT non-detection and the faintness of the BAT source, it is not possible to tell whether this trigger is a statistical fluctuation or a real burst.

### 2 BAT Observation and Analysis

The source is detected at  $7.1\sigma$  in the BAT 15–50 keV energy band, at a ground-calculated position of

$$\begin{aligned} RA(J2000) &= 155.124^\circ = 10^h 20^m 29.8^s \\ Dec(J2000) &= +41.701^\circ = +41^\circ 42' 3.6'' \end{aligned}$$

with an uncertainty of 3.3 arcmin (radius, systematic+statistical, 90% containment). The partial coding was 98%.

The mask-weighted light curve (Figure 1) shows a single smooth bump starting at  $\sim T-5$  s and ending at  $\sim T+65$  s. It appears only in the 15–50 keV band.  $T_{90}$  (15–350 keV) is  $65 \pm 5$  s (estimated error including systematics).

The time-averaged spectrum from  $T+0.0$  to  $T+64.0$  s is best fitted by a simple power-law model. The power-law index of the time-averaged spectrum is  $2.51 \pm 0.59$ . The fluence in the 15–150 keV band is  $(1.4 \pm 0.5) \times 10^{-7}$  erg  $\text{cm}^{-2}$ . The 1-second peak photon flux measured from  $T+0.00$  s in the 15–150 keV band is  $0.04 \pm 0.01$  ph  $\text{cm}^{-2} \text{s}^{-1}$ . All the quoted errors are at the 90% confidence level.

### 3 XRT Observations and Analysis

In 25 ks of Photon Counting mode data, starting 136 s after the BAT trigger, a weak source is detected within the BAT error circle (Barthelmy et al. GCN Circ. 7420) at a count rate of  $(9.0 \pm 2.6) \times 10^{-4}$  count  $\text{s}^{-1}$ . The coordinates of this source are

$$\begin{aligned} RA(J2000) &= 155.0856^\circ = 10 20 20.55 \\ Dec(J2000) &= +41.6847^\circ = +41 41 04.8 \end{aligned}$$

with an estimated uncertainty of 5 arcsec (90% containment). It is not possible to determine whether this source is fading because of the limited statistics. With the exception of this source, the 3-sigma upper limit within the BAT error circle is  $5.2 \times 10^{-4}$  count  $\text{s}^{-1}$ .

Figure 2 shows the XRT field of view, with positions of sources and error circles marked. The yellow

circle indicates the possible afterglow.

## 4 UVOT Observation and Analysis

The Swift UVOT observed the field of GRB 080315 starting 125 s after the BAT trigger (Page et al., GCN Circ. 7416). No source was found in any of the individual or co-added exposures, either within the BAT error circle or at the location of the weak source detected by XRT (Barthelmy et al. GCN Circ. 7420).

The upper limits given in Table 1 have not been corrected for the expected Galactic extinction along the line of sight, corresponding to a reddening of  $E(B-V) = 0.01$  mag. All photometry is on the UVOT flight system described in [1].

## References

- [1] Poole, T.S. et al., 2008, MNRAS, 383, 627

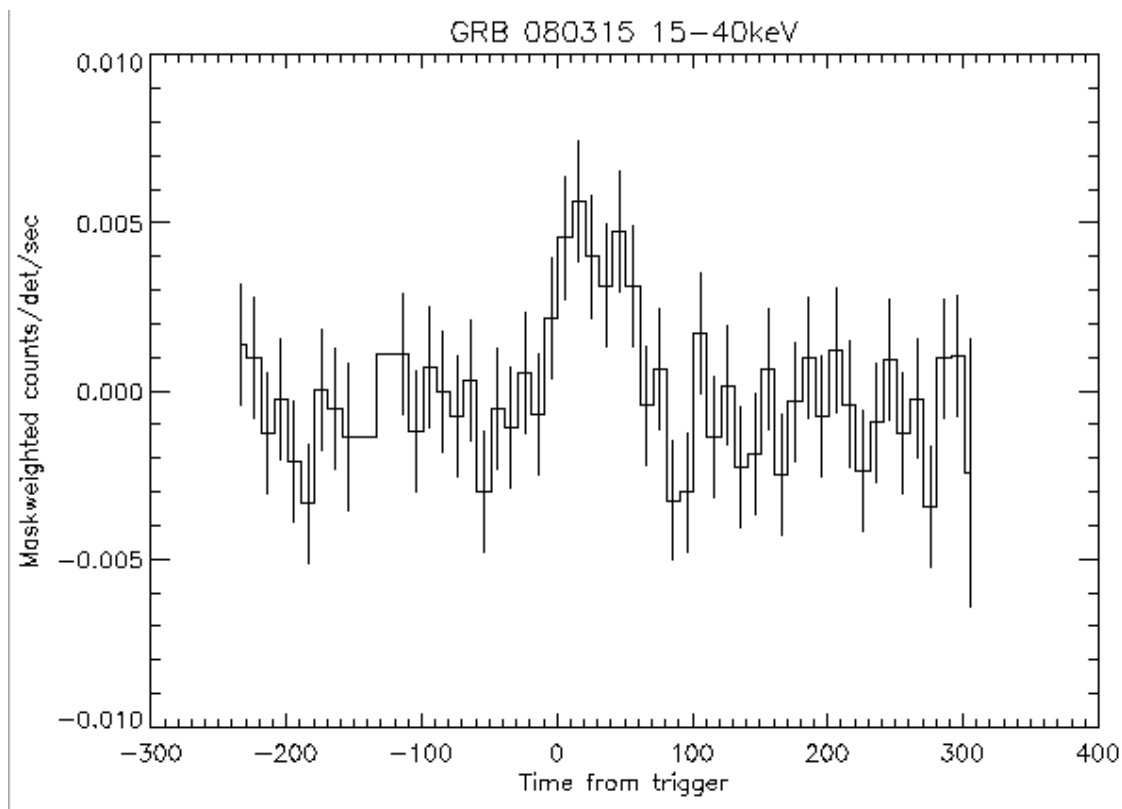


Figure 1: The BAT mask-weighted light-curve over 15-40 keV. The units are  $\text{count s}^{-1}$  (illuminated-detector) $^{-1}$ . Note illum-det =  $0.16 \text{ cm}^2$  and  $T_0$  is 02:25:01 UT.

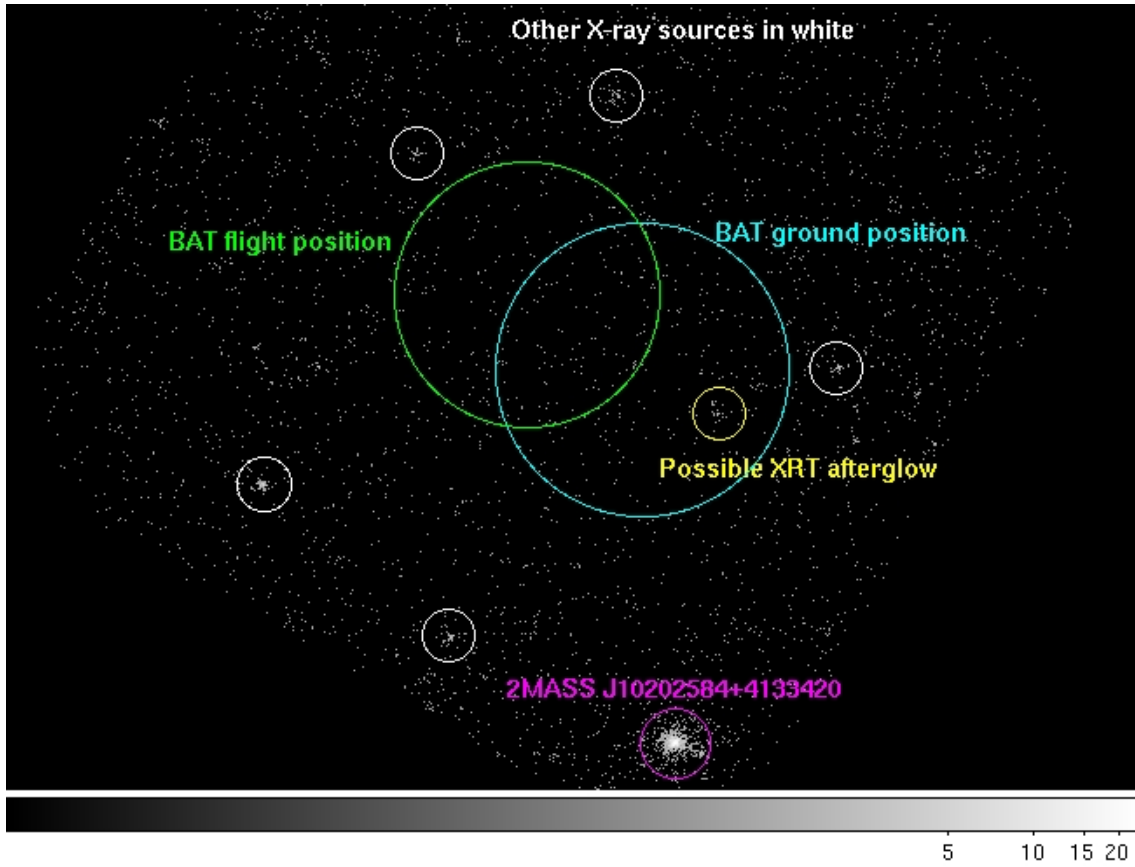


Figure 2: XRT field of view. The BAT error circles and possible X-ray sources are marked. The 2MASS source is a known QSO.

| Filter | Start | Stop  | Exposure | $5 \sigma$ UL |
|--------|-------|-------|----------|---------------|
| v      | 127   | 42160 | 6078.4   | > 20.79       |
| b      | 608   | 40422 | 5815.6   | > 21.84       |
| u      | 582   | 7467  | 620.7    | > 20.30       |
| uvw1   | 558   | 7281  | 468.7    | > 19.82       |
| uvm2   | 533   | 7075  | 858.7    | > 20.00       |
| uvw2   | 113   | 41328 | 5847.3   | > 21.63       |

Table 1: Magnitude limits from the UVOT observation