# Swift Observation of GRB 090827

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## 1 Introduction

BAT triggered on GRB 090827 at 19:06:26 UT (Trigger 361029; Target ID 020110) (Cummings, *et al.*, *GCN Circ.* 9846). While no source was found by the automatic detection algorithm onboard Swift, a source was found later in ground analysis of BAT event data. This burst also triggered Konus-Wind (Golenetskii, *et al.*, *GCN Circ.* 9848) and INTEGRAL-SPI-ACS (V. Pal'shin, private communication). ToO observations were requested and Swift XRT and UVOT observations began 25hrs after the BAT trigger. A source was detected by the XRT, but no new source was detected by UVOT (Evans & Oates, *GCN Circ.* 9847). Our best position is the XRT location RA($J2000$) = 18.4495 *deg* ($01h$ $13m$ $44.4s$), Dec($J2000$) = $-50.8957$ *deg* ($-50d$ $53'$ $44.0''$) with an error of 6.4 arcsec (radius, 90% containment).

## 2 BAT Observation and Analysis

The BAT position is RA($J2000$) = 18.435 *deg* ($01h$ $13m$ $44.4s$), Dec($J2000$) = $-50.899$ *deg* ($-50d$ $53'$ $58.0''$) with an uncertainty radius of 2.8 arcmin (estimated 90% containment, stat+sys). The burst consisted of a single pulse of 7 seconds. The source was 3% coded.

Because of the extreme partial coding, the spectral parameters can be defined only poorly. The spectrum is best fit by a simple power-law relation. The photon index is $1.0 \pm 0.3$. The fluence was $(4 \pm 2) \times 10^{-6}$ ergs/cm$^2$. The errors are estimated 1-sigma.

## 3 XRT Observations and Analysis

The Swift-XRT initially observed the field of GRB 090827 from T0+92 ks to T0+122 ks, gathering 7.1 ks of Photon Counting (PC) mode data. Inside the BAT error circle we found a single, uncatalogued source at a location of RA($J2000$) = 18.4495 *deg* ($01h$ $13m$ $44.4s$), Dec($J2000$) = $-50.8957$ *deg* ($-50d$ $53'$ $44.0''$) with an error of 6.4 arcsec (radius, 90% containment). There were only 14 counts detected from this source, giving it a count rate of $(3 \pm 1) \times 10^{-3}$ ct/sec. A spectrum formed from all available data can be well fitted using an absorbed power law, with a photon index of $1.6^{+0.9}_{-0.8}$ and an absorption column density consistent with the Galactic value of $1.6 \times 10^{20}$cm$^{-2}$ (Kalberla, et al., 2005).

Subsequent XRT observations were carried out on 2009 September 9th and 13th, 13 and 17 days after the trigger respectively. The XRT gathered 14 ks of Photon Counting mode data in this time. The source mentioned above was not detected in this time, with a 3-sigma upper limit of $8.6 \times 10^{-4}$ count s$^{-1}$, significantly below the level of the previous detection. We thus conclude that this source was the afterglow of GRB 090827. A light curve of the observations can be seen in Fig. 1.

The results of the automatic analysis of the XRT data are available at:
http://www.swift.ac.uk/xrt_products/00020110

## 4 UVOT Observation and Analysis

The Swift-UVOT began settled observations of the field 91.6 ks after the BAT trigger. We do not detect any source at the XRT position.

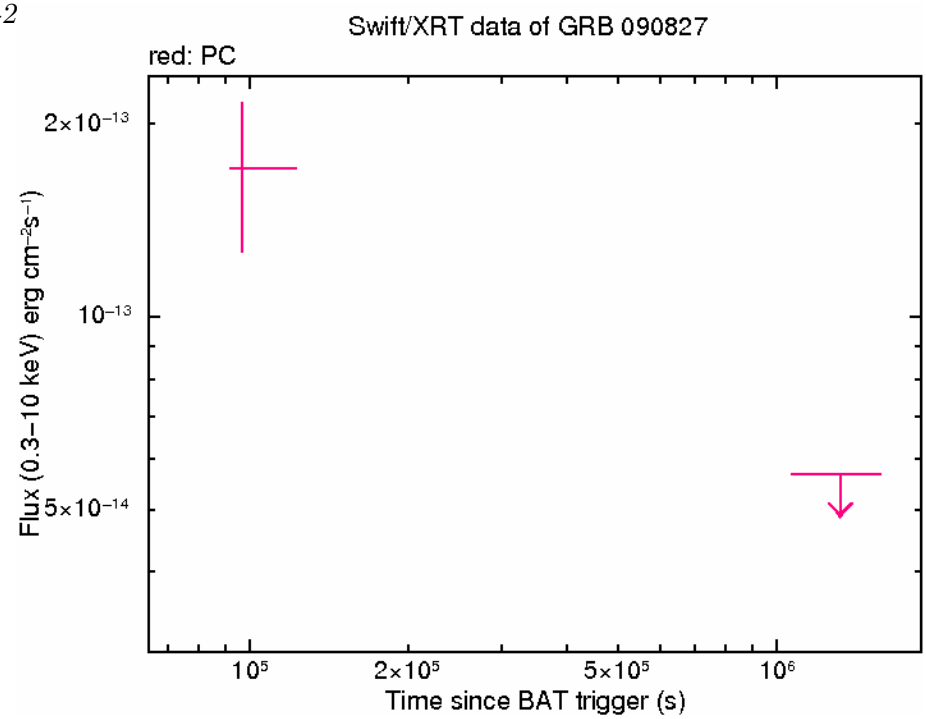


Figure 1: XRT light curve in the 0.3-10 keV band. The counts-to-flux conversion factor is 1 count = $6.7 \times 10^{-11}$erg cm$^{-2}$ s$^{-1}$.

The $3\sigma$ upper limit in the UVOT photometric system (Poole, *et al.*, 2008) for detecting a source in the u finding chart exposure is given in Table 1.

| Filter | Start (s) | Stop (s) | Exposure (s) | $3\sigma$ UL |
|---|---|---|---|---|
| u | 91644 | 120333 | 5671 | >21.94 |

Table 1: Magnitude limit from UVOT observations. The values quoted above are not corrected for the expected Galactic extinction corresponding to a reddening of E(B-V) = 0.01 mag in the direction of the burst (Schlegel, Finkbeiner & Davis, 1998).