

## Swift Observation of GRB 071025

*C. Pagani (PSU), J.L. Racusin (PSU), N.P.M. Kuin (MSSL/UCL), S.T. Holland (CRESST/USRA/GSFC), S.D. Barthelmy (GSFC), N. Gehrels (GSFC) for the Swift Team*

### 1 Introduction

BAT triggered on GRB 071025 at 04:08:54 UT (Trigger 295301) (Pagani, *et al.*, *GCN Circ.* 6986). This was a 64 seconds image-trigger on a burst with  $T_{90} \Rightarrow 109 \pm 2 \text{ sec}$ . Swift slewed immediately to the burst. The XRT imaged the field at 04:11:19 UT, 146 seconds after the BAT trigger. Due to the Earth constraint, Swift had to slew off the burst location 422 seconds after the trigger, so there is no information on the continuation of the emission beyond the  $T+422$  seconds limit. The UVOT started observing the field 155 seconds after the BAT trigger with a 100 seconds white filter exposure and no afterglow candidate was found.

### 2 BAT Observations and Analysis

Using the data set from  $T-239$  to  $T+422 \text{ sec}$  further analysis of BAT GRB 071025 has been performed by the Swift team (Barthelmy, *et al.*, *GCN Circ.* 6996).

The BAT ground-calculated position is  $RA(J2000) = 355.065deg$ ,  $Dec(J2000) = 31.784deg$ , which is  $RA(J2000) = 23h40m15.6s$

$Dec(J2000) = 31d47'3''$

with an uncertainty of 1.3 arcmin, (radius, sys+stat, 90% containment). The partial coding was 48%.

The mask-weighted light curve (Fig.1) shows a broad peak composed of several overlapping subpeaks. It starts at  $\approx T + 0 \text{ sec}$ , peaks  $\approx T + 90 \text{ sec}$ , and slowly decays out to at least  $T + 422 \text{ sec}$ . Because of an observing constraint, the spacecraft had to slew off the burst location, and so we do not have any information on the continuation of the emission beyond the  $T + 422 \text{ sec}$  limit.  $T_{90}(15 - 350keV)$  is at least  $109 \pm 2 \text{ sec}$  (estimated error including systematics).

The time-averaged spectrum from  $T + 38.5$  to  $T + 193.8 \text{ sec}$  is best fit by a simple power-law model. The power law index of the time-averaged spectrum is  $1.79 \pm 0.05$ . The fluence in the  $15 - 150 \text{ keV}$  band is  $6.5 \pm 0.2 \times 10^{-06} \text{ ergs/cm}^2$ .

The 1-sec peak photon flux measured from  $T+80.17 \text{ sec}$  in the  $15-150 \text{ keV}$  band is  $1.6 \pm 0.2 \text{ ph/cm}^2/\text{sec}$ . All the quoted errors are at the 90% confidence level considering the statistical and usual systematic effects.

### 3 XRT Observations and Analysis

Using 1189 seconds of overlapping XRT Photon Counting mode and UVOT V-band data, we find an astrometrically corrected X-ray position (using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue):  $RA(J2000) = 355.07142 \text{ deg}$ ,  $Dec(J2000) = 31.77857 \text{ deg}$ , which is equivalent to:

$RA(J2000) : 23h40m17.14s$

$Dec(J2000) : +31d46'42.9''$

with an uncertainty of  $1.7 \text{ arcsec}$  (radius, 90% confidence). This is  $7.1 \text{ arcsec}$  from the refined XRT position (Pagani, *GCN Circ.* 6990) and  $0.7 \text{ arcsec}$  from the optical afterglow found by ROTSE-III at McDonald Observatory (Rykoff, *et al.*, *GCN Circ.* 6987).

The bright  $0.3 - 10 \text{ keV}$  X-ray light curve (Fig.2) can be fitted by a broken power-law, with an initial steep decay index of  $2.8 \pm 0.3$  followed by a flatter decay index of  $1.5 \pm 0.1$  after a break at  $260 \pm 20 \text{ seconds}$ .

The X-ray spectrum of the WT data ( $T + 150$  to  $T + 400 \text{ sec}$ ) can be modeled as an absorbed power-law, with spectral index of  $1.40 \pm 0.05$ . The NH column density is  $(0.9 \pm 0.1) \times 10^{21} \text{ cm}^{-2}$ , in excess of the Galactic value of  $0.5 \times 10^{21} \text{ cm}^{-2}$ . The average unabsorbed flux over  $0.3 - 10 \text{ keV}$  for this spectrum (spanning a time of  $T + 150 \text{ sec}$  to  $T + 400 \text{ sec}$ ) is  $2.2 \times 10^{-09} \text{ ergs/cm}^2/\text{sec}$ .

## 4 UVOT Observations and Analysis

The Swift/UVOT began observing the field of GRB 071025  $137 \text{ sec}$  after the BAT trigger (N.P.M. Kuin, *et al.*, *GCN Circ.* 7000). No new source was found in any of the UVOT observations inside the refined position of the Swift XRT error circle (Pagani *et al.*, *GCN Circ.* 6998), or the position of the detection of a transient source in the infrared bands of which the most accurate was the PARITEL observation in the J band (J. Bloom *et al.*, *GCN Circ.* 6989).

The  $3 \sigma$  upper limits in the co-added frames are summarized in Table 1. No correction has been made for the expected Galactic reddening of  $E(B-V) = 0.074 \text{ mag}$ .

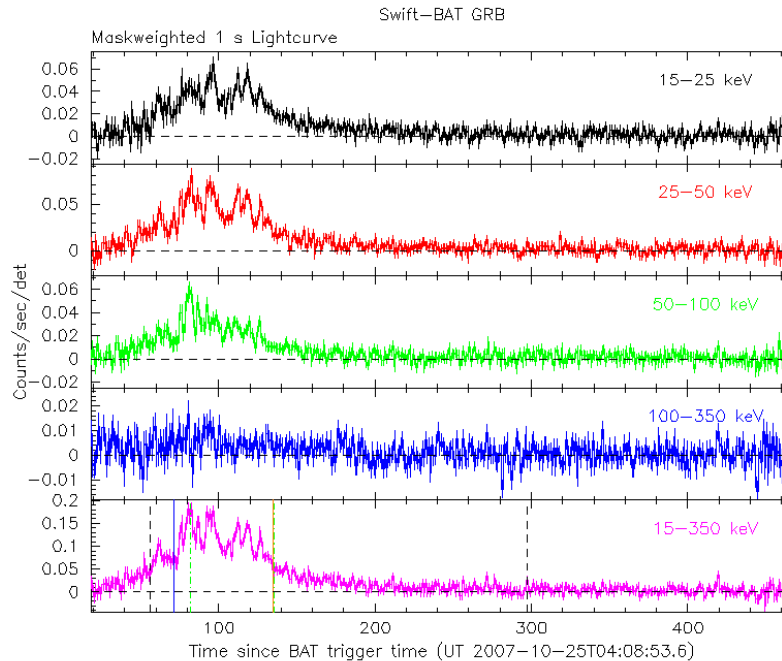


Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector and  $T_0$  is 04:08:53.6 UT.

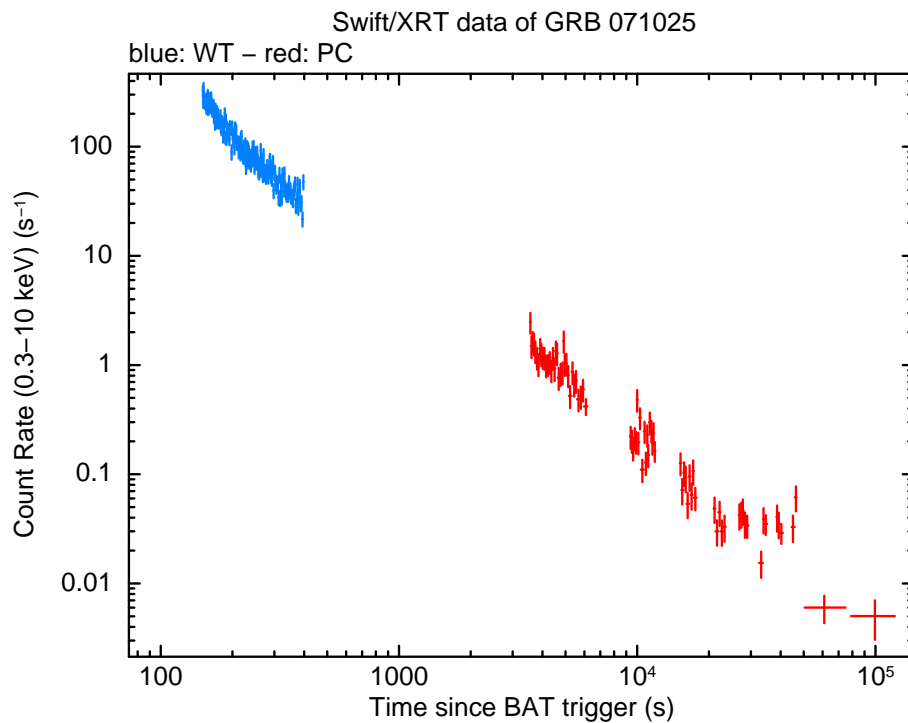


Figure 2: XRT Lightcurve. Counts/sec in the 0.3-10 keV band: Photon Counting mode. The approximate conversion is 1 count/sec =  $\sim 5.1 \times 10^{-11}$  *ergs/cm<sup>2</sup>/sec*.

Filter	Start	Stop	Exposure	$3 \sigma$ UL
White	155	16016	1377	22.8
V	137	17760	1319	21.2
B	3968	11968	1194	22.1
U	3760	23536	2085	22.1
UVW1	3552	22704	2164	22.1
UVM2	4784	21808	1082	21.4
UVW2	4368	16928	1279	21.9

Table 1: Magnitude limits from UVOT observations