

## Swift Observations of INTEGRAL GRB 071109

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### 1 Revisions

Added further XRT analysis based on a second Swift follow-up observation of the GRB 071109 field started about 4.4 days after the trigger.

### 2 Introduction

INTEGRAL triggered on and located GRB 071109 at 20:36:05 UT (Mereghetti et al., GCN Circ. 7046). The observed duration of the burst was  $\sim 30$  s while the peak flux integrated over 1 s in the 20–200 keV energy range was 0.46 photons ( $3.6 \times 10^{-8}$  erg cm $^{-2}$  s $^{-1}$ ). The fluence in the same band, integrated over 30 s, was  $6.6 \times 10^{-7}$  erg cm $^{-2}$  (Gotz, GCN Circ. 7048).

Following a Target of Opportunity request, Swift started observing the field at 22:21 UT, about 1.7 hours after the burst. No afterglow was detected by the two Swift narrow field instruments within the INTEGRAL error circle (Perri et al., GCN Circ. 7050-7053; Kuin et al., GCN Circ. 7054).

The best position is that determined from the INTEGRAL detection of the burst at RA(J2000)=289.913 deg, Dec(J2000)= +2.048 deg, RA(J2000)= 19<sup>h</sup>19<sup>m</sup>39.1<sup>s</sup>, Dec(J2000)= +02<sup>d</sup> 02' 53", with an uncertainty of 2.5 arcmin (Mereghetti et al., GCN Circ. 7046).

The detection of a radio source 3.4 hours after the burst was reported by Chandra & Frail (GCN Circ. 7049) with a flux density of  $188 \pm 42$   $\mu$ Jy at the position RA(J2000)= 19<sup>h</sup>19<sup>m</sup>51.67<sup>s</sup>, Dec(J2000)= +02<sup>d</sup> 01' 49.88", outside the INTEGRAL error circle. This radio source was not detected at later times (1.87 days from the trigger, Chandra & Frail, GCN Circ. 7055). No afterglow candidate from optical ground-based facilities has been detected.

### 3 XRT Observations and Analysis

Swift-XRT began observing the field of the INTEGRAL-detected burst at 22:21:50 UT,  $\sim 1.7$  hours after the INTEGRAL trigger. In a Photon Counting mode exposure of 9.7 ks we did not detect any X-ray source neither within the INTEGRAL error circle (Mereghetti et al., GCN Circ. 7046) nor at the position of the VLA radio source reported in GCN Circ. 7049 (Chandra & Frail). We estimate a 3-sigma upper limit on the count rate of about  $1.5 \times 10^{-3}$  cts/s. Assuming a power-law spectrum with photon index  $\Gamma = 2$  and a Galactic column density of  $2.5 \times 10^{21}$  cm $^{-2}$ , this corresponds to an upper limit on the observed flux of  $\sim 7 \times 10^{-14}$  erg cm $^{-2}$  s $^{-1}$  (0.3–10 keV).

Outside the INTEGRAL error circle two X-ray sources are detected by XRT:

Source # 1: RA(J2000)= 19<sup>h</sup>19<sup>m</sup>25.2<sup>s</sup>, Dec(J2000)= +02<sup>d</sup> 06' 02.1"; CR=(1.4 ± 0.5) × 10 $^{-3}$  cts/s;

Source # 2: RA(J2000)= 19<sup>h</sup>19<sup>m</sup>53.8<sup>s</sup>, Dec(J2000)= +02<sup>d</sup> 02' 46.0"; CR=(2.4 ± 0.6) × 10 $^{-3}$  cts/s;

These two sources lie 4.7 and 3.7 arcmin from the INTEGRAL position, respectively. Both sources are consistent with being constant during the XRT observation.

Swift-XRT observed again the field of GRB 071109 starting on 2007-11-14 at 06:52:59 UT and ending on 2007-11-16 at 13:49:57 UT. In a Photon Counting mode exposure of 15.5 ks we did not detect any X-ray source within the INTEGRAL error circle.

The two X-ray sources discovered in the first follow-up observation (# 1 and # 2, see above) were still detected with count rates  $\text{CR}=(1.5 \pm 0.4) \times 10^{-3}$  cts/s and  $\text{CR}=(0.8 \pm 0.4) \times 10^{-3}$  cts/s, respectively. We note that while the intensity of Source # 1 is constant, there is some indication that Source # 2 has faded between the two observations with a decay index of  $\sim -0.3$ .

## 4 UVOT Observation and Analysis

The Swift-UVOT observed the INTEGRAL burst GRB 071109 starting at 22:21 UT, 105 minutes after the trigger, cycling through exposures in the the UVW1, U, B, UVW2, V and UVM2 filters. No afterglow is detected at the position of the VLA measurement (Chandra & Frail, GCN Circ. 7049). A possible source at position RA(J2000)= $19^{\text{h}}19^{\text{m}}42.30^{\text{s}}$ , Dec(J2000)= $+02^{\text{d}}01'21.14''$  was investigated, since it was detected at the 3-sigma level ( $U=20.9 \pm 0.6$  mag) in the coadded U-filter images at 1.7 arcmin from the INTEGRAL position. This source is considered spurious since it was not found in any of the other filters, taken before or after the U-filter exposures.

No other fading source is found within the INTEGRAL error circle in this crowded field. The 3-sigma upper limits for detecting a source at the position of the VLA detection are reported in Table 1. The reported upper limits are not corrected for the expected Galactic extinction corresponding to a reddening of  $E_{B-V} = 0.61$  mag in the direction of the burst (Schlegel et al. 1998).

Filter	T_start (s)	T_stop (s)	Exp (s)	3-sigma UL mag
UVW1	6350	24158	1678	21.5
U	6782	24373	835	21.2
B	7000	24588	835	21.6
UVW2	7220	25435	3346	22.3
V	8078	25651	835	20.6
UVM2	8300	26033	2189	21.7

Table 1: Magnitude limits from UVOT observations.