Swift Observation of GRB 110530A
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1 Introduction
At 15:31:02 UT, the Swift BAT triggered and located GRB 110530A (trigger=454473, D’Avanzo et al. GCN Circ. 12046). Swift slewed after 7 minutes because of an observing constraint. The BAT on-board calculated location is RA, Dec (282.045, +61.932) deg, which is RA(J2000) = 18h 48m 11s
Dec(J2000) = +61° 55′ 54″
with an uncertainty of 3 arcmin (radius, 90% containment, including systematic uncertainty). The BAT light curve shows a single peak with a duration of about 20 sec. The peak count rate was ∼2000 counts/s (15 − 350 keV), at ∼2 s after T0.
The XRT began observing the field at T + 434.0 seconds after the BAT trigger finding a bright, uncatalogued X-ray source with an enhanced position RA, Dec (282.06843, +61.92897) deg which is equivalent to:
RA(J2000) = 18h 48m 16.42s
Dec(J2000) = +61° 55′ 44″
with an uncertainty of 1.4″ (radius, 90% containment; Evans et al. GCN Circ. 12055)
UVOT took a finding chart exposure of 150 seconds with the White filter starting 438.0 seconds after the BAT trigger finding an afterglow with magnitude ∼20.3 at a position consistent with the enhanced XRT error circle. No correction has been made for the expected extinction corresponding to E_B−V of 0.06.

2 BAT Observation and Analysis
Using the data set from T − 61 to T + 242 s further analysis of BAT GRB 110530A has been performed by the Swift team (Baumgartner, et al., GCN Circ. 12049). The BAT ground-calculated position is RA, Dec = (282.045, +61.953) deg, which is RA(J2000) = 18h 48m 10.8s
Dec(J2000) = +61° 57′ 11.2″
with an uncertainty of 2.3 arcmin, (radius, sys+stat, 90% containment). The partial coding was 98% (the bore sight angle was 16.0 deg).
The mask-weighted light curve shows (Fig.1) a single pulse starting at ∼T − 50 s with a slow rise, peaking at ∼T + 2 s, and ending at ∼T + 15 s. T90(15 − 350 keV) is 19.6 ± 3.1 s (estimated error including systematics).
The time-averaged spectrum from T − 4.5 to T + 17.4 s is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 2.06 ± 0.24. The fluence in the 15 − 150 keV band is (3.3 ± 0.5) × 10−7 ergs/cm2. The 1-sec peak photon flux measured from T + 1.01 s in the 15 − 150 keV band is 0.4 ± 0.1 ph/cm2/sec. All the quoted errors are at the 90% confidence level.
3 XRT Observations and Analysis

We have analysed 84.9 ks of XRT data for GRB 110530A in Photon Counting (PC) mode, from 446 s to 707.7 ks after the BAT trigger. The enhanced XRT position for this burst was given by Evans et al. (GCN Circ. 12055).

The light curve (Fig.2) can be modelled with an initial power-law decay with an index of $\alpha_1 = 0.63^{+0.10}_{-0.09}$, followed by a break at $T + 7834$ s to a decay with $\alpha_2 = 1.14^{+0.09}_{-0.07}$.

A spectrum formed from the PC mode data can be fitted with an absorbed power-law with a photon spectral index of $2.30^{+0.09}_{-0.17}$. The best-fitting absorption column is $(2.8 \pm 0.5) \times 10^{21}$ cm$^{-2}$, in excess of the Galactic value of $5.6 \times 10^{20}$ cm$^{-2}$ (Kalberla et al. 2005). The counts to observed (unabsorbed) 0.3–10 keV flux conversion factor deduced from this spectrum is $3.7 \times 10^{-11} (7.0 \times 10^{-11})$ erg cm$^{-2}$ count$^{-1}$.

4 UVOT Observation and Analysis

The Swift/UVOT began settled observations of the field of GRB 110530A 438 s after the BAT trigger (Marshall et al., GCN Circ. 12057). A fading source consistent with the enhanced XRT position (Evans et al., GCN Circ. 12055) is detected in the initial UVOT exposures at the following coordinates RA, Dec (282.06833, +61.92913) which is equivalent to:

RA(J2000) = 18$^h$ 48$^m$ 16.4$^s$
Dec(J2000) = +61° 55′ 44″

with a 90%-confidence error radius of 0.65″.

Detections and upper limits using the UVOT photometric system (Poole et al. 2008, MNRAS, 383, 627) are reported in Tab. 1. The UVOT light curve is shown in Fig.3.

<table>
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<tr>
<th>Filter</th>
<th>$T_{Start}(s)$</th>
<th>$T_{Stop}(s)$</th>
<th>Exposure (s)</th>
<th>Mag</th>
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<td>586</td>
<td>147</td>
<td>20.30 ± 0.14</td>
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<td>1013</td>
<td>147</td>
<td>20.32 ± 0.14</td>
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<tr>
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<td>1414</td>
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<td>43138</td>
<td>2461</td>
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</table>

Table 1: Magnitude and 2σ upper limits from UVOT observations of GRB 110530A. The values quoted above are not corrected for the Galactic extinction due to the reddening of $E_{B-V} = 0.06$ in the direction of the burst (Schlegel et al. 1998). Errors are at 1σ.
Figure 1: BAT Light curve of GRB 110530A. The mask-weighted light curve in the 4 individual plus total energy bands (15 - 25, 25 - 50, 50 - 100, 100 - 350 and 15 - 350 keV).
Figure 2: XRT Lightcurve of GRB 110530A. Data are from PC mode.
Figure 3: UVOT white band light curve of GRB 110530A