Swift Observations of GRB 071021

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1. INTRODUCTION

At 09:41:33 UT, the Swift Burst Alert Telescope (BAT) triggered and located GRB 071021 (trigger=294974). Swift slewed immediately to the burst. UVOT is still in engineering mode after the gyro restorations, so there will be no data products for this trigger. The best position is RA, Dec = 340.6431 deg, +23.7181 deg. from the XRT data.

2. BAT OBSERVATION AND ANALYSIS

The BAT ground-calculated position is RA, Dec = 340.573, 23.764 deg, which is
RA(J2000) = 22h 42m 17.6s
Dec(J2000) = +23d 45' 49"
with an uncertainty of 3.4 arcmin, (radius, sys+stat, 90% containment). The partial coding was 78%. The incident angle was 20 deg.

The mask-weighted light curve (Fig 1) shows a slow rise starting at ~T-30 sec and peaking around T+85 sec. The remaining portion of the lightcurve is consistant with either a low-level constant emission out to ~T+225 sec or with a decline to background around T+150 sec and then another weak peak from ~T+180 to ~T+220 sec. This latter interpretation is consistant with a flare in the XRT afterglow lightcurve around T+220 sec (see Fig 2). T90 (15-350 keV) is 225 +- 10 sec (estimated error including systematics).

The time-averaged spectrum from T-31.4 to T+252.2 sec is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.70 +- 0.21. The fluence in the 15-150 keV band is 1.3 +- 0.2 x 10^-6 erg/cm2. The 1-sec peak photon flux measured from T+87.32 sec in the 15-150 keV band is 0.7 +- 0.1 ph/cm2/sec. All the quoted errors are at the 90% confidence level.

3. XRT OBSERVATION AND ANALYSIS

We have analysed three orbits of Swift-XRT data obtained for GRB 071021, totalling 1.7 ks of Windowed Timing (WT) data and 5.3 ks of Photon Counting (PC) data. Using the PC data we derive a refined position of RA, Dec = 340.6431 deg, +23.7181 deg, which is equivalent to
RA(J2000) = 22h 42m 34.35s
Dec(J2000) = +23d 43' 05.1"
with an estimated error radius of 3.9 arcsec (90 percent containment). This is 4.8 arcsec from the onboard XRT position.

The X-ray light-curve (Fig 2) is initially quite flat, remaining at around 40-50 count/s until 230 seconds after the trigger. There follows a very steep decay, until about 700 seconds post-trigger, when a series of strong flares are seen; this behaviour continues into the second orbit, with the third orbit showing the afterglow emission has decayed further.

There is spectral evolution during the initial light-curve, although the WT data before the steep decay (135-245 seconds) can be modelled as an absorbed power-law, with Gamma = 2.12 +/- 0.09 and a total absorbing column of NH = (1.8 +/- 0.2)e21 /cm2, considerably in excess of the Galactic value of 4.8e20 /cm2. The 0.3-10 keV observed (unabsorbed) flux during this time is 1.3e-10 (1.9e-10) erg/cm2/s.

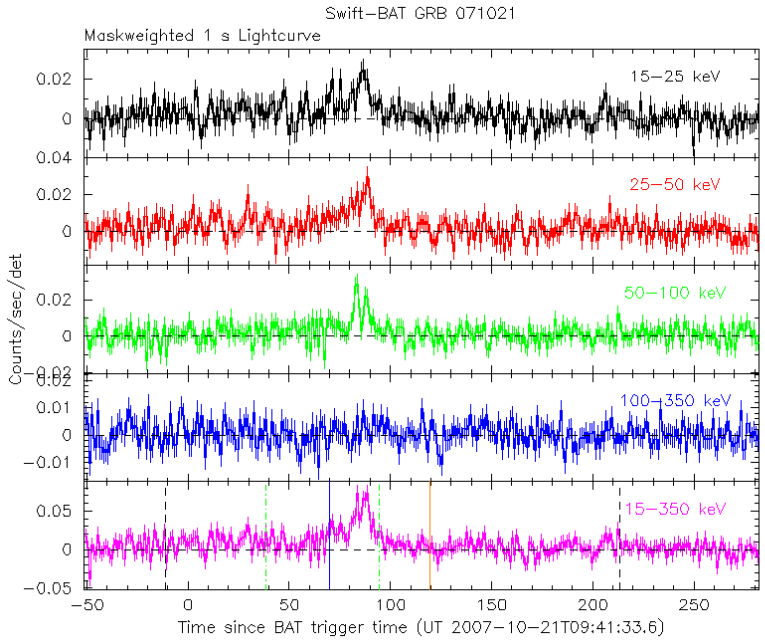

Fig.1: BAT Lightcurve. The light curve is in the 4 individual plus total energy bands. The black and green dotted lines show the time interval of T90 and T50 respectively. The blue solid line is the spacecraft slew start time and the orange solid line is the spacecraft slew settled time.

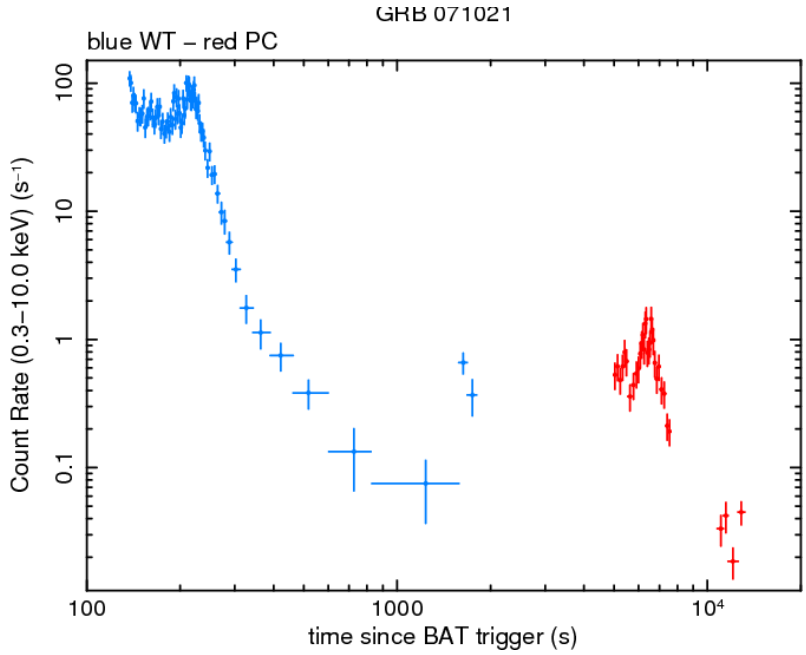

Fig. 2: XRT Lightcurve in the 0.3-10 keV band. The blue and the red data points are the WT and PC mode respectively. The conversion factor is 1 count/s = 6.4e-11 erg/cm2/s.