

Swift Observations of FERMI GRB 090926A

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1. Introduction

At 04:20:26.99 UT on 26 September 2009, the Fermi Gamma-Ray Burst Monitor (GBM) and Large Area Telescope (LAT) triggered and located GRB 090926A (Bissaldi et al., GCN Circ. 9933; Uehara et al., GCN Circ. 9934).

At 17:17 UT, September 26th, 2009, Swift began a Target of Opportunity of the LAT position (~13 hours after the Fermi detection). The afterglow was detected in both the XRT (Vetere et al., GCN Circ 9961) and UVOT (Gronwall & Vetere, GCN Circ. 9938). Using 3190 s of XRT Photon Counting mode data and 4 UVOT images, we find an astrometrically corrected X-ray position (using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue): RA, Dec =353.40070, -66.32390 which is equivalent to:

$$\text{RA (J2000)} = 23\ 33\ 36.18$$

$$\text{Dec (J2000)} = -66\ 19\ 25.9$$

with an uncertainty of 1.5 arc sec (radius, 90% confidence) .

GRB 090926A was also detected by many other telescopes. Skynet/PROMPT observed a rebrightening after 1d (Haislip et al., GCN Circ. 9937), VLT/X-shooter that measured a redshift of $z=2.1062$ (Malesani et al., GCN Circ 9942). This bright GRB triggered also SUZAKU/WAM (Noda et al. GCN Circ. 9951) and Konus-Wind (Golenetskii et al., GCN Circ. 9959) and was detected by the Konus-RF instrument and the RT-2 Experiment both onboard CORONAS-PHOTON (Chakrabarti et al., GCN Circ. 10009).

2. XRT Observations and Analysis

The XRT began observing GRB 090926A about at 17:17:16.4 UT, ~46.6 ks after the Fermi trigger in Photon Counting (PC) mode. We have analysed all the Swift XRT data collected for GRB090926A, totalling 442 ks of data out to $\sim 1.9 \times 10^6$ s after the Fermi/GBM trigger. The light curve (Fig. 1) shows a decaying behaviour with some flaring activity. It can be fit with a single power-law, decaying with $\alpha = 1.40 \pm 0.06$ (90% confidence level).

The average spectrum from T+46.6 ks to T+149 ks is best fit by an absorbed power-law model with a photon spectral index of 2.6 (+0.3,-0.2) and an absorption column density of 1.0 (+0.5,-0.3) e^{21} cm⁻² in excess of the Galactic value of 2.7 e^{20} cm⁻² (Kalberla et al. 2005). The counts-to-observed 0.3-10 keV flux conversion factor deduced from this spectrum is 3.5 e^{-11} erg cm⁻² count⁻¹. The average observed (unabsorbed) fluxes are 1.3 (1.9) e^{-12} ergs cm⁻² s⁻¹. Errors are given at the 90% confidence level.

3. UVOT Observations and Analysis

The Swift/UVOT began settled observations of the field of GRB 090926A approximately 13 hours after the Fermi/GBM trigger (Bissaldi, GCN Circ. 9933). A candidate optical afterglow was first identified in a 357

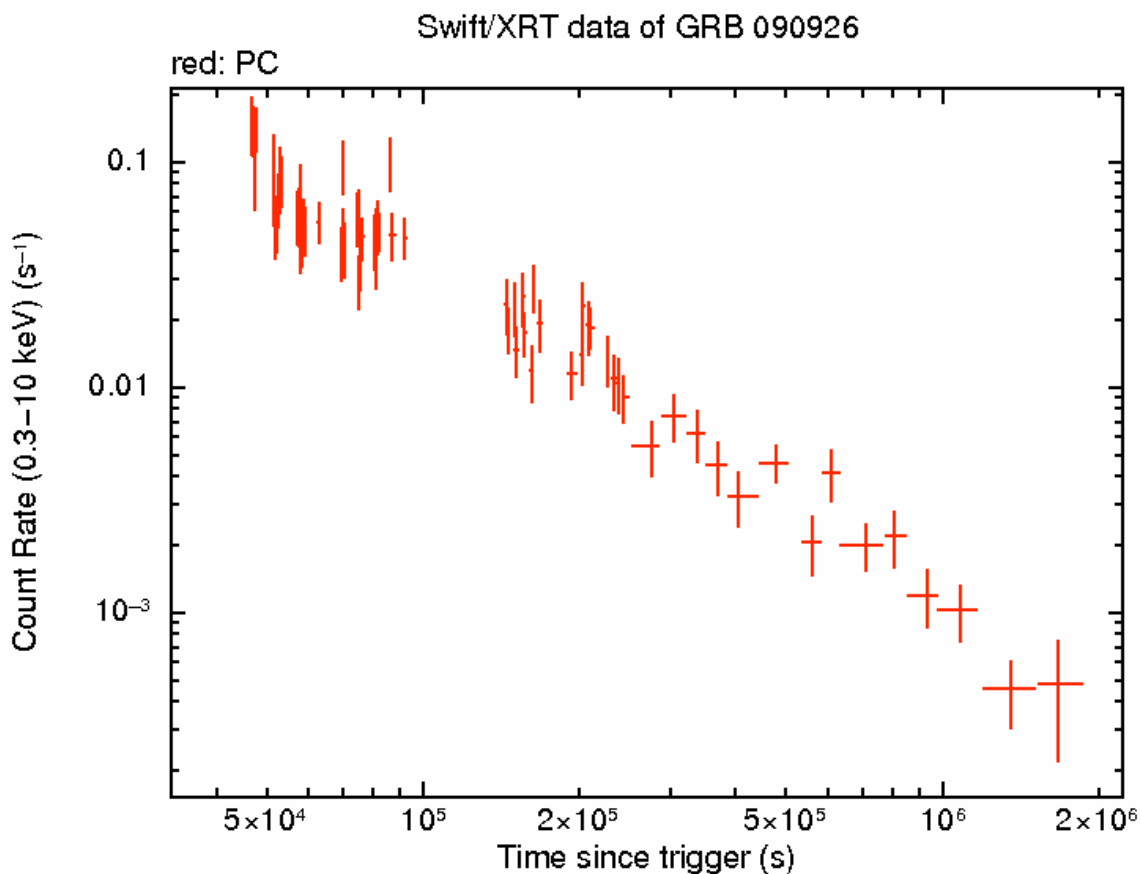


Fig. 1: XRT Light curve. Counts s^{-1} in the 0.3-10 keV band taken in Photon Counting mode. The approximate conversion is $1 \text{ count s}^{-1} \sim 3.5e^{-11} \text{ erg cm}^{-2} \text{ count}^{-1}$.

sec observation in the *white* filter (Gronwall et al., GCN Circ. 9938) RA, Dec =353.400154, -66.324067 which is equivalent to:

$$\text{RA(J2000)} = 23 \ 33 \ 36.04$$

$$\text{Dec(J2000)} = -66 \ 19 \ 26.6$$

with a 90%-confidence error radius of about 0.5 arc sec. This position is 0.99 arcsec from the center of the XRT error circle and is consistent with the optical afterglow position found by Skynet/PROMPT (Haislip et al., GCN Circ. 9937).

The afterglow was later detected in v and u filters also at the position reported by UVOT (Gronwall et al., GCN Circ. 9938). The light curve (Fig. 2) shows a decaying behaviour with a rebrightening around 80 ks after the Fermi trigger (as detected by Skynet/PROMPT, Haislip et al., GCN Circ. 9937) and a sudden drop in flux around 200 ks after the Fermi trigger.

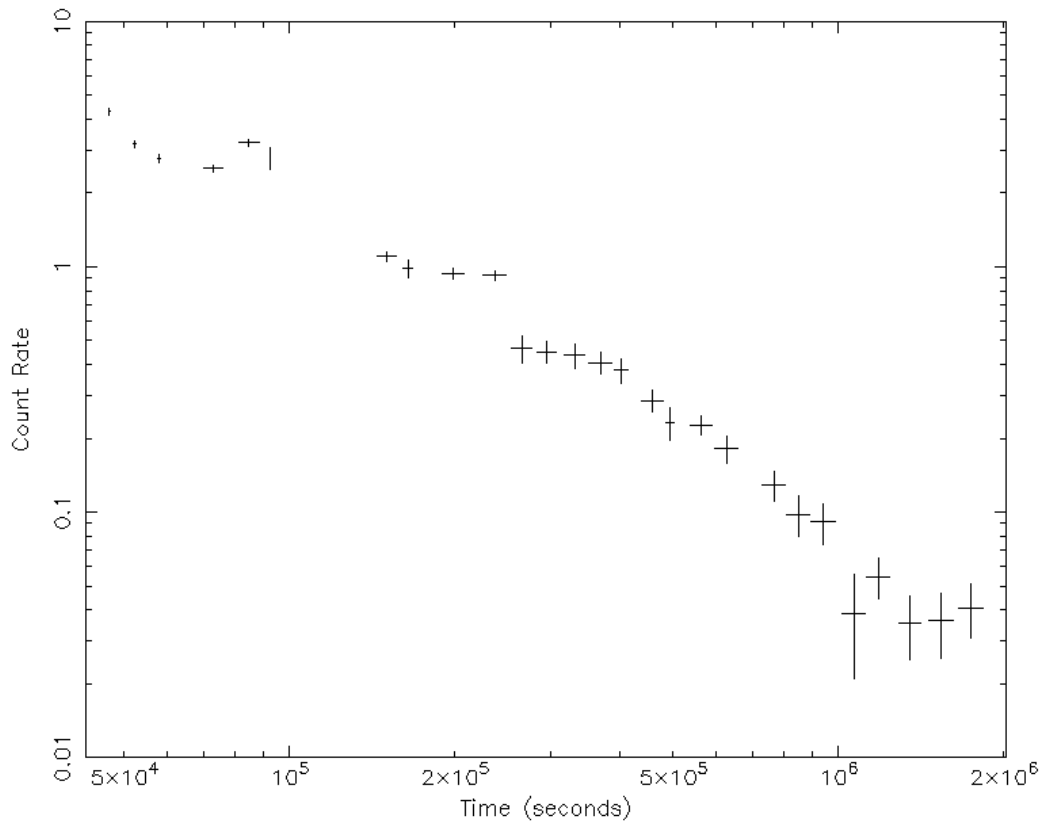


Fig. 3: UVOT Light curve in the white filter.