RevMexAA (Serie de Conferencias), **42**, 113–113 (2013)

GRB 100316A: A BURST FROM A HIGH REDSHIFT GALAXY

R. Sánchez-Ramírez,[1] J. Gorosabel,[1] A. de Ugarte Postigo,[1,2] A. J. Castro-Tirado,[1] C. C. Thöne,[1] J. P. U. Fynbo,[2] A. Cabrera-Lavers,[3] S. Guziy,[1] M. Jelínek,[1] J. C. Tello,[1] V. Peris,[4] and D. Galadí-Enríquez[1,5]

We report the first succesful spectroscopic ToO executed at GTC for a GRB afterglow. These observations correspond to a GRB hosted by a Lyman-Alpha Emitter (LAE) galaxy at $z = 3.155$.

A GRB (Gamma Ray Burst) is a brief and intense emission of very high energy photons. GRBs are followed by a long-lasting emission called afterglow. In the optical range, the flux of afterglows decay approximately as a power law ($F_\nu \sim t^{-\alpha}$; Sari et al. 1998) shining for hours-weeks after the gamma-ray emission. On 2010 March 16, Burst Alert Telescope (BAT) on board the Swift satellite discovered GRB 100316A at $T_0 = 02:23:00$ UT. An optical counterpart was discovered with the 1.23 m CAHA telescope 11 minutes after the GRB (Gorosabel et al. 2010) which allowed us to trigger our GTC program (GTC67-10A).

Table 1 displays our observing logs. Our observations revealed a rebrightening at $T - To \sim 0.06$ days present in both light curves. Due to the large slit width, we did not detect any absortion line except the Damped Lyman-α Absortion (DLA). Fortunately, the wide slit width allowed to include an intense Ly-α emission from the GRB host galaxy. Our first results are:

1. We detected a GRB afterglow with an optical decay that is not properly described by a power-law ($\chi^2/\mathrm{dof} = 17.9$). This could be due to some flaring activity contribution superposed to the optical power-law decay wich has an index $\alpha = 0.84 \pm 0.03$. We detect a possible flare present in both the X-ray and optical light curve.

TABLE 1

$T - T_0$ (days)	Telescope	Exposure (s)	Filter	Magnitude
0.02654	1.23 m CAHA	3×200s	Johnson R	20.76±0.07
0.04425	1.23 m CAHA	3×200s	Johnson R	21.23±0.07
0.07615	1.23 m CAHA	3×200s	Johnson R	21.35±0.08
0.09199	10.4 m GTC	1×70s	Sloan r'	22.43±0.07
0.09977	10.4 m GTC	3×40s	Sloan r'	22.49±0.06
0.94281	10.4 m GTC	4×120s	Sloan g'	>24.5
0.95854	10.4 m GTC	3×90s	Sloan r'	>23.3
0.96565	10.4 m GTC	5×60s	Sloan i'	>23.1
0.97312	10.4 m GTC	5×60s	Sloan z'	>23.5
2.13729	10.4 m GTC	8×80s	Sloan i'	24.05±0.07
2.14777	10.4 m GTC	3×180s	Sloan r'	24.12±0.08
2.16652	10.4 m GTC	3×240s	Sloan g'	26.71±0.08
2.16786	10.4 m GTC	8×90s	Sloan z'	23.83±0.09
123.07184	10.4 m GTC	7×300s	Sloan r'	25.25±0.04
$T - T_0$ (days)	Telescope	Exposure (s)	Grating	Slit width ($''$)
0.12101	10.4 m GTC	3×900s	R300R	2.52
0.15942	10.4 m GTC	2×900s	R300B	2.52

2. The Ly-α column density derived from voigt profile fitting is $N_\mathrm{H} = 22.1 \pm 0.2\ \mathrm{cm}^{-2}$. This column density value is located in the mid-high region of galaxies analysed by Fynbo et al. (2009).
3. We detect a host galaxy ($r' = 25.25$) that is a LAE. Using this emission line we derived a redshift of $z = 3.155$.
4. The Ly-α emission line is slightly off from the afterglow trace. Assuming standard cosmological parameters we estimate an impact parameter between the emission line and the trace of $d = 9.0 \pm 2.5$ kpc.

REFERENCES

Sari, R., et al. 1998, ApJ, 497, L17
Fynbo, J. P. U., et al. 2009, ApJS, 185, 526
Gorosabel, J., et al. 2010, GCN Circ., 10488, 1

[1]Instituto de Astrofísica de Andalucía (IAA-CSIC), Glorieta de la Astronomía s/n, 18008 Granada, Spain (ruben@iaa.es).
[2]Dark Cosmology Centre, Niels Bohr Institute, Juliane Maries Vej 30, Copenhagen, 2100, Denmark.
[4]Observatori Astronómic, Universidad de Valencia, Calle Catedrático José Beltrán 2, 46980 Paterna, Spain.
[3]Instituto de Astrofísica de Canarias, Calle Vía Láctea s/n, 38205 La Laguna, Spain.
[5]Centro Astronómico Hispano-Alemán (CAHA A.I.E), Jesús Durbán Remón 2-2, 04004 Almería, Spain.