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|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Publication Year</b> | 2015                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Acceptance in OA</b> | 2020-03-31T08:53:18Z                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Title</b>            | VizieR Online Data Catalog: GRB 130606A VLT/X-shooter spectroscopy (Hartoog+, 2015)                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Authors</b>          | Hartoog, O. E., Malesani, D., Fynbo, J. P. U., Goto, T., Kruhler, T., Vreeswijk, P. M., De Cia, A., Xu, D., Moller, P., COVINO, Stefano, D'Elia, V., Flores, H., Goldoni, P., Hjorth, J., Jakobsson, P., Krogager, J. -K., Kaper, L., Ledoux, C., Levan, A. J., Milvang-Jensen, B., Sollerman, J., Sparre, M., TAGLIAFERRI, Gianpiero, Tanvir, N. R., de Ugarte Postigo, A., Vergani, S. D., Wiersema, K., Datson, J., Salinas, R., Mikkelsen, K., Aghanim, N. |
| <b>Handle</b>           | <a href="http://hdl.handle.net/20.500.12386/23738">http://hdl.handle.net/20.500.12386/23738</a>                                                                                                                                                                                                                                                                                                                                                                |
| <b>Journal</b>          | VizieR Online Data Catalog                                                                                                                                                                                                                                                                                                                                                                                                                                     |

VLT/X-shooter spectroscopy of the afterglow of the Swift GRB 130606A.  
Hartoog O.E., Malesani D., Fynbo J.P.U., Goto T., Kruhler T., Vreeswijk P.M., De Cia A., Xu D., Moller P., Covino S., D'Elia V., Flores H., Gondoni P., Hjorth J., Jakobsson P., Krogager J.-K., Kaper L., Ledoux C., Levan A.J., Milvang-Jensen B., Sollerman J., Sparre M., Tagliaferri G., Tanvir N.R., de Ugarte Postigo A., Vergani S.D., Wiersema K., Datson J., Salinas R., Mikkelsen K., Aghanim N.  
<Astron. Astrophys. 580, A139 (2015)>  
=2015A&A...580A.139H

**ADC\_Keywords:** Gamma rays ; Spectra, infrared ; Spectroscopy

**Keywords:** gamma-ray bursts: individual: GRB 130606A - cosmology: observations - dark ages, reionisation, first stars - ISM: abundances

**Abstract:**

The reionisation of the Universe is a process that is thought to have ended around  $z\sim 6$ , as inferred from spectroscopy of distant bright background sources, such as quasars (QSO) and gamma-ray burst (GRB) afterglows. Furthermore, spectroscopy of a GRB afterglow provides insight in its host galaxy, which is often too dim and distant to study otherwise.

For the Swift GRB 130606A at  $z=5.913$  we have obtained a high S/N spectrum covering the full optical and near-IR wavelength region at intermediate spectral resolution with VLT/X-Shooter. We aim to measure the degree of ionisation of the intergalactic medium (IGM) between  $z=5.02\text{--}5.84$  and to study the chemical abundance pattern and dust content of its host galaxy.

We estimated the UV continuum of the GRB afterglow using a power-law extrapolation, then measured the flux decrement due to absorption at  $\text{Ly}\alpha$ ,  $\beta$ , and  $\gamma$  wavelength regions. Furthermore, we fitted the shape of the red damping wing of  $\text{Ly}\alpha$ . The hydrogen and metal absorption lines formed in the host galaxy were fitted with Voigt profiles to obtain column densities. We investigated whether ionisation corrections needed to be applied.

**Description:**

Reduced visual (VIS) and Near-IR (NIR) VLT/X-shooter spectra (before normalization) of the afterglow of GRB130606A (Pipeline produced, see headers of the fits files for additional info).

The original data files and calibrations can be found on <http://archive.eso.org/wdb/wdb/eso/xshooter/form> under program 091.C-0934(C) querying the following coordinates:  
coord1 = 16 37 35.188  
coord2 = +29 47 47.03

**Objects:**

| RA          | (2000) | DE          | Designation(s)            |
|-------------|--------|-------------|---------------------------|
| 16 37 35.12 |        | +29 47 46.4 | GRB 130606A = GRB 130606A |

**File Summary:**

| FileName                 | Lrecl | Records | Explanations            |
|--------------------------|-------|---------|-------------------------|
| ReadMe                   | 80    | .       | This file               |
| <a href="#">list.dat</a> | 162   | 16      | List of fits spectra    |
| fits/*                   | 0     | 16      | Individual fits spectra |

**Byte-by-byte Description of file:** [list.dat](#)

| Bytes   | Format | Units                  | Label    | Explanations                                      |
|---------|--------|------------------------|----------|---------------------------------------------------|
| 1- 5    | I5     | ---                    | Nx       | Number of pixels along X-axis                     |
| 7       | I1     | ---                    | Nsp      | Number of spectra in the file <a href="#">(1)</a> |
| 9- 18   | A10    | "YYYY-DD-MM"           | Obs.date | Observation date (2013-06-07)                     |
| 19      | A1     | ---                    | [T]      |                                                   |
| 20- 32  | A13    | "h:m:s"                | Obs.time | Observation time                                  |
| 34- 40  | F7.2   | <a href="#">nm</a>     | lam.min  | [533/1066] Lower value of wavelength interval     |
| 42- 48  | F7.2   | <a href="#">nm</a>     | lam.max  | [1019/2480] Upper value of wavelength interval    |
| 50- 53  | F4.2   | <a href="#">nm</a>     | dlam     | [0.02/0.05] Spectral resolution                   |
| 55- 57  | I3     | <a href="#">Kibyte</a> | size     | Size of FITS file                                 |
| 59-120  | A62    | ---                    | FileName | Name of FITS file, in subdirectory fits           |
| 122-162 | A41    | ---                    | Title    | Title of the file                                 |

**Note (1):** For individual observations (xsn\*), spectrum, error and quality.

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**Acknowledgements:**

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**(End)**

Patricia Vannier [CDS] 22-Jun-2015

*The document above follows the rules of the [Standard Description for Astronomical Catalogues](#); from this documentation it is possible to generate `f77` program to load files [into arrays](#) or [line by line](#)*

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