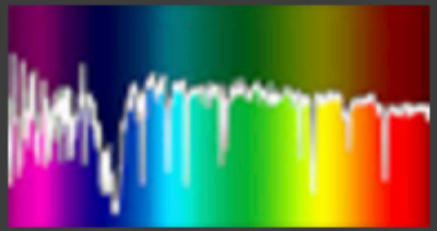


A spectroscopy database?

- ❖ Hundreds of GRB afterglow spectra from tens of different facilities
- ❖ Spectra reduction is complex
- ❖ Having access to large samples
- ❖ Collaborative effort
- ❖ Combine both GRB information and observations

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Welcome to the GRBSpec database!

GRBSpec is a database of GRB spectra that compiles spectra of gamma-ray bursts (GRBs) and their host galaxies. It is a collaborative effort in which users are invited to upload their data. Please register to be able to upload and download data. **GRBSpec is free!**

Database statistics

868 spectra

1857 GRB's, 290 with associated spectra

2148 uploaded files

When using GRBSpec for a publication please cite: "**de Ugarte Postigo et al.: GRBSpec: a multi-observatory database for gamma-ray burst spectroscopy, SPIE, 9152 (2014), [adsabs.harvard.edu/abs/ 2014SPIE.9152E..0BD](https://ui.adsabs.harvard.edu/abs/2014SPIE.9152E..0BD)**" and include in the acknowledgements: "**This work made use of the GRBSpec database grbspec.eu**".

This work is produced with the support of a 2016 Leonardo Grant for Researchers and Cultural Creators, BBVA Foundation. Previous funding was received from the Marie Curie Career Integration Grant programme (FP7-PEOPLE-2012-CIG 322307) and the Spanish research projects AYA2012-39362-C02-02, AYA2014-58381-P and AYA2017-89384-P.

What to store? GRB information

Catalogue of GRB spectra

Searching for spectra in the database.

GRB 100418A

Automatically updated from mission tables (*Swift, Fermi*)

Detected by :	Swift
T0 :	21:10:08 UT
T90 :	7 seconds
RA (J2000.0) :	17:05:27.12
DEC (J2000.0) :	+11:27:42.48
Position error :	± 0.5"
Recalculated Galactic <i>L</i> , <i>B</i>	31.7, 28.1
SWIFT BAT fluence (15-150 keV) :	3.4± 0.5 10-E7 erg/cm2
SWIFT BAT 1-sec Peak Photon Flux :	1± 0.2 ph/cm2/sec";
Primary redshift :	0.6237

What to store? Spectroscopic observations

Spectra in data

Catalogue of GRB spectra

Information about a specific spectrum.

Options

→ Spectrum

→ Spectrum

→ Spectrum

→ Spectrum

→ Spectrum

→ Spectrum

→ Spectrum

→ Spectrum

→ Spectrum

Spectrum of GRB 100418A

Mean time since burst (t-t0) :	9.003 hours
Exposure :	4x1200 seconds
Spectral Range :	3100 - 5500 Å
Resolution :	5100
Signal to Noise Ratio :	31
Slit width :	0
Dispersing element :	UVB
Acquisition Filter :	R
Acquisition Magnitude :	18.1 ± 0.1 mag
Vacuum wavelengths :	No
Heliocentric correction :	Yes
Telluric correction :	No
Reference :	2011AN....332..297D
Redshift :	0.6237
Instrument/Telescope :	X-Shooter / 8.2m Very Large Telescope - UT2 (Chile / Paranal)
Uploader :	Antonio de Ugarte Postigo, IAA-CSIC

cope

T2

T2

T2

T2

T2

T2

T2

T2

T2

Linked data

References

What to store? Spectral data files

- ❖ 1D spectra: ASCII or fits files

- ❖ Count

- ❖ Normalised

- ❖ Flux calibrated

- ❖ 2D spectra: fits files

- ❖ Count

- ❖ Flux calibrated

- ❖ Plot image (no longer in use)

Spectrum files :

Show original files

Code	File	Units	Options
SF1	1D flux-calibrated spectrum (fits)	Å	 
EF1	1D flux-calibrated error spectrum (fits)	Å	 
PIC	Image of spectrum	Å	 
SN1	1D normalised spectrum (fits)	nm	 
EN1	1D normalised error spectrum (fits)	nm	 
SF2	2D flux-calibrated spectrum (fits)	nm	 
EF2	2D flux-calibrated error spectrum (fits)	nm	 

Upload new file

Type of spectrum to upload:

1D count spectrum (fits) ▾

Units:

Å ▾

File:

Browse

Upload

What to store? Spectral measurements

Fluxes :

No flux measurements are available

Add new values of flux measurements +

Observed λ (Å):

5364.35

FLUX:

6.37

±

0.53

Due to:

unknown 0

▼

Z:

2.21

Add Flux

Column densities :

No column density measurements are available.

Add new values of column densities +

Element:

All

▼

Z:

2.21

column density log N:

6.37

±

0.53

B:

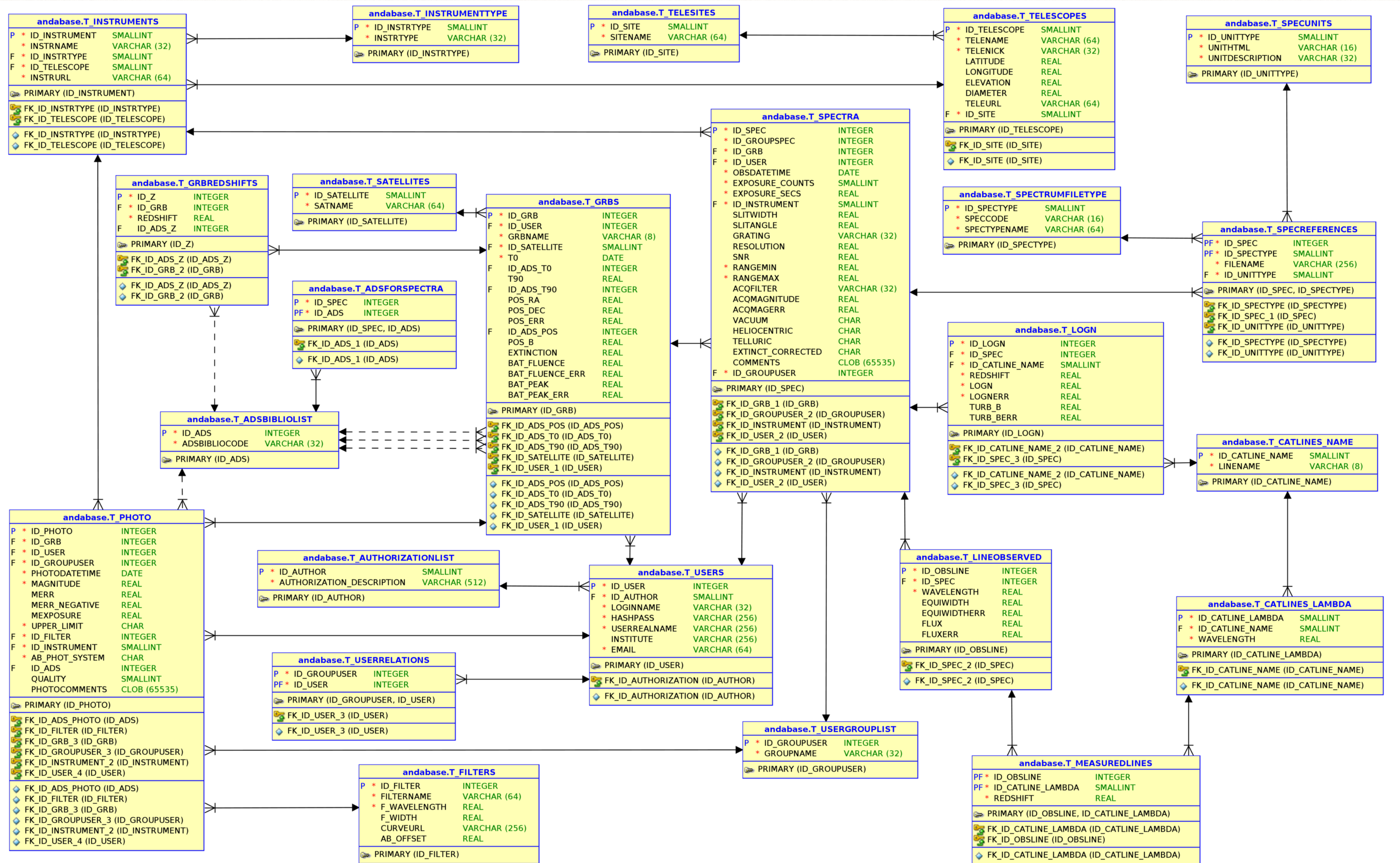
6.37

±

0.53

Add Log N

Database structure



❖ MySQL

❖ PHP

❖ Javascript

❖ Plotly

User management

- ❖ Data are available to registered users (limited access without login)
- ❖ Different levels of access: Guest, Uploader / Downloader, Administrator
- ❖ Security of passwords
- ❖ Users and collaborations
- ❖ Data ownership:
 - ❖ Public data
 - ❖ Collaboration data (access limited to collaborators)

Search engine

Catalogue of GRB spectra Searching for spectra in the database.

GRB Name:

 Satellite:

 Date:

Restframe search ☐

 T90 [s]:

Min	5.3	Max	40.1
-----	-----	-----	------

 DEC [deg]:

Min	-30.4	Max	55.1
-----	-------	-----	------

 E(B-V) Extinction:

Min	-0.4	Max	1.1
-----	------	-----	-----

Show individual spectra (multiplot) ☒

 Time since GRB, t-t0 (hr):

Min	0	Max	24
-----	---	-----	----

 Signal to noise ratio:

Min	3	Max	100
-----	---	-----	-----

 RA [deg] Min:

Min	155.34	Max	167.1
-----	--------	-----	-------

 Galactic b [deg]:

Min	12.3	Max	90
-----	------	-----	----

 Redshift z :

Min	0.55	Max	4.2
-----	------	-----	-----

 Spectral resolution:

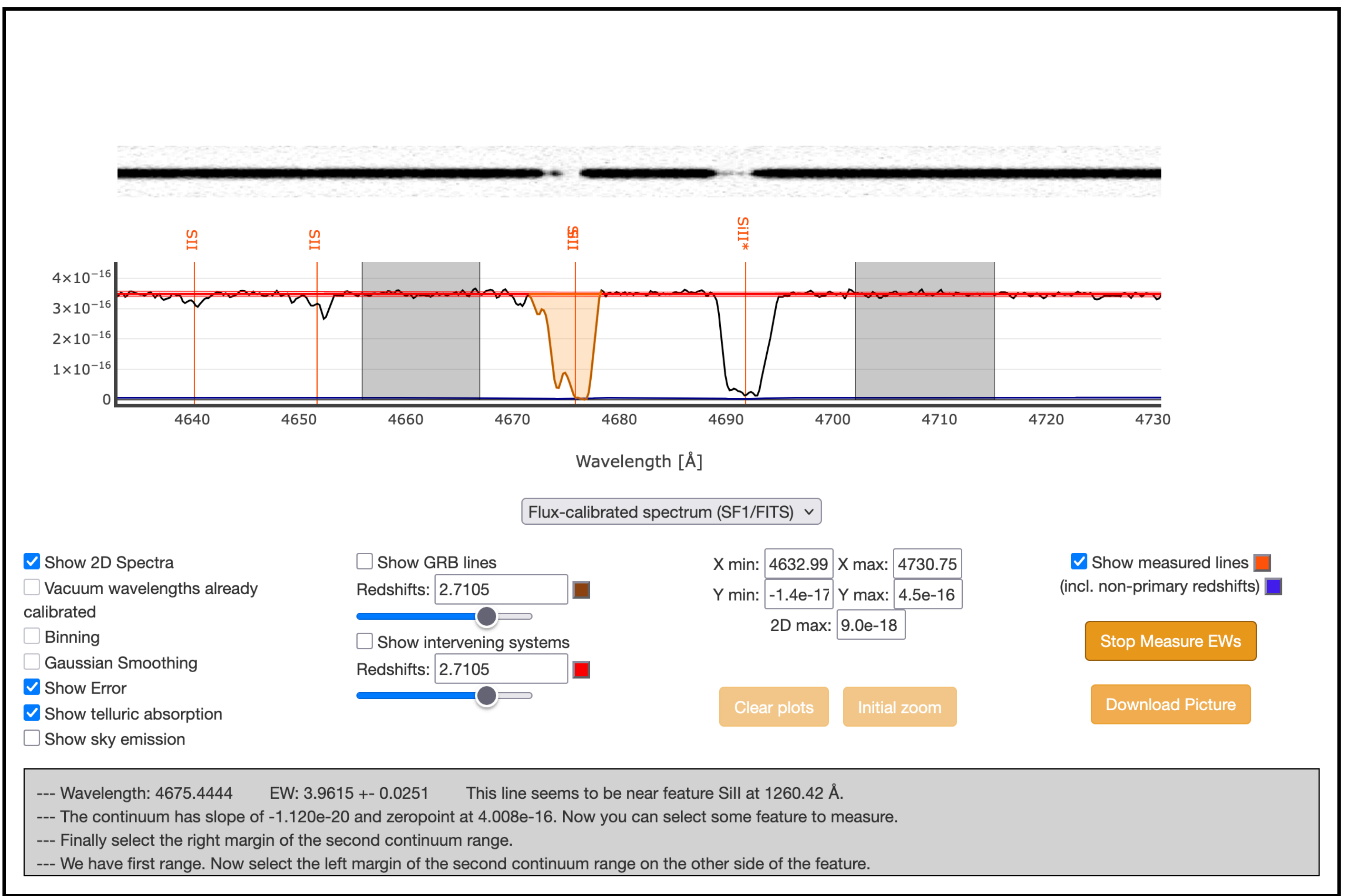
Min	500	Max	1000
-----	-----	-----	------

Spectral range ☒

Exposure time ☒

Submit

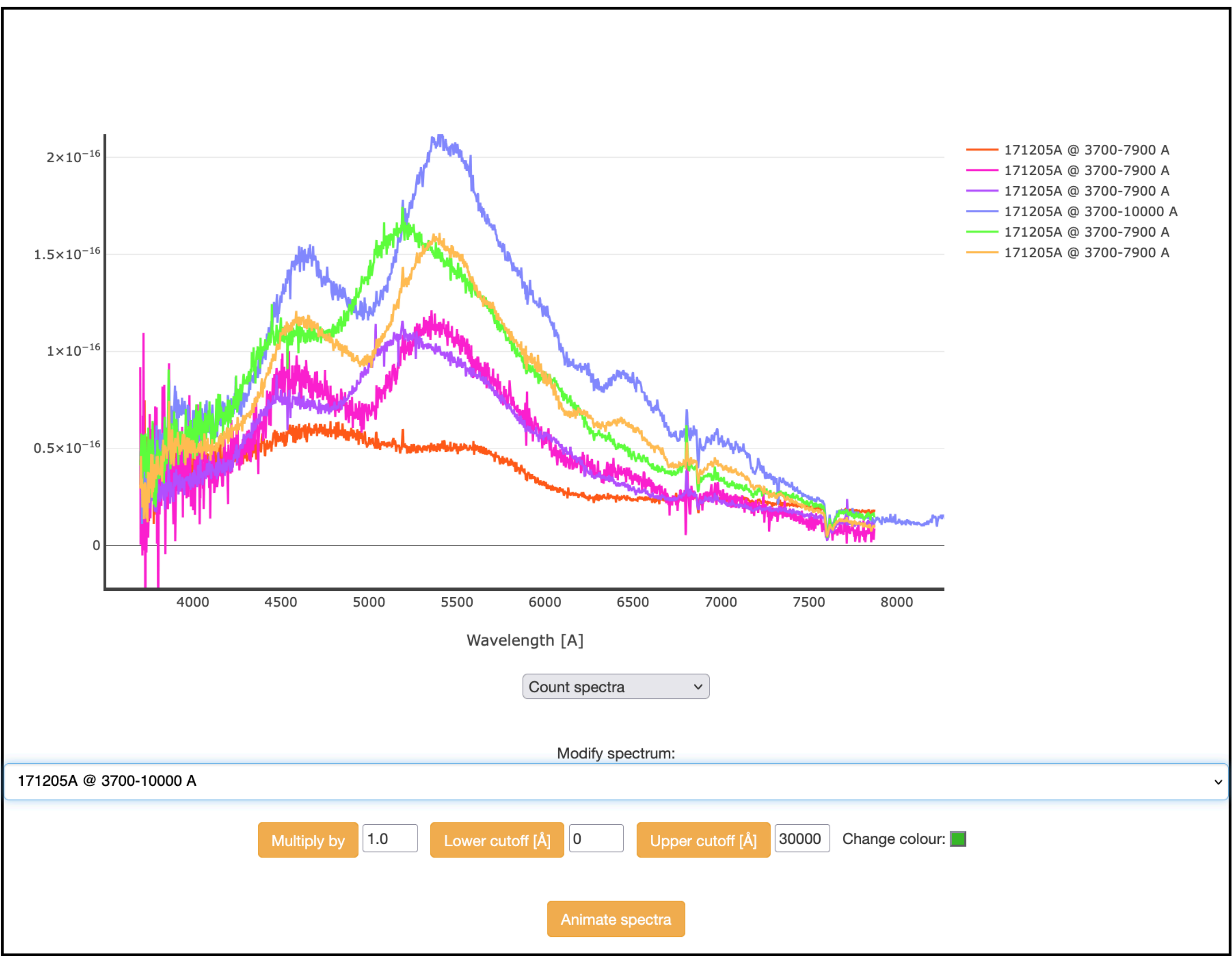
Plotting (and measuring) tool



Multi-spectra plot

Catalogue of GRB spectra

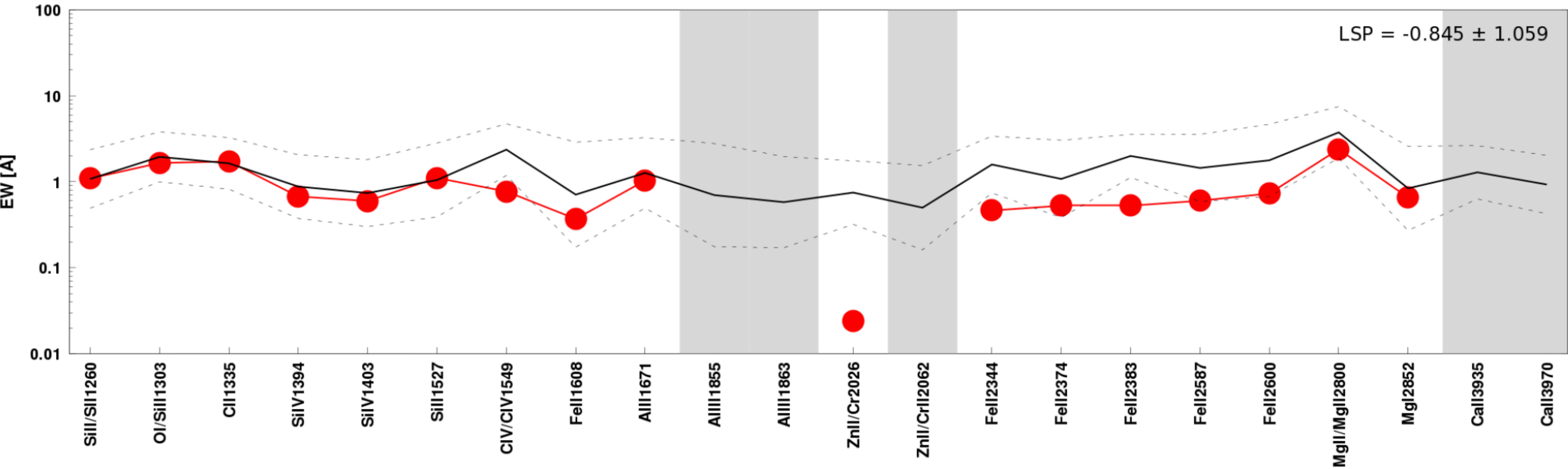
Multispectral plotting



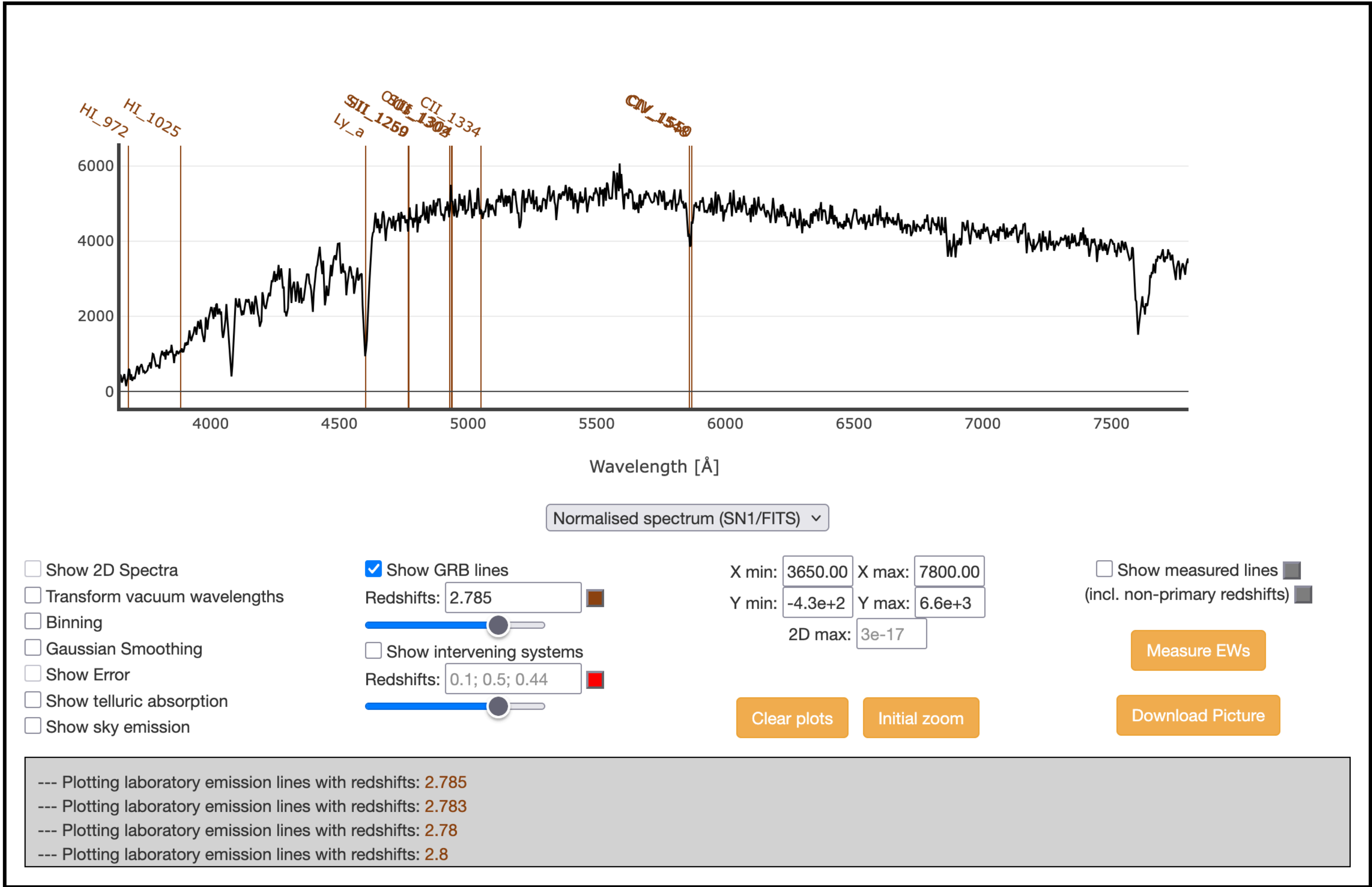
Line strength diagram tool

Line Strength Diagram

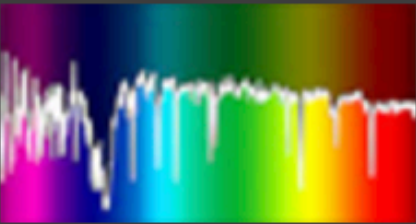
Comparison of the line strengths with a sample of GRB afterglow. For more details see [de Ugarte Postigo et al. \(2012\)](#)
Datapoints in this diagram are collected from EW measurements from all other spectra in the dataset connected to actual spectrum



Sandbox: tool for quick spectral analysis



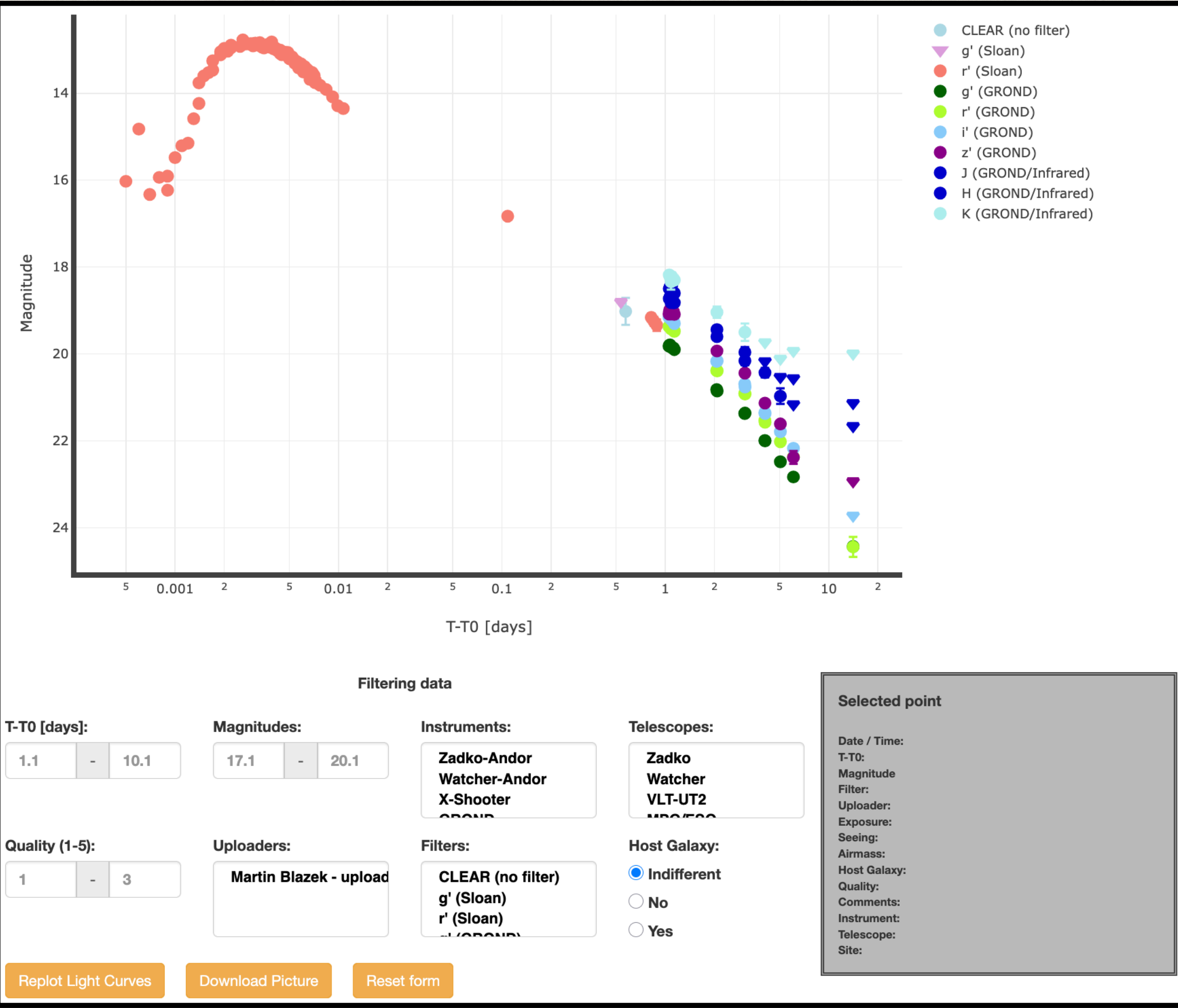
Photometric data



GRBPhot Catalogue of GRB Photometry

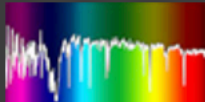
Photometry of GRB 161023A

T0 :	2016-10-26 15:50:00
Detected by :	INTEGRAL
T90 :	44 seconds
Number of data points :	187
Magnitudes :	12.773
Time period :	2016-10-26 15:45:00 - 2016-10-26 15:55:00



Data uploading

- ❖ GRB information
 - ❖ Automatically from mission tables
 - ❖ Manually using a simple form
- ❖ Spectra uploaded manually:
 1. Short form with observation data
 2. Manual upload of spectra files
- ❖ Tables and photometric data
 - ❖ Bulk through JSON formatted files
 - ❖ Manual upload

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Submit new GRB entry

Add new GRB catalogue entry in the database

Highlighted variables are mandatory. Information about other redshift measurements (intervening systems) and their references can be assigned later on the main page of the GRB.

GRB Name: <input type="text" value="YYMMDDA"/>	Time T0 [UT]: <input type="text" value="H"/> <input type="text" value="M"/> <input type="text" value="S"/>	Detected by: <input type="text" value="--OTHER--"/>	Time T90 [sec]: <input type="text"/>
Right Ascension [deg]: <input type="text"/>	Declination [deg]: <input type="text"/>	Position err [arcsecs]: <input type="text"/>	Galactic latitude B [deg]: <input type="text"/>
Extinction E(B-V): <input type="text"/>	ADS reference for T0: <input type="text"/>	ADS reference for T90: <input type="text"/>	ADS reference for R.A., Dec.: <input type="text"/>

Submit new Spectrum entry

Add new Spectrum catalogue entry in the database

Information about instruments, observatory, Group for the spectra and other redshift measurements (intervening systems) and their references can be assigned later on the main page of the Spectra.

GRB Name: (Empty if is composite) <input type="text" value="YYMMDDA"/>	Date [UT]: <input type="text"/>	Time [UT]: <input type="text" value="H"/> <input type="text" value="M"/> <input type="text" value="S"/>	Number of Exposures: <input type="text"/>	Single Exposure Time: <input type="text"/>
Lower Range [Å]: <input type="text"/>	Upper Range [Å]: <input type="text"/>	Slit width [arcsec]: <input type="text"/>	Position Angle (North to East) [deg]: <input type="text"/>	
Grating/dispersing element name: <input type="text"/>	Resolution [-]: <input type="text"/>	Signal to Noise Ratio [-]: <input type="text"/>	Acquisition Filter: <input type="text"/>	
Acquisition Magnitude [mag]: <input type="text"/>	Magnitude Error [mag]: <input type="text"/>	Vacuum wavelengths: <input type="text" value="Unknow"/>	Heliocentric correction: <input type="text" value="Unknow"/>	Telluric correction: <input type="text" value="Unknow"/>

Comments:

Current status

- ❖ Hosted at a foreign institution
- ❖ No funding since 2020: Not maintained
- ❖ Registration tool not working
- ❖ New GRBs not being updated



To Do...

- ❖ Transfer to a server in LAM
- ❖ Urgent maintenance updates (users and automatic GRB ingestion)
- ❖ Add radio and X-ray light curves (as part of the photometric database)
- ❖ Light curve analysis tools: Light curve fits (slopes, breaks, similar to XRT)
- ❖ SED analysis tool (something like Ny Avo's tool?)
- ❖ Host COLIBRÍ light curves?

Conclusions

- ❖ Database combining high-energy information with spectroscopy and photometry
- ❖ Collaborative effort
- ❖ Powerful search engine
- ❖ Potential to create extensive statistical samples
- ❖ Display and analysis tools
- ❖ Measurement tables