



EUROPEAN ARC
ALMA Regional Centre



ALMA Science Archive update 2020

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DA-64

| 1. Introduction

Science Archives

Rationale

- Archival research
- Multi-wavelength astronomy
- Proposing
- Reproducibility
- Time variability
- Support of developing countries
- Citizen-Science
- Outreach

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Rationale

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1 PB

Science Archives fastronomy

It is not enough that people can do what they need to do.
It has to be **fast**.



fastronomy

Let scientists concentrate on science

Science Archives User-experience



2007



2. ALMA Science Archive

ALMA Science Archive

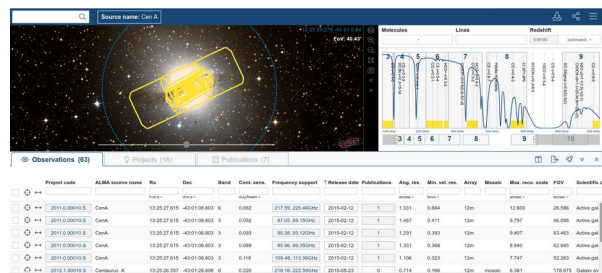
Search interface

The screenshot displays the ALMA Science Archive search interface. At the top, a search bar contains 'Source name: Cen A'. Below this is a large image of the source with a yellow box highlighting a region. To the right, a spectral plot shows intensity versus frequency (100 GHz to 700 GHz) with labeled peaks for various molecules and lines. Below the plot are tabs for 'Observations (63)', 'Projects (18)', and 'Publications (7)'. At the bottom, a table lists the search results.

Project code	ALMA source name	Ra	Dec	Band	Cont. sens.	Frequency support	Release date	Publications	Ang. res.	Min. vel. res.	Array	Mosaic	Max. reco. scale	FOV	Scientific c
2011.0.00010.S	CenA	13:25:27.615	-43:01:08.803	6	0.062	217.59..220.46GHz	2015-02-12	1	1.331	0.664	12m		12.600	26.586	Active gal
2011.0.00010.S	CenA	13:25:27.615	-43:01:08.803	3	0.092	87.05..89.15GHz	2015-02-12	1	1.467	0.411	12m		9.797	66.095	Active gal
2011.0.00010.S	CenA	13:25:27.615	-43:01:08.803	3	0.093	90.38..93.12GHz	2015-02-12	1	1.291	0.393	12m		9.407	63.463	Active gal
2011.0.00010.S	CenA	13:25:27.615	-43:01:08.803	3	0.089	85.96..99.35GHz	2015-02-12	1	1.331	0.368	12m		8.840	62.845	Active gal
2011.0.00010.S	CenA	13:25:27.615	-43:01:08.803	3	0.118	109.48..113.36GHz	2015-02-12	1	1.106	0.323	12m		7.747	52.263	Active gal
2012.1.00019.S	Centaurus A	13:25:26.557	-43:01:28.898	6	0.220	218.18..222.59GHz	2015-05-23	0	0.714	0.166	12m	mosaic	6.381	178.675	Galaxy ev

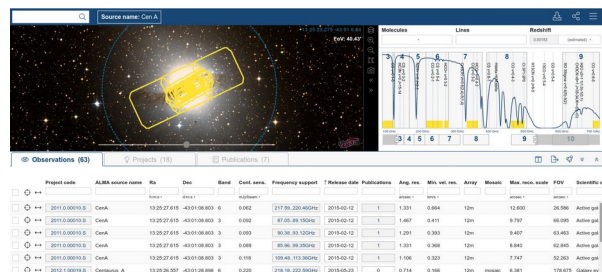
ALMA Science Archive Search interface

- Instantaneous search-as-you type
- Unscoped search
- Background slider
- Toggleable and invertible constraints
- Target-list upload
- Simultaneous search for observations, projects and publications
- Search for public unpublished
- Get calendar event for proprietary data



ALMA Science Archive Search interface

- Search for a particular data collection
- Selectable footprints
- Queries to Vizier/NED/Simbad from the sky-view
- Change the layout
- Zoomable spectral coverage at one glimpse
- Redshifted line-overlay with Line filter
- Bookmark and data-export capability
- Send results directly to VO tools



ALMA Science Archive

Programmatic access: VO services

The screenshot displays the ALMA Science Archive interface with several components:

- SAMP Hub Security Dialog:** A modal window asking for authorization. It contains the following text:

The following application, probably running in a browser, is requesting SAMP Hub registration:

Name:
Origin: <https://almascience.eso.org>
URL: undeclared

If you permit this, it may be able to access local files and other resources on your computer.

You should only accept if you have just performed some action in the browser, on a web site you trust, that you expect to have caused this.

Do you authorize connection?

No Yes
- Spectral Plot:** A plot showing flux density versus frequency. The x-axis ranges from 300 GHz to 400 GHz. A peak is visible at approximately 370 GHz.
- Galaxy Image:** A color image of a galaxy labeled "DSS2 color". The image shows a spiral galaxy with a bright central region. A search box at the bottom of the image contains the text "23 39 x 11 59".
- Data Table:** A table with columns: Project, ALMA sou..., Ra, Dec, Band, Cont. se..., Frequent..., Release ..., Publicat..., Ang. res., and Mj. The table contains several rows of data, including:

ALMA Science Archive Download

ALMA Request Handler Logout

Anonymous User: Request #2154933509907 ✓
 Request Title: [click to edit](#)

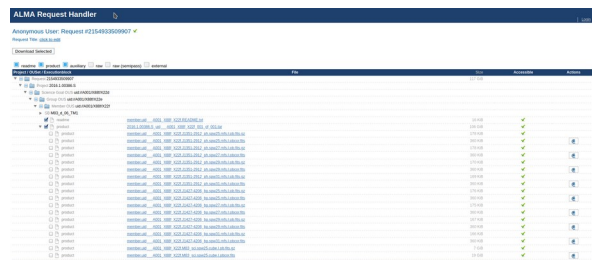
readme
 product
 auxiliary
 raw
 raw (semipass)
 external

Project / OUSet / Executionblock	File	Size	Accessible	Actions
Request 2154933509907		117 GiB		
Project 2016.1.00386.S				
Science Goal OUS uid://A001/X88f/X22d				
Group OUS uid://A001/X88f/X22e				
Member OUS uid://A001/X88f/X22f				
SB M83_d_06_TM1				
<input checked="" type="checkbox"/> readme	member.uid_A001_X88f_X22f_README.txt	16 KiB	✓	
<input checked="" type="checkbox"/> product	2016.1.00386.S_uid_A001_X88f_X22f_001_of_001.tar	106 GiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31351-2912_ph.spw25.mfs.l.pb.fits.gz	178 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31351-2912_ph.spw25.mfs.l.pbcor.fits	360 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31351-2912_ph.spw27.mfs.l.pb.fits.gz	178 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31351-2912_ph.spw27.mfs.l.pbcor.fits	360 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31351-2912_ph.spw29.mfs.l.pb.fits.gz	170 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31351-2912_ph.spw29.mfs.l.pbcor.fits	360 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31351-2912_ph.spw31.mfs.l.pb.fits.gz	169 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31351-2912_ph.spw31.mfs.l.pbcor.fits	360 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31427-4206_bp.spw25.mfs.l.pb.fits.gz	176 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31427-4206_bp.spw25.mfs.l.pbcor.fits	360 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31427-4206_bp.spw27.mfs.l.pb.fits.gz	175 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31427-4206_bp.spw27.mfs.l.pbcor.fits	360 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31427-4206_bp.spw29.mfs.l.pb.fits.gz	167 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31427-4206_bp.spw29.mfs.l.pbcor.fits	360 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31427-4206_bp.spw31.mfs.l.pb.fits.gz	166 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_31427-4206_bp.spw31.mfs.l.pbcor.fits	360 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_M83_sci.spw25.cube.l.pb.fits.gz	7 GiB	✓	
<input type="checkbox"/> product	member.uid_A001_X88f_X22f_M83_sci.spw25.cube.l.pbcor.fits	19 GiB	✓	

ALMA Science Archive Download

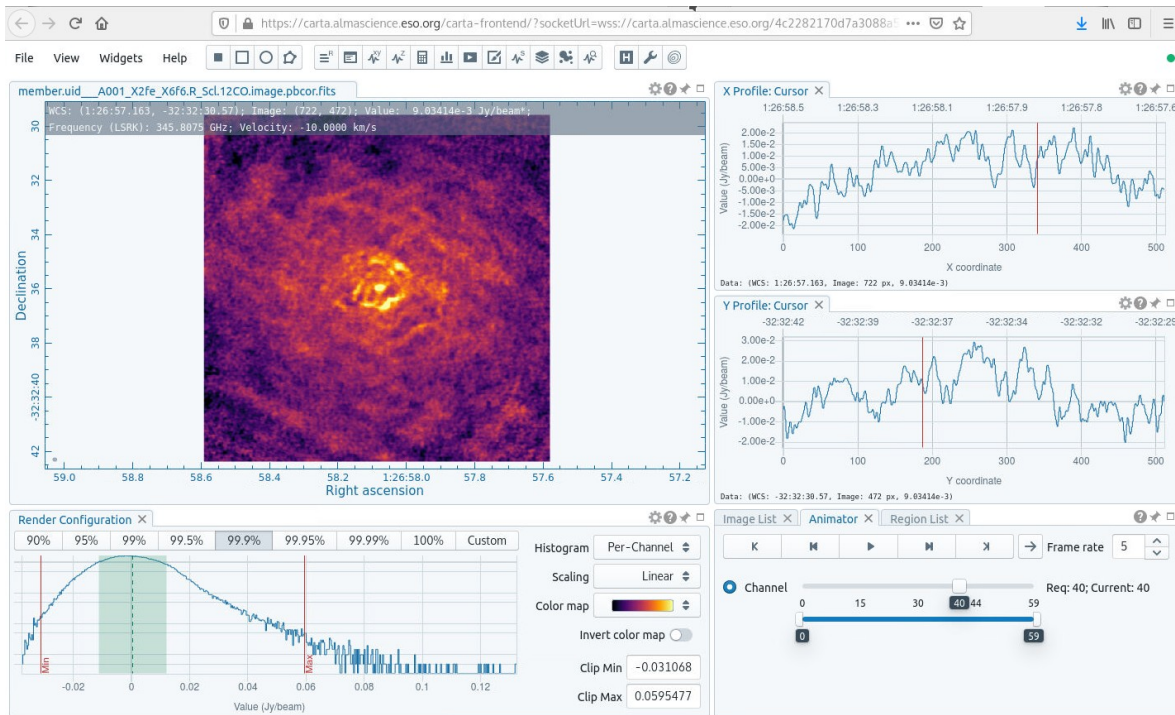
- **All** FITS and README files are accessible
- individually (except Cy0)
- Parallel scripted downloads
- Over 5000 MOUS have updated QA reports and README files
- Direct download of over 74000 ARI-L products

- Remote visualization of all ALMA science FITS files with CARTA



The screenshot shows the ALMA Request Handler interface. At the top, it displays the user 'Anonymous User (Request 0258493050002)' and the request ID 'Request ID: 00833308'. Below this, there is a tree view of the data structure, including folders for 'Data', 'README', and 'QA'. The main part of the interface is a table with columns for 'File', 'Size', 'Accessed', and 'Action'. The table lists numerous files, including FITS files and README files, with their respective sizes and access dates. The 'Action' column contains icons for downloading and deleting files.

ALMA Science Archive CARTA



ALMA Science Archive Programmatic access: VO services

TAP, SIA2 and Datalink registered with the VO

The image displays a Virtual Observatory (VO) interface with three main components:

- Table Access Protocol (TAP) Query Window:** Shows a query window with a "Find:" field, a "Service:" dropdown, and a "Run Query" button. The "Table List" shows a table named "lva_obscore" with 1,000 rows and 6 columns.
- Table Browser:** Displays a table named "lva_obscore" with columns: "access", "proposal id", "data rights", "gal longitude", "gal latitude", and "obs public". The table contains 20 rows of data.
- Visualization:** A 3D visualization of astronomical data, showing a red sphere with a grid of points and lines, representing a celestial object or region.

ALMA Science Archive

Programmatic access: astroquery

ALMA contribution to the astroquery package

```
>>> from astroquery.alma import Alma
>>> m83_data = Alma.query_object('M83')
>>> print(len(m83_data))
830
```


ALMA Data Processing

Calibrated Measurement Sets

- EU calMS service developed by Dirk Petry
- Go to help.almascience.eso.org
- Select 'Data request' and specify project code and MOUS

| 4. Summary

Conclusions

Summary

- ALMA Science Archive: Lots of progress in 2020 from the search interface over the individual data files, the VO services to the remote visualization

- Questions, suggestions, comments: help.almascience.org