Hands-On with the

ALMA Archive

Follow Along!

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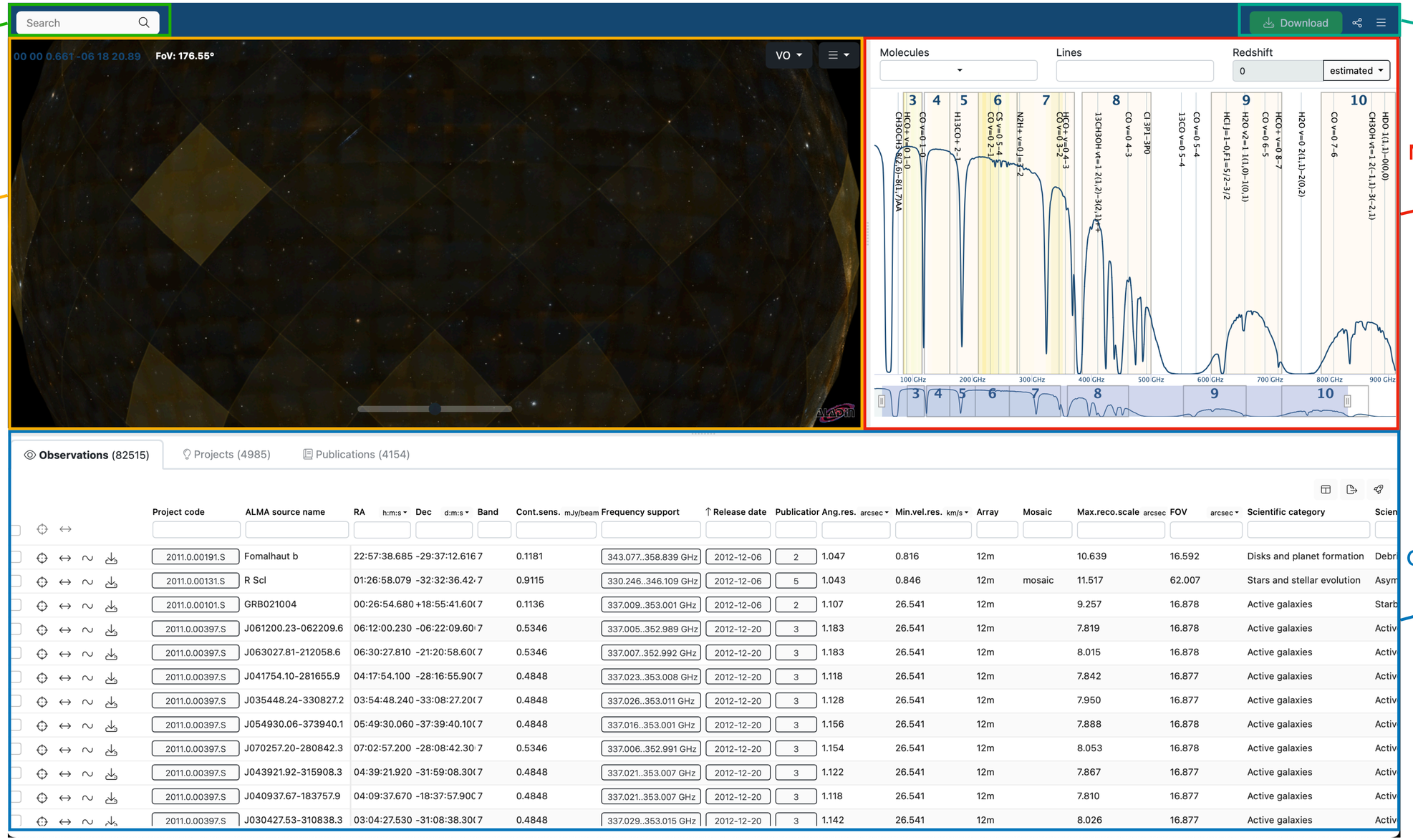
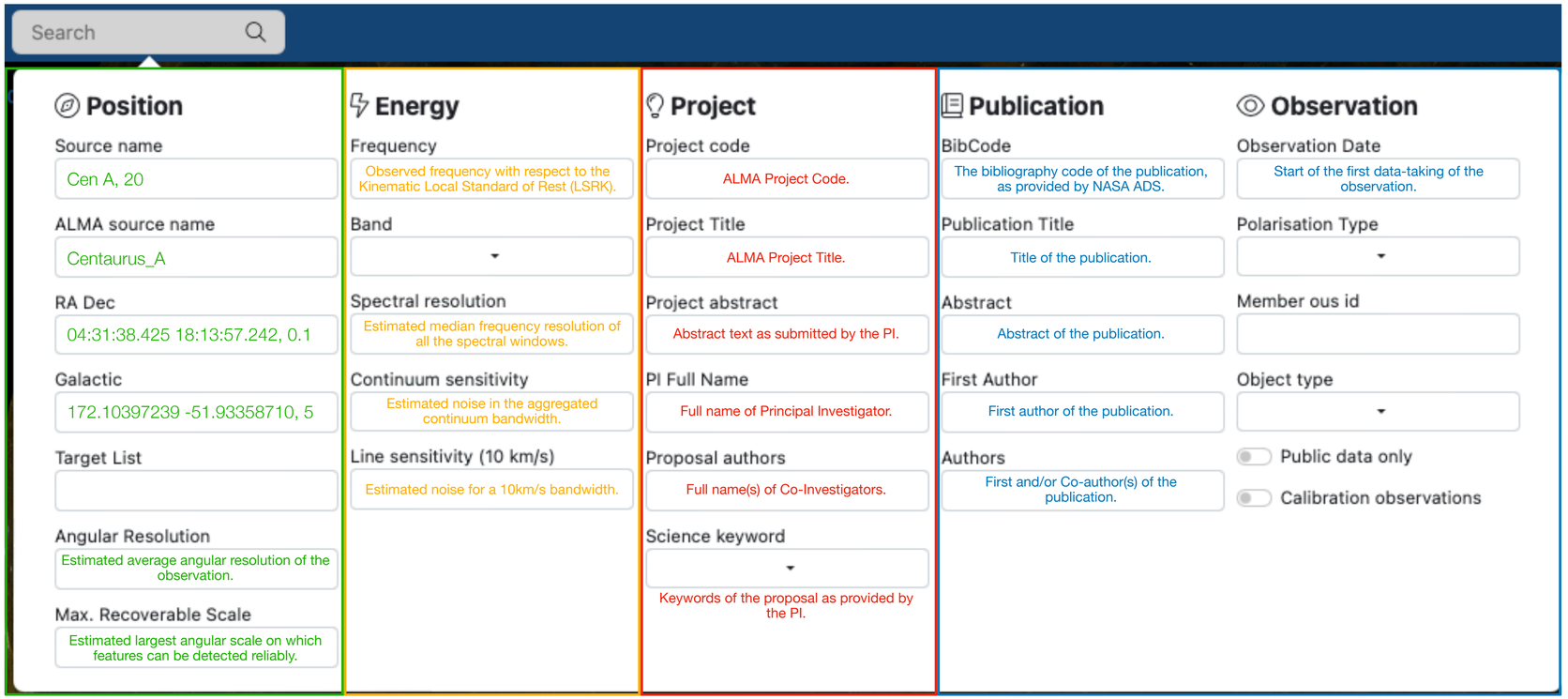
The ALMA Archive Layout

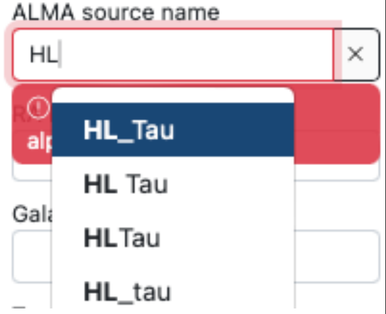


Project code	ALMA source name	RA h:m:s	Dec d:m:s	Band	Cont.sens. mJy/beam	Frequency support	Release date	Publicatior	Ang.res. arcsec	Min.vel.res. km/s	Array	Mosaic	Max.reco.scale arcsec	FOV arcsec	Scientific category	Scien
2011.0.00191.S	Fomalhaut b	22:57:38.685	-29:37:12.616	7	0.1181	343.077..358.839 GHz	2012-12-06	2	1.047	0.816	12m		10.639	16.592	Disks and planet formation	Debr
2011.0.00131.S	R Scl	01:26:58.079	-32:32:36.42	7	0.9115	330.246..346.109 GHz	2012-12-06	5	1.043	0.846	12m	mosaic	11.517	62.007	Stars and stellar evolution	Asym
2011.0.00101.S	GRB021004	00:26:54.680	+18:55:41.60	7	0.1136	337.009..353.001 GHz	2012-12-06	2	1.107	26.541	12m		9.257	16.878	Active galaxies	Starb
2011.0.00397.S	J061200.23-062209.6	06:12:00.230	-06:22:09.60	7	0.5346	337.005..352.989 GHz	2012-12-20	3	1.183	26.541	12m		7.819	16.878	Active galaxies	Activ
2011.0.00397.S	J063027.81-212058.6	06:30:27.810	-21:20:58.60	7	0.5346	337.007..352.992 GHz	2012-12-20	3	1.183	26.541	12m		8.015	16.878	Active galaxies	Activ
2011.0.00397.S	J041754.10-281655.9	04:17:54.100	-28:16:55.90	7	0.4848	337.023..353.008 GHz	2012-12-20	3	1.118	26.541	12m		7.842	16.877	Active galaxies	Activ
2011.0.00397.S	J035448.24-330827.2	03:54:48.240	-33:08:27.20	7	0.4848	337.026..353.011 GHz	2012-12-20	3	1.128	26.541	12m		7.950	16.877	Active galaxies	Activ
2011.0.00397.S	J054930.06-373940.1	05:49:30.060	-37:39:40.10	7	0.4848	337.016..353.001 GHz	2012-12-20	3	1.156	26.541	12m		7.888	16.878	Active galaxies	Activ
2011.0.00397.S	J070257.20-280842.3	07:02:57.200	-28:08:42.30	7	0.5346	337.006..352.991 GHz	2012-12-20	3	1.154	26.541	12m		8.053	16.878	Active galaxies	Activ
2011.0.00397.S	J043921.92-315908.3	04:39:21.920	-31:59:08.30	7	0.4848	337.021..353.007 GHz	2012-12-20	3	1.122	26.541	12m		7.867	16.877	Active galaxies	Activ
2011.0.00397.S	J040937.67-183757.9	04:09:37.670	-18:37:57.90	7	0.4848	337.021..353.007 GHz	2012-12-20	3	1.118	26.541	12m		7.810	16.877	Active galaxies	Activ
2011.0.00397.S	J030427.53-310838.3	03:04:27.530	-31:08:38.30	7	0.4848	337.029..353.015 GHz	2012-12-20	3	1.142	26.541	12m		8.026	16.877	Active galaxies	Activ

The ALMA Archive Search Bar



Names for the same object may have been spelled differently in different ALMA projects



Currently Available ALMA Bands

1	35..50 GHz
3	84..116 GHz
4	125..163 GHz
5	163..211 GHz
6	211..275 GHz
7	275..373 GHz
8	385..500 GHz
9	602..720 GHz
10	787..950 GHz

Frequency Searching

Frequency: 219.56

A single frequency value returns all observations with spectral windows covering this frequency.

Frequency: 100..300

A frequency range returns all observations with spectral windows overlapping that frequency range.

Frequency: 219.56 | 329.33

Multiple frequencies and/or ranges can be given.

Publication / Observation Searching

BibCode: 2023ApJ...951....8O

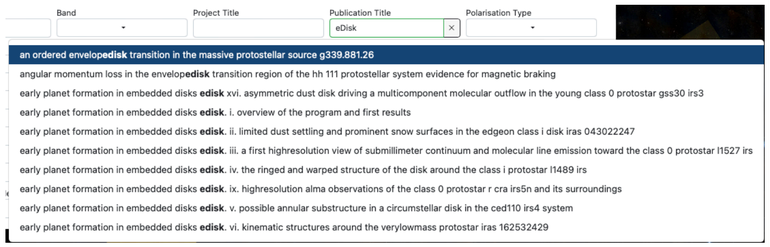
Pro Tip: Click on the Bibcode on ADS to copy to your clipboard and paste in the BibCode search.

Public data only

Show only data that is publicly available. (out of proprietary period)

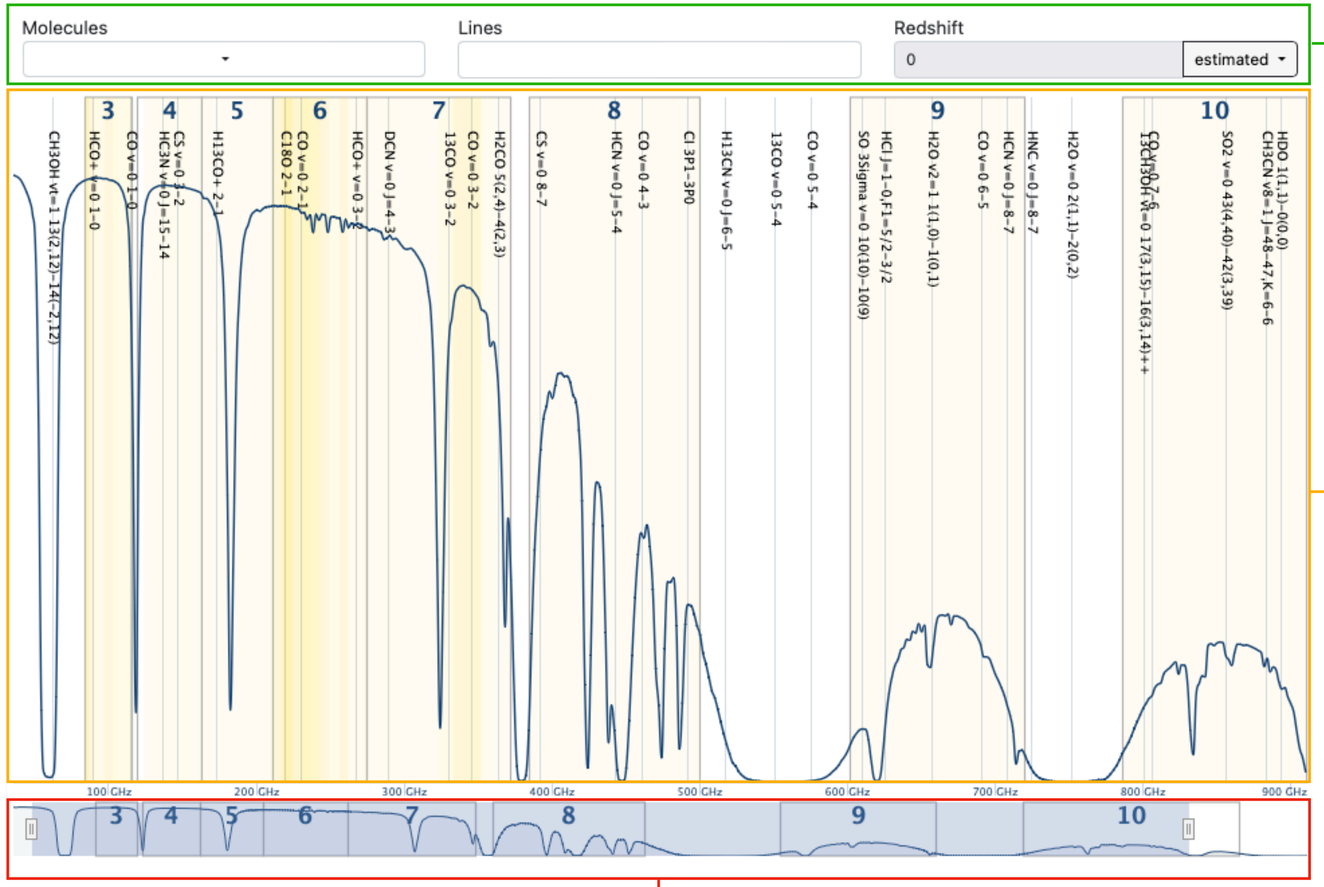
Available polarization types

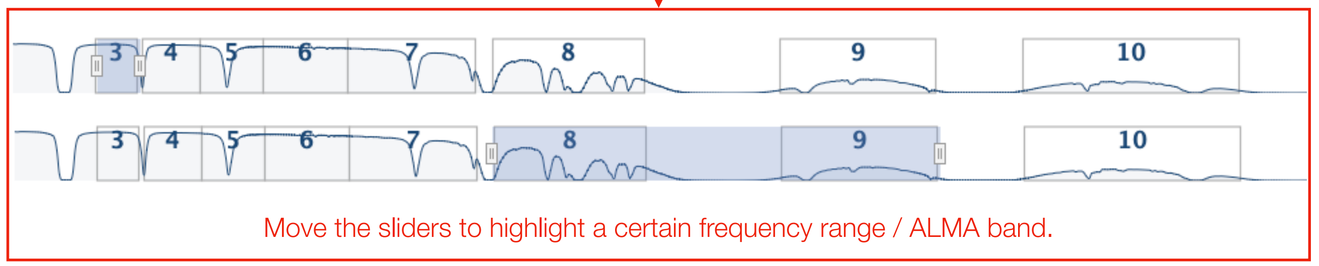
Single	XX or YY
Dual	XX YY
Full	XX XY YX YY



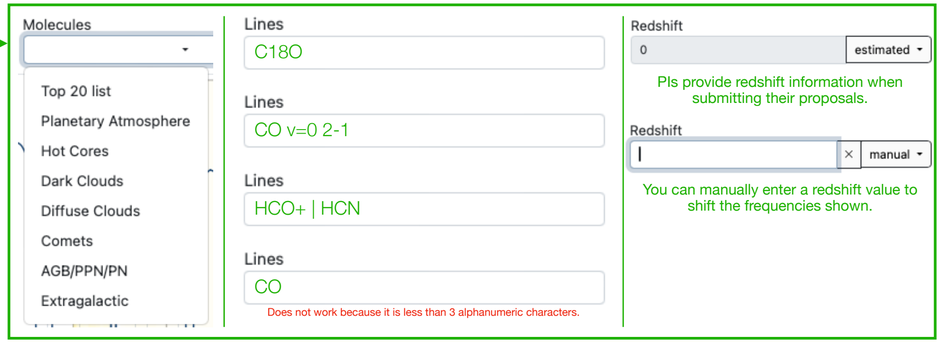
Type a keyword from the publication that uses ALMA data

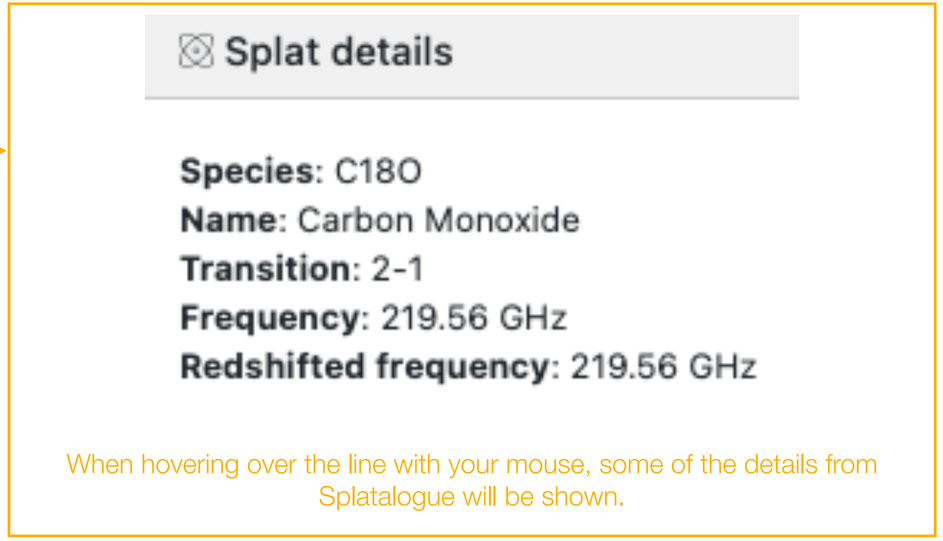
The ALMA Archive Line Query





Move the sliders to highlight a certain frequency range / ALMA band.





When hovering over the line with your mouse, some of the details from Splatalogue will be shown.

Search for molecular lines and their properties using

Splatalogue

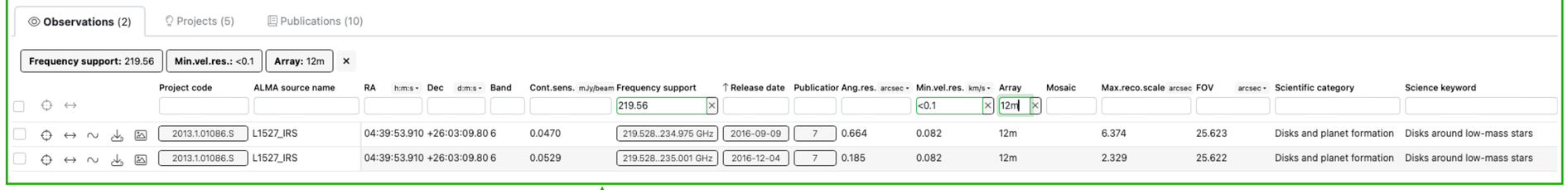
The ALMA Archive Results

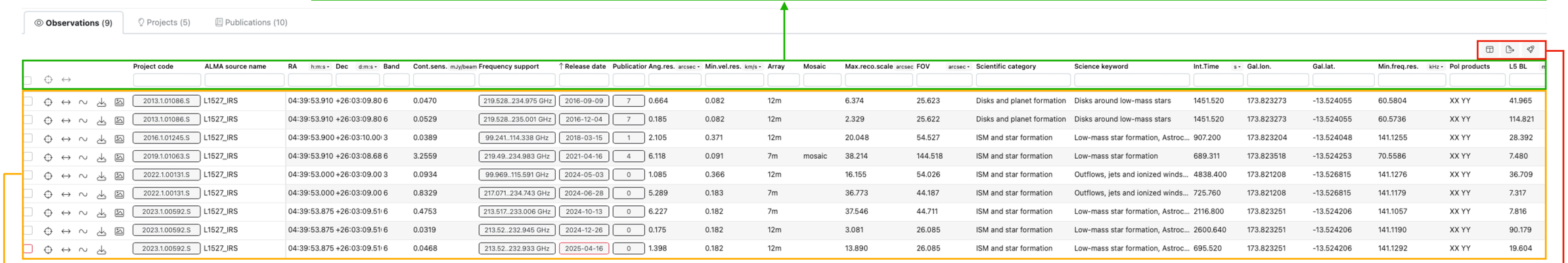
For Example

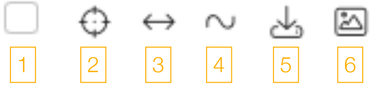
ALMA source name

L1527_IRS

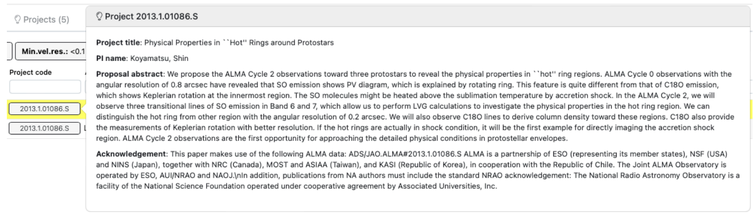
Columns with filter fields (similar to filtering in the Search Bar, see Slide 3)







1. Select observation
2. Center spectral coverage in Line Query viewer
3. Center sky for source
4. Show text-based similarity for source
5. Explore and download observation
6. Preview data for source

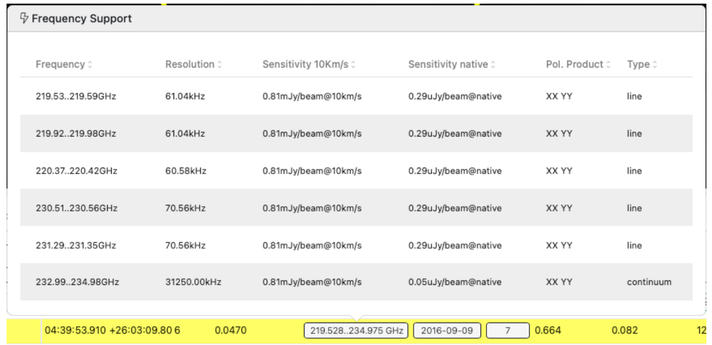


When hovering over the project code with your mouse, the Project Title, PI, Abstract and Acknowledgement will be shown.

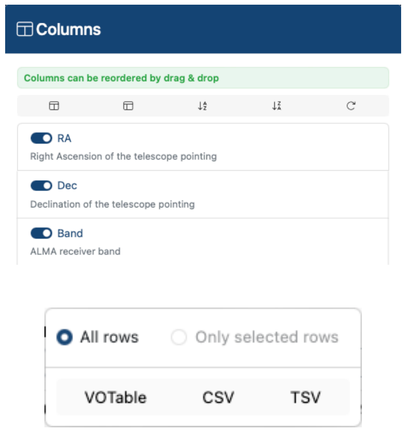
How to tell if the project is publicly available?

No outline means the data is publicly available

Red outline means the data is not publicly available



When hovering over the frequency support with your mouse, the Frequency, Resolution, Line Sensitivities, Polarization and Spectral Window Type will be shown.



The ALMA Archive Results

For Example

ALMA source name

L1527_IRS

Show the associated ALMA projects

Observations (9) | **Projects (5)** | Publications (10)

Project Code	Project Title	Type	Joint proposals	PI Name	Proposal authors	↑ Max.Release D	Publications	Observations	SB names
2013.1.01086.S	Physical Properties in ``Hot'' Rings around Protostars	S		Koyamatsu, Shin	Yen, Hsi-Wei; Tomisa...	2016-12-04	7	12	L1527_IR_a_06_TC, L1527_IR_a_06_TE
2016.1.01245.S	Laying the groundwork for future ALMA direct magnetic field detection	S		Cox, Erin	Tobin, John; Looney, ...	2018-03-15	1	21	IRAM_041_a_03_TM1, L1527_IR_a_03_TM1, Oph_MMS__a_03_TM1,...
2019.1.01063.S	The Kinematical Transition between the Envelope and Core around Young Embedded Protostars	S		Sai, Jinshi	Maret, Sébastien; Yen...	2021-04-16	4	10	IRAS_153_a_06_7M, L1489_IR_a_06_7M
2023.1.00592.S	Characterizing the sulfur family in low-mass protostars	S		van Gelder, Martijn	van Dishoeck, Ewine; ...	2025-10-30	0	47	L1527_IR_a_06_7M, L1527_IR_a_06_TM1, L1527_IR_a_06_TM2, Per-...
2022.1.00131.S	Outflows in Class 0/I Protostars with ALMA: A multi-scale approach	S		Plunkett, Adele	Tobin, John; Narayan...	2025-11-27	0	210	B335_a_03_7M, B335_a_03_TM1, B335_a_06_7M, B335_a_06_TP,...

Show the associated publications using the ALMA observations

Observations (9) | Projects (5) | **Publications (10)**

BibCode	First Author	Journal	Year	Publication Title	↑ Max.Release D	Projects	Observations	Authors
2020ApJ...893...51S	Sai, Jinshi	ApJ	2020	Disk Structure around the Class I Protostar L1489 IRS Revealed by ALMA: A Warped-disk System	2016-12-04	1	12	Sai, Jinshi; Ohashi, Nagayoshi; Saigo, Kazuya; Matsumoto, Tomoaki; Aso, Yusuke; Takakuwa, Shigehisa;...
2018A&A...615A..83V	van 't Hoff, Merel L. ...	A&A	2018	Unveiling the physical conditions of the youngest disks. A warm embedded disk in L1527	2016-12-04	1	12	van 't Hoff, Merel L. R.; Tobin, John J.; Harsono, Daniel; van Dishoeck, Ewine F.
2022ApJ...933...23O	Ohashi, Satoshi	ApJ	2022	No Evidence of the Significant Grain Growth but Tentative Discovery of Disk Substructure in a Disk arou...	2017-10-21	2	17	Ohashi, Satoshi; Kobayashi, Hiroshi; Sai, Jinshi; Sakai, Nami
2024A&A...686A.143G	Guzmán Ccolque, E.	A&A	2024	Episodicity in accretion-ejection processes associated with IRAS 15398-3359	2021-04-16	2	26	Guzmán Ccolque, E.; Fernández López, M.; Vazzano, M. M.; de Gregorio, I.; Plunkett, A.; Santamaría-Mi...
2023ApJ...944..222S	Sai, Jinshi (Insa Choi)	ApJ	2023	Probing Velocity Structures of Protostellar Envelopes: Infalling and Rotating Envelopes within Turbulent ...	2021-04-16	3	38	Sai, Jinshi (Insa Choi); Ohashi, Nagayoshi; Yen, Hsi-Wei; Maury, Anaëlle J.; Maret, Sébastien
2024ApJ...966..192S	Sai, Jinshi	ApJ	2024	Multiple Outflows around a Single Protostar IRAS 15398-3359	2021-04-16	1	10	Sai, Jinshi; Yen, Hsi-Wei; Machida, Masahiro N.; Ohashi, Nagayoshi; Aso, Yusuke; Maury, Anaëlle J.; Mar...
2022ApJ...925...12S	Sai, Jinshi	ApJ	2022	Which Part of Dense Cores Feeds Material to Protostars? The Case of L1489 IRS	2021-04-16	1	10	Sai, Jinshi; Ohashi, Nagayoshi; Maury, Anaëlle J.; Maret, Sébastien; Yen, Hsi-Wei; Aso, Yusuke; Gaudel, ...
2023ApJ...951....8O	Ohashi, Nagayoshi	ApJ	2023	Early Planet Formation in Embedded Disks (eDisk). I. Overview of the Program and First Results	2023-07-20	7	173	Ohashi, Nagayoshi; Tobin, John J.; Jørgensen, Jes K.; Takakuwa, Shigehisa; Sheehan, Patrick; Aikawa, ...
2023A&A...676A...4C	Cacciapuoti, L.	A&A	2023	FAUST. IX. Multiband, multiscale dust study of L1527 IRS. Evidence for variations in dust properties wit...	3000-01-01	20	563	Cacciapuoti, L.; Macias, E.; Maury, A. J.; Chandler, C. J.; Sakai, N.; Tychoniec, Ł.; Viti, S.; Natta, A.; De S...
2019Natur.565..206S	Sakai, Nami	Nature	2019	A warped disk around an infant protostar	3000-01-01	2	21	Sakai, Nami; Hanawa, Tomoyuki; Zhang, Yichen; Higuchi, Aya E.; Ohashi, Satoshi; Oya, Yoko; Yamamoto...

Downloading Data From The ALMA Archive

For Example

ALMA source name

L1527_IRS

Step 1:
Log in to your ALMA account

Enter your Userid and Password

Userid

Password

Sign In

If the data is yours and still in the proprietary period, you will be able to download once logged in.

Step 2: Select the data you want to download

Types of files available for download:

Products are fits images/cubes produced from running the scriptForImaging.py during the data calibration pipeline.

Auxiliary / Script are any additional files and calibration / imaging scripts that are used for doing the pipeline calibration.

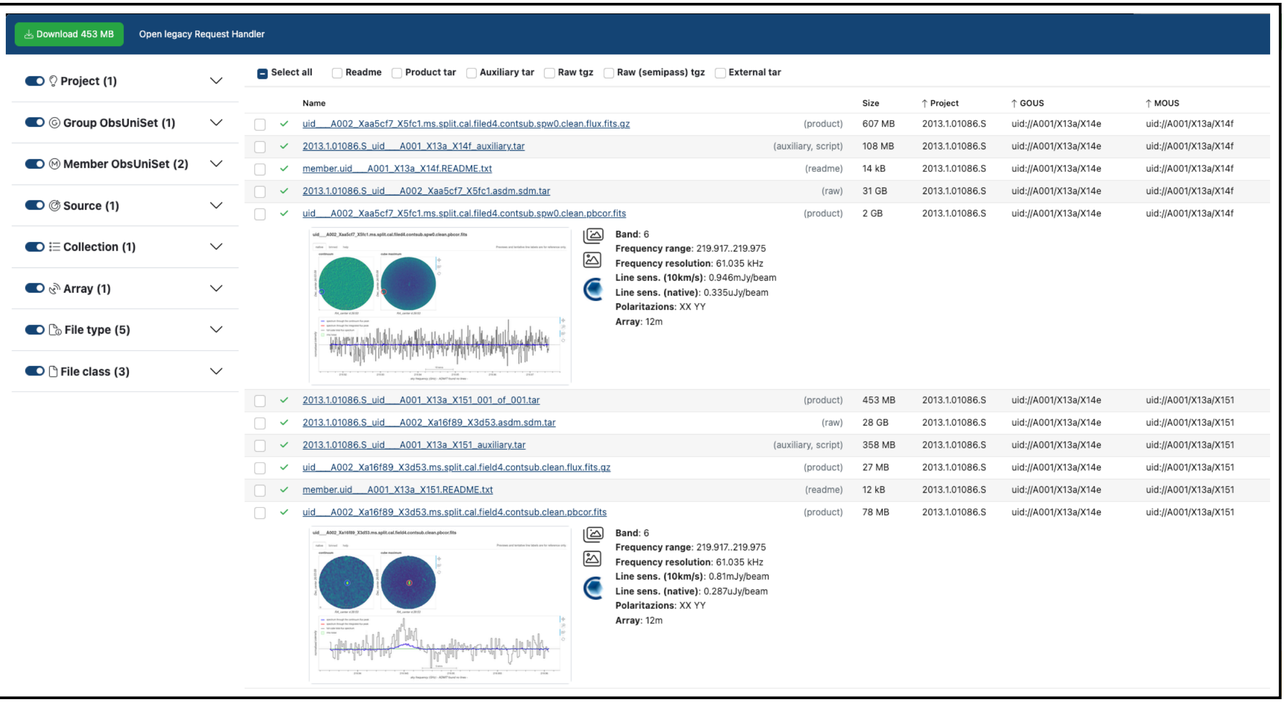
Raw / Raw (semipass) are the QA2 pass and QA2 semipass raw data, respectively, used in the pipeline calibration.

Readme is the readme file that contains information on the observations and some QA2 information.

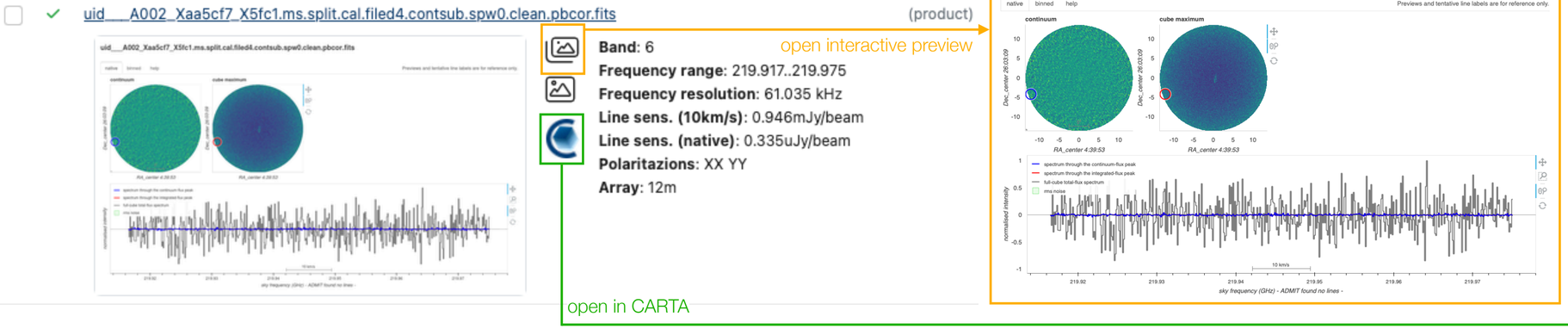
File selection and download:

Use the select buttons at the top to select which types of data you want to download, or manually select each the ones you want using the individual checkboxes.

Once the data is selected, press the green **Download** button in the top left corner of the page.



Bonus: Explore the product fits files before downloading!



Downloading Data From The ALMA Archive

Step 3a: Download using the modern interface

Clicking the **Download** button will download a file called **download-files.sh**

This script runs on Linux and MaxOS and downloads all the selected files to the current working directory in up to 5 parallel download streams.

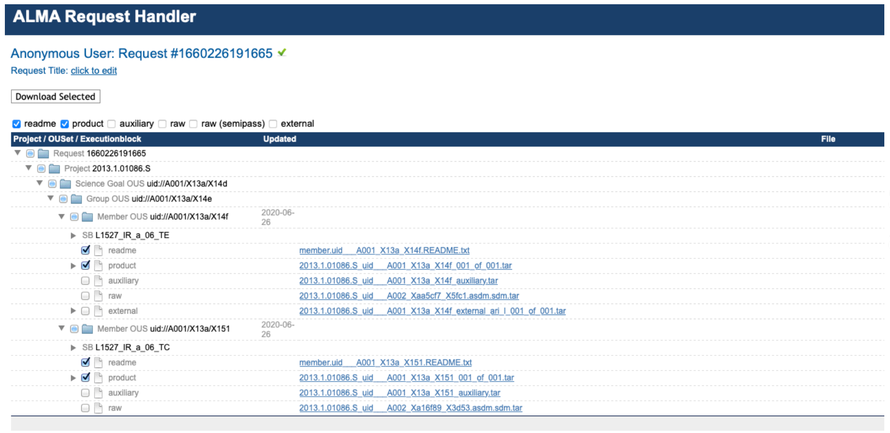
Should a download be aborted just run the entire script again, as partial downloads will be resumed.

To run the script:

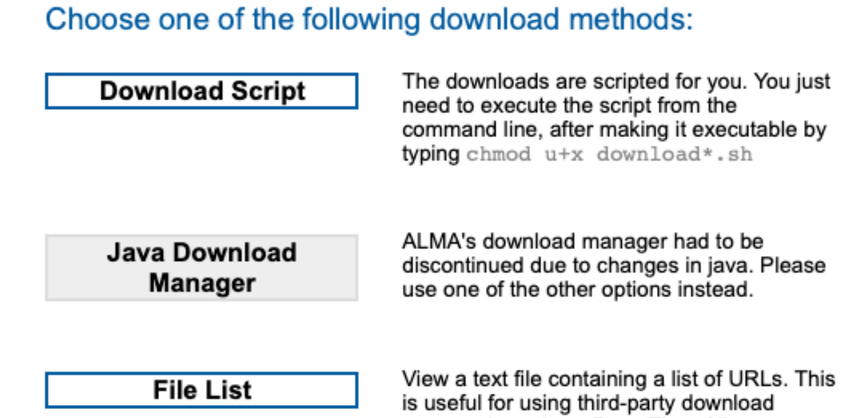
```
user@Computer % chmod u+x download-files.sh

user@Computer % ./download-files.sh
```

Step 3b: Download using the legacy interface



Select the files you wish to download and click **Download Selected**.



Choose between two main methods:

1) **Download Script** is the same as the method in Step 3a. It downloads a **download*.sh** file which can be executed in your terminal.
2) **File List** takes you to a page that contains a list of download URLs, which is useful when downloading via third-party software.

Note: the Java download manager method has been discontinued.

Let’s practice!

Access The ALMA Archive Using Python

astropy/**astroquery**

```
>>> from astropy import coordinates
>>> from astropy import units as u
>>> galactic_center = coordinates.SkyCoord(0*u.deg, 0*u.deg,
...                                        frame='galactic')
>>> alma = Alma()
>>> alma.archive_url = 'https://almascience.eso.org'  # optional to make doctest work
>>> gc_data = alma.query_region(galactic_center, 1*u.deg)
>>> print(gc_data)
     obs_publisher_did      obs_collection facility_name ...     scientific_category
                                                        ...
------------------------ -------------- ------------- ... --------------------------
ADS/JAO.ALMA#2012.1.00133.S           ALMA           JAO ...      ISM and star formatior
```

```
>>> from astroquery.alma.core import Alma
>>> from astropy import coordinates
>>> from astropy import units as u
>>> s255ir = coordinates.SkyCoord(93.26708333, 17.97888889, frame='fk5',
...                               unit=(u.deg, u.deg))
>>> alma = Alma()
>>> alma.archive_url = 'https://almascience.eso.org'  # optional to make doctest work
>>> result = alma.query_region(s255ir, radius=0.034*u.deg)
>>> uid_url_table = alma.get_data_info(result['member_ous_uid'][0], expand_tarfiles=True
>>> # downselect to just the FITSf files
>>> fits_urls = [url for url in uid_url_table['access_url'] if '.fits' in url]
>>> filelist = alma.download_files(fits_urls[:5])
```

ALMA archive mining and visualization toolkit

```
[1]: import alminer
     import pandas
     from astropy.io import ascii

[2]: myquery = alminer.target(['Orion KL', "AB Aur"])

     ================================
     alminer.target results
     ================================
     Target = Orion KL
     --------------------------------
     Number of projects = 23
     Number of observations = 38
     Number of unique subbands = 129
     Total number of subbands = 160
     18 target(s) with ALMA data = ['OMC1_NW', 'Orion-KL', 'orion_kl', 'BN-KL', 'OMC1_SE', 'Or

[3]: alminer.download_data(observations, fitsonly=True, dryrun=True, location='./data',
                           filename_must_include=['_sci', '.pbcor', 'cont', 'G31.41'],
                           print_urls=True)

     ================================
     This is a dryrun. To begin download, set dryrun=False.
     ================================
     Download location = ./data
     Total number of Member OUSs to download = 3
     Selected Member OUSs: ['uid://A001/X133d/X325', 'uid://A001/X133d/X327', 'uid://A001/X13
     Number of files to download = 4
     Needed disk space = 48.9 MB
     File URLs to download = https://almascience.eso.org/dataPortal/member.uid___A001_X133d_X3
     https://almascience.eso.org/dataPortal/member.uid___A001_X133d_X325._G31.41p0.31__sci.spv
     https://almascience.eso.org/dataPortal/member.uid___A001_X133d_X327._G31.41p0.31__sci.spv
     https://almascience.eso.org/dataPortal/member.uid___A001_X133d_X327._G31.41p0.31__sci.spv
     --------------------------------
```

Thank you!

Any questions?