

# ALMA Data Products



**Adele Plunkett**  
**NRAO**



Atacama Large Millimeter/submillimeter Array



# This talk is for you if...

- You are PI or co-I of an ALMA project with data in hand, or soon to be delivered (i.e. Cycle 5 and/or Cycle 6) .
- You want to start searching the ALMA archive for data.
- You have a fabulous science case that will be essential to follow-up with ALMA in future cycles.

**This talk will be available online for reference after this workshop.**

# The condensed version

- Data are delivered after passing Quality Assurance (QA)
- Download data from *Archive Query* and *Request Handler* tools on the ALMA Science Portal
- Delivered data include:
  - Calibration tables and diagnostics
  - Preliminary images (better products may be possible with more careful continuum identification & interactive cleaning)
  - Instructions on how to proceed (weblog!)
- See Sections 11- 13, and Appendix C of ALMA Technical Handbook (Cycle 6)

# The reference I often use (or refer others to):

## <https://help.almascience.org/index.php?/Knowledgebase/Article/View/375/>

Knowledgebase:

### What Cycle 4 or Cycle 5 Calibration and Imaging products will be delivered to me?



Posted by Catarina Ubach, Last modified by Sarah Wood on 24 May 2018 03:12 PM

What you see in your data package when you download it from the archive will depend on whether the imaging and calibration have been performed by the pipeline, or one or both via a manual process. Except for datasets that were put through the imaging pipeline, the data products are similar to those for Cycle 3, discussed in detail in <http://almascience.org/documents-and-tools/cycle3/ALMAQA2Products3.0.pdf>.

For Cycle 4 Imaging pipeline data and all of Cycle 5 data, the products are discussed in detail in <http://almascience.org/documents-and-tools/cycle5/ALMAQA2Productsv5.1.pdf>

In this article we give a quick guide to the data packages, and more detailed information on the imaging pipeline products for data processed after October 1 2016.

**More details here:**

<https://almascience.nrao.edu/documents-and-tools/cycle5/ALMAQA2Productsv5.1.pdf>



# Goals of Quality Assurance (QA) Process

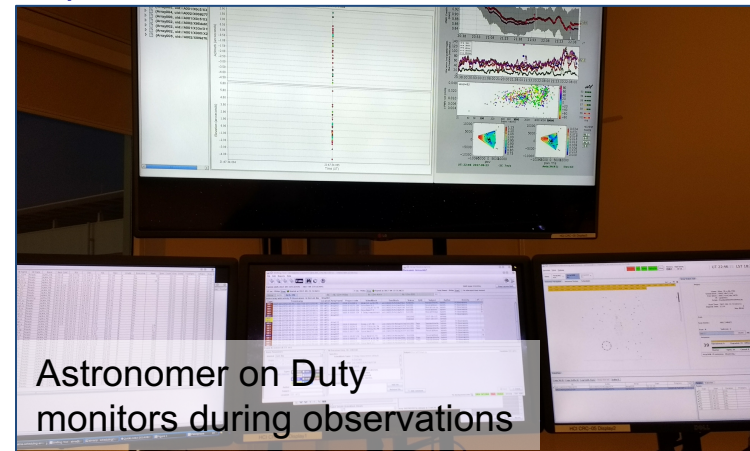
- Ensure reliable final data product
  - Desired sensitivity (as specified by PI)
  - Desired resolution (as specified by PI)
- Ensure calibration and QA imaging free from major artifacts
- Warning: Errors in PI-supplied parameters are outside scope of QA process, including:
  - Incorrect source coordinates
  - Inadequate frequency specification
  - Inadequate sensitivity limits

See ALMA Technical Handbook for details.



# During Observations – QA0

- Monitoring of on-the-fly calibration and system performance
- Rapidly-varying parameters ( $\sim$ SB/EB timescales)
  - Atmospheric effects
  - Antenna issues
  - Front-end issues
  - Connectivity issues
  - Back-end issues
- Tolerances for each are explicitly laid out
  - No fewer than 40 antennas in 12m array
  - Bandpass calibrator is strong enough
- Quick reduction may be run to check flux measurements and phase stability



# Between Observations – QA1

- “Regular array maintenance” timescales
- Slowly Varying Parameters (~MOUS timescales)
- General array calibration
  - Baseline measurements
  - Delays
- Antenna Calibrations
  - All-sky pointing
  - Focus curves
  - Beam patterns, etc.
- Observatory Calibrator Surveys
  - Solar-system and quasar flux monitoring

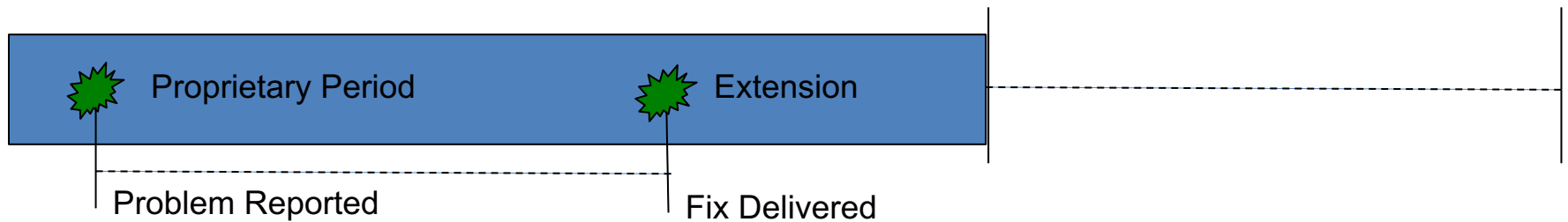
# After Observations – QA2

- Calibration by pipeline (~70%) or DA/staff.
- Final QA checks include
  - RMS of complex antenna-based gains
  - Absolute flux calibration scale
  - $T_{\text{sys}}$  within acceptable range
  - Proper phase transfer cadence
  - Proper bandpass corrections
- Assessment of Imaging Products
  - Signal-to-noise and angular resolution
  - No strong artifacts
  - Performed on the reference source/spectra
- Information about QA review is aggregated for delivery in the QA2 Report



# After Delivery – QA3

- Additional QA stage possibly triggered by PI reporting any issues underlying:
  - Data, observing procedure, calibration
- Re-evaluation of calibrated data products
  - Only occurs if QA0 -> QA2 miss something
- Likely results in fix being implemented and products re-ingested into ALMA archive
- Proprietary period extension (*within two months of delivery*)



- After two months, extension only until fix is delivered

# Monitor Project Status: *SnooPI*

<https://almascience.nrao.edu/observing/snoopi>

The screenshot displays the SnooPI web application interface. On the left is a dark blue navigation sidebar with the following items: SnooPI, NAVIGATION (Home, My Projects, My SBs), QUICK LINKS (User Manual, Science Portal, Archive Query, Helpdesk). The main content area features a header with the SnooPI logo, user information (Adele Plunkett, Executive: EU; ARC: EU), a 'Contact scientist' checkbox, and a 'Help' button. Below the header are six dashboard cards showing project statistics: PI Projects (7), PI Scheduling Blocks (19), Co-I Projects (43), Co-I Scheduling Blocks (144), Delegee Projects (3), and Delegee Scheduling Blocks (40). A news feed at the bottom shows updates since 2018-05-11, including project completion and data delivery dates.

**SnooPI** Adele Plunkett Executive: EU; ARC: EU  Contact scientist Help

ALMA

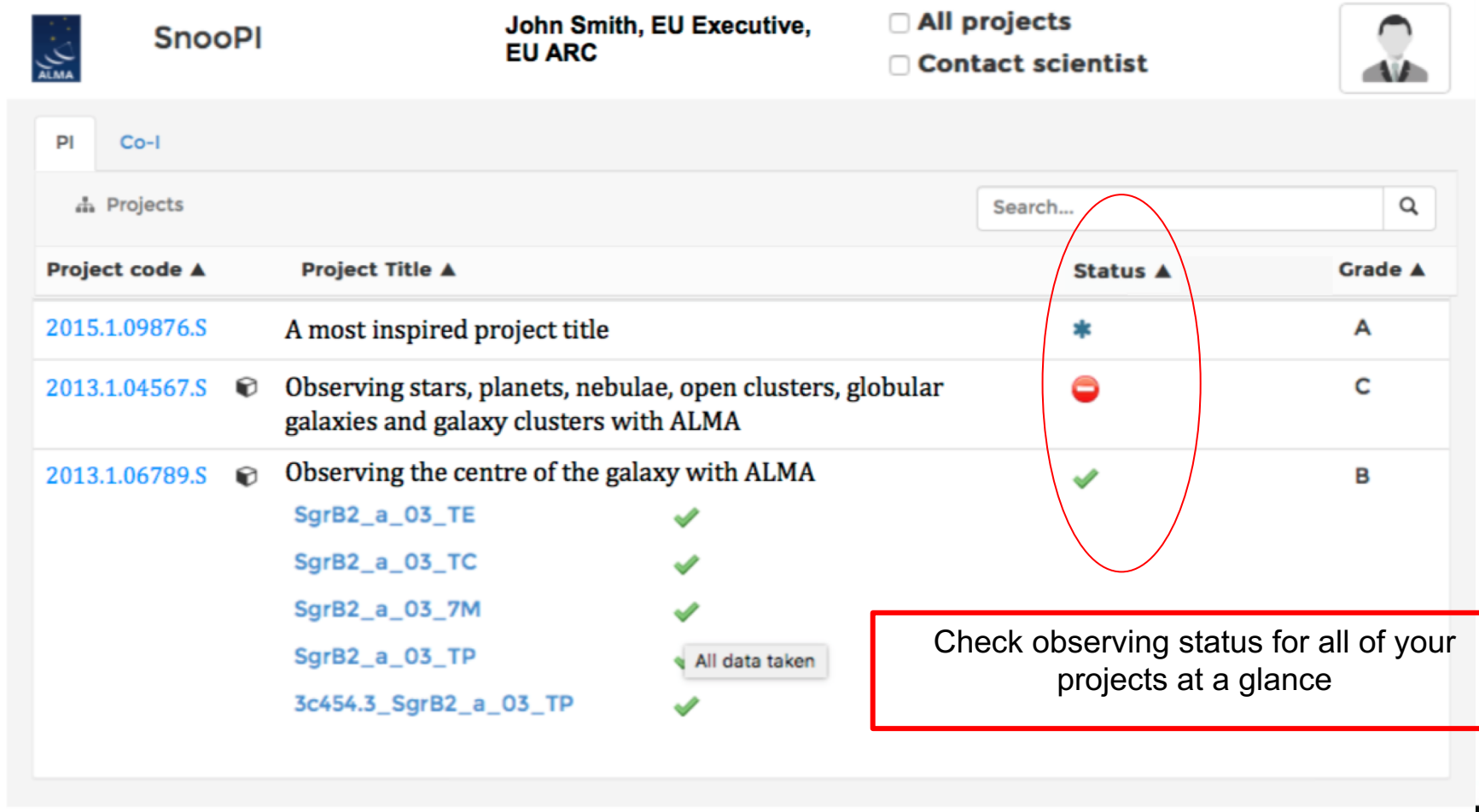
Category	Count
PI Projects	7
PI Scheduling Blocks	19
Co-I Projects	43
Co-I Scheduling Blocks	144
Delegee Projects	3
Delegee Scheduling Blocks	40

Since 2018-05-11 [More news...](#)

- 2018-08-02 Project 2017.1.001.S is now Completed. all data delivered
- 2018-06-05 All data taken for Scheduling Block \_\_\_\_\_ of project 2017.1.001.S
- 2018-05-11 All data taken for Scheduling Block \_\_\_\_\_ of project 2017.1.001.S

# Monitor Project Status: *SnooPI*

## Listing of PI (or co-PI) projects



The screenshot shows the SnooPI web interface. At the top left is the ALMA logo and the text "SnooPI". To the right, it displays the user's name "John Smith, EU Executive, EU ARC" and two checkboxes: "All projects" and "Contact scientist". A user profile picture is in the top right corner. Below the header, there are tabs for "PI" and "Co-I". A "Projects" section contains a search bar and a table of projects. The table has columns for "Project code", "Project Title", "Status", and "Grade". The "Status" column is circled in red. The first row has a blue asterisk, the second has a red minus sign, and the third has a green checkmark. Below the third row, several sub-projects are listed with green checkmarks, and a button labeled "All data taken" is visible.

Project code ▲	Project Title ▲	Status ▲	Grade ▲
2015.1.09876.S	A most inspired project title	*	A
2013.1.04567.S	Observing stars, planets, nebulae, open clusters, globular galaxies and galaxy clusters with ALMA	⊖	C
2013.1.06789.S	Observing the centre of the galaxy with ALMA	✓	B
SgrB2_a_03_TE		✓	
SgrB2_a_03_TC		✓	
SgrB2_a_03_7M		✓	
SgrB2_a_03_TP		✓	
3c454.3_SgrB2_a_03_TP		✓	

All data taken

Check observing status for all of your projects at a glance

# Monitor Project Status: *SnooPI*

## Listing of PI (or co-PI) projects

- \* Approved but SBs not yet prepared
- 👍 SBs prepared but are not yet in the observing queue
- 👍 SBs are in the observing queue but not yet taken
- 🔴 Some data has been taken
- 🟡 All the data has been taken
- ✅ Completed and delivered
- ⌚ Project is timed out
- ❌ Rejected at proposal review stage
- 🚫 Unknown status
- ❌
- ❓

# Monitor Project Status: *SnooPI*

## Single project view




The screenshot displays the SnooPI web interface. At the top left is the ALMA logo. The main header shows the project name "SnooPI", the user "John Smith, EU Executive, EU ARC", and two checkboxes: "All projects" and "Contact scientist". A user profile icon is on the right. Below the header, the project code "2013.1.06789.S" is shown with a link to the "Full Proposal [pdf]". Other details include "Grade B", "ARC node: Czech", and "Contact scientist: Jack Black". A "Project report." link is on the right. The main content area lists project components in a tree view:

- 2013.1.06789.S (Status: Exec.)
  - Observing the centre of the galaxy with ALMA
    - ObsUnitSet
      - SG OUS (CH3CN 5-4 & isotopologue, H2CS 3-2, HCO+ 1-0, HCN 1-0, HNC 1-0 map)
        - Group OUS
          - Member OUS (SgrB2)
            - SgrB2\_a\_03\_TP (Status: 41/40)
            - Member OUS (SgrB2)
              - SgrB2\_a\_03\_TC (Status: 4/3)
              - Member OUS (SgrB2)
                - SgrB2\_a\_03\_7M (Status: 4/4)
                - Member OUS (query)
                  - 3c454.3\_SgrB2\_a\_03\_TP (Status: 6/1)
                  - Member OUS (SgrB2)
                    - SgrB2\_a\_03\_TE (Status: 4/4)

;; Click here to find QA Report !!

# Monitor Project Status: *SnooPI*

## Single project view

-  a set of gears indicate that the MOUS is being processed;
-  a smiling face shows that the MOUS are ready to be delivered;
-  a truck indicates that the MOUS has been delivered

# Monitor Project Status:

## Optional Emails

- Subscribe to email notification for updates on changes to project status through your Science Portal user profile
  - ...
  - Phase2Submitted
  - Running
  - Partially Observed
  - Fully Observed
  - Pipeline Processing
  - ...
- With or without optional emails, PIs always receive notification when new data are available

# Optional emails



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In search of our Cosmic Origins



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## Observatory News

[Additional Information for Cycle 6 Proposals](#)  
Feb 01, 2018

[New Science Verification data are now available for download](#)  
Jan 22, 2018

[Announcement of intent to release a new installment of Science Verification data](#)  
Feb 03, 2018  
[More...](#)

## EU ARC News

[Researcher position available at the Nordic ARC node](#)  
Jan 10, 2018

[Post-doc position available at the Italian ARC-node](#)  
Dec 20, 2017

[2017 European Radio Interferometry School](#)  
May 11, 2017

[More...](#)

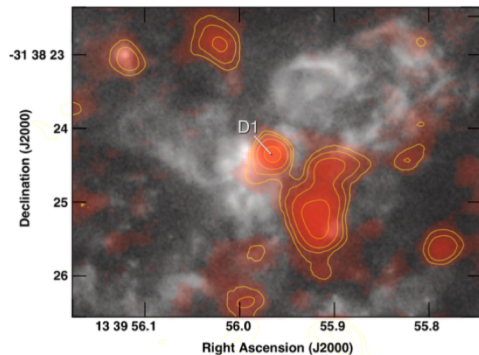
## Status

[ALMA Cycle 5 Config Schedule](#)

Refereed publications: 916  
Last observed source: W43-MM1  
Current configuration: C43-5

[More...](#)

## Science Highlights - Molecular Gas Within the Supernebula of the Dwarf Galaxy NGC 5253



One of the areas of extragalactic research which makes great use of ALMA's resolution and sensitivity is the study of the molecular gas properties of dwarf galaxies. In a [recent study](#) by Dr. Jean Turner and her collaborators, they make use of Band 7 ALMA observations to detect warm  $^{12}\text{CO}(3-2)$  and  $^{13}\text{CO}(3-2)$  emission (Cloud D1) from the core of a giant star-forming region, in the dwarf galaxy NGC 5253. This "supernebula" is the source of one-third of the galaxy's infrared luminosity and is in proximity to optical clusters with measured stellar ages of  $\sim 1$  Myr. From radio recombination line analysis, the region is estimated to have 1400-1800 O stars..

[Full Summary...](#)





# Optional emails



## ALMA Central Authentication Service (CAS)

ALMA username  
and password



**Enter your NetID and Password**

NetID:

Password:

Warn me before logging me into other sites.

For security reasons, please Log Out and Exit your web browser when you are done accessing services that require authentication!

If you don't have an account, you can create one in the following link:  
[Registration web form](#)

If you forgot you account ID, you can go to the following link:  
[Forgot account ID page](#)

If you want to reset your password, you can go to the following link:  
[Reset password page](#)

You may find a solution to your problem in the Support Center/Knowledgebase:  
[Helpdesk](#)

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Powered by [JA-SIG Central Authentication Service 3.4.10](#)



# Optional emails

Click Name



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Erica Keller

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## Observatory News

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Feb 01, 2018

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Verification data  
More...

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Dec 20, 2017

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May 11, 2017

More...

## Status [Click Profile](#)

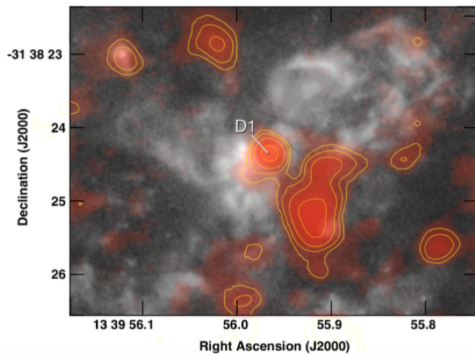
[ALMA Cycle 5 Config Schedule](#)

Refereed publications: 916  
Last observed source: W43-MM1  
Current configuration: C43-5

More...

## Science Highlights - Molecular Gas Within the Supernebula of the Dwarf Galaxy NGC 5253

by [Portal Admin](#) — last modified Nov 30, 2017 09:38 PM



One of the areas of extragalactic research which makes great use of ALMA's resolution and sensitivity is the study of the molecular gas properties of dwarf galaxies. In a [recent study](#) by Dr. Jean Turner and her collaborators, they make use of Band 7 ALMA observations to detect warm  $^{12}\text{CO}(3-2)$  and  $^{13}\text{CO}(3-2)$  emission (Cloud D1) from the core of a giant star-forming region, in the dwarf galaxy NGC 5253. This "supernebula" is the source of one-third of the galaxy's infrared luminosity and is in proximity to optical clusters with measured stellar ages of  $\sim 1$  Myr. From radio recombination line analysis, the region is estimated to have 1400-1800 O stars..

[Full Summary...](#)



# Optional emails



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ESO NRAO NAOJ

Account info Project delegation Account linking Demographics

## Edit Profile

(Fields marked with a red dot are mandatory)

|                         |   |
|-------------------------|---|
| First name              | <input type="text" value="Erica"/>  |
| Middle initials         | <input type="text" value="C"/>  |
| Surname                 | <input type="text" value="Keller"/>   |
| E-mail                  | <input type="text"/>  |
| Receive optional emails | <input checked="" type="checkbox"/>   |
| Account name            | <input type="text"/>  |
| Password                | <input type="password"/> Last password update: 25-Feb-2016 15:26:38   |
| Re-type password        | <input type="password"/>  |
| Institution             | <input type="text" value="United States"/> <input type="text" value="VA"/> <input type="text" value="National Radio Astronomy Observatory; North American ALMA Scier"/> |

Click Checkbox

In case of problems with the registration, please use [this Web form](#) to contact us  
You may find a solution to your problem in the [Support Center/Knowledgebase](#)

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# Data Delivery Email

- Sent when an individual MOUS passes QA2
- Data are ingested into the archive and made available at all Regional Centers
- This email only Sent to PI
- Included Metadata:
  - MOUS ID, Scheduling Block (SB) name, project title
- Included Instructions:
  - Downloading data
  - Delegating access for registered ALMA users
- Included Descriptions:
  - Proprietary period
  - Note: Triggers start of proprietary period (Usually 12 months)*



# Project delegation: how to



Atacama Large Millimeter/submillimeter Array  
In search of our Cosmic Origins



ESO NRAO NAOJ

Account info Project delegation Account linking Demographics

## Edit Profile

(Fields marked with a red dot are mandatory)

|  |   |
|--|---|
| First name   | <input type="text" value="Erica"/>  |
| Middle initials  | <input type="text" value="C"/>  |
| Surname  | <input type="text" value="Keller"/>   |
| E-mail   | <input type="text"/>  |
| Receive optional emails  | <input checked="" type="checkbox"/>   |
| Account name   | <input type="text"/>  |
| Password   | <input type="text"/> Last password update: 25-Feb-2016 15:26:38   |
| Re-type password   | <input type="text"/>  |
| Institution  | <input type="text" value="United States"/> <input type="text" value="VA"/> <input type="text" value="National Radio Astronomy Observatory; North American ALMA Scier"/> |
| <input type="button" value="Update"/> <input type="button" value="Cancel"/> <input type="button" value="Reset"/> |   |

In case of problems with the registration, please use [this Web form](#) to contact us  
You may find a solution to your problem in the [Support Center/Knowledgebase](#)

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# Data Delivery Email (cont'd)

- Includes Links:
  - Archive query for MOUS package
  - Fully-calibrated MS (North America Only)
  - CASA download and mailing lists
- Publication Requirements:
  - ALMA acknowledgement
  - ARC specific acknowledgement
- Additional Support:
  - Funded face-to-face reduction visits to your home ARC
  - Contact info for your ARC Helpdesk

# QA2 Data Products Package

After untarring the processed data we have a directory tree like this:

## Project code

### -- Science goal

-- **Group OUS**: Combination of member OUS's

-- **Member OUS**: May contain 12m, 7m, or Total Power observations

| -- **DATA DELIVERY PRODUCTS**

For example:

```
2017.1.05267.S/  
`-- science_goal.uid__ A001_X1299_X2z  
  `-- group.uid__ A001_X1299_X25  
    `-- member.uid__ A001_X1299_X39
```

```
|-- calibration  
|-- log  
|-- member.uid__ A001_X1299_X39.README.txt  
|-- product  
|-- qa  
|-- script
```

**DATA DELIVERY PRODUCTS**

Note, the exact structure of the data delivery products (especially README) depends on cycle and dataset (i.e. pipeline or manual).

# QA2 Data Products Package

## The log and product directories

Log of equivalent CASA commands  
(non-executable)

```
-- log
  |-- member.uid__A001_X1299_X39.hifa_calimage.casa_commands.log
-- member.uid__A001_X1299_X39.README.txt
-- product
  |-- member.uid__A001_X1299_X39.SOURCE_sci.spw25_27_29_31.cont.I.pb.fits
  |-- member.uid__A001_X1299_X39.SOURCE_sci.spw25_27_29_31.cont.I.pbcor.fits
  |-- member.uid__A001_X1299_X39.SOURCE_sci.spw25.cube.I.mask.fits
  |-- member.uid__A001_X1299_X39.SOURCE_sci.spw25.cube.I.pbcor.fits
  |-- member.uid__A001_X1299_X39.SOURCE_sci.spw25.cube.I.pb.fits.gz
  |-- member.uid__A001_X1299_X39.J0117p1418_ph.spw31.mfs.I.pbcor.fits
  |-- member.uid__A001_X1299_X39.J0117p1418_ph.spw31.mfs.I.pb.fits.gz
```

Directions to access QA comments and restoration instructions. Check SnooPI.

Calibration and Target images produced during reduction  
(may be representative)



# Monitor Project Status: *SnooPI*

Remember the project view

**SnooPI** John Smith, EU Executive, EU ARC  All projects  Contact scientist

Project Code: 2013.1.06789.S . [Full Proposal \[pdf\]](#). Grade B. ARC node: Czech. Contact scientist: Jack Black [Project report.](#)

| Project Code  | Status | Completion |
|---|--------|------------|
| 2013.1.06789.S  | Exec.  |            |
| Observing the centre of the galaxy with ALMA                                |        |            |
| ObsUnitSet  |        |            |
| SG OUS (CH3CN 5-4 & isotopologue, H2CS 3-2, HCO+ 1-0, HCN 1-0, HNC 1-0 map) |        |            |
| Group OUS   |        |            |
| Member OUS (SgrB2)  |        |            |
| SgrB2_a_03_TP   | ✓      | 41/40      |
| Member OUS (SgrB2)  | ⚙️     | 4/3        |
| SgrB2_a_03_TC   |        | 4/3        |
| Member OUS (SgrB2)  | ⚙️     | 4/4        |
| SgrB2_a_03_7M   |        | 4/4        |
| Member OUS (query)  | ✓      | 6/1        |
| 3c454.3_SgrB2_a_03_TP   |        | 6/1        |
| Member OUS (SgrB2)  | ⚙️     | 4/4        |
| SgrB2_a_03_TE   |        | 4/4        |

Click here to find QA Report, and directions on how to calibrate the data.

# QA2 Data Products Package

## The calibration directory

Contains manual flagging commands, continuum selection, flux measurements for calibrators

```
| -- calibration
|   |-- member.uid___A001_X1299_X39.hifa_calimage.auxproducts.tgz
|   |-- member.uid___A001_X1299_X39.session_1.auxcaltables.tgz
|   |-- member.uid___A001_X1299_X39.session_1.caltables.tgz
|   |-- uid___A002_Xc8ed15_X1a9.ms.calapply.txt
|   |-- uid___A002_Xc8ed15_X1a9.ms.flagversions.tgz
|   |-- uid___A002_Xc8ed15_X1a9.target.ms.auxcalapply.txt
```

Calibration tables  
generated by the  
pipeline

All flags will be restored during calibration

# QA2 Data Products Package

## The weblog, and calibration scripts

**Weblog contains plots and images from reduction and imaging. Unpack this for lots of information!**

```
| -- qa  
|   `-- member.uid___A001_X1299_X39.hifa_calimage.weblog.tgz  
| -- script  
|   |-- member.uid___A001_X1299_X39.calimage.pipeline_manifest.xml  
|   |-- member.uid___A001_X1299_X39.calimage.product_rename.txt  
|   |-- member.uid___A001_X1299_X39.hifa_calimage.casa_piperestorescript.py  
|   |-- member.uid___A001_X1299_X39.hifa_calimage.casa_pipescript.py  
|   |-- member.uid___A001_X1299_X39.hifa_calimage.pprequest.xml  
|   `-- member.uid___A001_X1299_X39.scriptForPI.py
```

**Commands to re-run  
the pipeline**

**Run scriptForPI.py to restore calibration  
(and get calibrated measurement set data  
in directory called “calibrated”)**

# QA2 Data Products Package

## Processed ALMA Data

- **Summary:**
  - Check the README, access SnooPI
  - Image products are delivered to you in the “product” directory
  - Calibration/flagging files are saved in the “calibration” directory, but these *you* do not need to change or access directly.
  - You can run “script/scriptForPI.py” to obtain the \*.ms calibrated data, for further imaging (\*\* NA delivers the calibrated \*.ms to PI)
- If the **imaging pipeline** has been run, the weblog includes the imaging steps. For **manual calibrations**, the QA information is in several files that together constitute a QA summary for the data.

At the beginning of Cycle 4, the Science Pipeline was enabled to also perform imaging. This increased the processing capacity of the QA2 team significantly. We refer to data processed by the imaging section of the Science Pipeline as “**pipeline-imaged**”. If it was processed by an analyst using CASA directly without the help of the pipeline, we call it “**manually imaged**”. In Cycle 5, ca. 60% of all science data is pipeline-imaged. The approval of the imaging products remains in the hands of the analysts and Data Reduction Managers. Note that manual imaging is sometimes performed on pipeline-calibrated datasets, occasionally in addition to pipeline-imaging. See <https://almascience.org/processing/science-pipeline> and chapter 13 of the Cycle 5 ALMA Technical Handbook for more details on the pipeline.



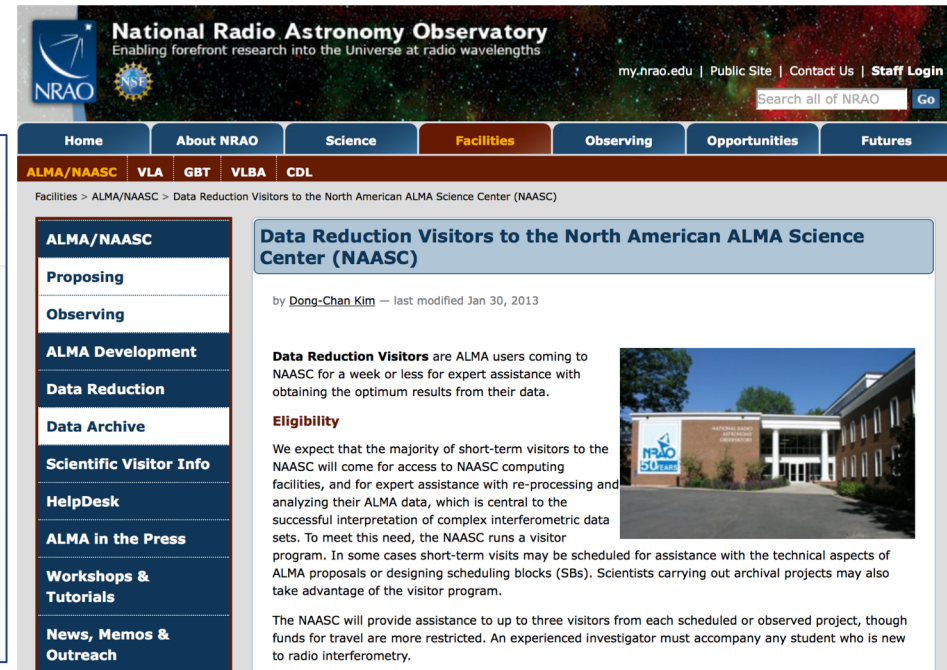
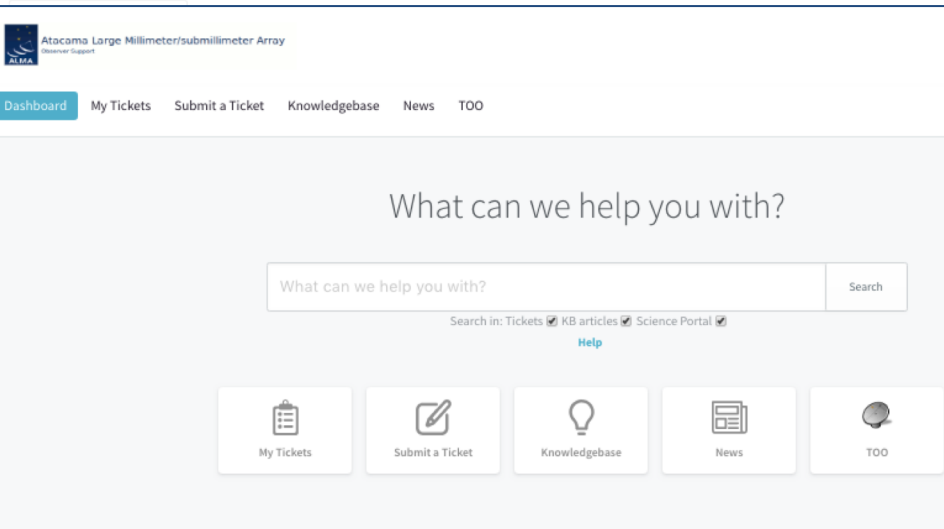
# Resources After Delivery

## HelpDesk & Knowledgebase:

[help.almascience.org](http://help.almascience.org)

## Face-to-Face visits in Charlottesville:

<https://science.nrao.edu/facilities/alma/visitors-shortterm>



# Remember, you can monitor the current observations at ALMA.

<https://almascience.nrao.edu/observing/alma-status-pag>

The screenshot shows the ALMA Status Page on a web browser. The page title is "ALMA Status Page" and it was last modified on Mar 16, 2017. The page is divided into several sections:

- Weather Conditions at AOS:** A table showing current weather data for the Central Weather Station.
- Recent observations (QAO Pass):** A table listing recent observations with columns for Project, Source, and PI.
- Public observations:** A table listing public observations with columns for Project, Source, and PI.
- Publications (Current total: 1133):** A list of publications related to ALMA observations.

The footer of the page includes links for Site Map, Accessibility, Contact, Privacy Statement, ESO, NRAO, and NAOJ.

| Current Date | Current Time | Location                | Humidity | Temperature | Dewpoint   | Wind Direction | Wind Speed | Pressure   |
|--------------|--------------|-------------------------|----------|-------------|------------|----------------|------------|------------|
| 2018/09/07   | 12:39:46 UTC | Central Weather Station | 10.39 %  | 0.90 ° C    | -26.80 ° C | 83.00 °        | 1.70 m/s   | 557.37 hPA |

| Project   | Source             | PI                 |
|---|--------------------|--------------------|
| A survey of prestellar, high-mass clump candidates: constraining models of high-mass star formation |                    |                    |
| 2017.1.00716.S  | G018.80            | Sanhueza, Patricio |
| ALMA-IMF: ALMA transforms our view of the origin of stellar masses                                  |                    |                    |
| 2017.1.01355.L  | W43-MM2            | Motte, Frederique  |
| Establishing a timeline for the high-mass star-formation process                                    |                    |                    |
| 2017.1.00367.S  | AGAL330.819-00.367 | Giannetti, Andrea  |

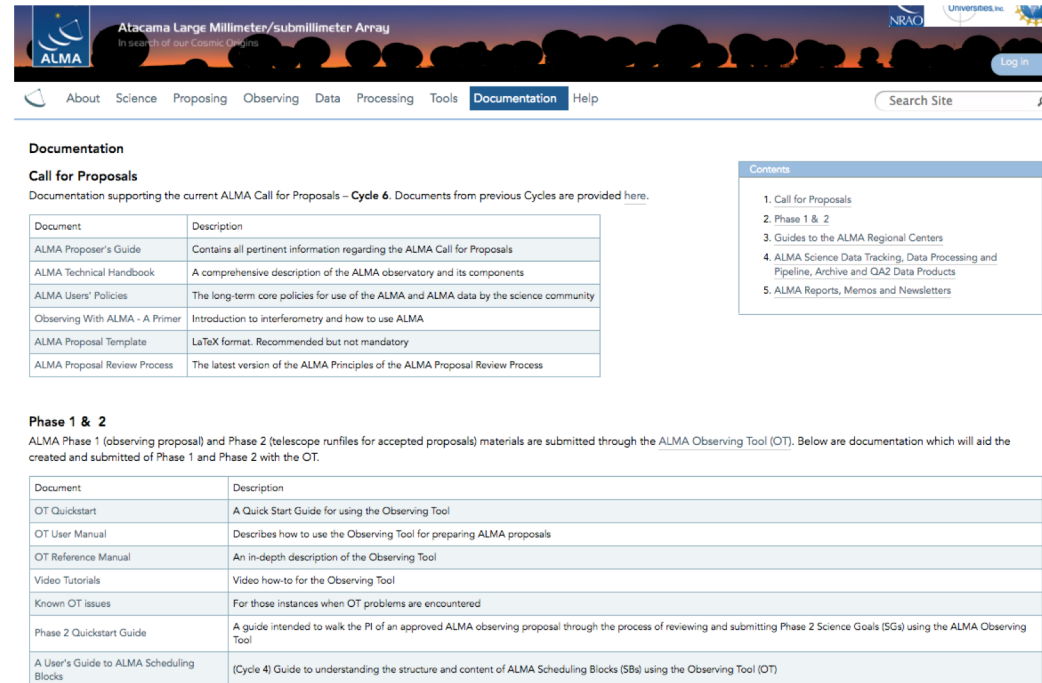
| Project  | Source           | PI              |
|--|------------------|-----------------|
| Arp 220 Nuclear Disks at 50 mas Resolution     |                  |                 |
| 2015.1.00113.S                                 | ARP220           | Scoville, Nick  |
| CO Imaging of Ultraluminous Infrared QSO Hosts |                  |                 |
| 2015.1.01147.S                                 | IRAS_F11119+3257 | Kohno, Kotaro   |
| Protostellar Multiplicity in Isolation         |                  |                 |
| 2016.1.00085.S                                 | B335             | Dunham, Michael |

Publications (Current total: 1133)  
ALMA Observations of the Massive Molecular Outflow G331.512-0.103  
Mareilo, Manuel, ApJ, volume 774, 2013  
ALMA Resolves 30 Doradus: Sub-parsec Molecular Cloud Structure near the Closest Super Star Cluster  
Indebetouw, Rémy, ApJ, volume 774, 2013  
ALMA Observations of the HH 46/47 Molecular Outflow  
Arce, Héctor G., ApJ, volume 774, 2013



# Wait, what about setting up my proposal/observations?

- Check out other ALMA Community Day events, includes *Proposal Preparation Process and Strategies + ALMA Data Products*: <https://science.nrao.edu/facilities/alma/naasc-workshops/nrao-cd-chile18/program>
- Search documentation online: <https://almascience.nrao.edu/proposin/g/documents-and-tools>



The screenshot shows the ALMA documentation website. The header includes the ALMA logo and the text 'Atacama Large Millimeter/submillimeter Array' and 'In search of our Cosmic Origins'. The navigation menu includes 'About', 'Science', 'Proposing', 'Observing', 'Data', 'Processing', 'Tools', 'Documentation', and 'Help'. A search bar is located on the right side of the header.

The main content area is titled 'Documentation' and 'Call for Proposals'. It states: 'Documentation supporting the current ALMA Call for Proposals – Cycle 6. Documents from previous Cycles are provided here.'

| Document                       | Description  |
|--------------------------------|--|
| ALMA Proposer's Guide          | Contains all pertinent information regarding the ALMA Call for Proposals               |
| ALMA Technical Handbook        | A comprehensive description of the ALMA observatory and its components                 |
| ALMA Users' Policies           | The long-term core policies for use of the ALMA and ALMA data by the science community |
| Observing With ALMA - A Primer | Introduction to interferometry and how to use ALMA                                     |
| ALMA Proposal Template         | LaTeX format. Recommended but not mandatory  |
| ALMA Proposal Review Process   | The latest version of the ALMA Principles of the ALMA Proposal Review Process          |

On the right side, there is a 'Contents' sidebar with a list of links:

1. Call for Proposals
2. Phase 1 & 2
3. Guides to the ALMA Regional Centers
4. ALMA Science Data Tracking, Data Processing and Pipeline, Archive and QA2 Data Products
5. ALMA Reports, Memos and Newsletters

Below the 'Call for Proposals' section, there is a section for 'Phase 1 & 2' with the text: 'ALMA Phase 1 (observing proposal) and Phase 2 (telescope runfiles for accepted proposals) materials are submitted through the ALMA Observing Tool (OT). Below are documentation which will aid the created and submitted of Phase 1 and Phase 2 with the OT.'

| Document                                 | Description  |
|--|--|
| OT Quickstart                            | A Quick Start Guide for using the Observing Tool   |
| OT User Manual                           | Describes how to use the Observing Tool for preparing ALMA proposals   |
| OT Reference Manual                      | An in-depth description of the Observing Tool  |
| Video Tutorials                          | Video how-to for the Observing Tool  |
| Known OT issues                          | For those instances when OT problems are encountered   |
| Phase 2 Quickstart Guide                 | A guide intended to walk the PI of an approved ALMA observing proposal through the process of reviewing and submitting Phase 2 Science Goals (SGs) using the ALMA Observing Tool |
| A User's Guide to ALMA Scheduling Blocks | (Cycle 4) Guide to understanding the structure and content of ALMA Scheduling Blocks (SBs) using the Observing Tool (OT)   |

# Retrieving ALMA Archival Data



\*\* In case of lack of time, this will be available online.

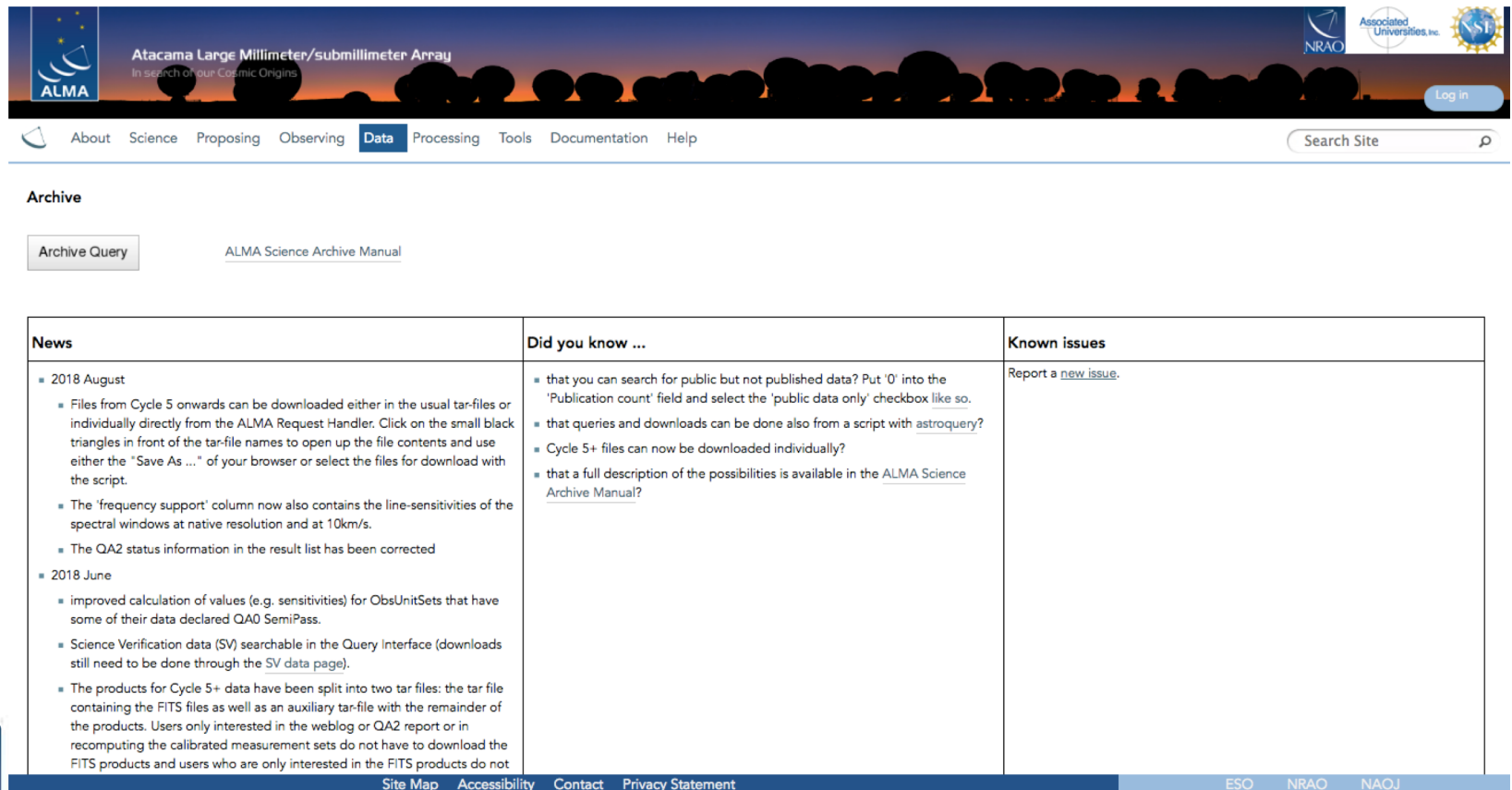


# How to find the archive

Go to the science portal: <https://almascience.nrao.edu>

(Later, it will prompt you to log-in to download your proprietary data.)

- Click on “Data” and select “Archive”



The screenshot shows the ALMA Science Portal website. At the top, there is a header with the ALMA logo and the text "Atacama Large Millimeter/submillimeter Array In search of our Cosmic Origins". To the right of the header are logos for NRAO, Associated Universities, Inc., and NSF. Below the header is a navigation menu with links for "About", "Science", "Proposing", "Observing", "Data", "Processing", "Tools", "Documentation", and "Help". A search bar is located on the right side of the menu. The "Data" link is highlighted. Below the navigation menu, the "Archive" section is visible, containing a button for "Archive Query" and a link for "ALMA Science Archive Manual".

| News  | Did you know ...  | Known issues                         |
|---|---|--------------------------------------|
| <ul style="list-style-type: none"><li>2018 August<ul style="list-style-type: none"><li>Files from Cycle 5 onwards can be downloaded either in the usual tar-files or individually directly from the ALMA Request Handler. Click on the small black triangles in front of the tar-file names to open up the file contents and use either the "Save As ..." of your browser or select the files for download with the script.</li><li>The 'frequency support' column now also contains the line-sensitivities of the spectral windows at native resolution and at 10km/s.</li><li>The QA2 status information in the result list has been corrected</li></ul></li><li>2018 June<ul style="list-style-type: none"><li>improved calculation of values (e.g. sensitivities) for ObsUnitSets that have some of their data declared QAO SemiPass.</li><li>Science Verification data (SV) searchable in the Query Interface (downloads still need to be done through the SV data page).</li><li>The products for Cycle 5+ data have been split into two tar files: the tar file containing the FITS files as well as an auxiliary tar-file with the remainder of the products. Users only interested in the weblog or QA2 report or in recomputing the calibrated measurement sets do not have to download the FITS products and users who are only interested in the FITS products do not</li></ul></li></ul> | <ul style="list-style-type: none"><li>that you can search for public but not published data? Put '0' into the 'Publication count' field and select the 'public data only' checkbox like so.</li><li>that queries and downloads can be done also from a script with <a href="#">astroquery</a>?</li><li>Cycle 5+ files can now be downloaded individually?</li><li>that a full description of the possibilities is available in the <a href="#">ALMA Science Archive Manual</a>?</li></ul> | Report a <a href="#">new issue</a> . |

# Find data in archive:

## Archive Query <http://almascience.nrao.edu/aq/>

ALMA Science Archive

Query Help

Query Form Results Table

Search Reset

**Position**

- Source name (Resolver)
- Source name (ALMA)
- RA Dec
- Galactic
- Target list
- Angular resolution
- Largest angular scale
- Field of view

**Energy**

- Frequency
- Bandwidth
- Spectral resolution
- Band

**Time**

- Observation date
- Integration time

**Polarisation**

- Polarisation type

**Observation**

- Line sensitivity (10 km/s)
- Continuum sensitivity
- Water vapour

**Project**

- Project code
- Project title
- PI name
  - Plu
  - Plunkett, Adele
- Project abstract
- Publication count
- Science keyword

**Publication**

- Bibcode
- Title
- PI Full Name
- ALMA PI name
- Description
- case-insensitive partial match over the full PI name. Wildcards can be used
- Example
- [Smith, Fred](#)
- [SMI\\*](#)
- [fr?d](#)

**Options**

View:

- observation
- project
- publication
- public data only
- science observations only

**Pro tip:** Use auto-complete suggestions

# Archive Query

Query Form

Results Table

Submit download request

Results Bookmark Export Table Results Help

More columns

Showing 30 rows (30 before filtering).

| <input type="checkbox"/>            | Project code         | Source name          | RA                   | Dec                  | Band                 | Integration          | Release date ▲          | Velocity resolution   | Frequency support                 |
|-------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-------------------------|---|-----------------------------------|
| Filter:                             | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/>    | <input type="text" value="m/s"/> <input type="button" value="↓"/> | <input type="text"/>              |
| <input checked="" type="checkbox"/> | 2012.1.00090.S       | S2CLS_UDS110         | 02:18:48.44          | -05:18:05.0          | 7                    | 9.326                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input checked="" type="checkbox"/> | 2012.1.00090.S       | S2CLS_UDS156         | 02:18:24.23          | -05:22:53.4          | 7                    | 8.836                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input checked="" type="checkbox"/> | 2012.1.00090.S       | S2CLS_UDS160         | 02:18:23.86          | -05:11:36.2          | 7                    | 8.842                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input type="checkbox"/>            | 2012.1.00090.S       | S2CLS_UDS168         | 02:18:20.34          | -05:31:41.6          | 7                    | 8.843                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input checked="" type="checkbox"/> | 2012.1.00090.S       | S2CLS_UDS199         | 02:18:07.38          | -04:44:11.7          | 7                    | 8.812                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input type="checkbox"/>            | 2012.1.00090.S       | S2CLS_UDS204         | 02:18:03.01          | -05:28:39.8          | 7                    | 8.873                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input type="checkbox"/>            | 2012.1.00090.S       | S2CLS_UDS216         | 02:17:56.80          | -04:52:39.6          | 7                    | 8.82                 | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input type="checkbox"/>            | 2012.1.00090.S       | S2CLS_UDS252         | 02:17:37.79          | -05:20:10.2          | 7                    | 8.827                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input type="checkbox"/>            | 2012.1.00090.S       | S2CLS_UDS286         | 02:17:25.76          | -05:25:36.5          | 7                    | 9.657                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input type="checkbox"/>            | 2012.1.00090.S       | S2CLS_UDS292         | 02:17:21.85          | -05:19:03.3          | 7                    | 8.815                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input type="checkbox"/>            | 2012.1.00090.S       | S2CLS_UDS298         | 02:17:19.90          | -05:09:36.4          | 7                    | 9.55                 | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input type="checkbox"/>            | 2012.1.00090.S       | S2CLS_UDS334         | 02:17:02.81          | -04:57:24.9          | 7                    | 8.856                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input type="checkbox"/>            | 2012.1.00090.S       | S2CLS_UDS408         | 02:16:22.59          | -05:11:06.0          | 7                    | 8.819                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input type="checkbox"/>            | 2012.1.00090.S       | S2CLS_UDS421         | 02:16:17.62          | -05:09:02.0          | 7                    | 8.803                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |
| <input type="checkbox"/>            | 2012.1.00090.S       | S2CLS_UDS47          | 02:19:24.97          | -05:09:19.9          | 7                    | 8.785                | 2014-11-07T09:35:00.000 | 27236.96  | <a href="#">336.00..351.99GHz</a> |



# Archive Query: more columns

| <input type="checkbox"/> | Project code                   | <input type="checkbox"/> Show all columns <input type="checkbox"/> Reset column order <input type="checkbox"/> Order alphabetically |   | Frequency support                 |
|--------------------------|--------------------------------|---|---|-----------------------------------|
| Filter:                  | <input type="text"/>           |   |   | <input type="text"/>              |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input checked="" type="checkbox"/> Project code  | Project code, in the form YYYY.NNNNN.C.AAA, where:  | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input checked="" type="checkbox"/> Source name   | Name of the source as registered in the ASDM. Partial matches through wildcards (? , *), and boolean OR expressions (" "), can be used. | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input checked="" type="checkbox"/> RA  | deg Right Ascension of the field pointing.  | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input checked="" type="checkbox"/> Dec   | deg Declination of the field pointing.  | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input checked="" type="checkbox"/> Band  | ALMA receiver band.   | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input checked="" type="checkbox"/> Integration   | s Aggregated integration time for the field in the ASDM.  | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input checked="" type="checkbox"/> Release date  |   | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input checked="" type="checkbox"/> Velocity resolution   | m/s Estimated velocity resolution from all the spectral windows, from frequency resolution.   | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input checked="" type="checkbox"/> Frequency support   | GHz All frequency ranges used by the field  | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <hr style="border: 2px solid red;"/>  |   | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input type="checkbox"/> Spatial resolution   |   | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input type="checkbox"/> Frequency resolution   | kHz Estimated frequency resolution from all the spectral windows, using median values of channel widths.                                | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input type="checkbox"/> Pol products   | Polarisation products provided.   | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input type="checkbox"/> Observation date   |   | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input type="checkbox"/> PI name  | case-insensitive partial match over the full PI name. Wildcards can be used   | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input type="checkbox"/> PWV  | mm Estimated precipitable water vapour from the XML_CALWVR_ENTITIES table.  | <a href="#">335.99..351.99GHz</a> |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input type="checkbox"/> Member ous id  | MEMBER_OUSS_ID generating this ASDM.  |                                   |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input type="checkbox"/> Asdm uid   | UID of the ASDM containing this Field.  |                                   |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input type="checkbox"/> Project title  | Case-insensitive search over the project title  |                                   |
| <input type="checkbox"/> | <a href="#">2012.1.00090.S</a> | <input type="checkbox"/> Project type   | Project type.   |                                   |

# Downloading the data:

## *Request Handler*

- All data downloaded as tar files
- Large data sets may be broken into several pieces
  - Name is [project\_code]\_[OUS\_ID]\_m\_of\_n.tar
  - Raw data packaged as one tar file per execution block (EB)
    - name is [project\_code]\_[EB\_ID].asdm.sdm.tar
- For Cycle 0-5 projects, cannot directly download individual data products but potentially coming in Cycle 6...
  - FITS images
  - Diagnostic plots, etc.

# Request Handler

## ALMA Request Handler

Login

Anonymous User: Request #436233140 ✓

Request Title: [Click to edit](#)



[Download Selected](#)

Include Raw

| Project / OUSet / Executionblock            | File   | Size    | Accessible   |
|---|--|---------|--------------|
| Request 436233140                           |  |         |              |
| Project 2012.1.00090.S                      |  |         |              |
| Science Goal OUS uid://A002/X5eed86/X25     |  |         |              |
| Group OUS uid://A002/X5eed86/X26            |  |         |              |
| Member OUS uid://A002/X5eed86/X27           |  |         |              |
| <input checked="" type="checkbox"/> product | <a href="#">2012.1.00090.S uid_A002_X5eed86_X27_001_of_001.tar</a> | 374.9MB | ✓            |
| <input type="checkbox"/> raw                | <a href="#">2012.1.00090.S uid_A002_X7143f6_Xca4.asdm.sdm.tar</a>  | 4.0GB   | ✓            |
| Science Goal OUS uid://A002/X5eed86/X29     |  |         |              |
| Group OUS uid://A002/X5eed86/X2a            |  |         |              |
| Member OUS uid://A002/X5eed86/X2b           |  |         |              |
| <input checked="" type="checkbox"/> product | <a href="#">2012.1.00090.S uid_A002_X5eed86_X2b_001_of_001.tar</a> | 377.8MB | ✓            |
| <input type="checkbox"/> raw                | <a href="#">2012.1.00090.S uid_A002_X7143f6_Xf9b.asdm.sdm.tar</a>  | 4.0GB   | ✓            |
|   |  |         | Total: 8.7GB |



# Request Handler prompts an email

From do-not-reply@nrao.edu ☆  
Subject ALMA Archive at NRAO: Request 223292105  
Reply to [REDACTED]  
To [REDACTED]

Reply Reply All Forward Archive Junk Delete

1:24 PM

Other Actions

Dear [REDACTED],

Thank you for using the ALMA archive.

Your data selection (4.3GB) is available from this link

<https://almascience.nrao.edu/rh/requests/nbrunett/223292105>

We hope they meet your expectations and will lead to a successful completion of your scientific program.

Publications making use of these data must include the following statement in the acknowledgment:

"This paper makes use of the following ALMA data: ADS/JAO.ALMA#2012.1.00090.S. ALMA is a partnership of ESO (representing its member states), NSF (USA) and NINS (Japan), together with NRC (Canada) and NSC and ASIAA (Taiwan), in cooperation with the Republic of Chile. The Joint ALMA Observatory is operated by ESO, AUI/NRAO and NAOJ."

Please submit your requests for help, for a visit to the ARC, or to report any problems discovered in your data through the ALMA Helpdesk at <https://help.almascience.org>.

Best regards,

The North American ALMA Archive at the NAASC

Summary:

Files available: 2 (4.3GB)

Files under proprietary period: 0 (-)

Files not available: 0 (-)

Details:

Files available:

- 2012.1.00090.S\_uid\_\_A002\_X5eed86\_X2b\_001\_of\_001.tar : AUTHORIZED
- 2012.1.00090.S\_uid\_\_A002\_X7143f6\_Xf9b.asdm.sdm.tar : AUTHORIZED

Files under proprietary period:



# Request Handler: Download options

Choose one of the following download methods:

|                              |   |
|------------------------------|---|
| <b>Download Script</b>       | The downloads are scripted for you. You just need to execute the script from the command line, after making it executable by typing <code>chmod u+x download*.sh</code>     |
| <b>Java Download Manager</b> | ALMA's download manager is launched as a desktop application via Java Web Start. It will not stop if you close your browser. You must have Java installed on your computer. |
| <b>File List</b>             | View a text file containing a list of URLs. This is useful for using third-party download manager's such as <i>DownThemAll</i> .  |



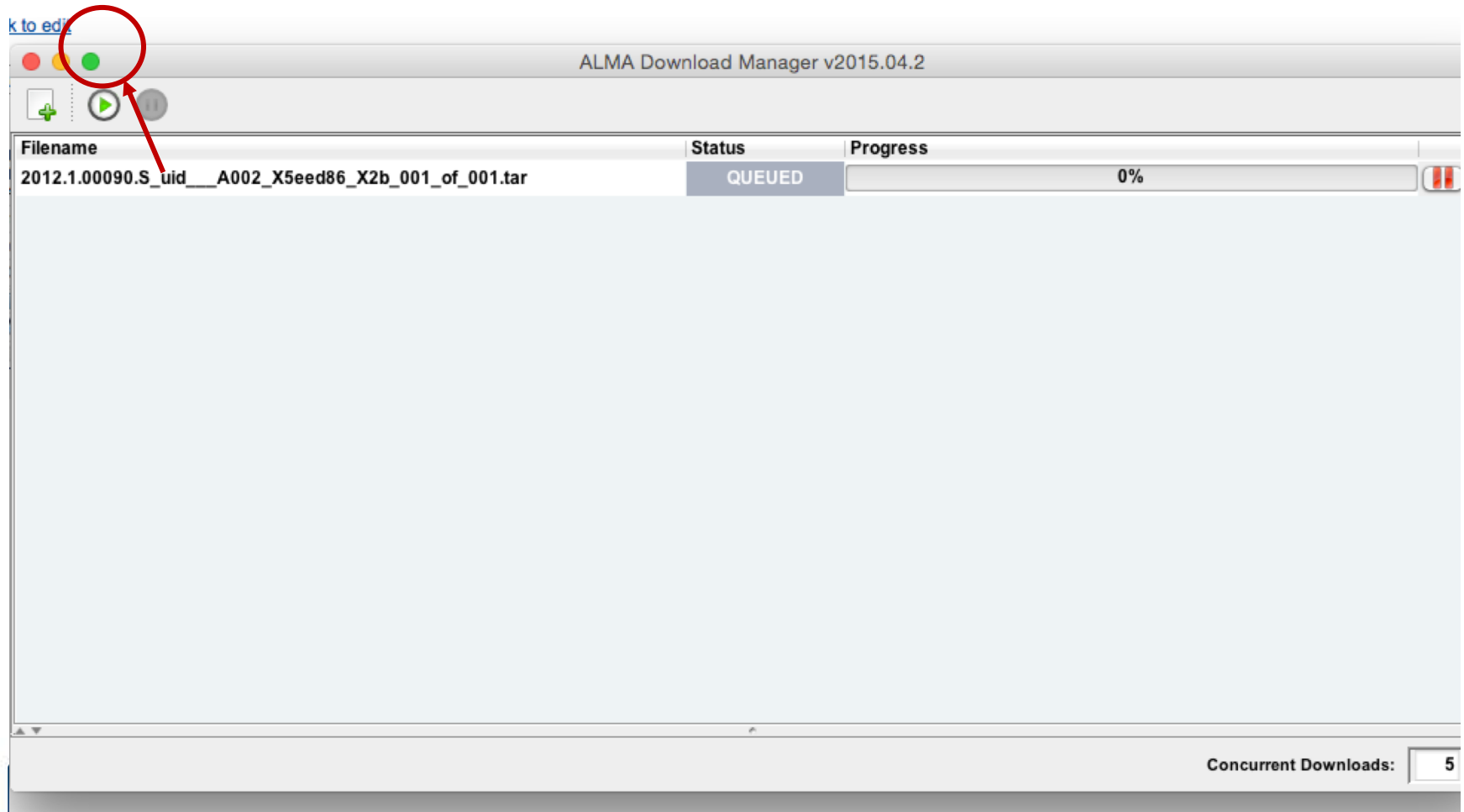
# *Request Handler:* *script*

```
#!/bin/bash
#Please use the current script to download the whole content of request
223732763

echo "Please provide a password"
read -s PASSWORD

wget --auth-no-challenge --no-check-certificate --http-user="nbrunett" --
http-password=$PASSWORD
https://almascience.nrao.edu/dataPortal/api/requests/nbrunett/223732763/ALMA/2
012.1.00090.S_uid__A002_X5eed86_X2b_001_of_001.tar/2012.1.00090.S_uid__A002_
X5eed86_X2b_001_of_001.tar
.
.
.
```

# *Request Handler:* Java Download Manager



# Resources related to the Archive

Check the science portal for possible maintenance message.

<https://almascience.nrao.edu>

There are 3 versions of the ALMA archive. If one is down, it is possible 1 of the other two are available.

- NRAO: <http://almascience.nrao.edu/aq/>
- ESO: <http://almascience.eso.org/aq/>
- NAOJ: [almascience.nao.ac.jp/aq/](http://almascience.nao.ac.jp/aq/)

Contact your local helpdesk and provide:

- Project ID
- SBname
- ASDM
- What method you are using to download?





**For more info:**

<https://almascience.nrao.edu/>

The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership of Europe, North America and East Asia in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Organization for Astronomical Research in the Southern Hemisphere (ESO), in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC), and in East Asia by the National Institutes of Natural Sciences (NINS) of Japan in cooperation with the Academia Sinica (AS) in Taiwan. ALMA construction and operations are led on behalf of Europe by ESO, on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI), and on behalf of East Asia by the National Astronomical Observatory of Japan (NAOJ). The Joint ALMA Observatory (JAO) provides the unified leadership and management of the construction and operation of ALMA.





**[www.nrao.edu](http://www.nrao.edu)**  
**[science.nrao.edu](http://science.nrao.edu)**

*The National Radio Astronomy Observatory is a facility of the National Science Foundation  
operated under cooperative agreement by Associated Universities, Inc.*

