

ALMA Data – what to expect after your observations are made



Sarah Wood

Authors: Sarah Wood, Devaky Kunneriath, Sabrina Stierwalt, Erica Keller

Atacama Large Millimeter/submillimeter Array
Expanded Very Large Array



The Condensed Version

- Data 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*)
- Sections 11, 12, 14, and Appendix C of ALMA Technical Handbook

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

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 (~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 – QA I

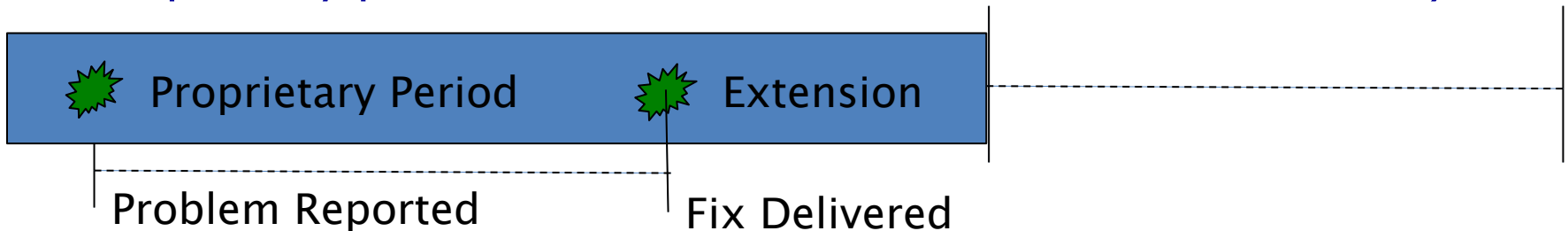
- “Regular array maintenance” timescales
- Slowly Varying Parameters (~MOUS timescales)
- General array calibration
 - Baseline measurements
 - Delays
- Antenna Calibrations
 - All-sky pointing
 - Focus curves
 - Beam patterns, etc.
- Observatory Calibrator Surveys
 - Solar-system and quasar flux monitoring

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_{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

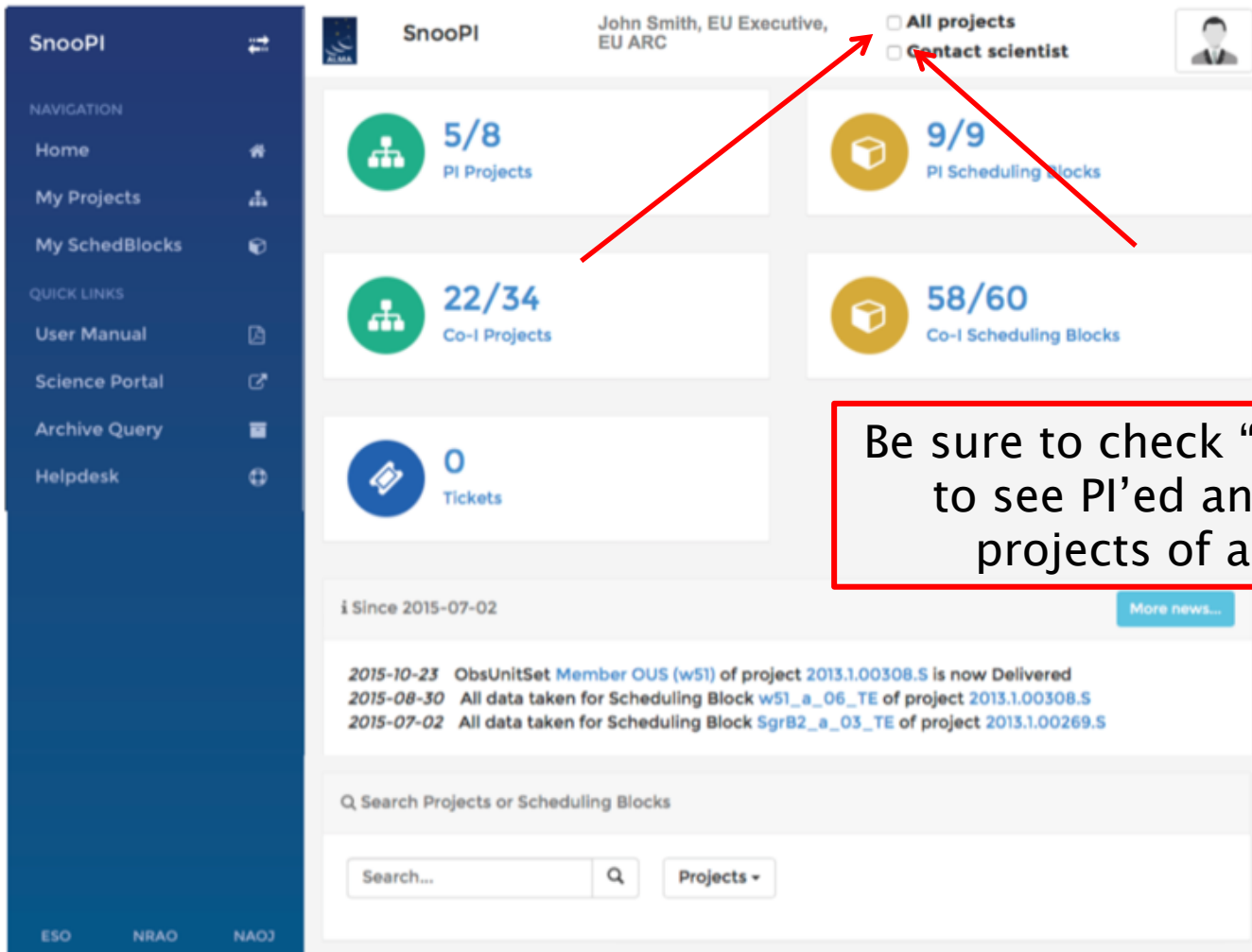
- Additional QA stage possibly triggered by PI reporting any issues underlying:
 - Data, observing procedure, calibration
- Re-evaluation of calibrated data products
 - Only occurs if QA0 → QA2 miss something
- Likely results in fix being implemented and products re-ingested into ALMA archive
- Proprietary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



- After two months, extension only until fix is delivered

Monitor Project Status: SnooPI

<https://almascience.eso.org/observing/snoopi>



SnooPI John Smith, EU Executive, EU ARC

All projects
 Contact scientist

5/8 PI Projects

9/9 PI Scheduling Blocks

22/34 Co-I Projects

58/60 Co-I Scheduling Blocks

0 Tickets

Since 2015-07-02 [More news...](#)

2015-10-23 ObsUnitSet Member OUS (w51) of project 2013.1.00308.S is now Delivered
2015-08-30 All data taken for Scheduling Block w51_a_06_TE of project 2013.1.00308.S
2015-07-02 All data taken for Scheduling Block SgrB2_a_03_TE of project 2013.1.00269.S

Q Search Projects or Scheduling Blocks


Search...

ESO NRAO NAOJ

Be sure to check "All projects" to see PI'ed and co-I'ed projects of all ranks

Monitor Project Status: SnooPI


Listing of PI'ed projects



SnooPI



John Smith, EU Executive,
EU ARC

All projects
 Contact scientist



PI
Co-I

Projects

| 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 SgrB2_a_03_TE ✓ SgrB2_a_03_TC ✓ SgrB2_a_03_7M ✓ SgrB2_a_03_TP ✓ 3c454.3_SgrB2_a_03_TP ✓ | ✓ | B |

All data taken

Check observing status for all of your projects at a glance


Monitor Project Status: SnooPI

Listing of PI'ed 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:



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.](#)

| |
|--|
| <ul style="list-style-type: none"> 👤 2013.1.06789.S ✓ 📄 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) <ul style="list-style-type: none"> 🔗 SgrB2_a_03_TP ✓ 41/40 🔗 Member OUS (SgrB2) ⚙️ 4/3 🔗 SgrB2_a_03_TC 4/4 🔗 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

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



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



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[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](#)
Jan 22, 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

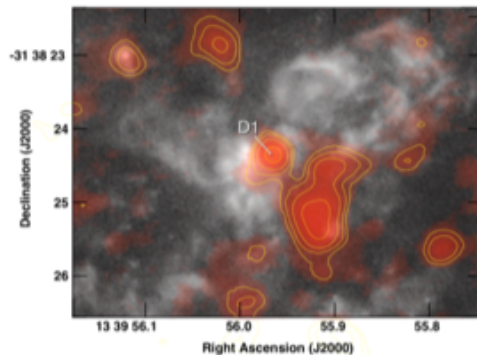
[2017 European Radio Interferometry School](#)
May 11, 2017
[More...](#)

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 ~ 1 Myr. From radio recombination line analysis, the region is estimated to have 1400-1800 O stars..

[Full Summary...](#)

Optional emails

Click Name



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

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Observatory News

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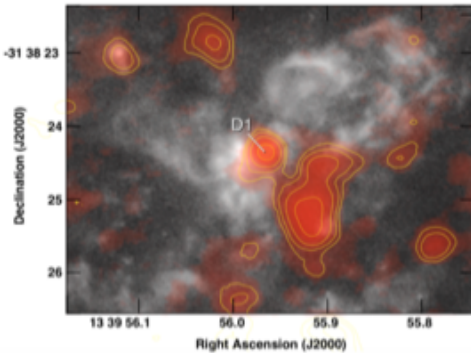
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by Portal Admin — last modified Nov 30, 2017 09:38 PM



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[Full Summary...](#)



Optional emails



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 15:28:38 |
| 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](#)

Data Delivery Email

- Sent when an individual MOUS passes QA2
- Data are ingested into the archive and made available at all Regional Centers
- Triggers Start of Proprietary Period
 - Usually 12 months
- 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



- Account info
- Project delegation
- Account linking
- Demographics

Project Delegation

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 15:28:38 |
| 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
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Data Delivery Email

- Included 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 ARC Helpdesk

QA2 Data Products Package: the processed data

After un-tarring the processed data we have a directory tree:

Science
goal

Project code

```
2017.1.05267.S/
|-- science_goal.uid__A001_X1299_X2z
|   |-- group.uid__A001_X1299_X25
|       |-- member.uid__A001_X1299_X39
```

Group OUS:
combination of
member OUS's

```
| |-- calibration
| |-- log
| |-- member.uid__A001_X1299_X39.README.txt
| |-- product
| |-- qa
| |-- script
```

Member OUS: may contain
12-m array, ALMA Compact
Array (ACA), or Total Power
observation

Data delivery products...

QA2 Data Products Package: the processed data

Calibration Directory:

Calibration tables
generated by the
pipeline

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
```

All flags will be restored during calibration

QA2 Data Products Package: the processed data

Calibration Products:

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

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

Monitor Project Status: SnooPI

Single 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.](#)

| |
|---|
| <ul style="list-style-type: none"> 👤 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) <ul style="list-style-type: none"> 🔗 SgrB2_a_03_TP ✓ 41/40 🔗 Member OUS (SgrB2) ⚙️ 4/3 🔗 SgrB2_a_03_TC ⚙️ 4/4 🔗 Member OUS (SgrB2) ⚙️ 4/4 🔗 SgrB2_a_03_7M ✓ 6/1 🔗 Member OUS (query) ✓ 6/1 🔗 3c454.3_SgrB2_a_03_TP ⚙️ 4/4 🔗 Member OUS (SgrB2) ⚙️ 4/4 🔗 SgrB2_a_03_TE ⚙️ 4/4 |
|---|

Click here to find QA Report

QA2 Data Products Package: the processed data

Calibration Scripts and Weblog:

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
```

Run `scriptForPI.py` to restore calibration

Commands to re-run the pipeline

Resources After Delivery

- HelpDesk
- Face to Face visits in Charlottesville:
<https://science.nrao.edu/facilities/alma/visitors-shortterm>



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ALMA/NAASC | VLA | GBT | VLBA | CDL

Facilities > ALMA/NAASC > Data Reduction Visitors to the North American ALMA Science Center (NAASC)

ALMA/NAASC

- Proposing
- Observing
- ALMA Development
- Data Reduction
- Data Archive
- Scientific Visitor Info
- HelpDesk
- ALMA in the Press
- Workshops & Tutorials
- News, Memos & Outreach

Data Reduction Visitors to the North American ALMA Science Center (NAASC)

by [Dong-Chan Kim](#) — last modified Jan 30, 2013

Data Reduction Visitors are ALMA users coming to NAASC for a week or less for expert assistance with obtaining the optimum results from their data.

Eligibility

We expect that the majority of short-term visitors to the NAASC will come for access to NAASC computing facilities, and for expert assistance with re-processing and analyzing their ALMA data, which is central to the successful interpretation of complex interferometric data sets. To meet this need, the NAASC runs a visitor program. In some cases short-term visits may be scheduled for assistance with the technical aspects of ALMA proposals or designing scheduling blocks (SBs). Scientists carrying out archival projects may also take advantage of the visitor program.

The NAASC will provide assistance to up to three visitors from each scheduled or observed project, though funds for travel are more restricted. An experienced investigator must accompany any student who is new to radio interferometry.





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.