



ALMA Cycle 6 Capabilities

Overview of ALMA Capabilities

Number of Antennas

12-m Array	7-m Array	12-m TP
43 (50)	10 (12)	3 (4)

Receiver Bands and 12-m Array Configurations

Band:	3	4	5	6	7	8	9	10
Wavelength (mm):	3.1	2.1	1.6	1.3	0.87	0.74	0.44	0.35
Frequency (GHz):	100	150	183	230	345	460	650	870
Max Baseline (km):	16	16	16	16	8.5	3.6	3.6	3.6
Max Resolution ("):	0.042	0.028	0.021	0.018	0.028	0.046	0.033	0.024

For future reference, see Appendix A of the ALMA Proposer's Guide available at:

<https://almascience.nrao.edu/documents-and-tools>



Overview of ALMA Capabilities

Available Observing Time

	12-m Array	7-m Array	12-m TP
Time (hours):	4000*	3000	3000

* Includes DDT, Cycle 5 carryover and resubmissions

Spectral Line, Continuum, and Mosaic Observations

- **Spectral line and continuum:** 12-m Array and the 7-m Array, All Bands
- **Single pointing:** 12-m Array, 7-m Array, All Bands
- **Mosaics:** 12-m Array, 7-m Array, Band 3-9
- **TP spectral line (no continuum):** Bands 3-8

Polarization

- Single pointing, on axis, full (including circular) polarization for both continuum and full-spectral-resolution in Band 3, 4, 5, 6, and 7 offered for 12-m Array
- Minimum detectable degree of circular polarization = 1.8% of peak flux
- Only for on-axis sources with an angular size $< 10\%$ of FWHM primary beam



ALMA Capabilities

Standard vs Non-Standard modes:

Cycle 6 should still be around 20% of the time going to non-standard modes.

This fraction will get smaller as we go into Full Operation and the amount of new capabilities decreases.

The fraction of time available for testing of new capabilities in Cycle 6 drops to ~10%

Non-Standard Observing Modes include:

- Bands 9 and 10 observations
- Band 7 observations with maximum baselines > 5 km
- All polarization observations
- Spectral scans
- Bandwidth switching projects (having less than 1 GHz aggregate bandwidths over all spectral windows)
- Solar observations
- VLBI observations
- Non-standard calibrations (user-defined calibrations selected in the OT)
- Astrometric Observations

ALMA Capabilities

In Cycle 6 we continue to operate as what is been defined as “Steady State Operations”*

New Observing Modes for Cycle 6:

Circular Polarization Observations.

- Proposals will now be accepted for circular polarization observations in high spectral resolution for Bands 3, 4, 5, 6 and 7. See upcoming slide for details.

Time Simultaneous Observations.

- The restrictions for time simultaneous observations between the 12-m and 7-m Arrays that were present in Cycle 5 have been lifted.

Band 8 Observations will be Standard Observing Mode.

- Will allow stand alone ACA observations.

Band 6 IF Extension.

- The Band 6 IF bandwidth as been increased by 0.5 GHz to enable simultaneous observations of ^{12}CO , ^{13}CO and C^{18}O with broader spectral windows.

ALMA Capabilities

Steady State (Cycle 6) and Full Operations (Cycle 7)

Antennas:

At least 43, 12-m antennas in the main array

Full operations will target 45

ten 7-m antennas and three 12-m antennas (for single-dish maps) in the ACA.

Performance-based,
vis-à-vis operational metrics

Capability-based,
vis-à-vis the science
reference plan &
baseline
deliverables

Receiver bands:

3, 4, 5, 6, 7, 8, 9, & 10 (wavelengths of about 3.1, 2.1, 1.5, 1.3, 0.87, 0.74, 0.44, and 0.35 mm, respectively).

Full operations will include Band 1 and 2 (Cy 7+).

Baselines:

up to 3.7 km for Bands 8, 9 and 10 / up to 6.8 km for Band 7 / and >15 km for Bands 3, 4, 5 & 6.

Full operations will require Band 7 observations at the longest baseline and a goal of all Bands available.
Some long baseline observations may never be considered “standard” observing modes.

Standard vs Non-Standard modes:

Cycle 6 should still be around 20% of the time going to non-standard modes.

This fraction will get smaller as we go into Full Operation and the amount of new capabilities decreases.

The fraction of time available for testing of new capabilities in Cycle 6 drops to ~10%



ALMA Capabilities

Steady State (Cycle 6) and Full Operations (Cycle 7)

Observing Time:

4000 hours for successful proposals of PI programs expected on the 12m Array
(includes DDT, Cycle 4 Carryover and resubmissions)

3000 hours available on the ACA

3000 hours available on the Total Power Array

Observing Modes (All Cycle 5 Modes plus...):

Full Operations include Bands 1 and 2

Wide field polarization capabilities (12m + 7m arrays)

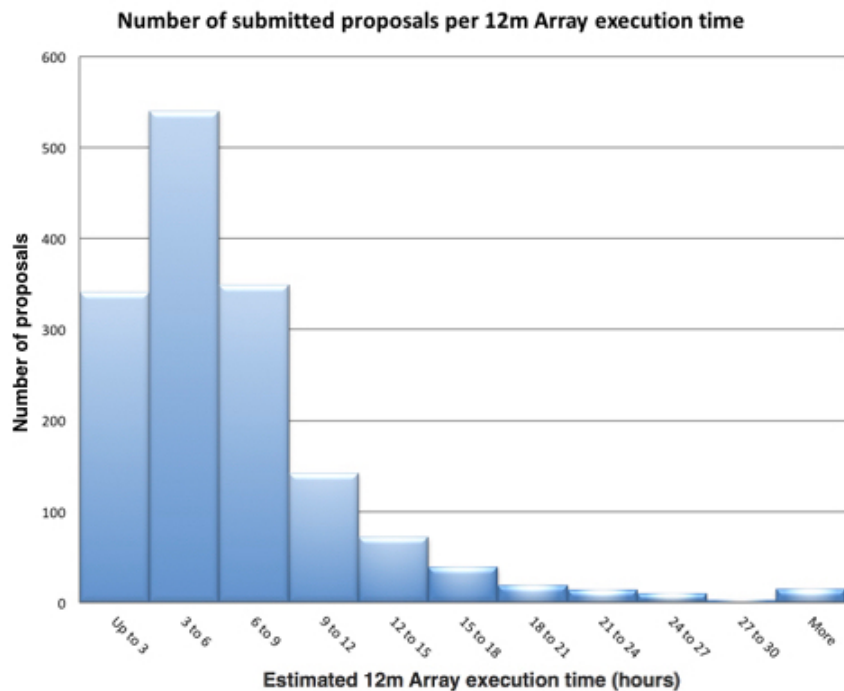
Full operations include full Stoke plus circular polarization at all observing bands including mosaics and Total Power

Improved spectral scan mode using differential gain calibration and more efficient calibration strategies including the use of sessions (sessions -> using already observed calibrators between science goals)

ALMA Capabilities

Observing Time:

- Strongly encourage ACA only observations in a wide range of science and large observing times.
- Also encourage “medium size” proposals of about 10-30 hours



ALMA Timelines and Milestones

The ALMA Cycle 6 Timeline

Date	Milestone
20 March 2018 (15:00UT)	Release of Cycle 6 Call for Proposals, Observing Tool & supporting documents and Opening of the Archive for proposal submission
19 April 2018 (15:00 UT)	Proposal submission deadline
End of July 2018	Announcement of the outcome of the Proposal Review Process
10 September 2018	Submission of Phase 2 by PIs
October 2018	Start of ALMA Cycle 6 Science Observations
September 2018	End of ALMA Cycle 6

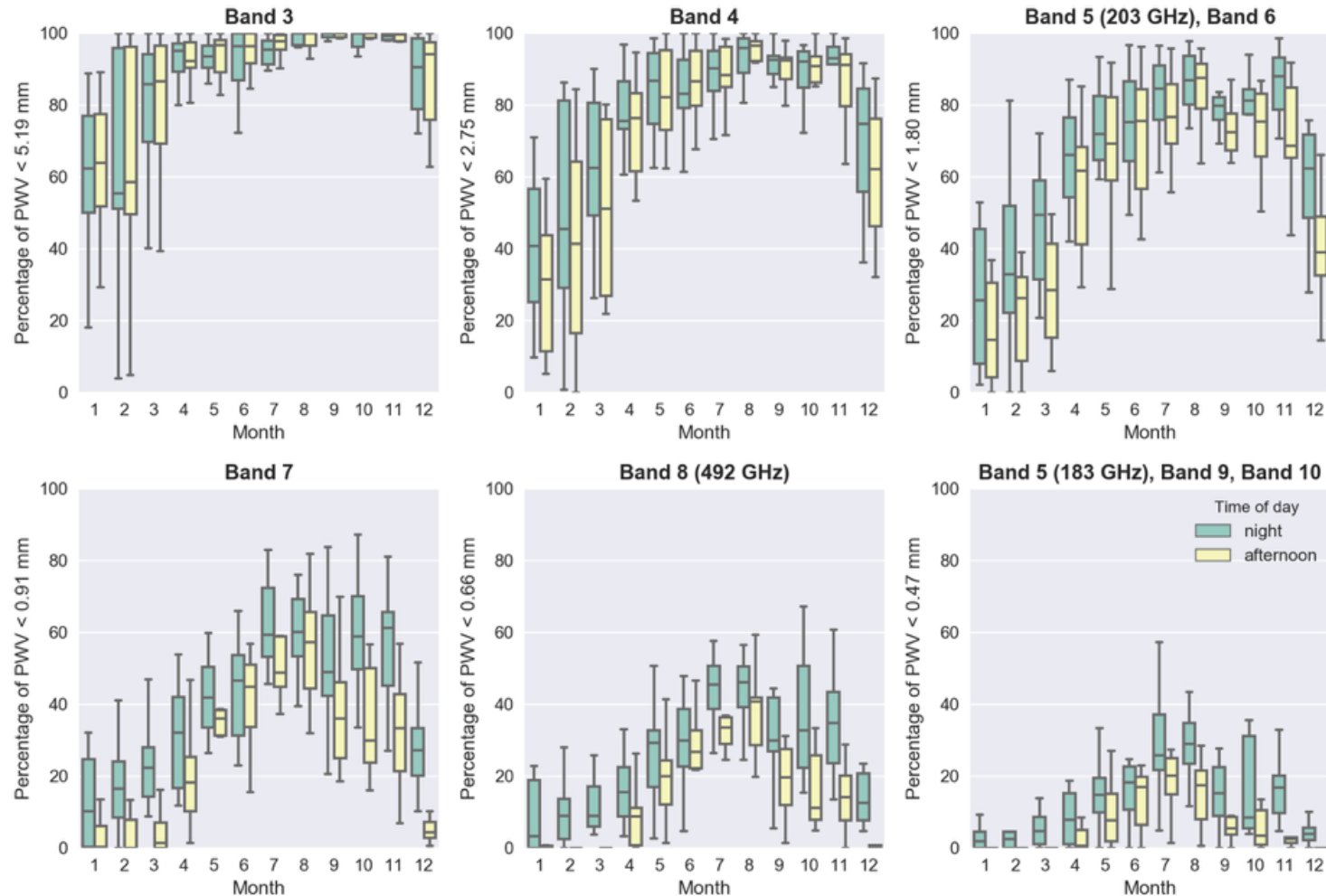
ALMA Array Configuration Schedule (Cycle 6)

For Cycle 6, the extended array configurations will be in the southern hemisphere winter in order to accommodate more high frequency observations. The array configuration schedule will cycle every couple years to accommodate the range of LST.

NOTE: No PI observing takes place in Feb!

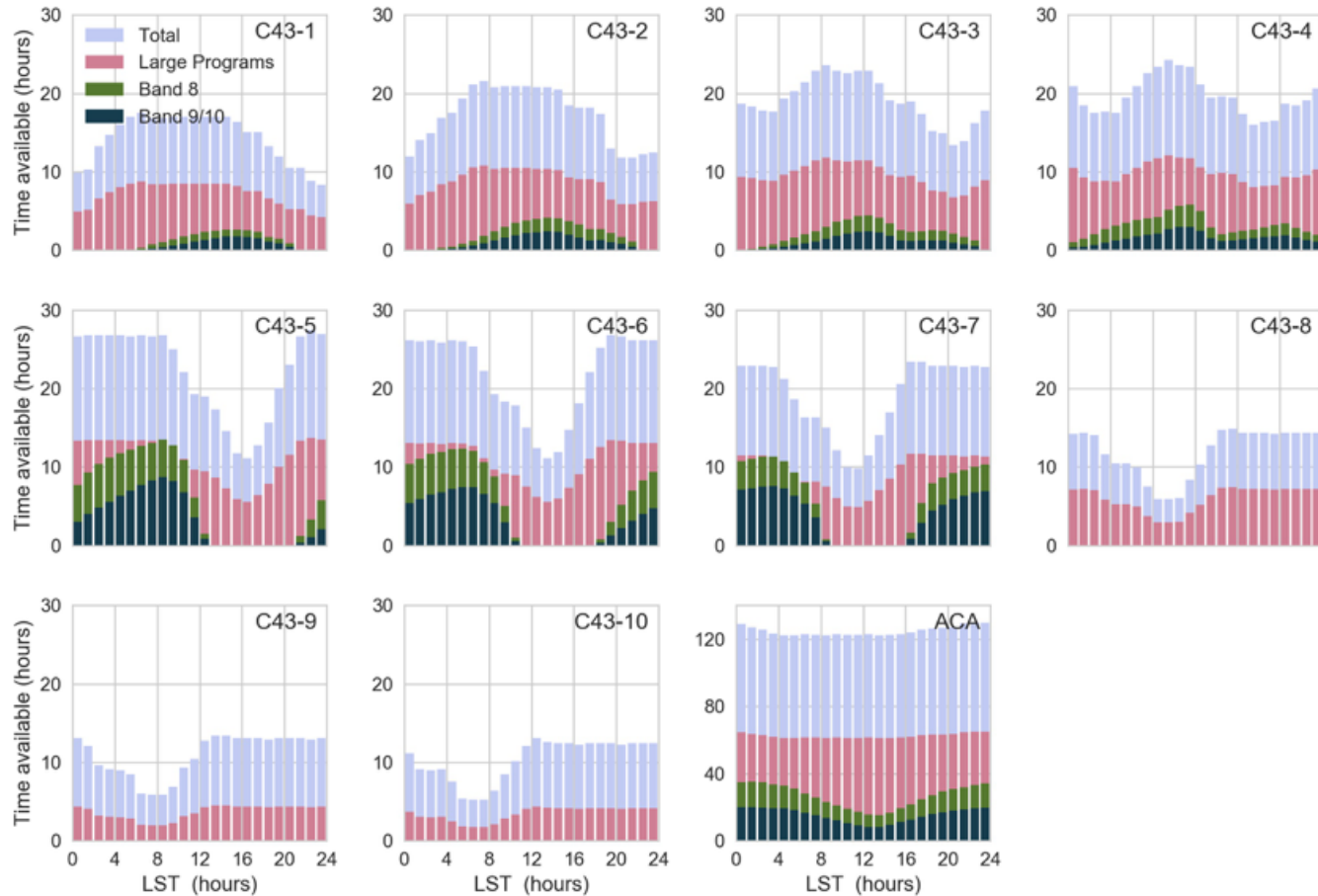
Start date	Configuration	Longest baseline	LST for best observing conditions
2018 October 1	C43-6	2.5 km	~ 22h – 10h
2018 October 15	C43-5	1.4 km	~ 0h – 12h
2018 November 25	C43-4	0.78 km	~ 2h – 14h
2018 December 15	C43-3	0.50 km	~ 4h – 15h
2019 January 5	C43-2	0.31 km	~ 5h – 16h
2019 January 20	C43-1	0.16 km	~ 6h – 17h
2019 February 1-28	No observations due to February shutdown		
2019 March 1	C43-1	0.16 km	~ 8h – 21h
2019 March 15	C43-2	0.31 km	~ 8h – 22h
2019 April 1	C43-3	0.50 km	~ 9h – 23h
2019 April 15	C43-4	0.78 km	~ 10h – 0h
2019 May 1-31	No observations due to major antenna relocation		
2019 June 1	C43-10	16.2 km	~ 13h – 3h
2019 June 20	C43-9	13.9 km	~ 14h – 5h
2019 July 10	C43-8	8.5 km	~ 16h – 6h
2019 August 1	C43-7	3.6 km	~ 18h – 8h
2019 September 5	C43-6	2.5 km	~ 20h – 9h

ALMA Observing Strategies (Cycle 6)



Box and whisker plots of the percentage of time that the precipitable water vapor (PWV) is less than the thresholds adopted for the various ALMA bands versus the month of the year. Results are shown for both night time (green) and mid-afternoon (yellow), and assume a source elevation of 60 degrees. The horizontal line within a box indicates the median, the boundaries of a box indicate the 25th- and 75th-percentile of the distribution, and the whiskers indicate the highest and lowest values of the distribution. The PWV measurements were obtained by the APEX weather stations between 2007 and 2017.

ALMA Observing Strategies (Cycle 6)



Effective observing time available per configuration for executing PI projects (blue). As an example, up to 10 hours may be allocated to Large Programs in configuration C43-2 at LST = 10 h. The total number of hours excludes time spent on observatory calibrations, maintenance, and antenna relocations. The amount of time available for Large Programs and high frequency observations are also indicated. The data files containing these histograms are available [here](#).

NAASC Sources of Support

- **ALMA Helpdesk:** User support is a priority so questions are usually answered within 48 hours (with around the clock staffing in the week leading up to the proposal deadline) - <https://help.alma-science.org>
- **Student Observing Support:** Successful ALMA proposals will be invited to apply for up to \$35k to support undergraduate or graduate student involvement - <https://science.nrao.edu/opportunities/student-programs/sos>
- **Page Charges:** Upon request NRAO covers page charges for authors at US institutions when reporting results from ALMA/VLA - <https://library.nrao.edu/pubsup.shtml>
- **Face-to-face Visitor Support:** Upon request NRAO will cover the travel expenses of up to 2 people from 2 teams per week to come to the NAASC to get support for data reduction, proposal preparation, etc... We also have long term visitor support as well - <https://science.nrao.edu/facilities/alma/visitors-shortterm>
- **ALMA Ambassadors:** You too can become an ALMA Ambassador. For program eligibility visit - <https://science.nrao.edu/facilities/alma/ambassadors-program>



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