

Cycle-7 Capabilities

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EUROPEAN ARC
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Cycle 7 Overview

- Call for Proposals was released on 19 March
- 4300 hours available on 12-m array
 - Up from 4000 hours in Cycle 6
- 3000 hours of ACA time
 - Plus more in Supplemental Call
- Deadline: **Wednesday 17 April @ 15:00 UT**
- Observing starts on 1 October and lasts for one year
 - February shutdown for maintenance

Configurations and antennas

- Numbers of antennas
 - 12-m array: 43
 - 7-m array: 10
 - TP array: 3
- 12-m configurations
 - 6 short-baseline configurations (C43-1 to C43-6)
 - Available in all frequency bands
 - 4 long-baseline (C43-7 to C43-10)
 - C43-7: All bands
 - C43-8 to C43-10: Bands 3 to 7

Unchanged from Cycle 6

Bands and baselines

“High-frequency”

	B3	B4	B5	B6	B7	B8	B9	B10
C43-1 ... C43-6	✓	✓	✓	✓	✓	✓	✓	✓
C43-7 (3.6 km)	✓	✓	✓	✓	✓	✓	✓	✓
C43-8 (8.5 km)	✓	✓	✓	✓	✓*			
C43-9 (13.9 km)	✓	✓	✓	✓	✓*			
C40-10 (16.2 km)	✓	✓	✓	✓	✓*			

“Long-baseline”

* New in Cycle 7

Angular resolution range: 4" to 12 mas

Band 7 with C43-8 to -10

- Previously restricted to \leq C43-7
- Tricky to calibrate
 - Either need a nearby phase calibrator...
 - Or use “Band-to-Band” (B2B) calibration
- The OT will check for a bright-enough phase calibrator
 - Must be within 5 degrees of target
 - Uses a look-up table for speed
- If none is found → non-standard
 - Pipeline cannot handle B2B yet
 - Your project is now fighting for 20% of available time

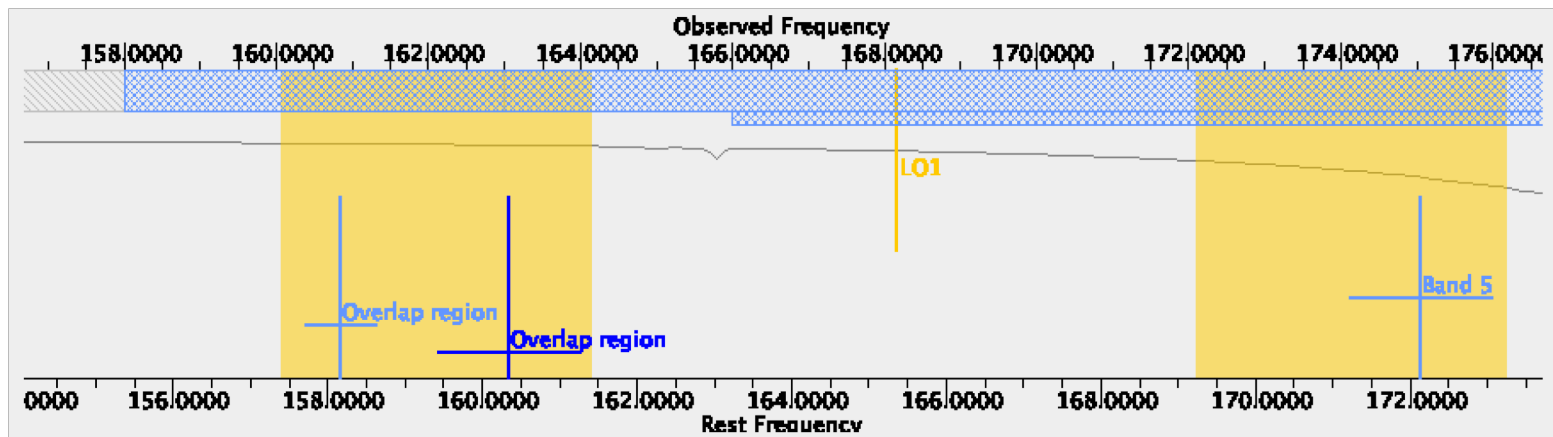
Phase-calibration cycle times

- Lower values for “intermediate baselines” (C43-5 & -6)
 - More frequent phase calibration leads to higher total times

Band	Old value (min)	New value (min)
3	10	5
4	10	5
5	8	4
6	8	3
7	7	3
8	7	3
9	7	3
10	5	3

Band 5 overlap with Band 4

- The overlap extends from 158-163 GHz
 - Band 5 lower edge lowered to avoid atmos. H₂O line at 183 GHz
- Now possible to define Band-5 spws in overlap region
- If all spws only in overlap region → Band 5
 - Lower noise due to no warm optics
 - Sensitivity Calculator gives better Band 4 noise (band average)

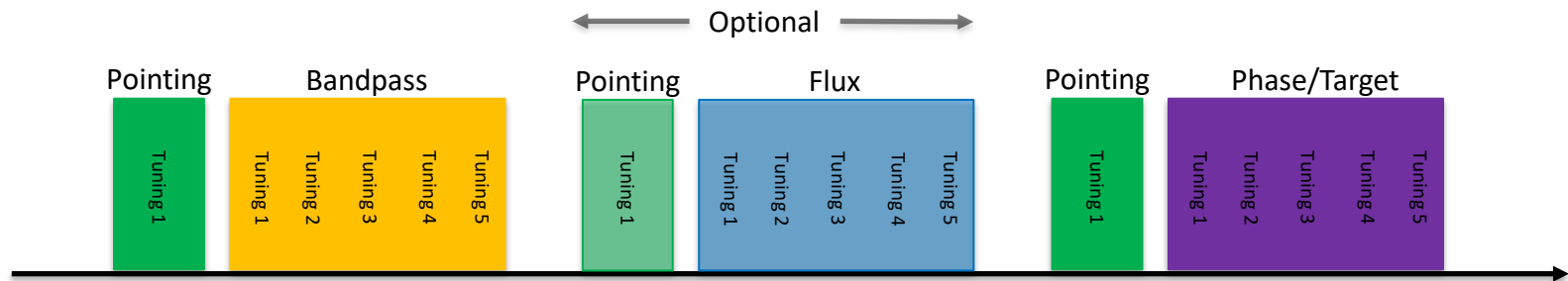


Polarization

- Bands 3 to 7
- Minimum 3 hours for calibration purposes
- Minimum detectable polarization
 - Linear: 0.1%
 - Circular: 1.8% (makes Zeeman difficult)
- Maximum source size
 - $< 1/3$ of antenna beamsizes for linear polarization
 - $< 1/10$ of antenna beamsizes for circular
 - OT uses largest angular size as a proxy for field of view

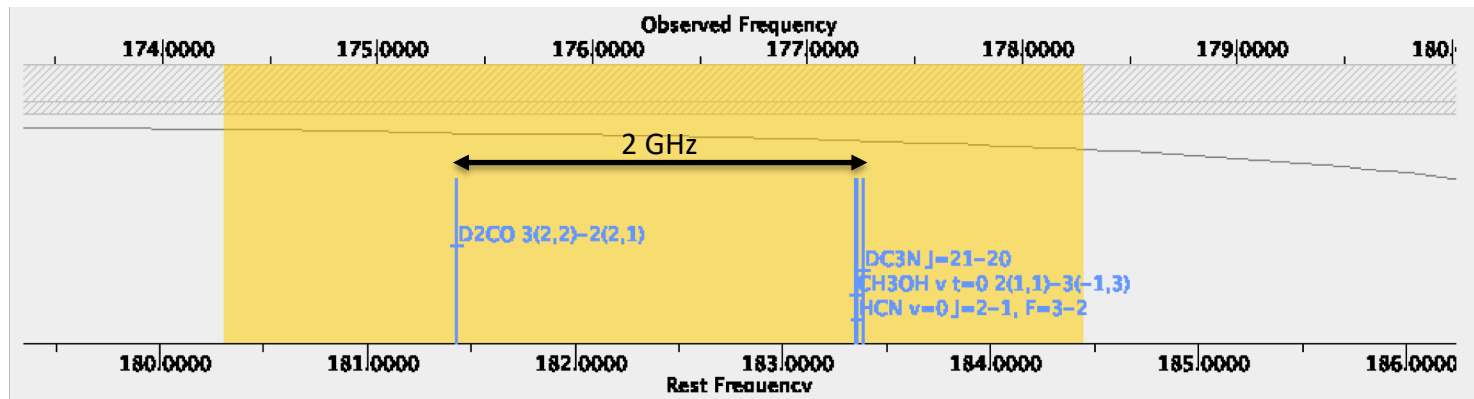
Spectral scans

- Previous strategy
 - Observe all sources of a tuning before re-tuning
 - Pointing calibrations must be repeated for each tuning
- New strategy
 - Slew to a source and observe all tunings → go to next source
- Time savings can be up to 25%



Baseband edges

- Performance at baseband edge is poor
 - Increased noise
 - Poor calibration
- OT now **warns** if any part of spw is within 30 MHz of edge



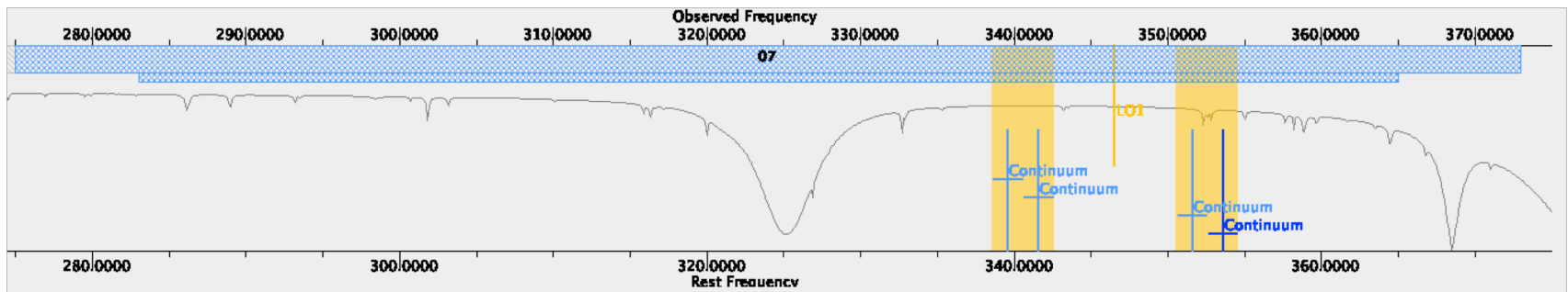
1/4	183.36033 GHz	177.23326 GHz	HCN v=0 J=2-...	58.594 MHz(99 km/s), 141.113 kHz(0.239 km/s)	2	⊗
1/4	183.34973 GHz	177.22301 GHz	CH3OH v t=0 2...	58.594 MHz(99 km/s), 141.113 kHz(0.239 km/s)	2	⊗
1/4	183.39136 GHz	177.26325 GHz	DC3N J=21-20	58.594 MHz(99 km/s), 141.113 kHz(0.239 km/s)	2	⊗
1/4	181.43214 GHz	175.36950 GHz	D2CO 3(2,2)-2(...	58.594 MHz(100 km/s), 141.113 kHz(0.241 km/s)	2	⊗

Date rates

- ALMA was recording two sets of correlated data
 - Raw data
 - Raw data with phases corrected for water vapour column
- Only uncorrected data is now written out
 - Halves data rates!
- Now quite difficult to trigger data warnings/errors
- Spectral averaging of $N=2$ remains the default
 - Only degrades spectral resolution by 15%
- ACA data rates are now also checked by the OT
 - Only relevant for large TP maps

Solar Observing

- Band 7 is available for the first time
 - Fixed continuum frequencies: 339.6, 341.6, 351.6 & 353.6 GHz
 - C43-1 and -2 (AR: 0.67-0.98")
- Other configuration changes
 - Band 3: C43-1 to C43-4
 - Band 6: C43-1 to C43-3 (unchanged)



Solar Time Estimates

- Time estimates are now more rigorous
 - User enters requested **on-source** time (was total time + cal.)
 - OT calculates total time according to observing sequence

The screenshot displays the ALMA Observing Tools (OT) interface. The main window is titled 'Editors' and has three tabs: 'Spectral', 'Spatial', and 'Control and Performance'. The 'Control and Performance' tab is active, showing various configuration parameters for observations. Below the tabs, a text box states: 'These parameters are used to control various aspects of the observations, including the required antenna configurations and integration times.'

The 'Control and Performance' section includes a 'Configuration Information' subsection with a '?' icon. It contains fields for 'Antenna Beamsize (1.13 * λ / D)' for 12m (16.468 arcsec) and 7m (28.230 arcsec), 'Number of Antennas' for 12m (43) and 7m (10), and 'TP' (3). Below these are three columns for different configurations: 'ACA 7m configuration', 'Most compact 12m configuration', and 'Most extended 12m configuration'. Fields for 'Longest baseline', 'Synthesized beamsize', 'Shortest baseline', and 'Maximum recoverable scale' are provided for each configuration.

The 'Desired Performance' section includes radio buttons for 'Single', 'Range' (selected), and 'Any', and a checkbox for 'Standalone ACA'. It also has a 'Desired Angular Resolution (Synthesized Beam)' field with a range from 0.665 to 0.97600 arcsec. A 'Total on-source time estimate' field is set to 30.0 min. A 'Science Goal time estimate' field is set to 30.0 min. A 'Time Estimate' button is present. There are also checkboxes for 'Simultaneous 12-m and ACA observations' and 'Are the observations time-constrained?'. A 'Time Estimate' dialog box is open on the right, showing the 'Requested Solar Time' (2.93 h) and a table of 'Possible Configuration Combinations'.

The 'Time Estimate' dialog box has a title bar with standard window controls. It contains a 'Requested Solar Time' section with the value '2.93 h'. Below this is a 'Cluster 1' table with columns: 'Source Name', 'RA', 'Dec', and 'Velocity'. The table contains one row for 'Sun_10' with RA '22:57:46.1700', Dec '-06:37:55.800', and Velocity '0.000 km/s'. Below the table is a 'Possible Configuration Combinations' table with columns: '12-m (1)', '12-m (2)', '7-m', 'TP', 'Nominal Beam"', and 'Max expected axial ratio'. The table contains two rows for 'C43-1' and 'C43-2'. Below the table is an 'Interferometric array' section with fields for 'Total time on-source' (30.00 min), 'Total time for 1 SB execution' (1.27 h), 'Number of SB executions' (1), and 'Total time to complete SB' (1.27 h). Below this is a 'Total power array' section with fields for 'Time for 1 SB execution' (25.00 min), 'Number of SB executions' (4), and 'Total TP time' (1.67 h). The 'Estimated total time' is 2.93 h. A 'Close' button is at the bottom right.

Source Name	RA	Dec	Velocity
Sun_10	22:57:46.1700	-06:37:55.800	0.000 km/s

12-m (1)	12-m (2)	7-m	TP	Nominal Beam"	Max expected axial ratio
C43-1	None	No	Yes	0.924 x 1.033	1.5
C43-2	None	No	Yes	0.63 x 0.702	1.5

Interferometric array	
Total time on-source	30.00 min
Total time for 1 SB execution	1.27 h
Number of SB executions	1
Total time to complete SB	1.27 h

Total power array	
Time for 1 SB execution	25.00 min
Number of SB executions	4
Total TP time	1.67 h

Estimated total time 2.93 h

Receiver temperatures

- Previous values were rather conservative
 - Now updated based on years of real measurements

Band	Old value (K)	New value (K)	Time Saving (%)
3	45	40	13 (100 GHz)
4	51	42	21 (150 GHz)
5	55	50	5 (185 GHz)
6	55	50	11 (230 GHz)
7	75	72	5 (345 GHz)
8	150	135	11 (460 GHz)
9	110	105	4 (650 GHz)
10	230	230	0

Continuing restrictions

- No total power continuum
 - Except for solar...
- No total power in Bands 9 and 10
- Single pointings only with:
 - Band 10
 - Full polarization
- No polarization with ACA or solar
- No spectral scans with ACA

Non-standard modes

- Only eligible for 20% of available time
 - Bands 9 and 10
 - Band 7 long-baseline with no phase calibrator
 - Polarization
 - Narrow aggregate bandwidth (<1 GHz)
 - User-defined calibration
 - Solar
 - VLBI
 - Astrometry
- Stand-alone ACA cannot use non-standard modes

Range of Angular Resolution

- OT offers three choices for angular resolution
 - Single value
 - Range
 - “Any” (C43-1 to C43-6)
- We strongly recommend that a range be entered
 - Really consider what you can do your science with
 - Increased likelihood of execution
 - Less (no?) need for Change Requests
- **Don’t just enter what’s in the Proposer’s Guide!**
 - Values there correspond to single frequency and zenith
 - Look at values shown in OT

Scientific Justification

- ALMA policy on font size
 - *“The total length of the PDF document is limited to four pages for Regular, ToO, Solar, mm-VLBI and DDT proposals and to six pages for Large Programmes (A4 or US Letter format), with a **font size no smaller than 12 points.**”*
- OT now checks font size in PDF
 - A **warning** is issued if >15% is smaller than 12 point
 - This may lead to a proposal being rejected!
- Things to be aware of
 - All text is checked i.e. figure captions and tables
 - This includes “hidden text” e.g. present in a cropped figure

Reducing bias in proposal review

- Signs of bias exist in the results of proposal review
 - Not just an ALMA problem!
 - Hope to improve this in Cycle 7
- Changes made to Proposal Cover Sheet
 - The PI is not specifically identified
 - Order of investigators is randomized
 - No first names are shown, just initials

INVESTIGATOR NAME(S): (in random order)	A. Avison, T. Muxlow, A. Richards, G. Bendo, A. Biggs
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Supplemental Call

- As in Cycle 6 there will be an **ACA-only** Call for Proposals
 - Opens 3 September 2019
 - Observations start January 2020
- A minimum of 750 hours will be available
- Distributed Peer Review will be trialled
 - Each proposal must nominate a reviewer
 - He/she will need to review 10 proposals
 - Failure to do this by the deadline will lead to proposal rejection

Phase 2 Procedure

- Results of review go out end of July (hopefully)
- PIs then requested to submit their Phase-2 SGs
- There is a **hard** deadline for this
 - PIs who miss this will be downgraded (A→B, B→C, C→oblivion)
- Submission of Phase-2 SGs can be delegated to a co-I
 - Available from Account Profile in Science Portal

Account info **Project delegation** Account linking Demographics Confirm

Edit Profile

(Fields marked with a red dot are mandatory)

First name

Middle initials

Surname

Gender

E-mail

Receive optional emails ☒

Account name

Password

Re-type password

Institution

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](#)

Proposer's Guide

- Good summary of everything you need to know
 - <https://almascience.nrao.edu/proposing/proposers-guide>

The screenshot shows the ALMA Science Portal website. The header features the ALMA logo, the text "Atacama Large Millimeter/submillimeter Array" and "In search of our Cosmic Origins", and logos for NRAO, Associated Universities, Inc., and NSF. A navigation bar includes links for About, Science, Proposing (highlighted), Observing, Data, Processing, Tools, Documentation, and Help. A search bar is on the right. The main content area is titled "Proposer's Guide" and includes a link to "Download PDF version". The section "Cycle 7 Call for Proposals" contains text about the ALMA Director's announcement, the availability of observation time, and the proposal review process. A "Contents" sidebar on the right lists sections from "1. 1 What's new in Cycle 7" to "4. 3.4 mm-VLBI Proposals". The footer includes links for Site Map, Accessibility, Contact, Privacy Statement, and logos for ESO, NRAO, and NAOJ.

Proposer's Guide
Download PDF version

Cycle 7 Call for Proposals

The ALMA Director, on behalf of the Joint ALMA Observatory (JAO) and the partner organisations in East Asia, Europe, and North America, is pleased to announce the ALMA Cycle 7 Call for Proposals (CfP) for scientific observations to be scheduled from October 2019 to September 2020. It is anticipated that 4300 hours of the 12-m Array time and 3750¹ hours of the Atacama Compact Array (ACA) time, also known as the Morita Array, will be available for successful proposals from Principal Investigators (PIs) in Cycle 7. Proposals must be prepared and submitted using the ALMA [Observing Tool \(OT\)](#), which is available for download from the ALMA Science Portal (www.almascience.org). Proposals will be assessed by competitive peer review by a single international review committee.

Cycle 7 will include a supplemental CfP for stand-alone ACA observations with the Cycle 7 technical capabilities specified in this document. The observations will be scheduled from January 2020 to September 2020 (Section 1.4). The supplemental call will have some differences compared to the main call including the priority of the observations and the proposal review process. Detailed documentation will be released with the supplemental CfP. In what follows, this document refers to the characteristics of the Cycle 7 main CfP unless specifically indicated otherwise.

ALMA Cycle 7 proposal submission will open at **15:00 UT on Tuesday, 19 March 2019**. The Cycle 7 proposal submission deadline is **15:00 UT on Wednesday, 17 April 2019**. **Table 1** summarises these and other important milestones for Cycle 7.

ALMA provides continuum and spectral-line capabilities for wavelengths from 0.32 mm to 3.6 mm, and angular resolutions from 0.012" to 3.4" on the 12-m Array. Cycle 7 will bring to ALMA several new observational capabilities, including observations in Band 7 out to 16.2 km baselines, Solar observations in Band 7 in the two most compact configurations and in Band 3 in one additional configuration (C43-4), an improved sensitivity limit for full spectral resolution linear polarization observations and improved observing efficiency for spectral scans.

This Proposer's Guide provides an overview of significant changes made in both the technical capabilities and observing strategies for Cycle 7 (Section 1), and

Contents

- 1. 1 What's new in Cycle 7
 - 1. 1.1 Technical and observing capabilities
 - 2. 1.2 Proposal format and cover sheet
 - 3. 1.3 Observing Tool features
 - 4. 1.4 Stand-alone ACA supplemental Call for Proposals
- 2. 2 ALMA overview
 - 1. 2.1 The ALMA partnership
 - 2. 2.2 The ALMA telescope
 - 3. 2.3 The Joint ALMA Observatory and the ALMA Regional Centres
 - 4. 2.4 The ALMA Science Portal
 - 5. 2.5 ALMA proposal eligibility
- 3. 3 Proposal types
 - 1. 3.1 Regular Proposals
 - 2. 3.2 Target of Opportunity Proposals
 - 3. 3.3 Large Programmes
 - 4. 3.4 mm-VLBI Proposals

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