



# Review of Cycle 5 Preparation and Planning

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# NAASC Status

## Outline

- Timeline of Cycle 5 Capabilities
  - This is actually applicable for any Cycle going forward
- Planned Cycle 5 Capabilities and De-scope
- Preparations for Cycle 5 Call for Proposals
- Planning for the Cycle 4 “Delta Call”
- Conclusions and Lessons’ Learned

# Conclusions and Lessons' Learned

- The consistent and dependable timeline for software (specifically OT) development and the testing for new capabilities have been lauded by the developers and test scientists.
- “Requirement creep” is going to happen but the timelines have enough mitigation to account (within reason)
- Clear requirements and effective de-scoping of non-fully commissioned modes have seen much less failures on the array and improved through-put for pipeline data reduction.
- The effectiveness of our end-user documents (esp the PG) is still somewhat unclear.
- Continued, extensive and outside testing of the software (esp the OT, SnooPI) has proven remarkably effective. Thank you!
- Effective scheduling and queue building is still a work in progress but it is definitely improving.

# Timeline of Cycle 5 Capabilities

- The planning for the start of an observing Cycle starts with the annual ObsMode meeting which is held in April/May.
  - The Cycle 6 ObsMode was completed 26 April 2017 (Vlahakis)
- At this meeting, ARC and JAO discuss plans for commissioning new modes and making overall improvements to observing.
- Initial prioritization is made on these discussions by the end of **May**
- Follow-up meetings happen from **Jun – Sept** to discuss progress and possible new features/de-scopes.
- **September 30** is the new feature deadline – any modes not fully commissioned or at least have significant progress made, will be de-scoped.
  - There are some exceptions to this but overall the timeline is followed
- **December 01** is the final “Go/No Go” decision point for new capabilities and observing improvements, edits to the ALMA OT. This is the final date for inclusion of the features into the Call for Proposals

# Timeline of Cycle 5 Capabilities – continued...

- **Late November and Early December** the Proposer's Guide and Technical Handbook Working Groups start to meet to include new capabilities and opportunities for ALMA observing.
- **February** – documentation is under final review by ARC and JAO staff. Software testing begins for the upcoming Call for Proposals. This is the end-user software including the OT, SnooPI, Archive and Science Portal.
- **March** – All documentation is ready for deployment; the PG is rendered in the Science Portal. Final consistency checks are made across the documentation and the Science Portal
- **~21 March** – Call for Proposals
- **~20 April** – Proposal Deadline
- Wash. Rinse. Repeat.

# Planned Cycle 5 Capabilities and De-scope

- Major efforts planned from Cycle 5 ObsMode
  - Full Band 5 Capabilities – STATUS: Band 5 was offered as a new observing mode in full polarization. However, it was not offered out to the longest baselines given the minimum number of available receivers.
  - Long Baselines – STATUS: Long baselines (out to 16.2 km) were offered for the first time as a standard mode at the lower frequencies.
  - 90 Degree Walsh Switching – STATUS: 90 Degree Walsh is available for Bands 9 and 10 – effectively doubling the bandwidth for continuum observations.
  - Range of Angular Resolutions – STATUS: PIs were able in Cycle 5 to enter a range of acceptable resolutions or “Any”.
  - Polarization – STATUS: Band 4 full polarization was offered. Differential Circular is still not an accepted mode.
  - Improved and more efficient spectral scans – STATUS: Not offered. Fell off due to other priorities.
  - TP Continuum using Fast Scanning – STATUS: Still only available for Solar observing.

# Planned Cycle 5 Capabilities and Downselect

- “Incremental” efforts planned from Cycle 5 ObsMode
  - Time Simultaneous observations – STATUS: Limited availability offered for the 12m and 7m arrays.
  - Reduced Time Restrictions – STATUS: Time restrictions were largely relaxed which opened up new opportunities for ToOs and Triggered Proposals.
  - Duplication Checker – STATUS: Improvements were made to the duplication checker to investigate possible overlaps in observing proposals.
  - Resubmissions – STATUS: Resubmissions were handled by the JAO. Checkbox removed from the OT.
  - Clustering Algorithm – STATUS: Greatly improved for Cycle 5 to include more sources sharing calibrators within a science goal
  - Setting Rest Frequency – STATUS: Users could identify the rest frequency within a SPW. Spectral lines were “remembered” even after closing out the of OT.
  - User defined calibration – STATUS: Users were able to self-select the same bandpass and flux calibrators to reduce overhead. User defined calibration triggered a warning – not an error.

# Final Cycle 5 Capabilities

In Cycle 5, we are in what is defined as “Steady State” Operations

The Cycle 5 capabilities are fully described in Appendix A of the ALMA Proposers Guide available at:

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

In summary:

- **Number of antennas**
  - At least forty-three (43) antennas in the 12-m Array
  - At least ten (10) 7-m antennas (for short baselines) and three (3) 12-m antennas (for making single-dish maps) in the ACA
- **Receiver bands**
  - Receiver Bands 3, 4, 5, 6, 7, 8, 9, and 10 (wavelengths of about 3.1, 2.1, 1.6, 1.3, 0.87, 0.74, 0.44, and 0.35 mm, respectively)
- **12-m Array Configurations**
  - Maximum baselines for the antenna configurations between 0.15 km and 16 km
  - Maximum baselines of 3.6 km for Bands 8, 9 and 10
  - Maximum baselines of 8.5 km for Band 7
  - Maximum baselines of 16 km for Bands 3, 4, 5 and 6
  - Files containing representative antenna configurations for the 12-m and 7-m arrays suitable for Common Astronomy Software Applications (CASA) simulations are available from the ALMA Science portal (<http://almascience.org/documents-and-tools/cycle5/alma-configuration-files>)

# Final Cycle 5 Capabilities

## Towards Steady State (Cycle 5)

- **Spectral line, continuum, and mosaic observations**
  - Spectral line and continuum observations with the 12-m Array and the 7-m Array in all bands
  - Single field interferometry (all bands) and mosaics (Bands 3 to 9) with the 12-m Array and the 7-m Array
  - Single-dish spectral line observations in Bands 3 to 8
- **Polarization**
  - Single pointing, on axis, full (linear) polarization capabilities for continuum and full spectral resolution observations in Bands 3, 4, 5, 6 and 7 on the 12-m Array.
  - While PIs will receive data that will allow them to generate circular polarization data, the quality and/or accuracy of that data is not assured in this cycle, and such data should not be used for scientific purposes.

# Final Cycle 5 Capabilities

## Towards Steady State (Cycle 5)

- **Standard vs Non-Standard modes:**
  - Cycle 5 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 5 drops to ~15%
    - and continues to drop to a steady state of ~10% in Full Operations.
- **Non-Standard Observing Modes include:**
  - Bands 8, 9 and 10 observations
  - Band 7 observations with maximum baselines > 5 km
  - All full polarization observations
  - Spectral scans
  - Bandwidth switching projects (having less than 1 GHz aggregate bandwidths over all spectral windows)
  - Astrometric Observations
  - Solar observations
  - VLBI observations
  - Non-standard calibrations (user-defined calibrations selected in the OT)

# Final Cycle 5 Capabilities

## Towards Steady State (Cycle 5) 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 AC

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 have all baselines available for all observing bands. Some long baseline observations may never be considered “standard” observing modes.

- **Standard vs Non-Standard modes:**

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# Preparations for Cycle 5 Call for Proposals

Once the de-scoping happened for the Cycle 5 Capabilities, work on the Proposer's Guide and Technical Handbook started with major overhauls.

## Proposer's Guide:

- Included a full description of the new capabilities and an updated appendix summarizing the capabilities.
- Included a full configuration schedule including the optimal LST range for a given array configuration. Also included fraction of time available per array configuration and observing band. Time requested per LST range was also provided.
- Recommendations were given to submit “medium” sized proposals (ie. About 15 – 30 hours).
- *Contains a combination of policy and proposal preparation information – is this effective?*
- *Cover to cover is 57 pages long – consider shortening?*

# Preparations for Cycle 5 Call for Proposals

## Technical Handbook:

- Included a full description of Band 5.
- New sections were added describing the 90 degree Walsh switching capabilities.
- Imaging and calibration chapters were updated to include the new antenna configuration files and new time ratios associated when combining arrays.
- Pipeline chapter was re-written to be more concise and refers to existing user documentation.
- *As a reference manual, is this document effective? Have you found what you have been looking for?*
- *Is there any critical material that should be moved to the other user documentation (e.g. Proposer's Guide or the PRIMER)?*

# Preparations for Cycle 5 Call for Proposals

## Software Testing:

- Extensive testing took place in Feb before the Call. Two subsystems got the most attention before the Cycle 5 Call for Proposals were the OT (as usual), Archive and AQUA.
- The OT testing is essential to ensure that all the requested capabilities and features from ObsMode were captured within the OT GUI interface (e.g. we offer Band 5 but can't select it!)
- Features in the OT that got the most attention included the PI range of acceptable resolutions (including did the time estimates make sense across the range of configuration); setting the rest frequency of a SPW; time simultaneous observations; large program validation and source clustering.
- *OT Testing was critical, effective and valuable feedback was delivered. Thanks to the ANASAC in participating in the testing!*

# Preparations for Cycle 5 Call for Proposals

## Software Testing:

- AQUA is an essential software system that will replace many of the existing staff developed tools currently used to track program execution through data reduction.
- Before AQUA could be tested, a new program LifeCycle had to be developed to track the progress of a program. The new LifeCycle is reflected in the Project Tracker interface available to ARC staff.
- AQUA tracks and changes the overall state of an observing program. *Once fully implemented, it will reduce the amount of accounting overhead used for data reduction and delivery.*
- Archive was also heavily tested during this time and several new features were tested and accepted including searching over an RMS and specifying a FOV.

# Cycle 4 “Delta” Call for Proposals

As we entered the middle of Cycle 4, it was clear that given the weather conditions and amount of time allocated for both ACA standalone and regular proposals including the ACA, there would not be enough programs available to run on the ACA. A “Delta” Call was implemented to fill the gap(s) (Wootten)

- While the 12-m Array queue was built more effectively, the ACA was still undersubscribed.

Working with IST, iSOPT generated requirements for the Call:

- Would use a modified Cycle 4 OT – required development work and testing. For the first time use a 2016.2.00xxx.S project code.
- Rolling deadline until the total time was allocated.
- Needed development work on the Science Portal – News items, new sites for the call materials and deployment of the new OT.
- Needed to be independent from the Cycle 5 Call.

*Call opened on 21 April, 2017 and closed on 15 May, 2017. Was very popular... “Final” numbers: 198 valid proposals requesting over 4800 hours!*

# Conclusions and Lessons' Learned

- The consistent and dependable timeline for software (specifically OT) development and the testing for new capabilities have been lauded by the developers and test scientists.
- “Requirement creep” is going to happen but the timelines have enough mitigation to account (within reason)
- Clear requirements and effective “downselect” of non-fully commissioned modes have seen much less failures on the array and improved through-put for pipeline data reduction.
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