

# ALMA Science Operations

Cycle 0 and Cycle I



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Atacama Large Millimeter/submillimeter Array  
Expanded Very Large Array  
Robert C. Byrd Green Bank Telescope  
Very Long Baseline Array



NAASC 

## Outline

- The Cycle 0 Proposal Review Process & End-to-end tests
  - Draft presentation from L. Nyman for ASAC (linked to from agenda)
- Cycle 0 Phase II process
- Cycle 0 data reduction
- Cycle I Plan
  - Draft presentation from R. Hills for ASAC (linked to from agenda)



## The Cycle 0 Proposal Review

See pdf by L. Nyman for ASAC (linked from agenda). Highlights:

- 919 proposals received
- Server errors in last 1.5 hrs due to unanticipated load from co-Is retrieving proposals or querying archive (deadline extended). No proposals affected
- Two stage process that included triage of 276 proposals (17 “resurrected” at panel meetings). 660 treated at meetings. 27 judged “not feasible” (4%)
- Idea of “grades” rejected
  - 112 proposals awarded “Highest Priority” status (500 hr estimated)
  - 51 proposals awarded “Filler” status (250 hr estimated)
  - “Not feasible” proposals told “will not be scheduled”
  - Remaining proposals “are not likely to be observed”
- Letters sent to all PIs on Sept 7
- JAO plans to publish titles, abstracts of top proposals (next week?)




## PRP Process: answers to ANASAC questions


- Where can we find list of accepted proposals?
  - Expect JAO to post news item to ALMA SP next week
- Where is the list of TAC members?
  - ALMA SP news item from Sept 9:  
<https://almascience.nrao.edu/news/outcome-of-the-proposal-review-process>
- Breakdown by science category (see ALMA/NRAO news items):  
 Cosmology/Galaxies/ISM/Stellar = 19% / 26% / 44% / 11%
- Breakdown by band category (see ALMA/NRAO news items): No. of proposals requesting B3 / B6 / B7 / B9 = 31 / 40 / 66 / 29
- How does TAC process compare with Great Observatories
  - Board policy document based in large on Great Observatories model
  - See slide 6 from pdf from Lars Nyman posted to agenda
- Number of proposals per reviewer: After triage ~90/panelist. 49 reviewers



## Cycle 0 Review Timeline




• Cycle 0 CfP	Mar 30
• Cycle 0 Deadline	June 30
• Start of Cycle 0 Science Assessments, Stage 1	July 10
• Deadline Stage 1	July 26
• Start of Stage 2, reading of remaining proposals	July 27
• Cycle 0 Technical pre-Assessments	July 20 - 31
• Cycle 0 Technical Assessment Workshop	Aug 1-5
• Cycle 0 ARP/APRC meetings	Aug 14-19
• Cycle 0 PRP results sent to PIs	Sept 7
• Cycle 0 review results posted	Sept 9




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## End-to-End tests and readiness for start of Cycle 0



- See [pdf](#) by L. Nyman for ASAC (linked from agenda). Highlights:
- End-to-end: from a science goal specification on the OT, through SB generation, scheduling, execution, logging, archiving, and retrieval from archive
  - Will be expanded soon to include data examination
- Have now conducted four E2E tests at AOS:
  - September 6 (failed)
  - September 8 (successful; 4 datasets w/10 antennas; 4hrs data out of 7hr observing)
  - September 13 (successful; 3 datasets w/12 antennas; 3 hrs data out of 5.5 hrs observing)
  - September 22 (successful execution however data did not replicated to SCO; 2 datasets w/13 antennas out of 17 available; 3 hrs out of 4.5 hrs observing.)



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## The Cycle 0 Process: Observing Preparation



- In August, JAO announced change in configuration scheduled compared to that published in Proposers Guide (due in part to poor weather)
  - New schedule: Compact configuration Oct-Jan (4mo)
  - No science observing in Feb
  - Extended configuration Mar-June (4mo)
  - No science observing in July
- Phase II products (SBs, Observing script, log, observing simulator output) will be generated by pan-JAO/ARC “Phase 2 Group” (P2G) of OT experts
  - NA: H. Liszt, K. Sheth, S. Corder
  - Training “bootcamp” held in Chile Aug 24-26; another to be held Oct 26-28
  - Document all work in a JIRA ticket that tracks all changes for any given project



### Cycle 0 Science Project Preparation: 2011.0.00236.S

[Edit](#)
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#### Description

PLEASE PASTE THE FOLLOWING INTO THE PROJECT CREATION JIRA TICKET:

Project code: 2011.0.00236.S  
 PI name: Jonathan Tan  
 Project title: The Dynamics of Massive Starless Cores

Name of P2G Phase II originator: Kartik Sheth  
 Supporting ARC: NA  
 ARC contact scientist(s): Scott Schnee  
 List of SB name(s): Project236\_ES\_v2\_ks

Configuration(s) requested: Compact only

Summary of Field Source positions [RA, Dec]: There are 4 sources all at RA = 18h45m and DEC between +01:26 to -04:04. Though no additional time was requested, PI expects track sharing over 4 hrs for "good UV-coverage"

Phase Calibrators used: J1830+063; B1827+062 - 420 mJy at 230 GHz, within ~8-10 degrees from all four sources.

Provisional Amplitude Calibrators used: B1749+096 RA: 17:51:32.82 DEC: 09:39:00.730 Flux: 3.62 Jy at 238 GHz - Jun 2011 (source of values unknown!) Flux: 5.65 Jy at 90 GHz - Jun 2011

Brief summary of receiver band(s) used &/or tuning(s): Band 6, LO1 = 223.71 GHz Phase 1 rest freqs requested: 231.32186, 231.22069, 217.7200, 216.11258 GHz (for all four sources).

## The Cycle 0 Process: Observing Preparation (continued)



- Each project assigned a P2G “originator” and ARC “contact scientist”, who will review Phase II products with PIs
- Projects assigned to one of three Phase II generation periods, based on required array configuration
- Current timeline only includes preparation for projects with “Highest Priority” rating
  - Pressing JAO to define policies/procedures for Filler projects (topic for Nov f2f meeting)




## Phase II Preparation periods



Batches	Project Rating	Total # of Projects	P2G SB Generation Period	PI Interaction Period	P2G Validation	Array Config.
Batch #1	Highest Priority	21	August 26 - September 11	September 12-28	September 29-30	Compact
Batch #2	Highest Priority	40	October 1 - 15	October 16-29	October 30 - November 1	Compact
Batch #3	Highest Priority	51	November 1 - December 1	December 2 - January 10	January 11-15	Extended
TBD	Filler	51	(if at all)	TBD	TBD	

Table 1: ALMA Cycle 0 Phase II preparation periods






## Review of Phase II Materials with PI


- Contact Scientist (CS) assigned by ARC
- CS contacts PI to setup timeframe for review
  - Currently email/phone/skype. For Batch 2 & 3 will be through helpdesk
- P2G member creates phase II materials & JIRA ticket
- CS reviews Phase II materials with P2G member
- CS reviews Phase II materials with PI
- Tweaks and corrections by P2G if necessary
- PI signs off on products
- Submitted to JAO to scheduling

**Lessons Learned:**

- Much more time consuming than anticipated (~12hrs per project)
- Will train more P2G members (October bootcamp)
- Training of Batch 2-3 Contact Scientists in 1 week, based on “lessons learned” from Batch I




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## Major & Minor change requests

- CS or PI can request minor changes & have P2G implement directly
  - Defn: changes with no implied changes to the science scope and do not increase the total execution time
  - Examples: change in pointings by  $< \text{HPBW}/2$ , in frequency by  $< 20\%$  spw,
- Any Major changes require approval though helpdesk request
  - Defn: changes to science scope or increase total execution time
  - Examples: switch targets, changes in spw that may increase spectral coverage
  - Process: PI submits helpdesk ticket; triggers review by “Change Request Standing Committee” (JAO staff with review by Director); verdict entered into ticket & related back to PI



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## NA Cycle 0 Project Analysis (compiled by C. Brogan, with input from NA Contact Scientists)



- 38 “highest priority” NA projects; also supporting 7 (out of 11) “highest priority” Chilean projects =45 projects to support in total
- Of these, 50% have more than one “part” (more than one configuration, band, and/or spectral setup). Total number of individual project parts = 80 (by band: 15/14/32/19)
- Due to scheduling constraints on time for each SB (~1 hr) and location in the sky, each project part may have to be split into multiple scheduling blocks – each must be independently reduced.
  - # individual SBs > 159 SO FAR with < half projects accurately assessed
  - Each SB may need to be executed n times to reach required rms
- Other interesting stats:
  - 13 projects require both compact and extended configurations
    - 9 for imaging/uv-coverage (20%)
    - 4 for matched resolution
  - 8 projects have mosaics
  - 6 projects have > 20 individual sources (13%)
  - Only 2 projects can be characterized as “detection experiments”
  - 69% use the high spectral resolution “FDM” mode; 88% 4 spws

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## Project Preparation: initial NA “lessons learned”



- Some complex projects were approved that are very difficult to schedule
  - E.g. Need for compact + extended array and large uv coverage
- Some projects are less efficient than anticipated due to software version being used for Cycle 0 or scheduling decisions
  - E.g. Multiple widely spaced pointings; limiting SB length to mitigate against system instability
- Data processing will be quite complex for some projects
  - CfP needs more specificity, or Science Assessors (or TAs?) need to be given more explicit instructions
  - SB generation should take into consideration implications for data reduction



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## Project Preparation: initial NAASCS “lessons learned”

- OT overhead estimates are not always a good guide
  - Original overheads validated by SV projects that were simpler than many PI projects
  - We anticipated using the next version of the s/w for Cycle 0; some things much harder using current s/w
  - Late stage decisions on how to construct SBs (based on concerns about system stability)

Impact? Sec 3.4 of the Proposers Guide:

*"ALMA will strive to reach the sensitivity requested by the PIs. Projects will be considered complete when (a) the observations that have been obtained are within 10% of the sensitivity goal or (b) the observing time has reached twice the value estimated by the OT (with a maximum of 100 hours)".*




## Cycle 0 Data Reduction plan

- Data to be reduced by “human pipeline” in Chile on cluster/luster system
- Pipeline software will be commissioned this year, but not deployed until Cycle 1
- JAO has designated Data Reduction group (6 DSO staff, including 4 system astronomers) to be responsible for processing data through to “QA2”
  - QA2: data can be calibrated & imaged (metrics still being defined) without significant artifacts or errors
- Basic archived data products: Raw visibilities (ASDM format), flagging & calibration tables, measurement sets with Tsys, WVR & delays applied & averaged down in time, casapy data reduction script, logs & QA summaries
- QA2 Imaging Data products for Cycle 0(+) still under discussion
  - Full Operations goal: science quality data cubes
  - ES goal will probably be “QA2 validation images” of some target fields (images that show that each spw has been successfully flagged & calibrated)









## Cycle 0 Data Reduction plan

- To help JAO Data Reduction staff benefit from NRAO experience, NA will send interferometric/mm experts to Chile to work side-by-side with their team, processing data through QA2 & transferring knowledge
  - Ed Fomalont: Sept 21 – Oct 19
  - Crystal Brogan & Todd Hunter: Oct 16 – Nov 4 (w/OSF shift)
  - Nov-Jan (TBC): Kartik Sheth, some of: Steve Myers, Adam Leroy, Remy Indebetouw, Al Wootten
- Goal – process ~8hr observations in ~16 workhours by start of Extended Configuration observing (March 2012)
  - Fallback – JAO data reduction staff do fewer turnos
  - Fallback – Ship some projects to ARCs for processing




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## ALMA Cycle I

*See pdf on Cycle I capabilities by R. Hills for ASAC (linked from agenda)*

- Summary:
  - Nominally 9 month duration (Aug 2012 – April 2013)
  - ~twice as much time as Cycle 0 (~1400hr)
  - Thirty-two 12-m antennas + six 7m antennas
  - 12-m array: “psuedo-continuous” configurations with maximum baselines from 150m to 750m
  - PI’s will request angular resolution and largest angular scale, not configuration
    - How this will translate to observing plan still to be worked out




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## ALMA Cycle I: Capabilities

See pdf on Cycle I capabilities by R. Hills for ASAC (linked from agenda)

- Additional Baseline Capabilities:
  - Mixed correlator modes (one per baseband)
  - Single dish spectral line
  - Mosaics of up to 150 points per Science Goal
  - Polarization (linear, continuum, single field, 1% accuracy)
  - Solar observing (morphology & time variability only)
- Potential Cycle I “Stretch” Capabilities:
  - ACA stand-alone observations (for new receiver bands?)
  - Single dish continuum (fast scanning, not nutator)
  - Polarization (circular, spectral line, mosaics)
- Limitations to Surveys
  - On number of sources & spectral setups per proposal




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## ALMA Cycle I: Review process

See pdf on Cycle I capabilities by R. Hills for ASAC (linked from agenda)

- Will retain triage
- Technical Assessments will occur after panel reviews, only only “approved” proposals



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## NA ALMA Operations Cycle I Schedule



### Cycle I

- Cycle I decision on capabilities, documentation begins Oct 15
- JAO pre-announcement of Cycle I stretch capabilities Dec 1
- Deadline for final input to Science Portal content and decision on which stretch capabilities can be supported (others removed at that point). Jan 18
- Call for Proposals Feb 1
- Deadline for Proposal submission March 29
- Start of Cycle I Science Assessments, Stage I April 10
- Deadline Stage I May 10
- Start of Stage 2, reading of remaining proposals May 16
- Cycle I ARP/APRC meetings May 28 – June 1
- Cycle I Technical Assessments and Phase 2 June/July
- Start Cycle I observations. 9 months; 1400 hrs; 60% of SciOps Aug 1
- Pipeline commissioned & operational Oct
- First Cycle 0 data products publically available Oct

