Cycle-7 Capabilities

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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 ≤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

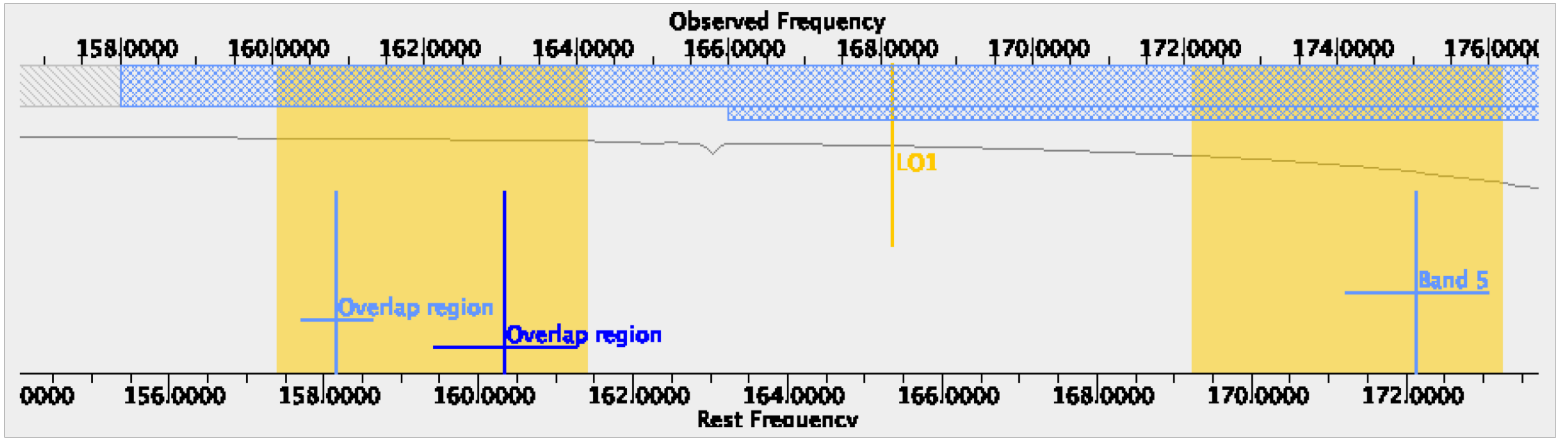
Phase-calibration cycle times

- 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. H_2O 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)

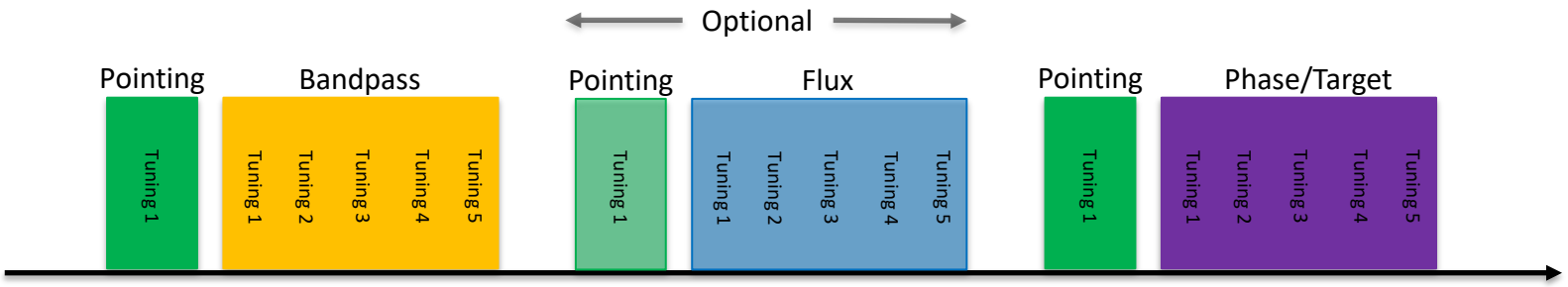


Polarization

- 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 beamsize for linear polarization
  - < 1/10 of antenna beamsize for circular
  - OT uses largest angular size as a proxy for field of view

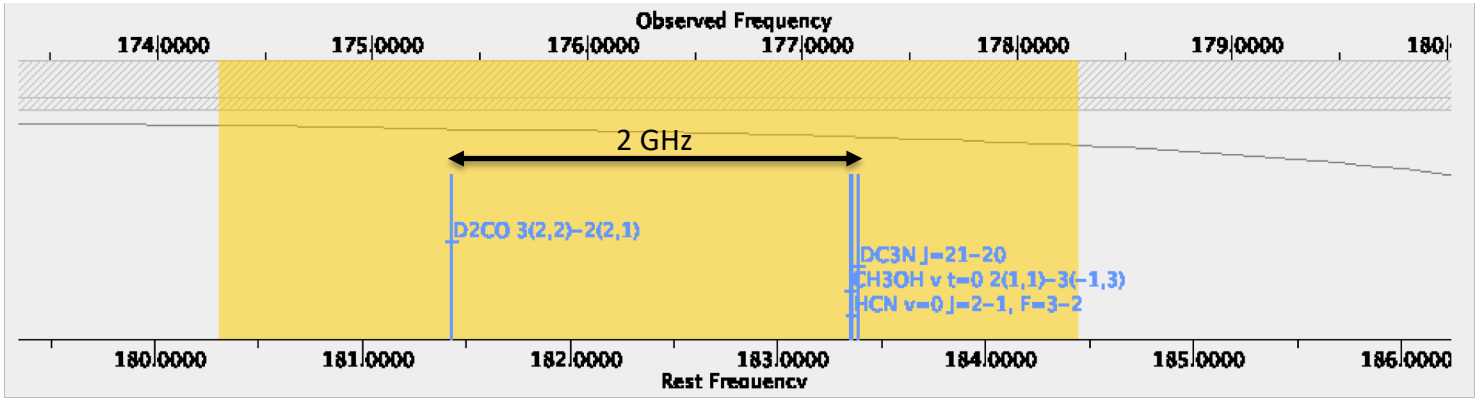
Spectral scans

- 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



Baseband-2

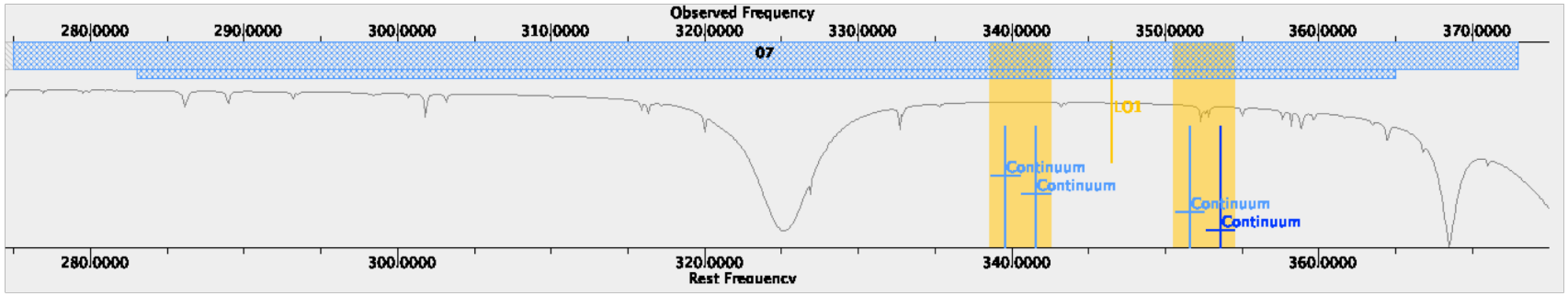
1/4	183.36033 GHz	177.23326 GHz	HCN v=0 J=2-...	58.594 MHz(99 km/s), 141.113 kHz(0.239 km/s)	2	◉
1/4	183.34973 GHz	177.22301 GHz	CH3OH v t=0 2...	58.594 MHz(99 km/s), 141.113 kHz(0.239 km/s)	2	○
1/4	183.39136 GHz	177.26325 GHz	DC3N J=21-20	58.594 MHz(99 km/s), 141.113 kHz(0.239 km/s)	2	○
1/4	181.43214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

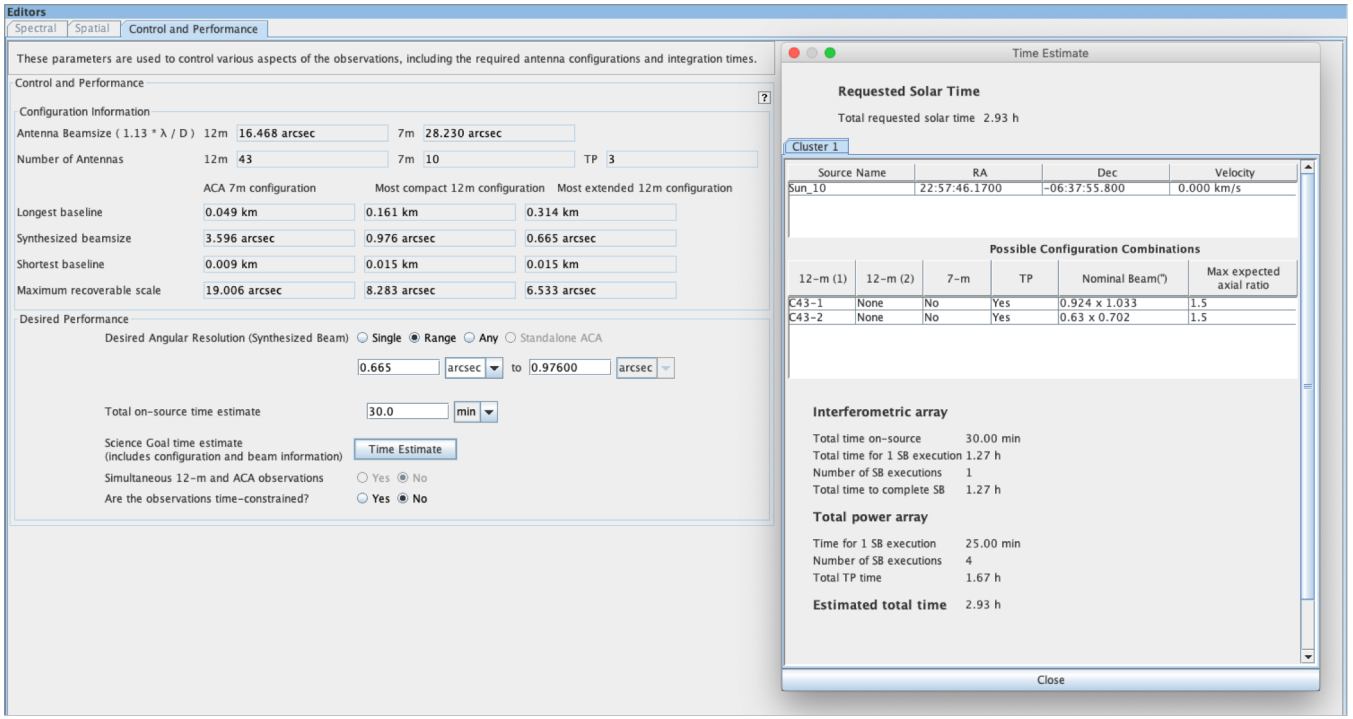
Solar Observing

- 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



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

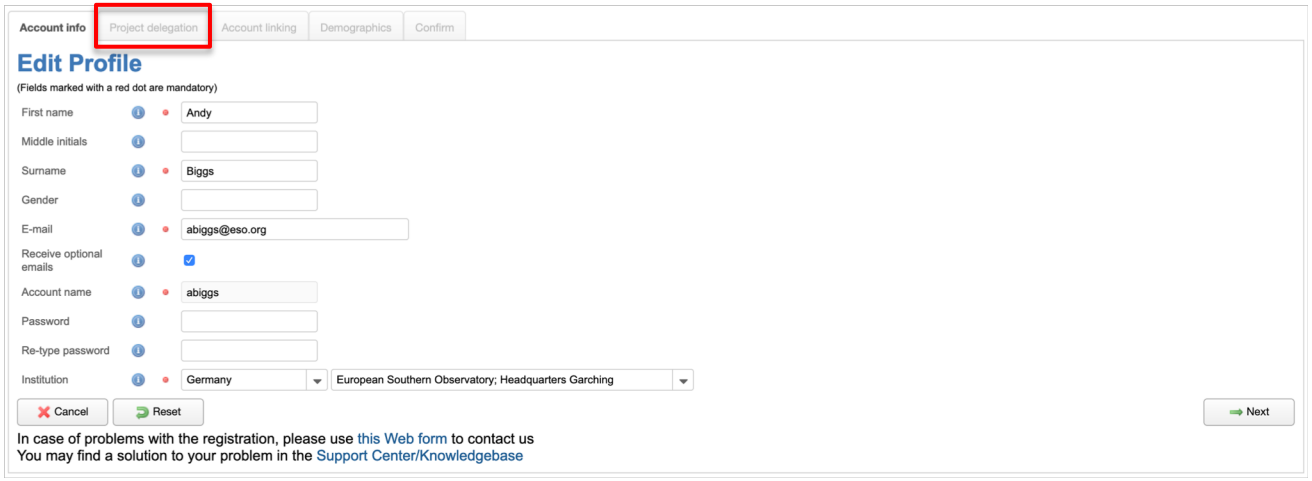
INVESTIGATOR NAME(S): (in random order)	A. Avison, T. Muxlow, A. Richards, G. Bendo, A. Biggs

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



Proposer's Guide

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