

What's new in ALMA Cycle 6?

Lydia Moser

German ALMA Regional Centre

Key Dates



- ALMA Cycle 6 start: early October 2018 - spans 12 months
- Anticipated time available for successful observations of approved projects:
 - 4000 hours on 12-m Array
 - 3000 hours on Atacama Compact Array (ACA), also known as the Morita Array (7-m + total power (TP))

Proposal Types

- **Cycle 6 proposal types**
 - same as in Cycle 5
- **Cycle 6 configuration schedule**
 - ideal for long baseline observations in Chilean winter (section **4.3.3 in proposer's guide (PG)**)
- performance enhancements to improve high-frequency observations
- **Regular Proposals:**
 - **may request up to 50 hours of 12-m Array time**
 - **or up to 150 hours of ACA stand-alone time**
 - In the previous cycle, the requested time of the majority of proposals was between 2 and 10 hours of 12-m Array time -> Regular Proposals that request over 10 hours of 12-m Array time are encouraged

Proposal Types

- **Large Programs**
 - may request more than 50 hours of 12-m Array time
 - or more than 150 hours of ACA stand-alone time
 - up to 600 hours of 12-m Array time and 450 hours of ACA stand-alone time allocated to Large Programs
 - only standard observing modes
- **Very Long Baseline Interferometry (VLBI) observations with ALMA**
 - in Bands 3 and 6 (wavelengths 3 mm and 1.3 mm) in the continuum only
 - in concert with an existing VLBI network:
 - Global mm-VLBI Array (GMVA) at 3 mm
 - Event Horizon Telescope Consortium (EHTC) network at 1.3 mm
 - In addition to submitting an ALMA proposal, proposers of 3-mm VLBI observations must have also submitted a proposal to the GMVA by its 1 February 2018 deadline

Anticipated Capabilities

- **Number of antennas**
 - ≥ 43 x 12-m antennas in the 12-m Array
 - ≥ 10 x 7-m antennas (for short baselines)) in the ACA
 - 3 x 12-m antennas (for making single-dish maps) in the ACA
- **Receiver bands**
 - Receiver bands 3, 4, 5, 6, 7, 8, 9 and 10 ($\lambda \approx 3.1, 2.1, 1.6, 1.3, 0.87, 0.74, 0.44$ and 0.35 mm, respectively)
- **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 (TP) spectral line observations in Bands 3 to 8



Anticipated Capabilities

- **12-m Array Configurations**
 - Maximum baselines
 - vary from 0.16 km to 16 km; planned configuration schedule:
Proposer's Guide
 - 3.6 km for Bands 8, 9 and 10
 - 8.5 km for Band 7
 - 16 km for Bands 3, 4, 5 and 6
 - for CASA simulations: representative antenna configurations files (12-m and 7-m Arrays) available on the ALMA Science Portal

Anticipated Capabilities

- **Polarization**

- Single pointing, on-axis, full linear and circular polarization for continuum and full spectral resolution observations in Band 3, 4, 5, 6 & 7 on the 12-m Array
- field of view limited to:
 - linear polarization: inner 30% of the primary beam
 - circular polarization : inner 10% of the primary beam
- expected minimum detectable degree (3x systematic calibration uncertainty)
 - linear polarization (values in brackets refer to spectral line modes):
 - 0.1% (1%) for compact sources
 - 0.3% (3%) for extended sources
 - circular polarization: 1.8%

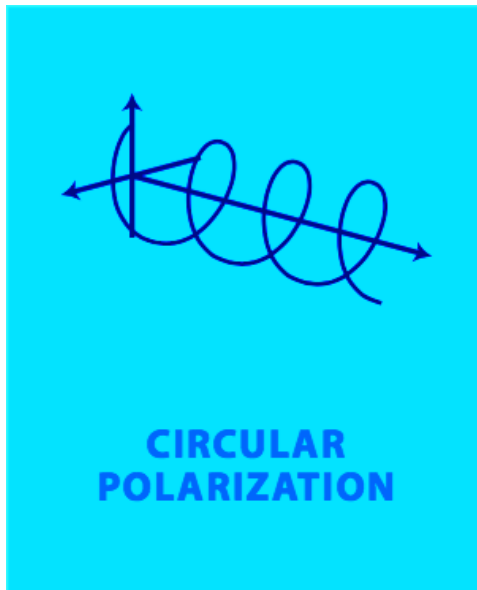
Anticipated Capabilities

- **Cycle 6 observing mode classes**
 - **Standard modes:** well characterized - calibration with the ALMA data reduction pipeline
 - **Non-standard modes:** not as well characterized - manual calibration by ALMA staff
 - Up to 20% of the observing time in Cycle 6 will be allocated to proposals requesting non-standard modes, which include:
 - Band 9 and 10 observations
 - Band 7 observations with maximum baselines > 5 km
 - All polarization observations
 - Spectral scans
 - Bandwidth switching projects (less than 1 GHz aggregate bandwidths over all spectral windows)
 - Solar observations (Bands 3 and 6)
 - VLBI observations
 - User-specified calibrations
 - Astrometric observations

What Is New In Cycle 6?

Technical And Observing Capabilities

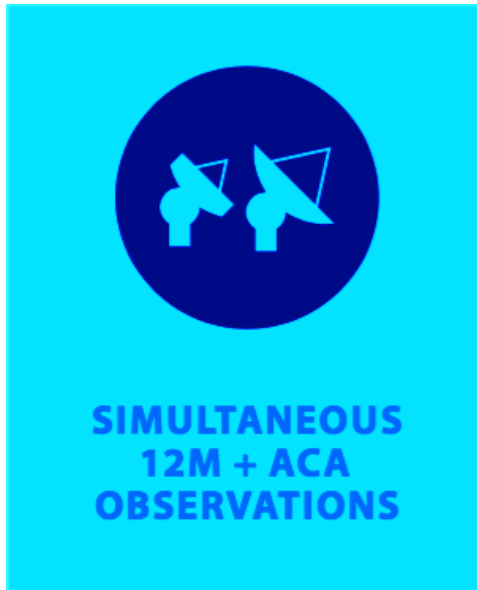
Appendix A in proposer's guide (PG); supplemental technical material:
Technical Handbook



- **Circular polarization observations**
 - Bands 3, 4, 5, 6 and 7 in all (including circular) polarization modes for continuum and spectral-line, single-field, on-axis, observations
 - minimum detectable degree of circular polarization, defined as three times the systematic calibration uncertainty, is currently 1.8% of the peak flux for both continuum and spectral-line data

What Is New In Cycle 6?

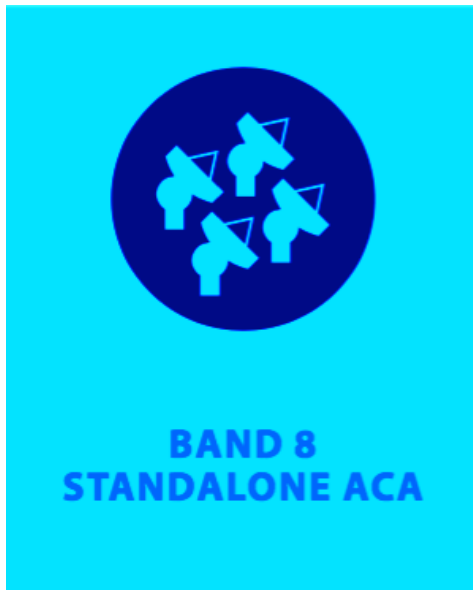
Technical And Observing Capabilities



- **Simultaneous observations with the 12-m Array and the ACA (7-m & TP)**
 - Except “long-baseline configurations”, see PG-Section 4.2
 - all observations will have the same duration (given by 12-m Array observation) -> restrictions on allowed configuration combinations and time multipliers specified in PG-Section A.4 do not apply

What Is New In Cycle 6?

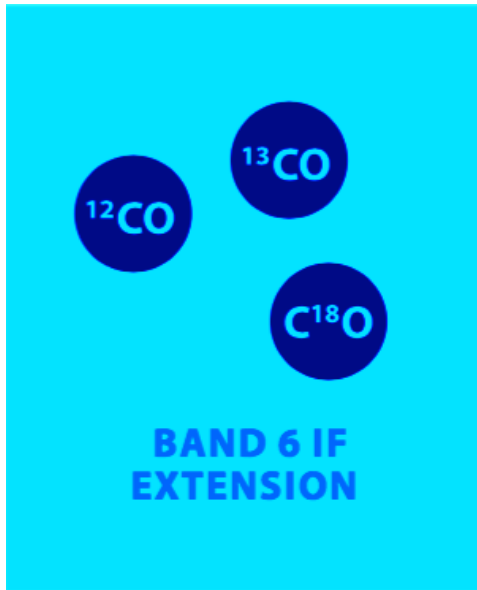
Technical And Observing Capabilities



- **Band 8 stand-alone ACA**
 - Band 8 observations will become a standard mode in Cycle 6 (see PG-Section 4.2)
 - proposals will be accepted for Band 8 stand-alone ACA observations

What Is New In Cycle 6?

Technical And Observing Capabilities



- **Band 6 IF extension**
 - Band 6 IF bandwidth increased by 0.5 GHz to extend from 4.5 to 10 GHz
 - ^{12}CO , ^{13}CO and C^{18}O J=2-1 can be observed simultaneously with broader spectral windows

Proposal Preparation Support 2018



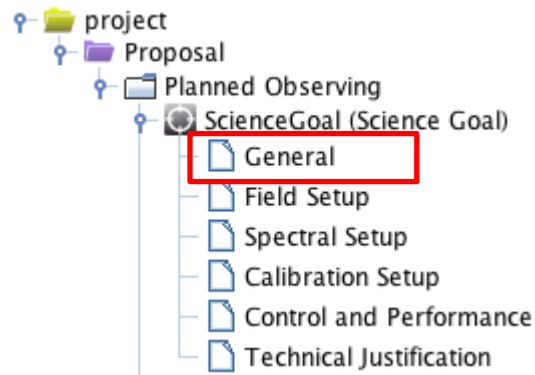
Argelander-
Institut
für
Astronomie

What Is New In Cycle 6?

Technical And Observing Capabilities

- **Proposal format**
 - figure captions, tables and references included in the proposal Scientific Justification (SJ) must use a 12-point font (see PG-Section 5.2.3)

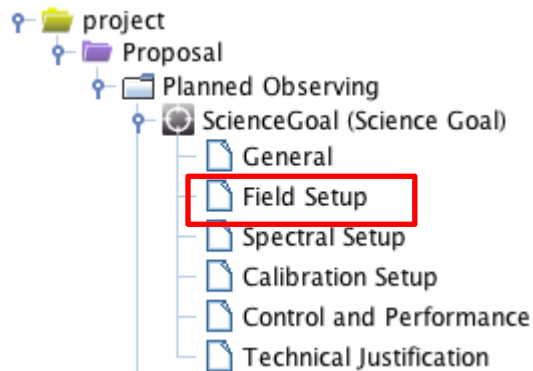
What Is New In Cycle 6? Observing Tool Features



- **General**
 - The PI institution and email is no longer shown on the proposal Cover Sheet
 - Investigator details (affiliation, email, etc.) will be updated at submission time (Phase 1 only)
- **other**
 - Java fix: Mac users may have experienced pop-up windows being hidden - this should now be fixed.

What Is New In Cycle 6?

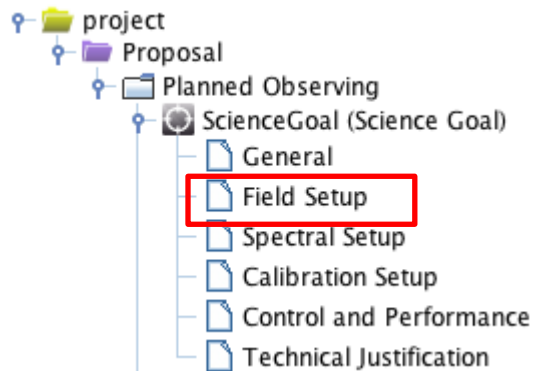
Observing Tool Features



- **Field setup**

- circular polarization will be officially supported for Cycle 6:
 - enter the expected level of circular polarization, for continuum and/or spectral line
 - A limit is enforced below which a validation error will be triggered
 - New circular-polarization columns have been added to the ASCII input format
- For sources distributed widely in the sky within one Science Goal (SG):
 - OT splits the SG into different “clusters”, each grouping all sources within a radius of 10 degrees (see Section A.8.1).
 - SGs with “long-baseline configurations” (see Section 4.2 for definition): grouping of sources into clusters will consider only sources within a radius of 1 degree (see Section A.8.1). For all other baselines, the grouping remains unchanged -> phase calibrator must be quite close to science targets

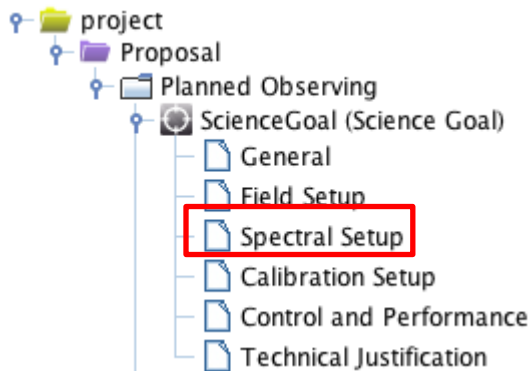
What Is New In Cycle 6? Observing Tool Features



- **Field setup**

- rectangular-field definition: assumes source coordinate system (no longer a separate coordinate system)
- FITS files in Galactic coordinates are now handled correctly
- ASCII input format: Source coordinates in decimal degrees will now be recognised as Galactic.

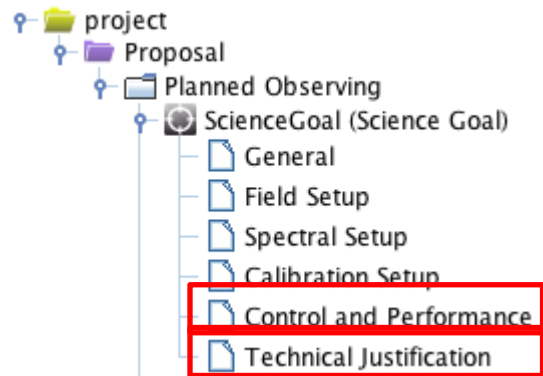
What Is New In Cycle 6? Observing Tool Features



- **Spectral Setup**

- It is no longer possible to enter a user-defined bandwidth that exceeds the bandwidth of the spectral setup
- Bug fix: the LSRK to Barycentric correction now works correctly for all velocity definitions. This may mean that existing projects will not validate. If so, the spectral setup should be (slightly) edited

What Is New In Cycle 6? Observing Tool Features



- **Control & Performance / Technical Justification**
 - There is no longer a text box associated with the time-constraint interface. The box on the TJ node should be used
 - Data rates now calculated for 50 antennas -> ensure that SB will not fail at execution time

**Thank you for listening
and a successful proposal!**