ALMA Capabilities in Cycle 4 and Upcoming Cycles

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Minimum number of antennas

- Steady State
- Cycle 4
- Cycle 3
- Cycle 2
- Cycle 1
- Cycle 0

Number of antennas offered

- 12 m Array
- 7m Array
- Total Power
ALMA receiver bands: Cycle 4
**Upcoming ALMA Receiver Bands**

<table>
<thead>
<tr>
<th>Freq. (GHz)</th>
<th>Timescale</th>
<th>Key Science</th>
</tr>
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<tbody>
<tr>
<td>Band 5</td>
<td>162 - 211</td>
<td>Cycle 5, Water in ISM/disks, C(^+) at z=8-10.6</td>
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</tbody>
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New Cycle 4 Capabilities: VLBI

3mm network
Global mm-VLBI Network (GMVA)

1mm network
NRAO/Event Horizon Telescope

Key Science Drivers
- Understanding accretion onto black hole
- Testing General Relativity
- Origin of jets in galactic nuclei
New Cycle 4 Capabilities: Solar Observations

**Solar chromosphere**
- Non-radiative heating
- Highly dynamic plasma
- Plasma $\beta$ and ionization fraction change by orders of magnitude

**Flare Physics**
- Highest energy electrons responsible for submm-$\lambda$ emissions
- Inverted spectral component above 100 GHz

**Filaments/Prominences**
- Magnetic structure
- Formation and destabilization

**New Diagnostics**
- Oscillations
- Spectral lines (RRLs, CO, …)

New Capabilities in Cycle 4

ACA “standalone”

Spectral Line Polarization
Upcoming Capabilities*

**Solar** (Cycle 6+)
- Higher frequencies
- Fast sampling

**Phased ALMA** (Cycle 6+)
- Spectral line
- Pulsars

**Single dish**
- orthogonal mapping scans (Cycle 5 or 6)
- multiple off positions (Cycle 5 or 6)
- continuum single dish (Cycle 6)
- Band 9-10 single dish (Cycle 7)

**Polarization**
- Bands 4 and/or 5 (Cycle 5)
- Zeeman and wide-field polarization (Cycle 6)
- Stokes V (Cycle 7)
- High frequency polarization (Cycle 7)

**Observing efficiency**
- Faster spectral scans (Cycles 5+6)
- Faster polarization calibration (Cycle 5+6)
- More efficient source surveys (Cycle 6)

**Combined array** (Cycle 6+)
- Correlate 12m, 7m, and Total Power antennas simultaneously

*Timescales are tentative*
Summary
ALMA is near full capabilities now

A steady list of enhancements are on the way!