ARO EQUIPMENT SUMMARY AND STATUS

12M Telescope (EIE ALMA Prototype Antenna) – Kitt Peak
April 18 2019

12 Meter Diameter; f/8
Observing season: October – June
Carbon fiber construction
Altitude over Azimuth
Absolute pointing accuracy: 2.5” rms
Tracking precision: 0.2” rms
Efficiency: 85% +/- 5%
Azimuth range: +/-270°
Elevation range: 3° to 110°
  Observational range: ~18°– 84°
Slew speed: 360° min⁻¹
  Observational value: 60° min⁻¹ (Dome tracking limited)
Supports position–switching, beam–switching, on–the–fly mapping, and continuum observing

Front Ends

3mm Sideband Separating (SBS) Receiver (Available)
ALMA Band 3 (84 – 116 GHz), Dual polarization, SBS
Image Rejection: 15 dB minimum, ≥ 20 dB typical
Typical T_{sys@90GHz} = 120–160 K, T_{sys@115GHz} = 250–375 K
Best T_{sys@90GHz} = 85–110 K, T_{sys@115GHz} = 150–200 K

Multi–Band Receiver (In development)
4mm, 3mm, 2mm, 1.2mm
Dual polarization, SBS
Initial commissioning Spring 2019

Back Ends

ARO Wideband Spectrometer (AROWS)
Interim: two 4 GHz wide IFs (Available)
Final: four 4 GHz wide IFs (Unavailable)

12 Meter Filters (Available; shared–risk. To be decommissioned at end of 2019B)
Supports 512 channels in any combination of filters below. Center frequency fixed at 6.3 GHz in Rx IF.

Observing Restrictions
Sun Avoidance: The 12m requires a 10° Sun avoidance zone.
Observing: On–the–fly mapping is currently unavailable with the MAC back end.

For more information, please contact:
Dr. H. Alyson Ford, Manager, Radio Telescopes
alysonford@email.arizona.edu

*This is the frequency sampling interval, not the FWHM channel width.
Front Ends

1.3mm Receiver (Available)
- ALMA Band 6 (205 – 280 GHz)
- Dual polarization, SBS
- Typical $T_{sys@230GHz}= 200$–275 K
- Best $T_{sys@230GHz}= 130$–160 K

0.8mm Receiver (Unavailable in 2019A)
- 325 – 370 GHz
- Dual polarization, DSB
- Typical $T_{sys@345GHz}= 600$–900 K
- Best $T_{sys@345GHz}= 350$–500 K

0.4mm Receiver (Unavailable in 2019A)
- 602 – 720 GHz
- Dual polarization, DSB
- 80 K $T_{Rx}$

0.7mm Receiver (Unavailable)
- 385 – 500 GHz
- Dual polarization, SBS
- 150 K $T_{Rx}$

New 0.8mm Band 7 Receiver (In development)
- ALMA Band 7 (275 – 373 GHz)
- Dual polarization, SBS

Back Ends

SMT Filter banks (Available)
The SMT IF range is 4–8 GHz for all receivers except the 0.8mm receiver, which has an IF range of 4–6 GHz. The IF center frequency is tunable from 4.5–7.5 GHz.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Bandwidth (MHz)</th>
<th>Resolution (kHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 IF</td>
<td>2000</td>
<td>1000</td>
</tr>
<tr>
<td>2 IF</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>2 IF</td>
<td>256</td>
<td>250</td>
</tr>
<tr>
<td>4 IF</td>
<td>512</td>
<td>1000</td>
</tr>
<tr>
<td>4 IF</td>
<td>128</td>
<td>250</td>
</tr>
</tbody>
</table>

Observing Restrictions
Sun Avoidance: The SMT requires a 45° Sun avoidance zone.
Observing: None.
12M Telescope (EIE ALMA Prototype Antenna) – Kitt Peak

Filters: Roughly 2–4% of channels are bad due to issues with the filter banks and the switcher and multiplexer assembly. 100kHz and 1 MHz (reds) have exhibited occasional platforming in 16–channel–wide blocks. When in series mode, 2 MHz red has baseline instability in upper half of band.

For 2 MHz series (both plain and red), random bad channels appear while in position–switching (PS) mode.

MAC: Unusable for on–the–fly mapping due to hardware limitations.

Submillimeter Telescope (SMT) – Mt. Graham

Filters 1.0MHz: There are periods of instability in the IF down conversion stages that manifests itself in platforming. Problems appear worse in position–switching and on–the–fly observing modes.

Filters 250kHz: The instability noted in the 1.0 MHz filters also appears in these filters. This platforming step is located at the IF center frequency and can be avoided by offsetting the IF.

Position–switching mode: There is a standing wave present when using observing in position–switching mode, especially at the upper end of 1.3mm receiver observing band. This standing wave is not atmospherically induced but instead is related to the receiver/hardware.

For more information, please contact: Dr. H. Alyson Ford, Manager, Radio Telescopes alysonford@email.arizona.edu