



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<sup>-1</sup>  
     Observational value: 60° min<sup>-1</sup>  
     (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  $T_{\text{sys}@90\text{GHz}} = 120\text{--}160\text{ K}$ ,  $T_{\text{sys}@115\text{GHz}} = 250\text{--}375\text{ K}$   
 Best  $T_{\text{sys}@90\text{GHz}} = 85\text{--}110\text{ K}$ ,  $T_{\text{sys}@115\text{GHz}} = 150\text{--}200\text{ K}$

**Multi-Band Receiver** (In development)  
 4mm, 3mm, 2mm, 1.2mm  
 Dual polarization, SBS  
 Initial commissioning ~Fall 2018

### Back Ends

**ARO Wideband Spectrometer (AROWS; In development)**  
 Interim system: two 4 GHz wide IFs (Fall 2017)  
 Final system: four 4 GHz wide IFs

Mode	Total Bandwidth (MHz)	Channel Spacing (kHz)	Velocity Resolution at 86 GHz (km s <sup>-1</sup> )	Velocity Resolution at 115 GHz (km s <sup>-1</sup> )
0	4000	625	4.4	3.2
1	2000	312.5	2.2	1.6
2	1000	156.25	1.1	0.8
3	500	78.125	0.54	0.40
4	250	39.0625	0.28	0.20
5	125	19.53	0.14	0.10

### 12 Meter Filters (Available)

Filter bank multiplexer supports 512 channels in any combination of filters listed below. Center frequency fixed at 6.3 GHz in receiver IF.

Filter	Channels
30 kHz	128
100 kHz	256
250 kHz	256
500 kHz	256
1000 kHz (Plain)	256
1000 kHz (Reds)	256
2000 kHz (Plain)	256
2000 kHz (Reds)	256

### 12 Meter MAC (2 IF Mode; Available)

Center frequency fixed at 6.3 GHz in receiver IF.

Bandwidth (MHz)	Channels	Usable (MHz)	Usable Channels	$\Delta v^*$ (kHz)	Resolution (kHz)
800	2048	600	1536	390.6	781.2
800	4096	600	3072	195.3	390.6
400	4096	300	3072	97.6	195.3
400	8192	300	6144	48.8	97.6
200	8192	150	6144	24.4	48.8
200	16384	150	12288	12.2	24.4
100	16384	75	12288	6.1	12.2
100	32768	75	24576	3	6.1

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

### 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:

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10 Meter Diameter, bent Cassegrain;  
 $f/13.8$   
 Observing season: October – June  
 Carbon fiber and invar steel construction  
 Altitude over Azimuth  
 Absolute pointing accuracy: 2" rms  
 Tracking precision: 0.2" rms  
 Efficiency: 71% +/- 5%  
 at 216 GHz and 228 GHz  
 Azimuth range: +/-270°  
 Elevation range: -2° to 91°  
 Observational range: ~20° – 84°  
 Slew speed: 60° min<sup>-1</sup>  
 Supports position-switching, beam-switching, on-the-fly mapping, and continuum observing

### Front Ends

#### 1.3mm Receiver (Available)

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

#### 0.4mm Receiver (Available; shared risk)

602 – 720 GHz  
 Dual polarization, DSB  
 80 K  $T_{\text{Rx}}$

#### 0.7mm Receiver (Unavailable)

385 – 500 GHz  
 Dual polarization, SBS  
 150 K  $T_{\text{Rx}}$

#### 0.8mm Receiver (Unavailable)

325 – 370 GHz  
 Dual polarization, DSB  
 Typical  $T_{\text{sys}@345\text{GHz}} = 600\text{--}900\text{ K}$   
 Best  $T_{\text{sys}@345\text{GHz}} = 350\text{--}500\text{ K}$

#### 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.

Mode	Bandwidth (MHz)	Resolution (kHz)
1 IF	2000	1000
2 IF	1000	1000
2 IF	256	250
4 IF	512	1000
4 IF	128	250

#### Observing Restrictions

Sun Avoidance: The SMT requires a 45° Sun avoidance zone.

Observing: None.

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#### **12M Telescope** (EIE ALMA Prototype Antenna) – Kitt Peak

**3mm SBS Receiver:** ~18 – 20+ dB rejection, except between 110 – 113 GHz in polarization 1, where performance deteriorates substantially. Rejection falls to near zero and stability becomes an issue. **This has been fixed as of July 2017.**

**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.

**MAC:** Unusable for on–the–fly mapping due to hardware limitations. **This will be fixed by Fall 2017.**

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#### **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.

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