



Project Scientist Status Report

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Interim Project Scientist

JAO/NRAO



Report

- ASAC
 - Considering Charges from Board
 - Ch 4: “The ASAC should read and discuss the Operations Plan. Depending on the questions raised in the formal review of the Operations Plan in late February, the Board may request ASAC input in formulating its responses. Such requests will come as addenda to these charges, if needed.”
 - To meet face-to-face 2007 May 7-8 University of Tokyo
- New personnel: Hills (Nov 1), Peck (Apr 1), Testi (May 1), Morita (Apr 1)
- Support to other IPTs
 - PSI support ongoing. Emerson, Mangum with SE, FE, BE, Computing IPTs achieved first fringes.
 - Review attendance-Nutator, PSI, AEM antenna, B9, Operations, JAO/IPT.
 - Postdocs receiving training at ATF

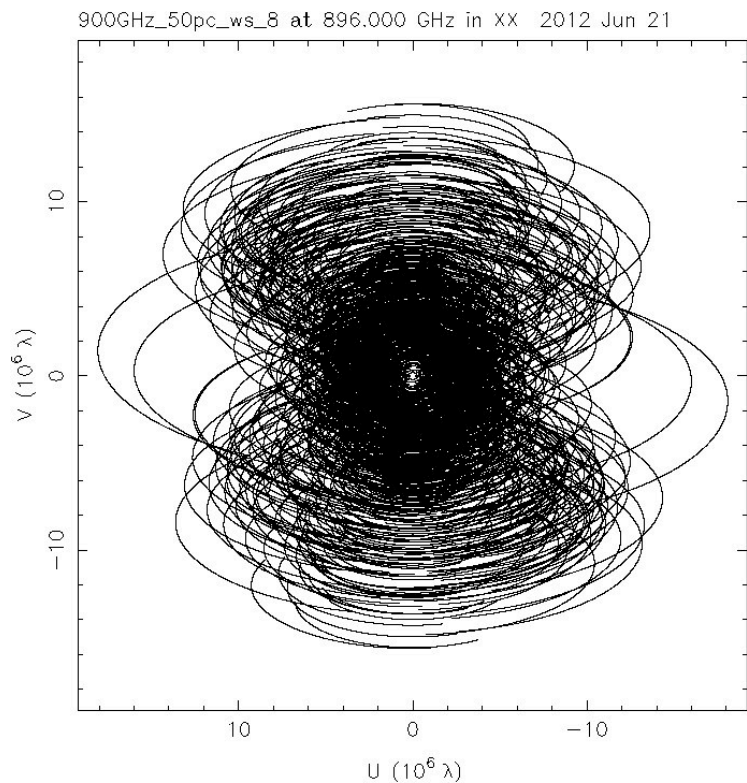


Configuration

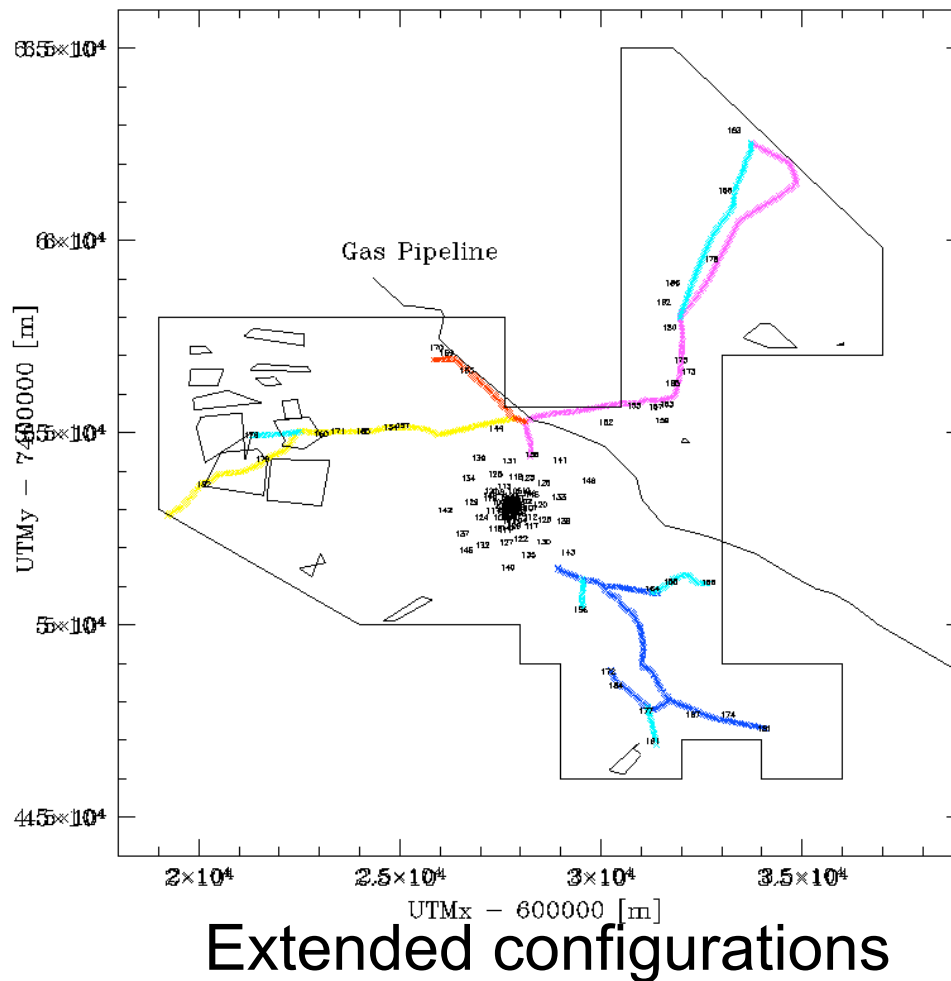
- The outer array design is complete, 8 configurations.
 - Measures of merit are:
 - max inner sidelobe: 7.7% (largest configuration: 6%)
 - max mid sidelobes: 5.5% (largest: 6%)
 - max outer sidelobes: 2.3% (largest: 3%)
 - at dec = -48 deg:
 - resolution at 300 GHz: 16 mas
 - $B_{maj}/B_{min} = 1.06$
 - Simulations with Casa begun (ongoing this week at NA ARC)
 - Configuration works well on baselines to other nearby telescopes
 - Example follows.



Configuration Characteristics



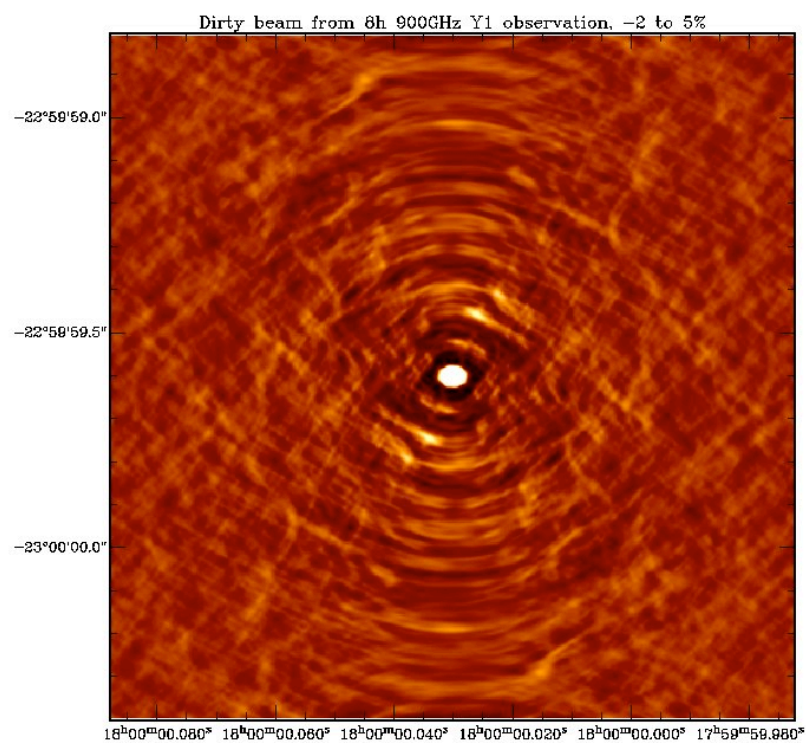
Uv tracks, from Casa



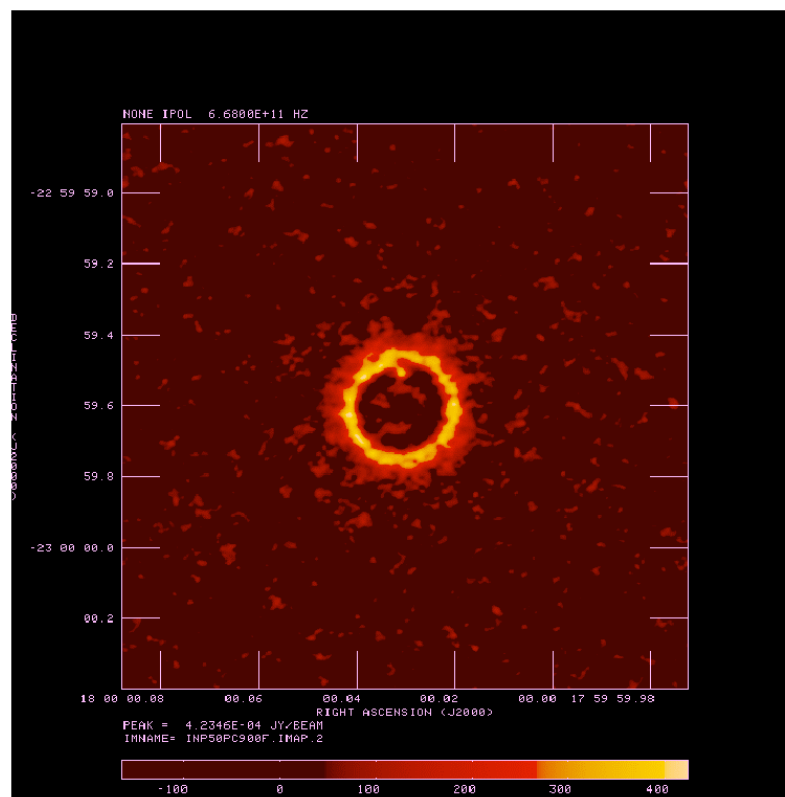
Extended configurations



Imaging Performance



Beam



Clean Image (provisional, Y1)



Design Reference Science Plan 2.0

- Purpose:
 - To include Enhanced ALMA features
 - To keep science plan fresh and aligned with current research.
- End of call was 31 October; submissions being refereed and tabulated.
 - About 15% new projects, many updates
 - ASAC, ESAC, ANASAC, and JSAC reviews mostly in hand.
 - Update in few weeks.



Students at P.U.C. Obsy

Outreach



Students at NRO 45m

- *Science with the Atacama Large Millimeter Array (ALMA) II.*
 - ALMA brochure in English and Spanish, CD with animations
 - Conference successful, presentations online, contributions appearing on astro-ph, special issue of *Astrophysics & Space Science*
 - *Other Planetary Systems Workshop* ESO/Vitacura
 - *Herschel Open Time Key Program Workshop*
 - *IAU Symposium 242, Astrophysical Masers and their environments*
- Bringing the promise of ALMA's transformational science to young astronomers.
 - Schools in Santiago and Tokyo.



Example multi-transition setup

Goal: Measure water in five transitions simultaneously, some of which mase.

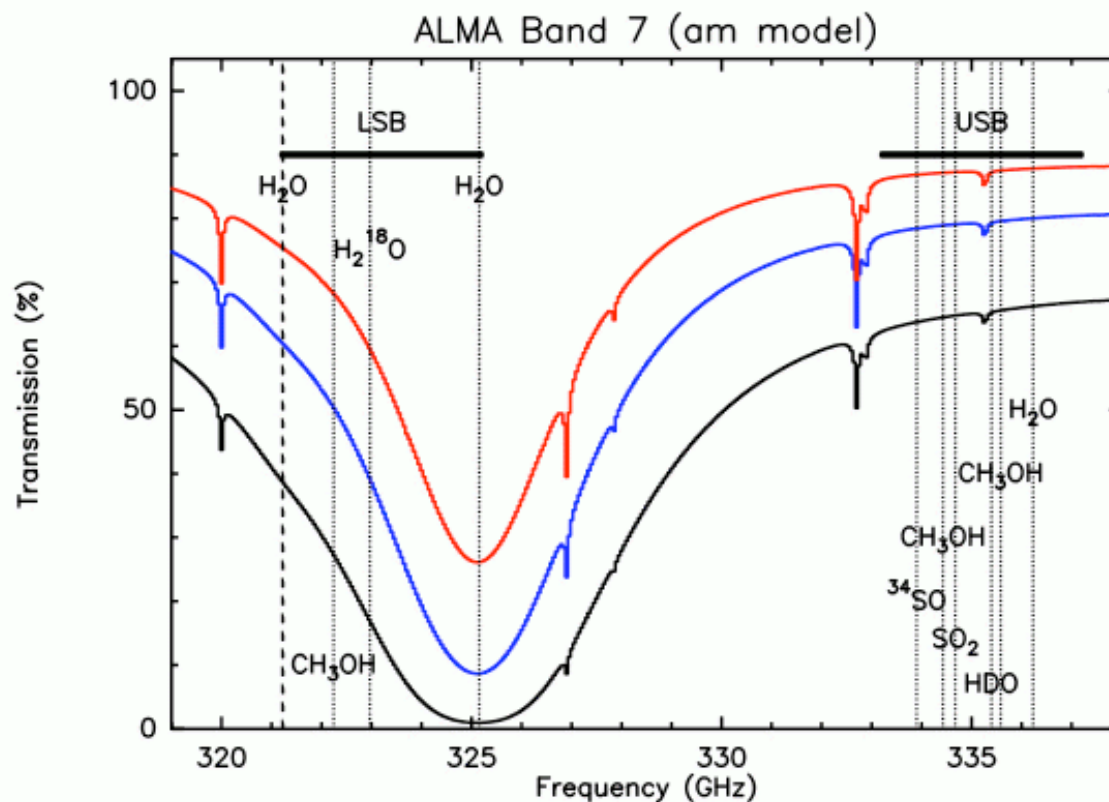
- $\text{H}_2\text{O } J_{K_a, K_c} 10_{29} 9_{36}$ 321.23 GHz ~ 1800 K ortho
 - E.g. 3-4 Jy SMA; $<1'' \Rightarrow T_b > ?$ K
- $\text{H}_2^{18}\text{O } J_{K_a, K_c} 5_{15} 4_{22}$ 322.97 GHz ~ 500 K para
- $\text{H}_2\text{O } J_{K_a, K_c} 5_{15} 4_{22}$ 325.15 GHz ~ 500 K para
- $\text{H}_2\text{O } J_{K_a, K_c} 5_{23} 6_{16} v_2 = 1$ 336.23 GHz ~ 2939 K ortho
- HDO $3_{31} - 4_{22}$ 335.396
- Also CH_3OH , SO, SO_2 lines
- Use B7, LSB on maser lines, largest array
- Dynamic Scheduler picks superb weather
 - PWV=0.35mm
- Beamsize = $0''.013$; T_b rms ~ 52 K 8 hrs, $\Delta S \sim 0.8$ mJy
- 5s ints, data rate ~ 30 MB/s, dataset size ~ 860 GB.



An unfriendly but not obstinate atmosphere...

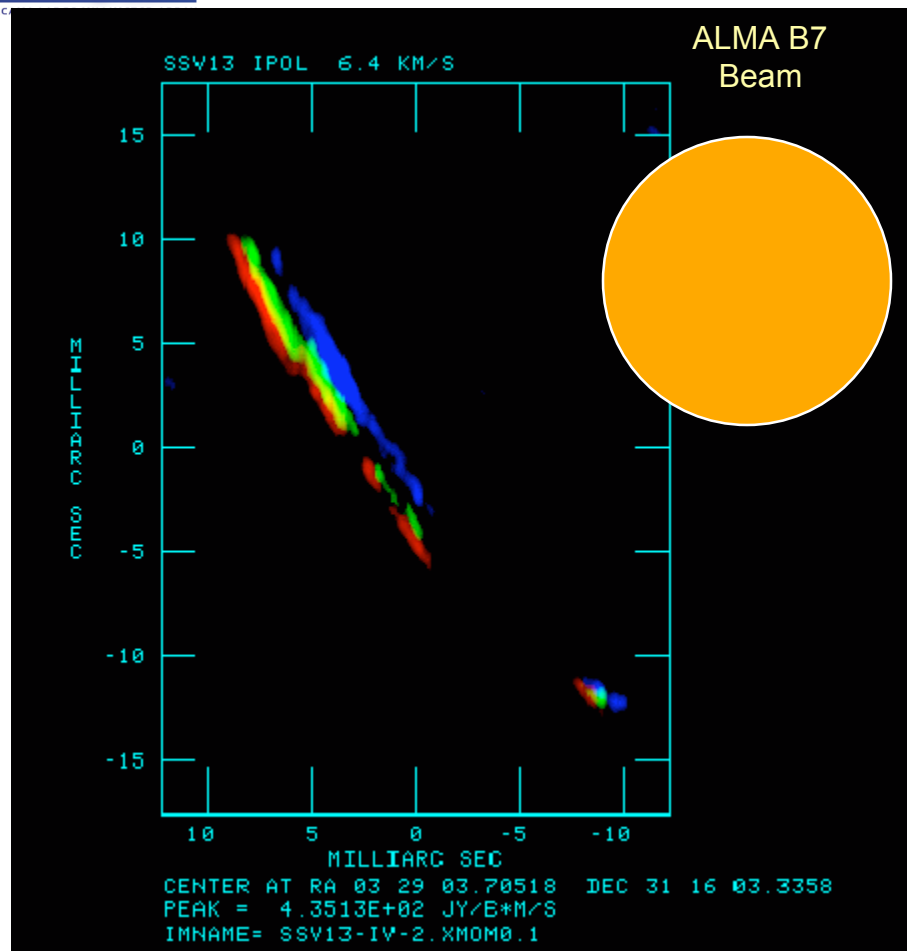
Chajnantor Atmosphere

Q	τ_{225}	pwv
1	.029	.52
2	.037	.66
3	.048	.86
4	.063	1.13
5	.086	1.54
6	.127	2.26
7	.232	4.14





Proper Motion and Structure of Shocks in Dense Clouds



Water masers observed over four epochs encompassing 50 days (22 GHz, VLBA). Several of the masers define an arc structure about 5AU in length. This consistently moved at a rate of 0.023 mas/day, or 13.6 km/s.

These structures apparently represent water emission from interstellar shocks driven by the outflow from SVS13. ALMA can provide images of chemistry in action in shocks such as this.

*Masers near SVS13; $l_{\text{mas}}=0.34\text{AU}$
Blue Epoch I, Green Epoch III, Blue Epoch IV*



www.alma.info

The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership among Europe, Japan and North America, in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Organization for Astronomical Research in the Southern Hemisphere, in Japan by the National Institutes of Natural Sciences (NINS) in cooperation with the Academia Sinica in Taiwan and in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC). ALMA construction and operations are led on behalf of Europe by ESO, on behalf of Japan by the National Astronomical Observatory of Japan (NAOJ) and on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI).