ALMA – Beyond Construction

ALMA Development in NA

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Atacama Large Millimeter/submillimeter Array
Expanded Very Large Array
Robert C. Byrd Green Bank Telescope
Very Long Baseline Array

NRAO

ALMA Development/NA

- Process began with March 2011 Workshop to collect response and ideas for a Call for Development Studies patterned after the earlier Eu Call
- Good response resulted in a refined draft Call, distributed to other entities among the NA partners and to NSF
- In response to that draft, a further refinement has been made and will soon be submitted to NSF seeking development study proposals from among North American entities
- A Software Development Workshop will be held at NRAO 12-14 Oct 2011
  - Aim is to come up with a set of ideas for software applications that will enhance the science output from ALMA
  - Some topics include
    - Line forest analysis
    - Feature finding in large datacubes
    - Matching data to simulations
    - Visualization
    - Compressive Sensing

Current NA Timeline

- Concurrently with Call, refinement of the implementation plan
- Call for Studies 'soon'
  - To include hardware and software
  - Better definition of software after Oct workshop
- Evaluation winter 2011/2 by external-to-NRAO committee
  - ANASAC involvement
- Kick-off for Studies early 2012

ANASAC: B1 Frequency Range

- ANASAC charge: The ANASAC is asked to comment on the scientific advantages of resiting ALMA Band 1 in frequency from 31.3-45 GHz to e.g. 34-53 GHz. Please note scientific advantages for the locations of the upper and lower edges of the band. Note that a paper on science goals of Band 1 is available in arXiv:0910.1609.
- ALMA may provide better complementarity to the eVLA if operating at higher B1 frequencies.
  - At these frequencies ALMA ~30 times faster for a point source (same beam) and covers 4x the field of view
  - Opposing hemispheres
- Propose (Draft) that Development proposers recommend that the specifications for Band 1 be broadened to allow for the development of the most effective and efficient receiver consistent with ALMA design with a frequency range anywhere from 31GHz to 51 GHz
  - Designing outside the approved range will require some redesign, which must be included in a Development proposal.

Science Drivers

- Frequency range: 31-45 GHz only loosely driven scientifically.
  - for continuum studies the effect of going to higher frequencies is a wash
  - anomalous dust observations : frequency variation with density is so far uncertain
- Line studies: no major loss moving the range higher--better for high-z CO studies. Some Line target gains:
  - CCS 4_3-3_2 45.38 GHz
    - Considered and early-stage molecule and magnetic field tracer through Zeeman measurements
  - Ground State CS lines (with isotopologues) - note only 2.5 GHz apart
    - CS 1-0 48.99 GHz
    - C^{33}S 1-0 48.58 GHz
    - C^{34}S 1-0 48.21 GHz
    - 13CS 1-0 46.25 GHz
  - CH$_3$OH 1_0-0_0 48.37 GHz Ground state methanol
  - H$_2$CO 4_13-4_14 48.28 GHz density tracer unaffected by optically thick dust
  - NH$_2$D 2(2,0)-2(2,1) 49.96 GHz and 3(1,3)-3(0,3) 43.04 GHz deuteration and excitation tracer (line ratio good for temperatures in the range 0-100K)