Updates from Commissioning and Science Verification (CSV)

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Excerpts from presentation by Alison Peck
Quick introduction

• Two sites, in the North of Chile:
  – Operations Support Facility (OSF), at 3000m
  – Array Operations Site (AOS), at 5000m

• The OSF is where the antennas are assembled/integrated/verified, where the control room is and where the personnel lives.

• The AOS is the observation site where the antennas and electronics are, including the correlator.
The OSF
The AOS
Quick overview of antenna workflow

1. The antennas arrive to the OSF in pieces (more or less depending on constructor).
2. The structure is assembled at the manufacturer’s camp.
3. The antenna is brought to the pads near the technical building, where the AIV team prepares it for operations (e.g. front end integration, panel setting, pointing/focus model determination).
4. The antenna is transported to the high site, where the CSV team uses it.
First European antenna delivered to AIV (April 21)
The AIV team is very busy (May 3)
Group structure of CSV team

- Antenna: final test and characterization at high site, monitoring
- Calibration: phase, amplitude, bandpass, polarization
- Correlator: hardware & software 64-input and ACA up to Archive
- Documentation: quality & organization of reports, procedures, records
- Imaging: data reduction, configuration planning, ancillary (weather, etc)
- Observing Modes: end-to-end test, Observing Tool, science verification
- System: covers signal path from input to front-end to arrival at correlator
Quick overview of activities during the last couple months

• New ALMA software (R8) deployed in December. Focused on testing and debugging until February.
• Campaign of polarization observations in February.
• Many nights lost to bad weather in February and March.
• Focusing now on science verification
• 10 antennas currently at high site
Pre-science verification observations
Galactic, high-velocity outflows

Observed on September 16
7 antennas, band 7, high-velocity CO + SO + continuum emission

Credit: JAO science team

NGC1333 IRAS4B, band 7
SMA, 230 GHz, high-velocity CO
+ continuum emission

Jorgensen 2007
Pre-science verification observations
Extragalactic, broad line/strong continuum

NGC 253 – B3 – CO J=1-0

NGC 253 – B6 – CO J=2-1

NGC 253 – B7 – CO=3-2

NGC 253 – B9 – CO=6-5

(Sakamoto et al, 2006)

Credit: JAO science team

May 5-6 2011

ALMA community days, Sydney
Pre-science verification observations
Galactic, “Line Forest”

G34.26+0.15 Band 3

Single 2 GHz Spectral Window

Credit: JAO science team
Pre-science verification observation
Extragalactic, Faint Continuum (High z)

SHADES SDXF 850.1, 3 and 5 at 345 GHz

Also testing multiple science targets in SB with single phase calibrator -- Oct 10, 2010

Credit: JAO science team
Pre-science verification observations
Extragalactic, High Redshift Line Sources

C[II] line in BRI 0952 at z=4.4

Credit: JAO science team

Band 7  16th Nov 2010 ↑
← APEX

ALMA community days, Sydney
Pre-science verification observations
Galactic, Faint Continuum (Debris Disk)

$\beta$ Pictoris

Herschel ↓ 70 microns

ALMA Band 7 ↓ (11th Nov)

Credit: JAO science team

May 5-6 2011

ALMA community days, Sydney
Science verification

• Goals:
  – End to End Test of ALMA as a telescope before Early Science
  – Provide data, images (and enthusiasm) to community

• Call for Suggestions
  – Not full proposals, just a couple of paragraphs
  – No full proposal review process, appropriate projects chosen by committee led by Project Scientist

• Data not proprietary
  – Images released through EPO department
  – Data available to any users who wish to try data reduction
Various types of observations needed

- Discrete sources, continuum and spectral line
- All bands, all correlator setups
- Single and multiple lines - is it easy to create complicated setups in the OT?
- Single and multiple sources per SB – can the system deal with different source redshifts and calibrate correctly?
- Bright and weak lines – weak lines need good bandpass
- Absorption and emission lines
- Narrow and broad lines
- High-resolution, narrow bandwidth correlator modes requiring wider bandwidth on calibrators
- (Mixed correlator modes – Q2 2011)
- (Compact & extended arrays - Q2 2011)
Current list of targets

• NGC3256
• TW Hydrae
• Antennae galaxies (NGC4038/4039)
• HD 107146 (debris disk)
• BRI1202-0725 (CII)
• IRAS16293
NGC3256
Extragalactic, Large disk of molecular gas
Band 3, continuum + CO (1-0)

Credit: JAO science team
NGC3256
Extragalactic, Large disk of molecular gas
Band 6, continuum + CO (2-1)

Credit: JAO science team
The Antennae galaxies (NGC4038/4039)
Extragalactic, star forming region
Band 3, CO (1-0), mosaic of 31 pointings

Credit: JAO science team