# EA ALMA Development Activities
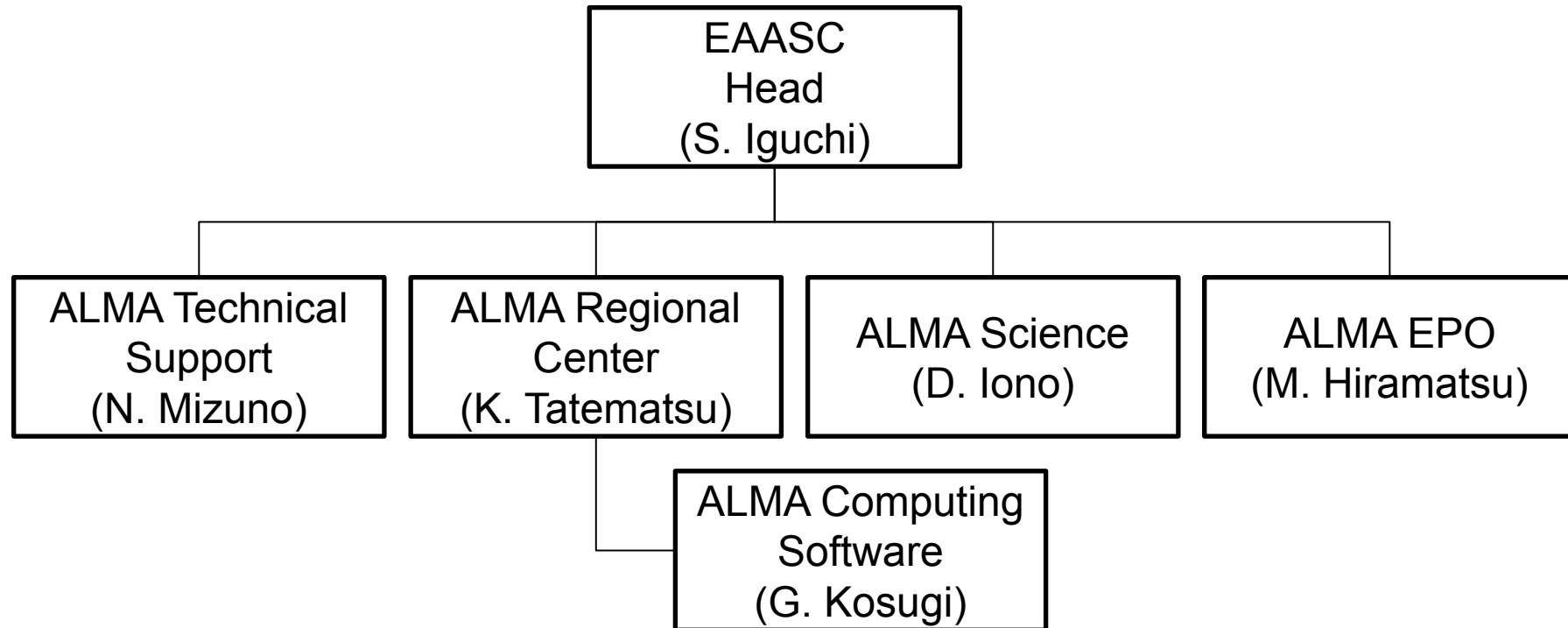


Daisuke Iono (NAOJ)

Atacama Large Millimeter/submillimeter Array

# EA ALMA Support Center (EAASC)
## – Organizational Structure –

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                    │   EAASC     │
                    │   Head      │
                    │ (S. Iguchi) │
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| ALMA Technical Support (N. Mizuno) | ALMA Regional Center (K. Tatematsu) | ALMA Science (D. Iono) | ALMA EPO (M. Hiramatsu) |
|---|---|---|---|

ALMA Computing Software (G. Kosugi)

- Provides *User Supports* to ALMA through **ALMA Regional Center (ARC)**
- Provides **ALMA Technical Support** and **ALMA Computing Software** in areas of *Off-site maintenance*, *Upgrades* and *Development*
- Coordinates **ALMA Science** and **Education and Public Outreach** activities

# EA Science Priorities

## Small scale projects

- e.g. Construction of baseline ALMA (Rx bands), site monitors
- Observatory/Institute/University driven with community support
- ~10s of MUSD or less
- Ongoing future development studies/projects

## Medium scale projects

- e.g. Moderate upgrade of ALMA, or projects that are complementary to ALMA
- Community driven
- Up to 100 MUSD
- Proposal to the Science Council of Japan

## Large scale projects

- e.g. Significant upgrade of ALMA, SKA
- International collaboration with solid community support
- > 100 MUSD
- Proposal to the Science Council of Japan

# EA Science Priorities

Small scale projects

- e.g. Construction of baseline ALMA (Rx bands), site monitors
- Observatory/Institute/University driven with community support
- ~10s of MUSD or less
- Ongoing future development studies/projects

Medium scale projects

- Moderate upgr... ...ojects that are complementary to ALMA

Immediate science priority for EA is the completion of <u>ACA and bands 4, 8 and 10</u> and to accelerate the ongoing development studies/projects (band 1, 11 and artificial noise)

Atacama Large Millimeter/submillimeter Array

# Ongoing EA studies/projects

- Band 1 (lead: ASIAA)
- Band 11
- Artificial noise source at AOS

# Band 1 status

- Band 1 is proposed as an ALMA-EA development project to the ADSC

- Kick off meeting (June 12-13, 2012)

- ALMA board granted conditionally approval to build a prototype

- Down selection review (Jan 14-15, 2013)
  - Key component designs were down selected

- Specification review
  - Mostly e-mail based discussion.  Final telecon on June 21, 2013

- PDR (scheduled for July 29-30, 2013)

# Band 11
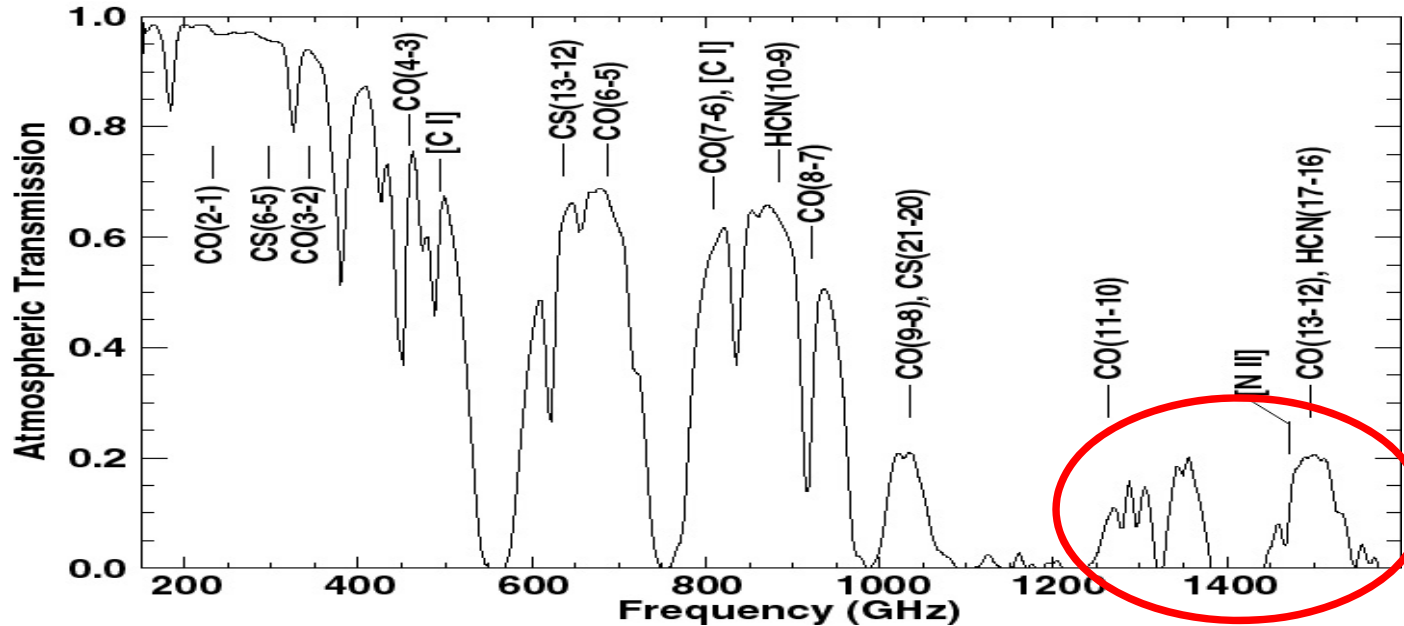


| Band[a] | Frequency (GHz) | $T^b_{SSB}$ (K) | Configuration of Receiver | Continuum[c] $\Delta S$ (mJy[c]) | Spectral Line[d] $\Delta S$ (mJy) | Beam[e] (arcsec) |
|---|---|---|---|---|---|---|
| 1 | 31 - 45 | *17* | HEMT | 0.03 (0.023) | 8.5 | 0.12 |
| 2 | 67 - 90 | *30* | HEMT | 0.04 (0.032) | 8.5 | 0.06 |
| 3 | 84 - 116 | 41 | 2SB | 0.040 (0.03) | 7.0 | 0.038 |
| 4 | 125 - 163 | 51 | 2SB | 0.06 (.046) | 7.1 | 0.030 |
| 5 | 163 - 211 | *65* | 2SB | 0.075 (0.059) | 4.9 | 0.021 |
| 6 | 211 - 275 | 83 | 2SB | 0.10 (0.075) | 10.2 | 0.018 |
| 7 | 275 - 373 | 147 | 2SB | 0.18 (0.14) | 16.3 | 0.012 |
| 8 | 385 - 500 | 196 | 2SB | 0.28 (0.02) | 22.6 | 0.010 |
| 9 | 602 - 720 | $175^f$ | DSB | 0.62 (0.49) | 62.1 | 0.006 |
| 10 | 787 - 950 | $230^f$ | DSB | 1.1 (0.84) | 56 | 0.005 |
| 11 | 1255 - 1565 | $375^f$ | DSB | *11 (9)* | *450* | 0.005 |

**Al Wootten, 2010**

# Band 11 initial study

- Initial study led by band 10 team (PI: Y. Uzawa)
- Tasks for band 11 development
  - Optics : modify band 10 optics
  - Heterodyne mixer: SIS (baseline) and HEB (backup)
  - IF amplifier: InP HEMT or SiGe HBT (need collaboration)
  - LO : need collaboration
  - Cartridge prototyping

# Artificial noise source at AOS (H. Kiuchi, R. Hills)

It is proposed that we place a small low-powered millimeter-wave source on one of the mountain peaks overlooking the ALMA operations site.

This will serve several purposes:

(1) to provide a signal for interferometric holography measurements of the antenna surfaces

(2) to provide a source of known and preferably changeable polarization so we can measure the polarization properties of the antennas

(3) to provide a source with high signal-to-noise ratio to help measure things like coherence, phase stability, switching times and perhaps stability and sideband ratio.
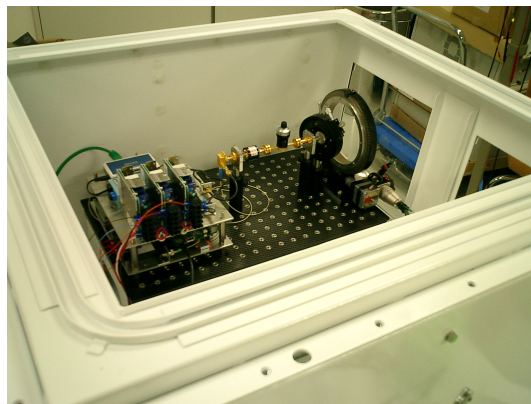
by Richard Hills

# Artificial noise source



Location of the planned communications tower
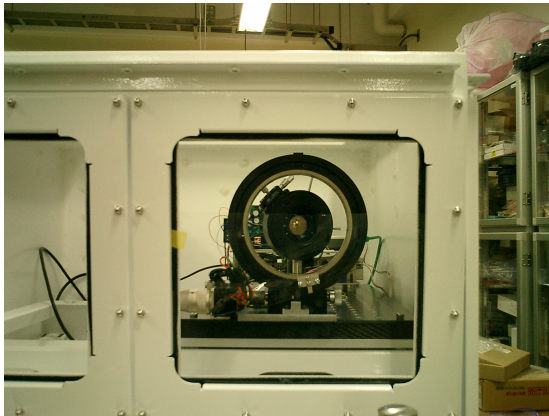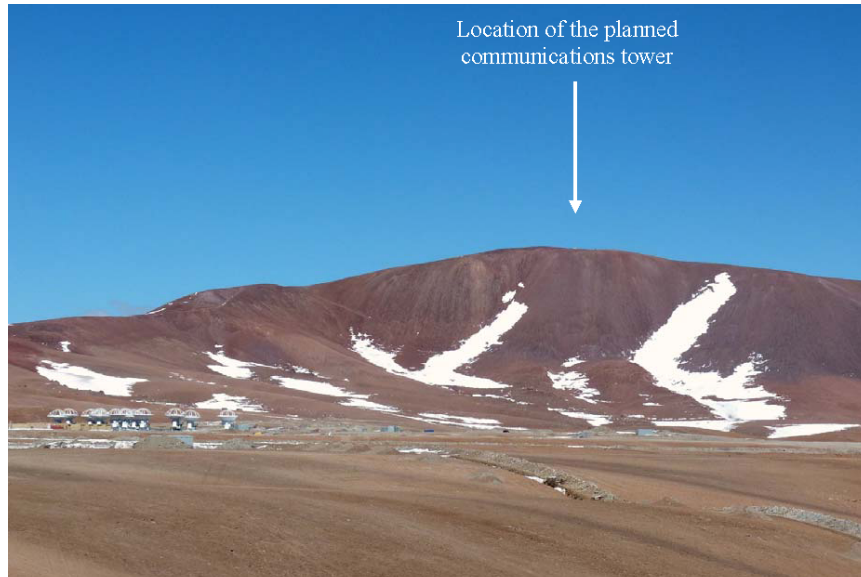




Front face

# Future development in EA

- EA Development Workshop planned in July, 2013
  - Provide update on the current development studies/projects and the near (~ 5 - 10 year) term development
  - Discuss and identify the important development for the next 10 - 20 years. (e.g. multi-beam Rx, wide bandwidth)