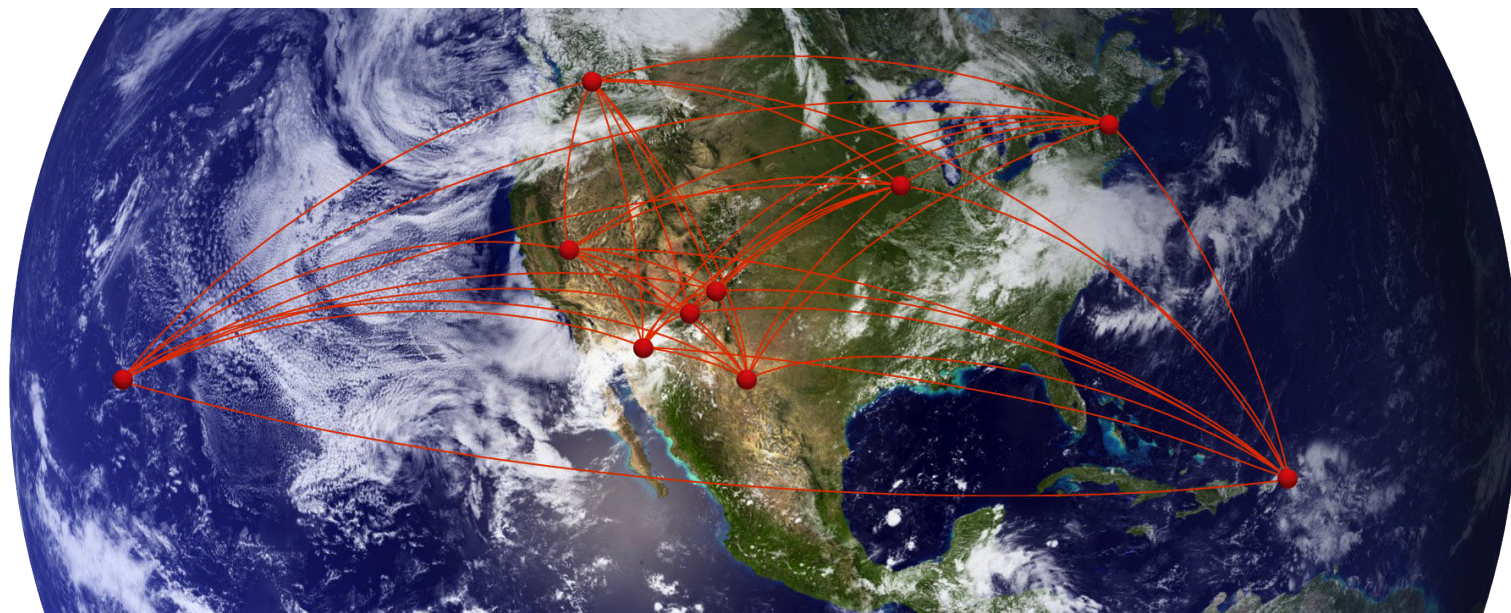


VLBA millimeter Observing : Status and Prospects

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Multi-Frequency mm-wave Radio Telescopes

Florence Oct 2015



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



VLBA Introduction

- Workhorse of US (& Global) VLB community.
- Year-round Availability, Reliability, Rapid Response.
- Key Science: Astrometry, ICRF/ITRF, MegaMasers, etc.
- 'Traditional' Multi-Frequency Capability:
 - L,S,C,X,U,K,Q,W : < 20sec for any band change.
 - Q/W freq-phase transfer : with difficulty (Dodson et al.)
 - S/X dichroic : geodetic standard.
- mm VLBI is supported, but does not dominate VLBA
e.g. GMVA is 4-5% of total science observing.
- Specifications:
science.nrao.edu/facilities/vlba/docs/manuals/oss/bands-perf

VLBA Recent Upgrades

science.nrao.edu/facilities/vlba/publications/memos/upgrade

- C-wide 4-8 GHz, Methanol masers: Galactic parallaxes.
- K band HEMT amps replaced, now 70K Tsys: H2O Megamasers.
- RDBE Backend, Xcube network switch: PFB, DDC-4, -8 modes.
- 2 Gbps recording: MK5B/PFB, vdif/DDC to MK5C disks.
- Tsys, pulsecal, SEFD calibration: all via new system.
- VME control computer & pointing replacement by Linux: in progress.
- **VLBA is over 20 years old. Current focus is on:
Reliability of Operation
Maintenance of Infrastructure**

VLBA millimeter Performance

7 mm : Works very well.

- Tsys 100K typ. Could be 80K with new HEMTs - unfunded.
- Antenna efficiency 50%

3 mm : Nucleus of GMVA – Krichbaum's talk.

- Recent LMT, ALMA success shows potential.
- However, the system can be improved. Examples:
 - 8 Rx now, including 2 older narrow band Rx.
 - Tsys 80-150K is site-dependent, cannot change.
 - 6 Rx are relatively new, Tsys already good.
 - Efficiency 10-20%. Improving to 30% is difficult,
 - Both main and subreflector need work.
 - Pointing also a limitation in daytime.

VLBA millimeter Wishlist

roughly in order of priority

Priorities may change based on users & funding.

- 500 MHz wideband total-power monitor.
- Pointing improvements, hardware & software.
- Dual MK5C = 4 Gbps recording rate.
- Surface improvements.
- New IF system (many GHz) + Recorders + Media: Expensive!
- Water-vapour radiometers.
- Multi-frequency single-beam observing.
- Dual-beam (simultaneous) phase referencing.

Currently, both resources and personnel are very limited.

VLBA Funding Climate

- 2012 Portfolio Review: NSF divestiture of VLBA.
- NRAO/AUI response is here. 50% divestment in progress.
<https://www.nrao.edu/pr/2012/portfolio/>
- NRAO/AUI are pursuing other sources of support, e.g.
- USNO daily EOP obs. Sponsored proposals. etc.
- AUI contract to manage NRAO is being re-competed.
- Results will be known before 2016.
- Post-2016: VLBA open-sky time is likely ~ 50%
- Scheduling will be more complicated.

Summary of VLBA Position

- Balance mm observing vs. other VLBA science.
- Balance stability of infrastructure vs. new development.
- New users, new funding will drive new directions.
- AUI recompetition, NSF support level: to be decided.

We welcome your comments, questions & proposals

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