



Photo: Jane Kaczmarek

VLBI with BIGCAT

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Australia's National Science Agency



VLBI Requirements

- Basic requirement is a tied array voltage beam
 - “VLBI” requirements should be suitable for any use case which wants raw voltages
 - Single voltage capture interface, so VLBI requirements need to include non-VLBI use cases
 - Make sure you let me know if you want to include requirements!!!

Basic Requirements

- Coherent sum of 1-6 antennas
 - Requires antennas can be calibrated in realtime and on demand
 - (pcal, dcal)
- Multiple subbands (“channels”) 1 .. 128 MHz
 - Tunable at at least 1 MHz steps
 - What flexibility is needed?
- Complex voltages
- 2, 4, 8 and 16 bit quantization (per complex component)
- (Optional) Conversion of linear polarization to circular
- VDIF format

Basic Requirements

- Recordable to disk
- Full 8 GHz in principle
 - 62 Gbps @ 2 bit, 245 Gbps @ 8 bit!!!
- 16 Gbps recorder available initially
 - 2 GHz bandwidth (2 bit, dual pol)
 - Sustained 16 Gbps may be problematic initially
- eVLBI (realtime off site voltage streaming)
 - Probably initially 8 Gbps max
- Full bandwidth local interferometer always running in parallel

Calibration

- Array needs to be amplitude, phase and delay calibrated before tied array
- Needs option for "on the fly" adjustment of (at least) phase on strong continuum calibrator
 - "Re-phasing"
- Need to be able to add/remove (calibrated) antenna in and out of array dynamically
- Need normal interferometer running in parallel

Without interrupting observing schedule

SEFD

- Need to measure SEFD for same portion of band recorded for VLBI

Multi-beaming

- Tied array has reduce fov compared to single antenna
 - Ratio of maximum (tied array) baseline length to dish diameter
 - For E-W configuration “pencil beam”
- Multiple “steerable” beams desirable
 - Increase fov
 - “In beam” calibrators
 - Tracking poorly known objects (e.g. satellites)
 - < 6!

“Tied array Grouping”

- Option to combine multiple sets of antenna simultaneously
 - All antennas same pointing center
- E.g. CA01..CA05, CA06 or CA01..CA05 and CA02..CA03
- Record *all* antenna individually (limited bandwidth)
 - Optionally disable fringe rotation
 - Can record in parallel for up to 256 MHz/GPU on “spare” GPUs
- Option to use different reference locations for each sub-group?
 - Additional phase rotation on zoomband before tied array?

Thank you

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