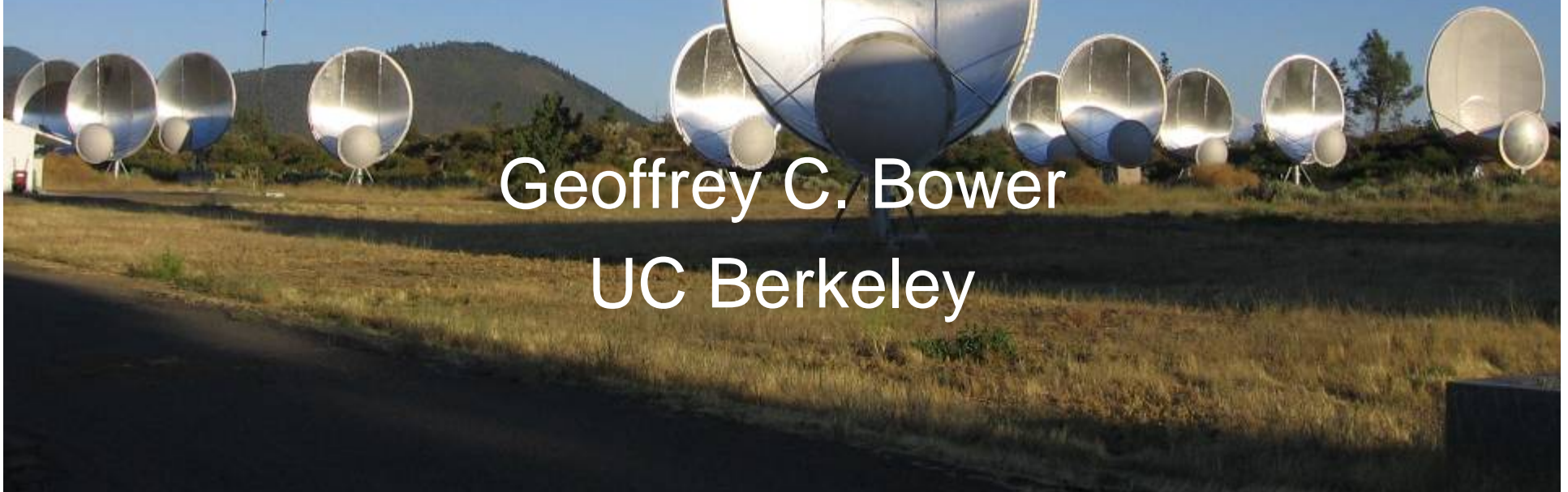


Allen Telescope Array Status

ATA SKA Development Facility

Geoffrey C. Bower
UC Berkeley

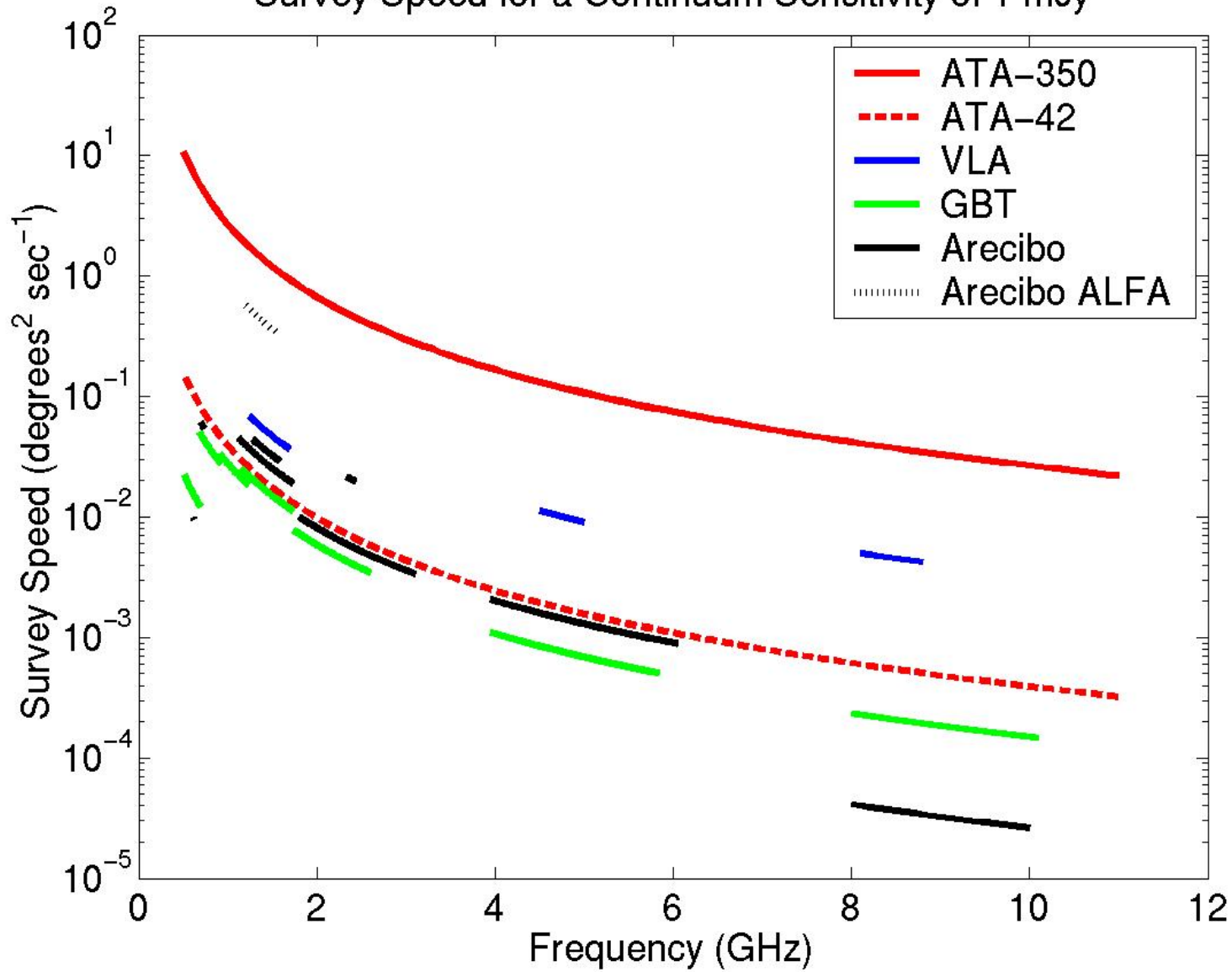


Allen Telescope Array

- Large N design
 - 350 x 6.1m antennas
 - Sensitivity of the VLA
 - Unprecedented imaging capabilities
- Continuous frequency coverage
 - 0.5 to 11.2 GHz
- Wide field of view
 - 3 degrees at 1 GHz
 - Excellent survey instrument: 17x FOV of VLA
- Compact Configuration
 - 1 arcmin at 1.4 GHz (350), 1 arcmin at 5 GHz (42)
- Simultaneous observing with multiple backends
 - Correlator: 2 x 100 MHz x full Stokes x 1024 channels
 - Phased array beams: 32 independent at 4 frequencies
- Joint project of UC Berkeley/SETI Inst.
- Privately funded construction (\$26M)
 - NSF support for correlator & operations (\$2.2M)
 - USNO support for construction (\$3M)



Survey Speed for a Continuum Sensitivity of 1 mJy



ATA Science

Array



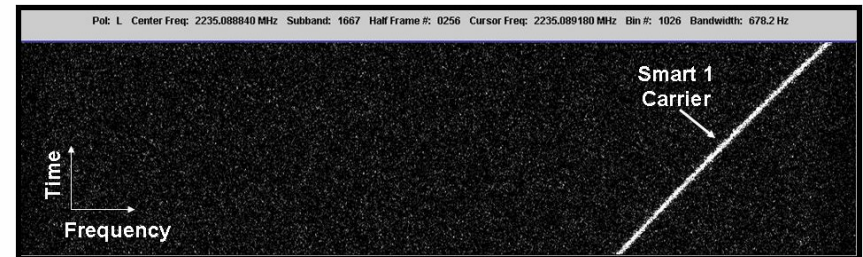
Telescope



Allen

SETI

- GC survey: 20 sq. deg, 1.4-1.7 GHz, 6 months
- 10^6 stars over 1-10 GHz
 - Arecibo radar detectable at 300 pc
- Simultaneous with correlator



Extragalactic HI survey

- Neutral gas SDSS equivalent
- L^* at $z=0.1$ over the entire sky

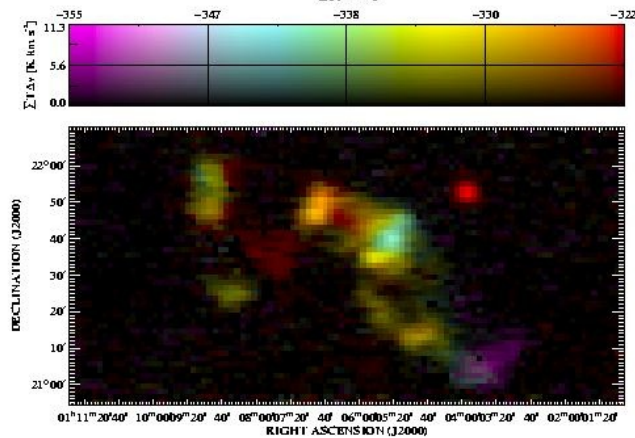
Galactic magnetic fields, HI, long-chain molecules

Pulsars

Radio continuum science

- Transients
- All sky surveys

Robishaw, Simon & Blitz 2002



LGS 3





The Antenna



- 6.1-m offset Gregorian
- Low diffractive spillover $\sim 1\%$ at all elevations
- Surface rms $\sim 1\text{mm}$
- Works to 25 GHz
- Going to 45 GHz will double cost of mounts and mirrors



ATA-42 Operational Soon

Array



Telescope



Allen



Array



Telescope



Allen



4 deg/sec in azimuth, 2 deg/sec in elevation

Movie 3x real time



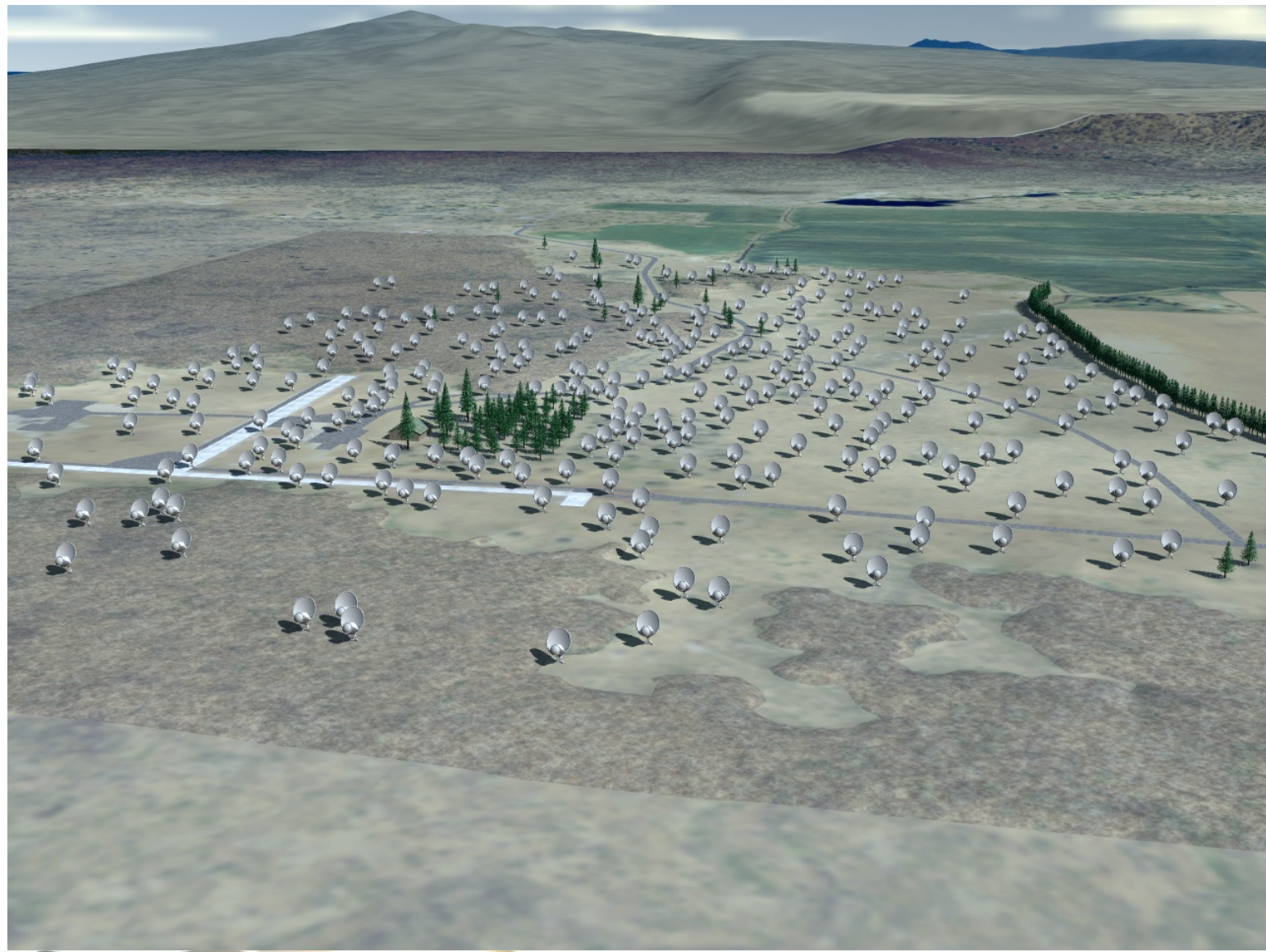
Allen



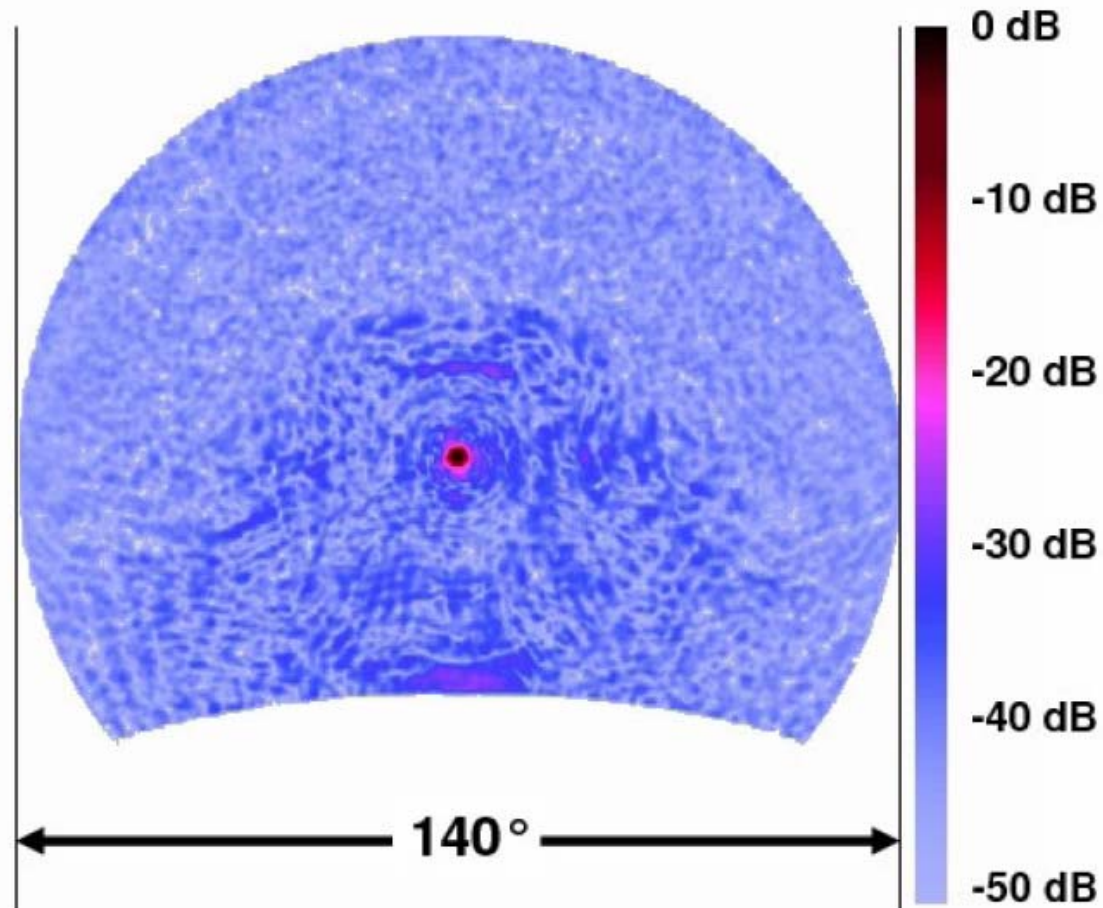
Telescope



Array



Large angle beam pattern



Array



Telescope



Allen

Excellent Pointing

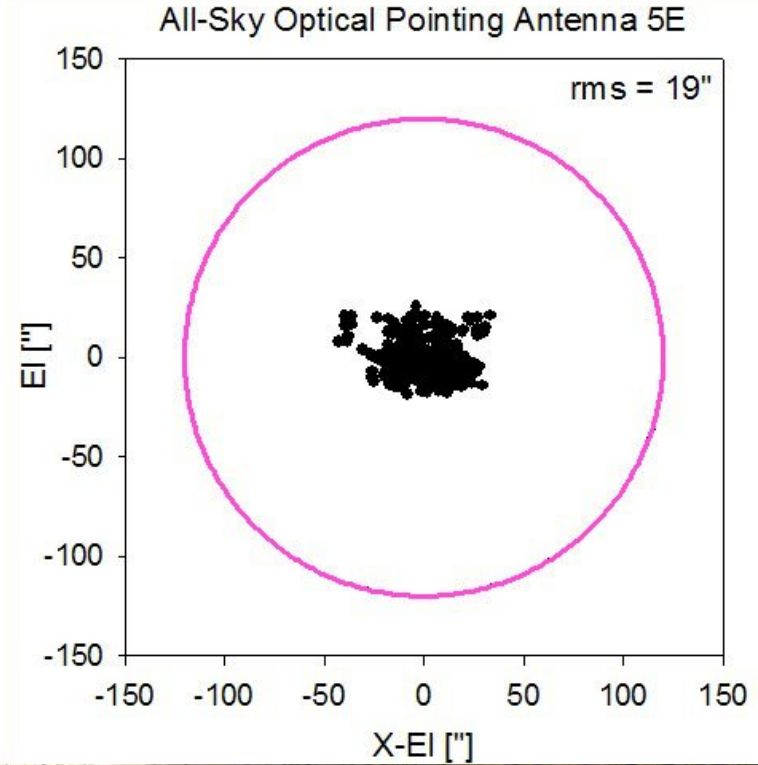
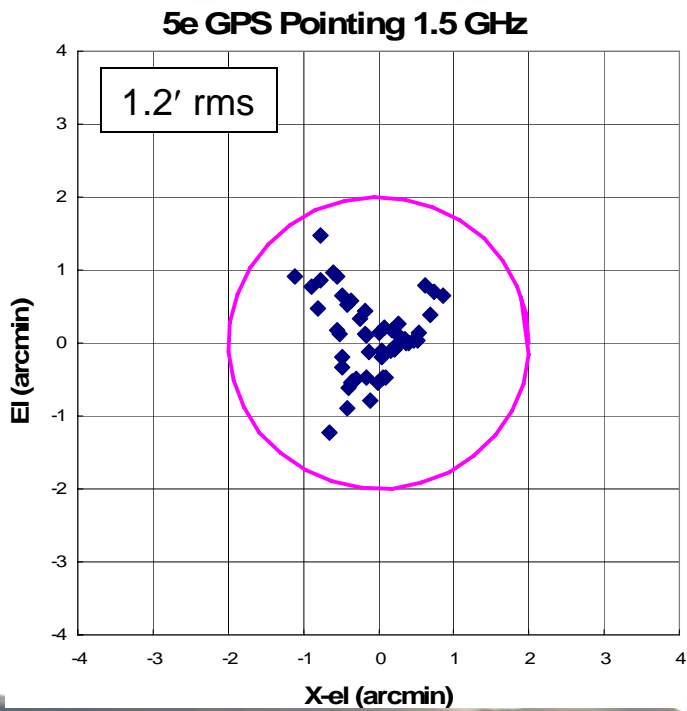
Array



Telescope



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Radio Pointing

Optical Pointing



ATA Log-Periodic Feed

Array



Telescope



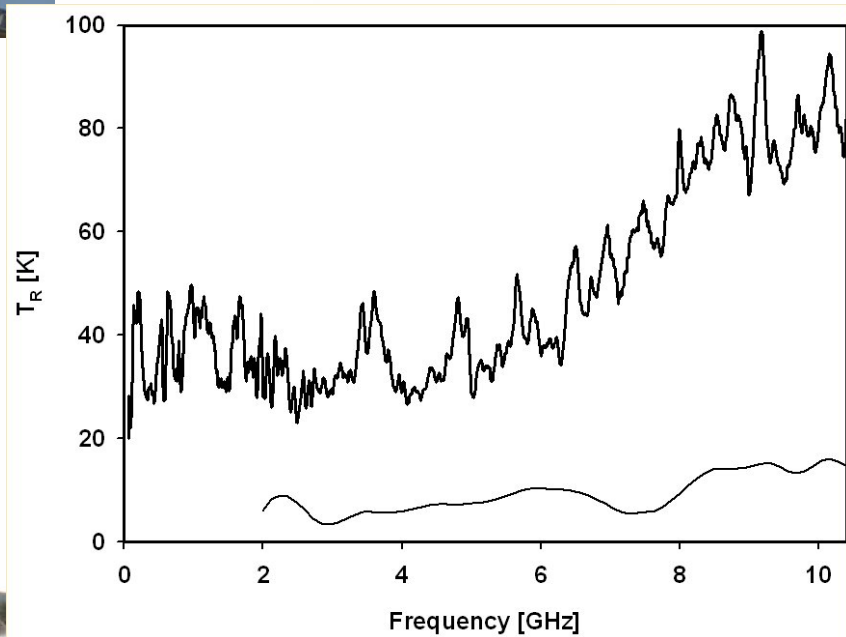
Allen



LNAs from Weinreb & Wadefalk

$$T_{\text{receiver}} \sim 35 \text{ K}$$

$$T_{\text{LNA}} \sim 10 \text{ K}$$



Correlator

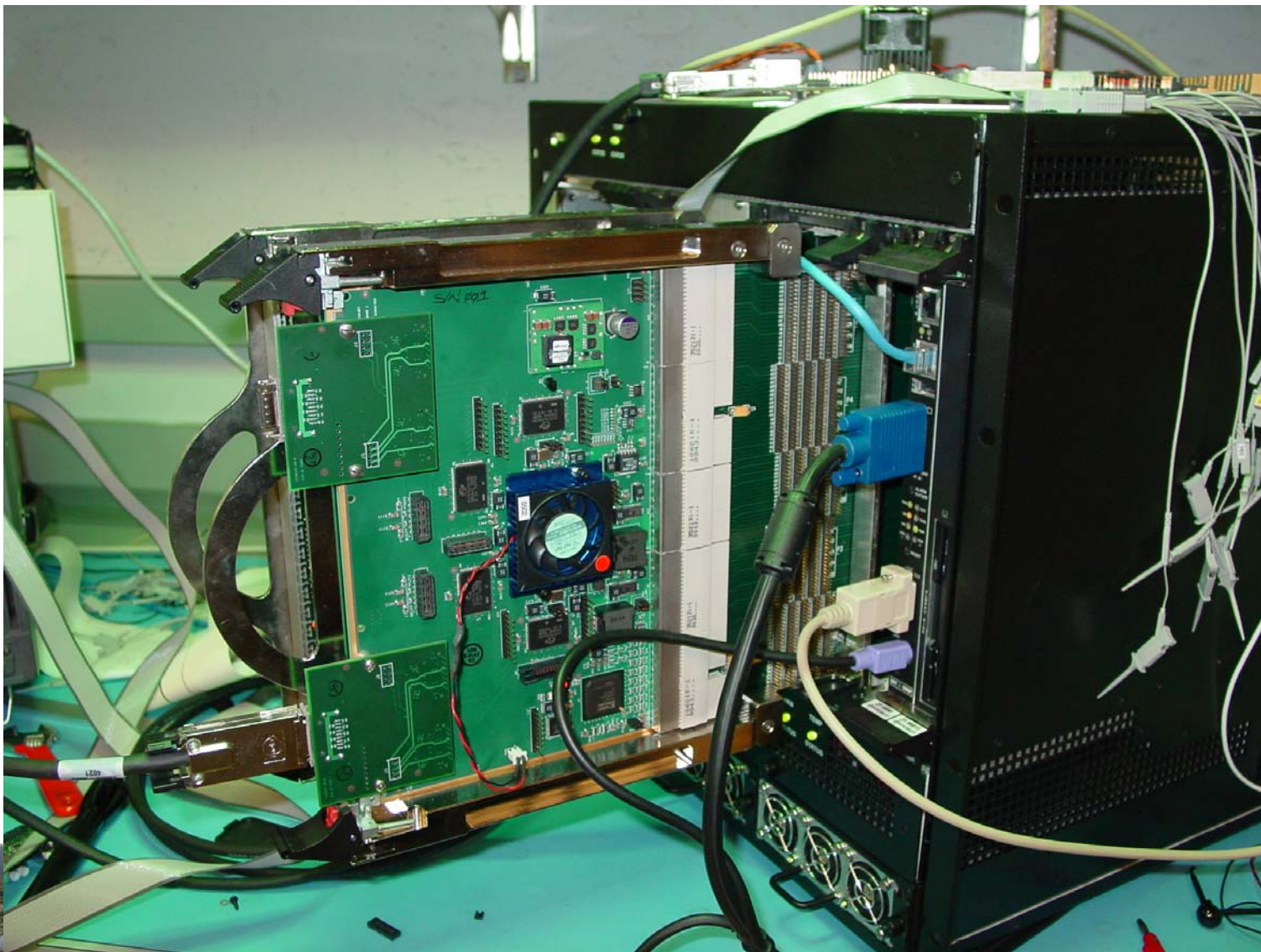
Array



Telescope



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Simultaneous Single Dish Spectrum

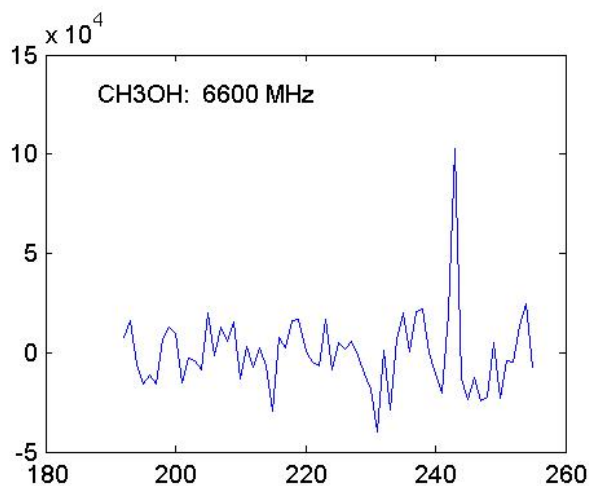
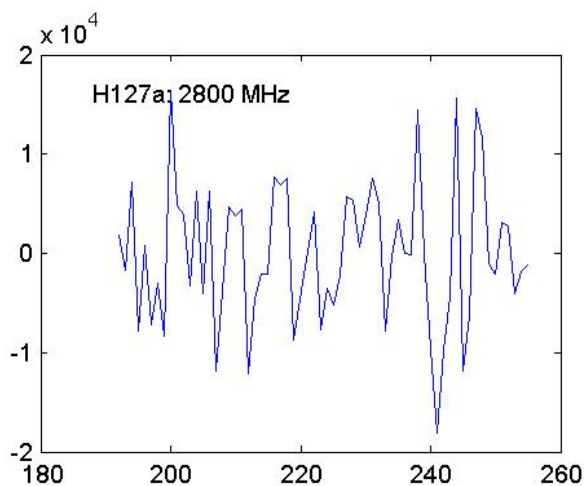
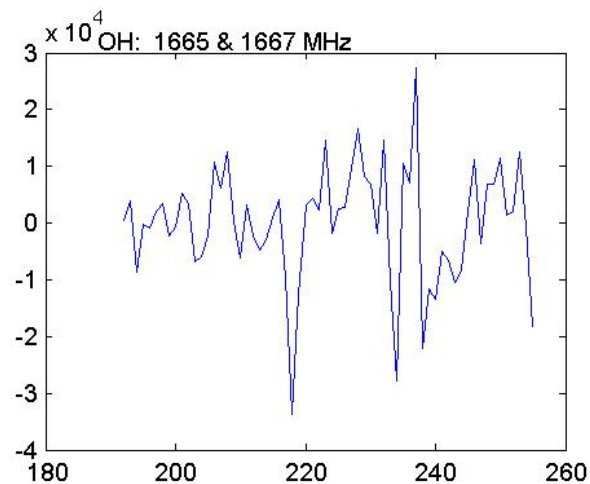
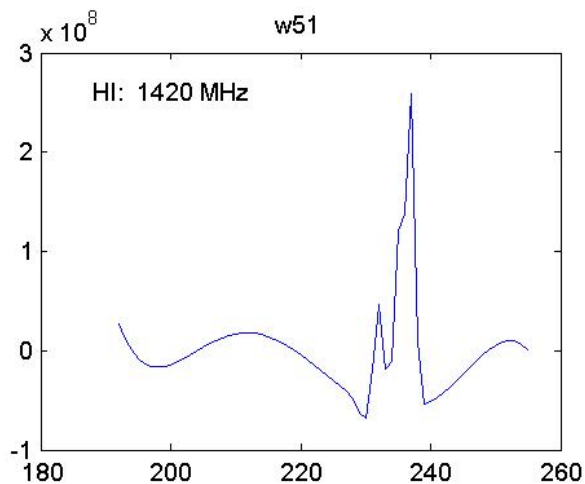
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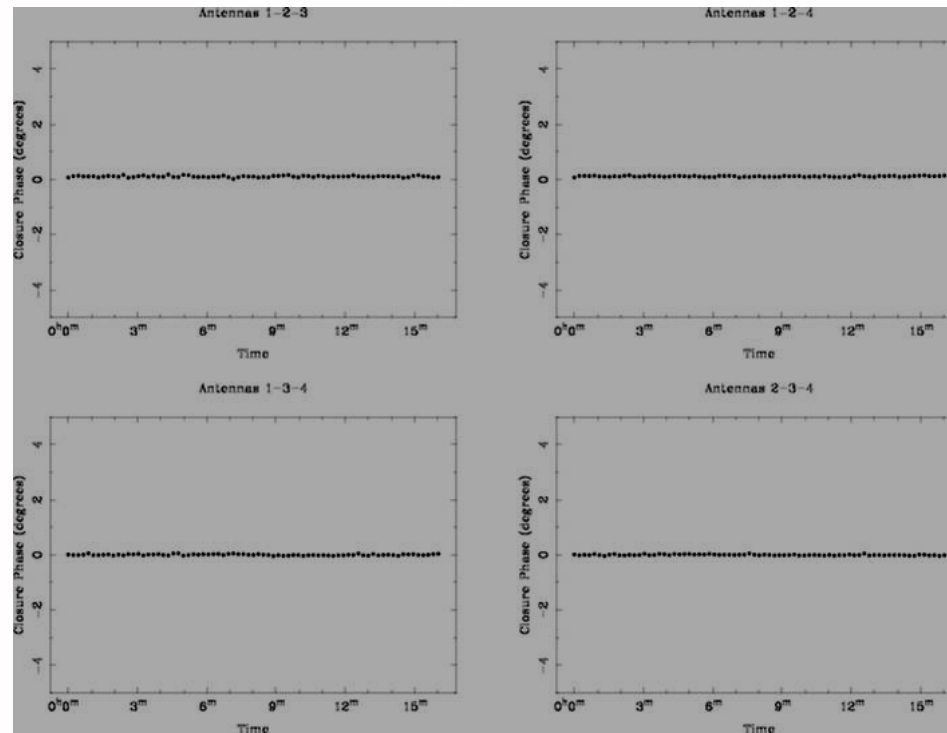
Telescope



Allen



Closure Phase



M31 in a Single Pointing

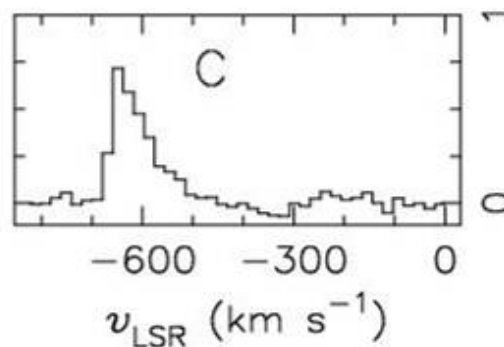
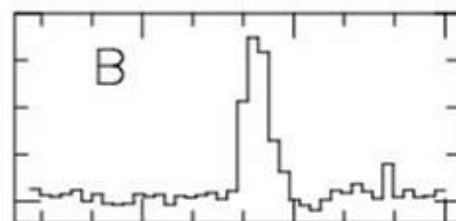
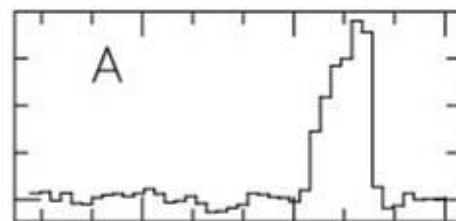
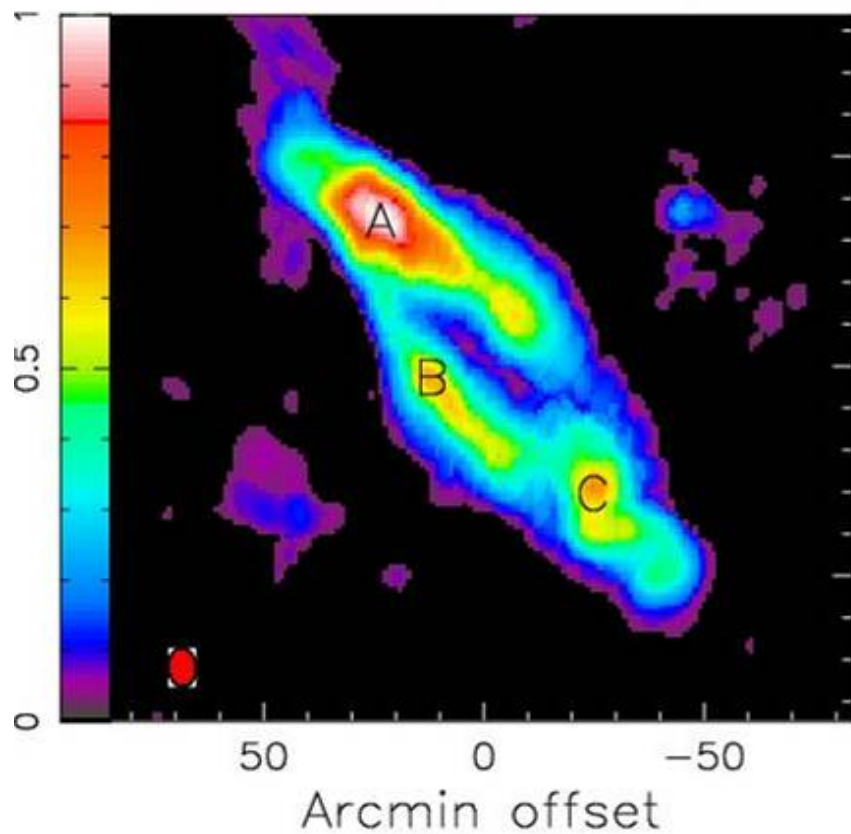
Array



Telescope



Allen



ATA SKA Development Facility

- Use ATA infrastructure for SKA development
- Concept originally proposed in TDP
- Community opportunity for development
- Available now



ATA SKA Dev. Facility Activities

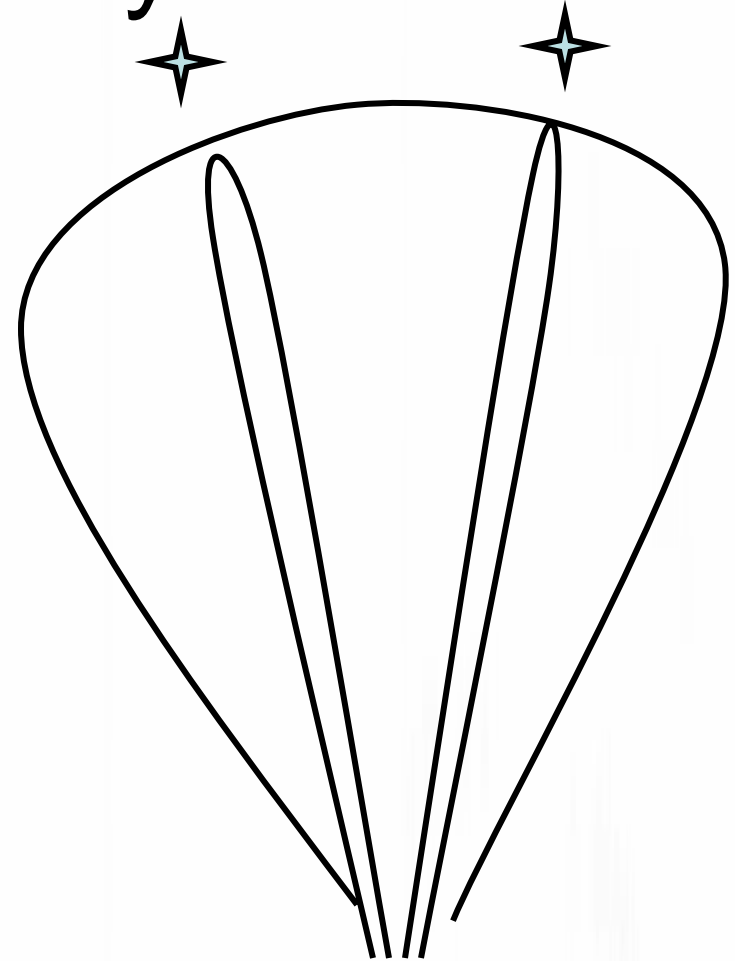
- Feed development & testing
 - High frequency extension of log-periodic feed
 - Test other broadband feed designs
 - Feed manufacturing, component design



ATA SKA Dev. Facility Activities

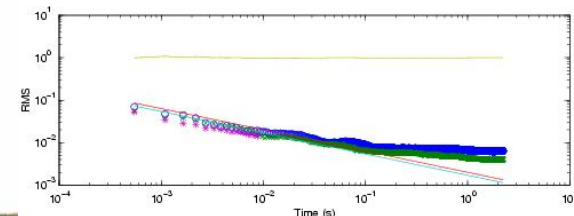
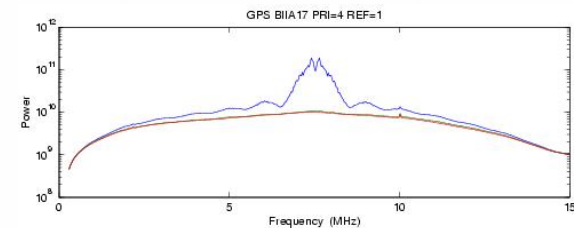
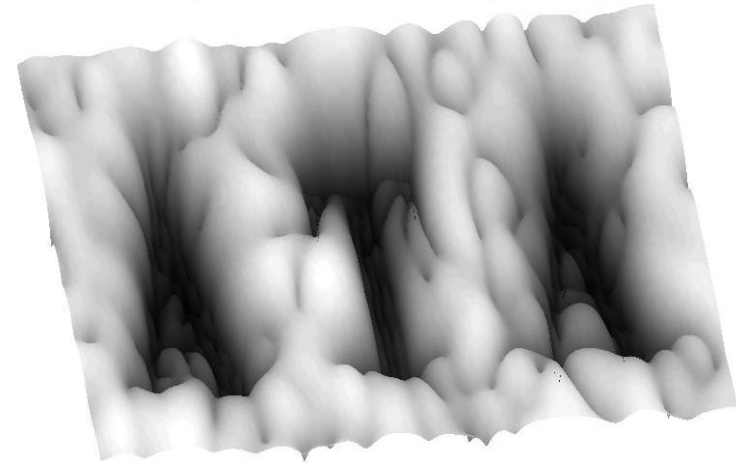
- Calibration & Imaging

- Form multiple phased array beams
- Test stability, calibration, interference rejection capabilities of phased array signals for SKA station use
- Simultaneous in-beam calibrator observations for precision VLBI astrometry and faint source detection
- Wide-field imaging
- Automated imaging algorithms & hardware



ATA SKA Dev. Facility Activities

- Interference mitigation
 - Nulling
 - Adaptive cancelling
 - Post-correlation



ATA SKA Dev. Facility Activities

- Digital backend devices
 - Put your hardware on one or more phased array beams
 - Broadband devices, large-N devices



The ATA is a Community Resource

- ATA-42 Coming Soon
 - NSF URO → 30% observing time for the community
 - Opportunities to collaborate sooner on science
- LNSD demonstrator
- SKA Development Facility
 - Technical development necessary to meet SKA goals
 - Developing collaboration with NRAO on technology
 - Community opportunity towards developing increased cm wavelength capabilities

