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

Survey Speed (degrees$^2$ sec$^{-1}$)

Frequency (GHz)

- ATA–350
- ATA–42
- VLA
- GBT
- Arecibo
- Arecibo ALFA
ATA Science

- **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
The Antenna

- 6.1-m offset Gregorian
- Low diffractive spillover ~1% at all elevations
- Surface rms ~ 1mm
- Works to 25 GHz
- Going to 45 GHz will double cost of mounts and mirrors
ATA-42 Operational Soon
Allen Array Telescope

Movie 3x real time

4 deg/sec in azimuth, 2 deg/sec in elevation
Large angle beam pattern
Excellent Pointing

Radio Pointing

Optical Pointing
ATA Log-Periodic Feed

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

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

LNAs from Weinreb & Wadefalk
Correlator
Simultaneous Single Dish Spectrum

- HI: 1420 MHz
- OH: 1665 & 1667 MHz
- H127: 2800 MHz
- CH3OH: 6600 MHz
Closure Phase
M31 in a Single Pointing
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
ATM 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