NRAO 2015

Tony Beasley

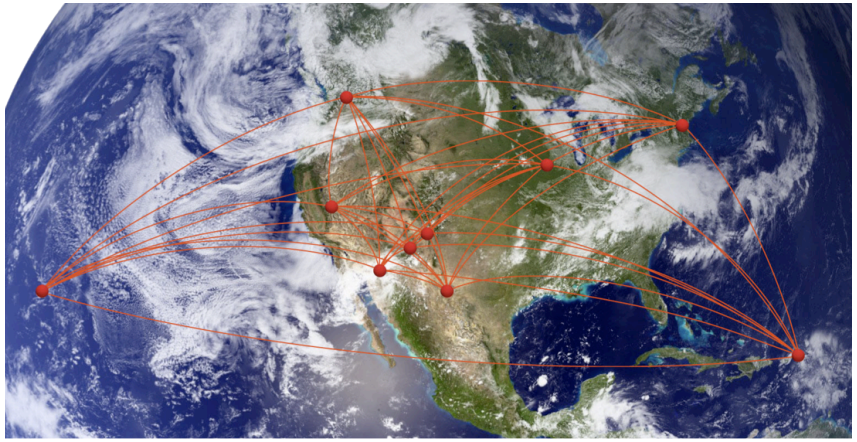
- Research Highlights

- NRAO Status & Budget
- Semester 2015B Call for Proposals
- Community Support Programs – NAC/NINE
- VLA Sky Survey
- NSF Portfolio Review
- Science-ready Data Products
- Strategic Planning

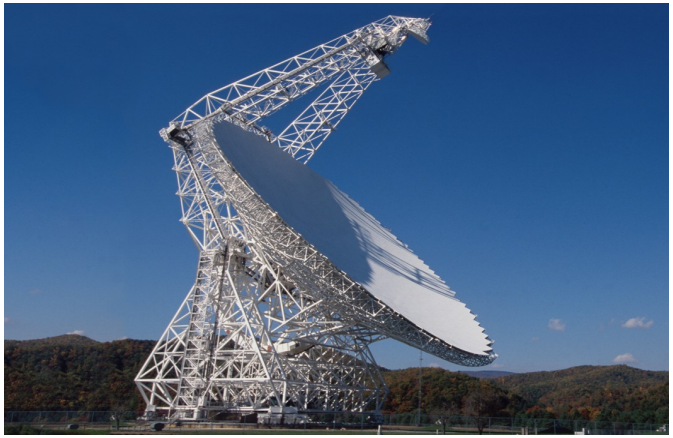
NRAO Research Facilities

Jansky Very Large Array

Very Long Baseline Array

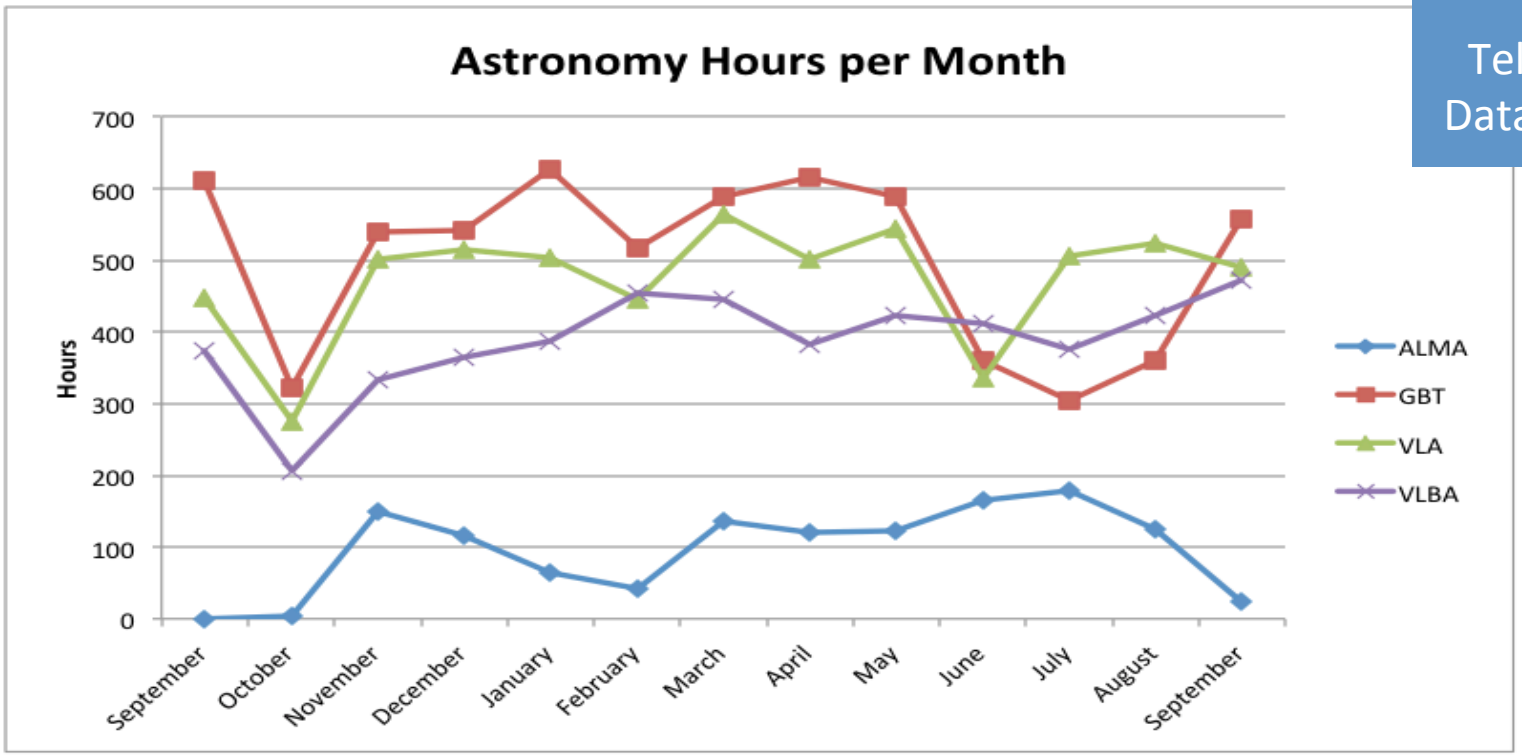


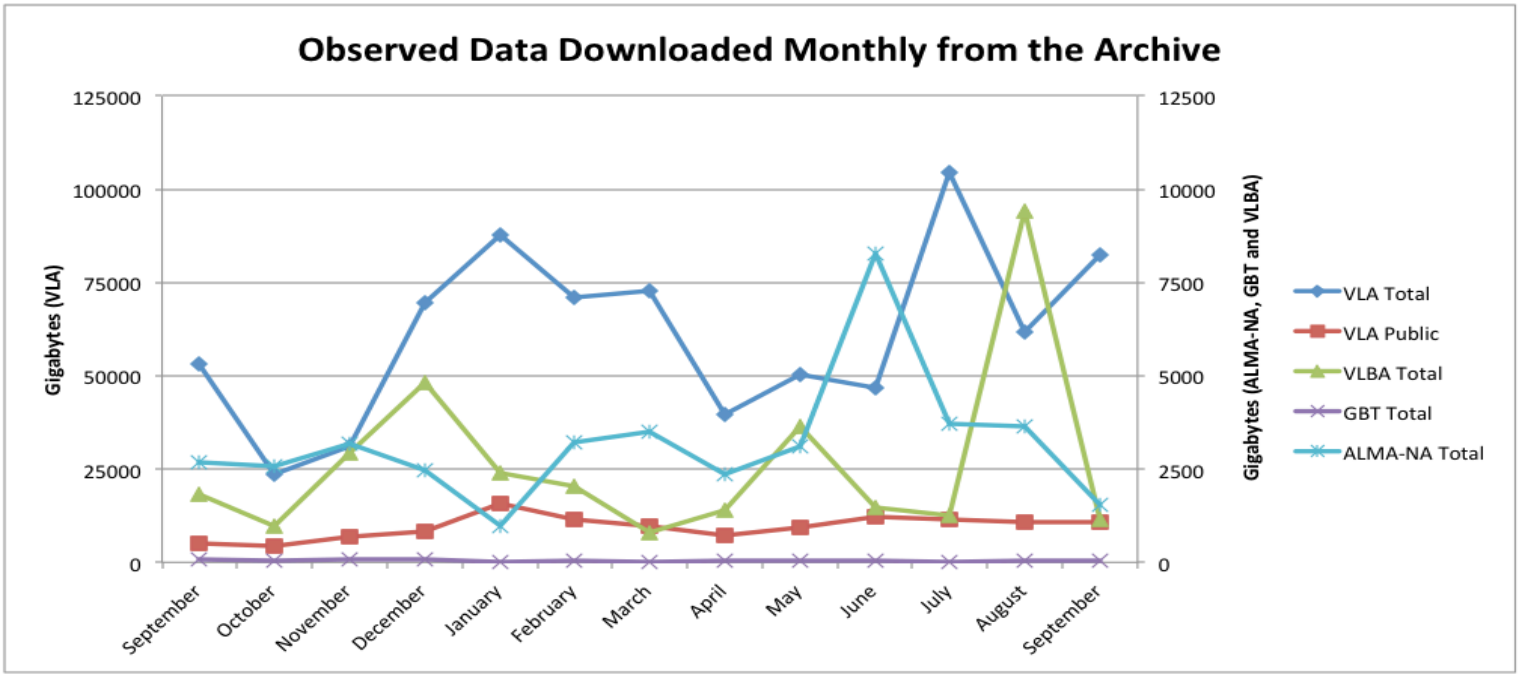
Green Bank Telescope

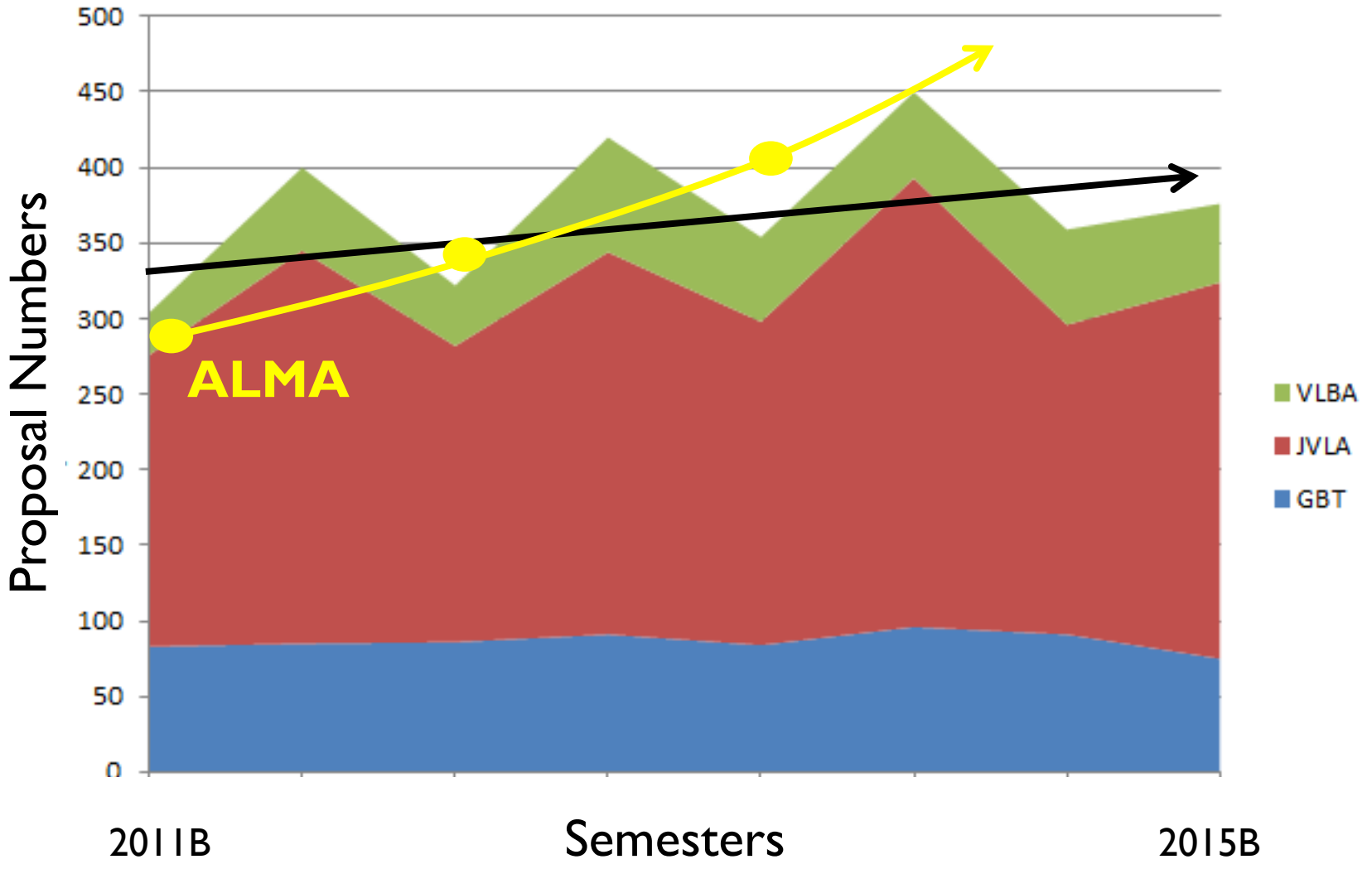


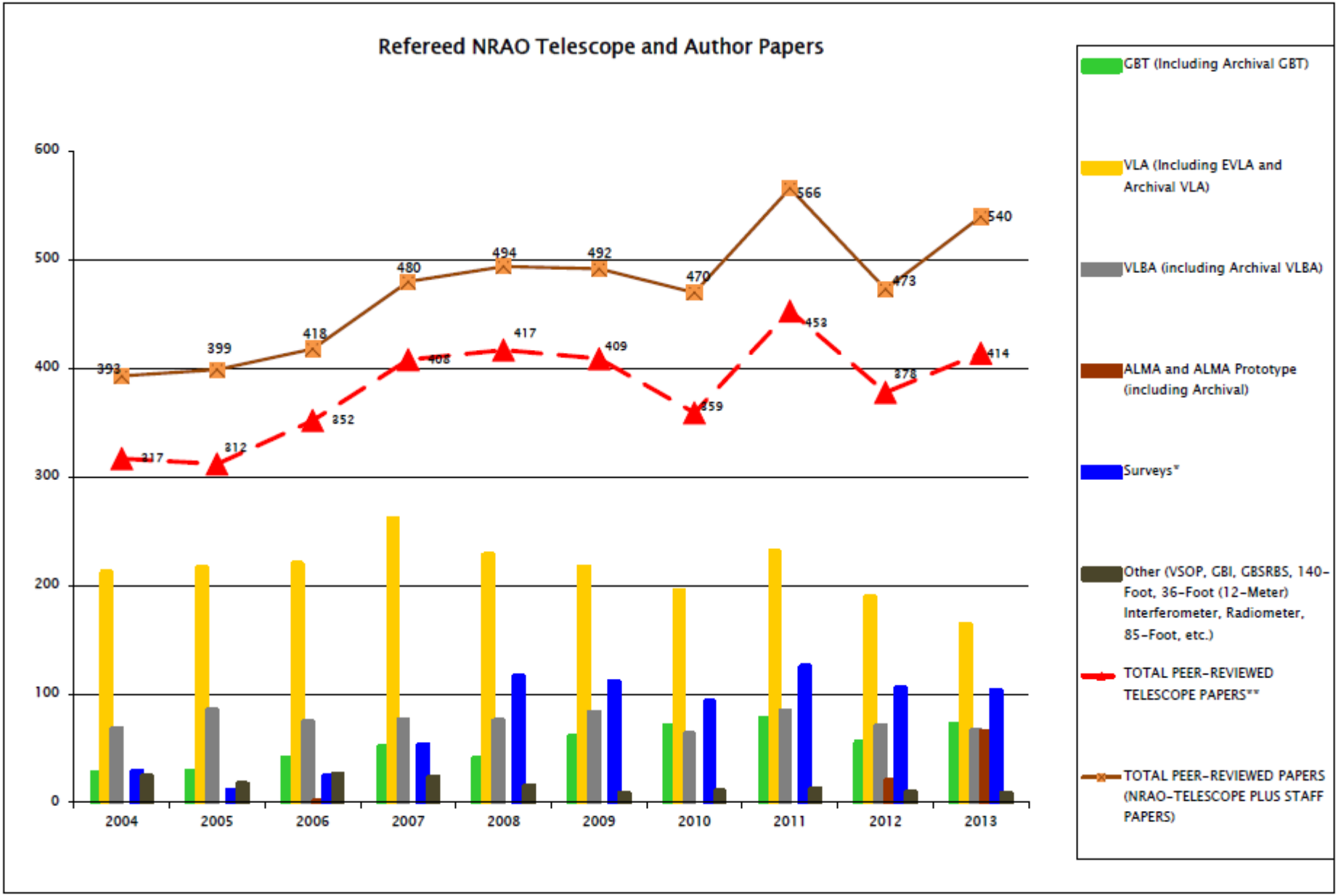
Atacama Large Millimeter/submm Array

Telescope Hrs Data Downloads






Proposal Numbers
500
450
400
350
300
250
200
150
100
50
0
ALMA
VLBA
JVLA
GBT
2011B
Semesters
2015B


Refereed NRAO Telescope and Author Papers
600
500
400
300
200
100
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
393
399
418
480
494
492
470
566
473
540
317
312
352
408
417
409
359
453
378
414
GBT (Including Archival GBT)
VLA (Including EVLA and Archival VLA)
VLBA (including Archival VLBA)
ALMA and ALMA Prototype (including Archival)
Surveys*
Other (VSOP, GBI, GBSRBS, 140-Foot, 36-Foot (12-Meter) Interferometer, Radiometer, 85-Foot, etc.)
TOTAL PEER-REVIEWED TELESCOPE PAPERS**
TOTAL PEER-REVIEWED PAPERS (NRAO-TELESCOPE PLUS STAFF PAPERS)

Budget

- 2013 – staff reductions; 2014 – benefit changes & hiring freeze
- ALMA construction project ended Sept 30th 2014
- Continuing to implement cost-cutting measures in all areas, seeking partners in technical development/operations
- Issues: staff stress, morale, aging infrastructure, opportunity costs, new requirements e.g. science-ready data products, community health
- Overall 2014: effective belt-tightening, staff performed well, instruments behaved. Tight year.
- 2015
  - Awaiting news – planned to NSF estimate
  - Replay of 2014… improved benefits for staff, infrastructure replacement
  - Managing the situation closely…

NRAO Semester 2015B

- NRAO Call for Proposals for Semester 2015B published

  https://science.nrao.edu/observing/call-for-proposals/2015B

- **Proposal deadline: Monday, 2 Feb 2015, 5 p.m. EST**
  - Jansky Very Large Array
  - Very Long Baseline Array + High Sensitivity Array + Global Array
  - Green Bank Telescope
  - Period: 1st August 2015 – 31st January 2016

- Highlight: opportunities for joint observations with the Hubble Space Telescope, Swift Gamma-Ray Burst Mission, Chandra & FERMI.
- Highlight: Large Millimeter Telescope is being offered for inclusion in the High Sensitivity Array (HSA) for 3mm Very Long Baseline Interferometry (VLBI).
- Encourage: submission of high-risk/high-reward proposals
- Proposers who need assistance with proposal preparation or have questions regarding the Call or NRAO telescope capabilities should contact Observatory staff via the NRAO Helpdesk.

Community Support

- **Jansky Postdoctoral Fellowships**
  - Annual application deadline: 1 Nov
  - Jansky Fellows carry out research independently & in collaboration with others within the wide framework of NRAO interests

https://science.nrao.edu/opportunities/postdoctoral-programs/jansky

- **Student Programs**
  - Annual application deadline: 1 Feb
  - 25 students presenting AAS225

https://science.nrao.edu/opportunities/student-programs/summerstudents

Community Support

- Internship & Co-op programs
- Student Observing Support
- Grote Reber Doctoral Fellowships
- Visitor Program – ALMA and VLA
- 2015: Returning page charge support (details TBD)

https://science.nrao.edu/opportunities

The National Astronomy Consortium (NAC) is a program led by the National Radio Astronomy Observatory (NRAO) and Associated Universities Inc., (AUI) in partnership with the National Society of Black Physicists (NSBP), and a number of minority and majority universities to increase the numbers of students from underrepresented groups and those otherwise overlooked by the traditional academic pipeline into STEM or STEM-related careers.

NAC Partner Institutions

7+ Majority

17+ MSIs

Plan to do 5 cohorts of 4 students each in 2015

NRAO International National Exchange (NINE) Program

- Partnership begun with South Africa / Africa → expanding to Chile
- Train and mentor students using bi-lateral faculty partnerships.
- Essential components
  i. Co-mentoring and exchange of students w/ the "posse" model
  ii. Exchange of postdocs and faculty on short and long time scales
  iii. Regular meetings to evaluate and critique progress / set goals,
  iv. Annual workshops + scientific training via virtual classrooms.

- Annual cohorts of ~4 MSc +2 PhD students
- Joint workshops / teaching (JEDI workshops)

- Growth of partnership w/ Universities
- Involvement of postdocs as glue between faculty / students
- US students / postdocs → RSA

NAC/NINE – Kartik Sheth (ksheth@nrao.edu)

Science User Support

- Tutorials
  - DPS meeting, Tucson, November 13, 2014: 1.5 hrs, talks on observations of solar system objects with NRAO instruments
  - AAS Splinter Session, Jan 2015, Seattle: "New Capabilities at the National Radio Astronomy Observatory"
    - 3 talks (ALMA, VLA, GBT) plus 1.5 hrs for one-on-one proposal help and discussion
  - AAS Plenary Session – speaker: Al Wootten (Thursday, 8 Jan)
  - SPF1 (Star & Planet Formation I) meeting in Tucson in March
    - full day https://lavinia.as.arizona.edu/~kkratter/SPF1/Home.html
  - 3 additional CDEs TBA
    - all FY15 Q2, 2-day events focused on ALMA Cycle 3 + synergy with other NRAO telescopes
  - **Data Reduction Tutorial – CV April 2015**
  - **A Radio Astronomy Summer School:**
    - **5 day school covering single dish + interferometry (including CASA tutorial) at GBT in July, 2015**

- Science Conferences & Workshops
  - Filamentary Structure in Molecular Clouds - 10-11 Oct 2014, Charlottesville v
  - Revolution in Astronomy With ALMA – The Third Year 8-11 Dec, Tokyo

VLA Sky Survey (VLASS)

- Completion of EVLA Project – new capabilities
- Community – science opportunities enabled by new survey?
- NRAO: provide process for evaluation
  - Science steering committee led by community members
  - Broad call for participation in science working
  - (telecons)(meetings)
  - Draft proposal
  - Internal (NRAO) evaluation of the proposal
  - External review March 2015
  - Decision – mid 2015
- Four components (ALLSKY, DEEP, WIDE, GALACTIC) – 9000hrs
- Community-led NRAO-facilitated initiative

NSF Portfolio Review

- NSF-AST PR Committee recommended divestment of GBT and VLBA by FY 2017
- Divestment – NSF seeking support for operations (e.g. 50-100%)
- Major impacts on the US astronomy community
    - Critical & irreplaceable scientific capabilities would be surrendered
    - Community's ability to train young scientists & engineers would be greatly reduced
    - US leadership in radio astronomy would be diminished
- NRAO and AUI working to maintain GBT and VLBA science capabilities for the community

- VLBA: growing existing partnerships, new opportunities (science/commercial) developed
- GBT: New partnerships and funding options close to completion, also science/commercial opportunities emerging
- Strong support from NSF in developing partners – team effort
- 2015: important to demonstrate progress in expanding Ops funding

Science-Ready Data Products

- Data Management problem – growing rapidly…
- Urgent goal – provide science-ready data products + analysis tools for users of all NRAO instruments
- For NRAO: pipeline software, data analysts, set priorities
- For Community: new paradigms
  - SRDP → publish
  - Involved in reduction? Visit NRAO (or community service prov.) or
  - Remote reduction (pilot experiments successful)
  - Data miners? Okay, but not required… best science involves investigation, experimentation…
- When, not if. Resources for CASA development TBD.

NRAO Strategic Planning

- NRAO: develop new Strategic Plan in 2015
- Inputs: Science; Partners; Community Health; NSF; Politics; Global Landscape (e.g. SKA)
- Outputs: Plan for capabilities & instruments, concepts & projects

- Some options for the next decade:
  - **Space:** **DARE, Far-infrared Interferometer ☹**
  - **Low-frequency:** **SKA-L, HERA, GW Observatory**
  - **Mid-frequency:** **SKA-Mid/High, Fast Transients, ngVLA**
  - **High-frequency:** **ALMA upgrade/expansion (2030s)**

- Already working with community partners in many of these…

Next Generation VLA

- Examine: opportunities for VLA development in ALMA/SKA era
- Workshop at AAS225
- Seed: x3-10 collecting areas, 1-100 GHz, few hundred kms, etc.
- Working Groups
  - Cradle of Life
  - Galaxy Ecosystems
  - Galaxy Assembly
  - Time domain, Cosmology, Physics
- Incredible range of exciting science ideas – white papers planned
- Follow-on meetings later in the year – science & technology

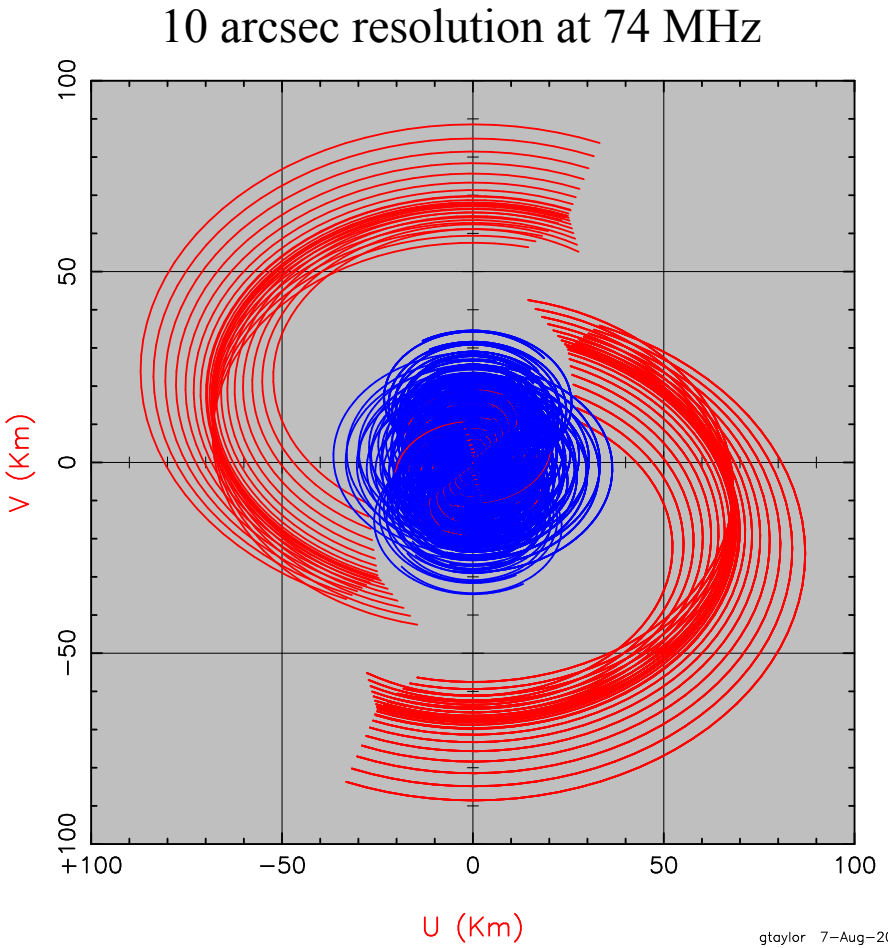
LWA Future

2015: LWA-Sevilleta under construction now
Test LWA1 + 6 VLA dipoles

2016: High Resolution Imaging
Two LWA stations in NM + VLA
Limited VLITE correlation

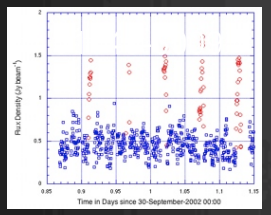
2018: Commensal Imaging
2-4 LWA stations in NM + VLA
LOBO Correlator routine

High Temporal, Spectral and
Spatial resolution

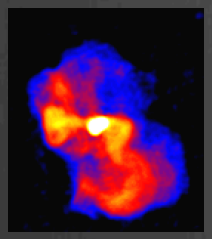


Vision for LOBO-LWA with the NGVLA

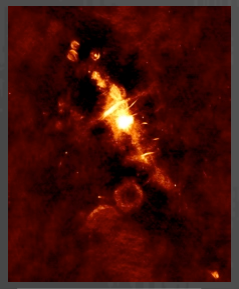
GCRT 330 MHz



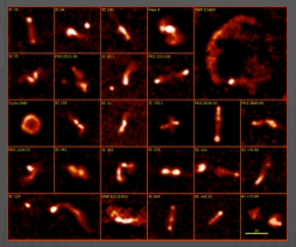
M87 74 MHz

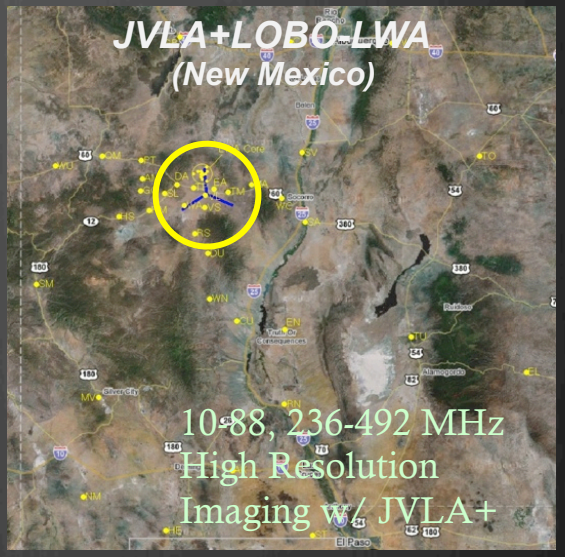


GC 330 MHz



VLSSr 74 MHz





Transients & Ionosphere + Imaging + Polarimetry

328–382 MHz 10 dishes → 54-86, 328-382 MHz 10 dishes → 54-86, 236-492 MHz, 27 dishes

VLITE	VLITE	LOBO	LOBO
P_N	$4+P_N$	$4+P_N$	$4+P_W$
NOW	***+ 1 year***	***+ 3 years***	***+ 5 years***

Test integration of LWA w/ VLITE 4 band

LWA1 → LWA SV

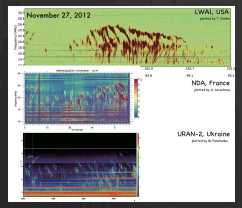
PSRs, Fireballs, Jupiter, Sun, Ionosphere

All-sky Imaging, Beam-forming

Targeted high resolution imaging

LWA 1 & 2 + LOBO → LWA 1,2 … N B ≤ 400 km

≥30 element aperture synthesis, commensal with JVLA



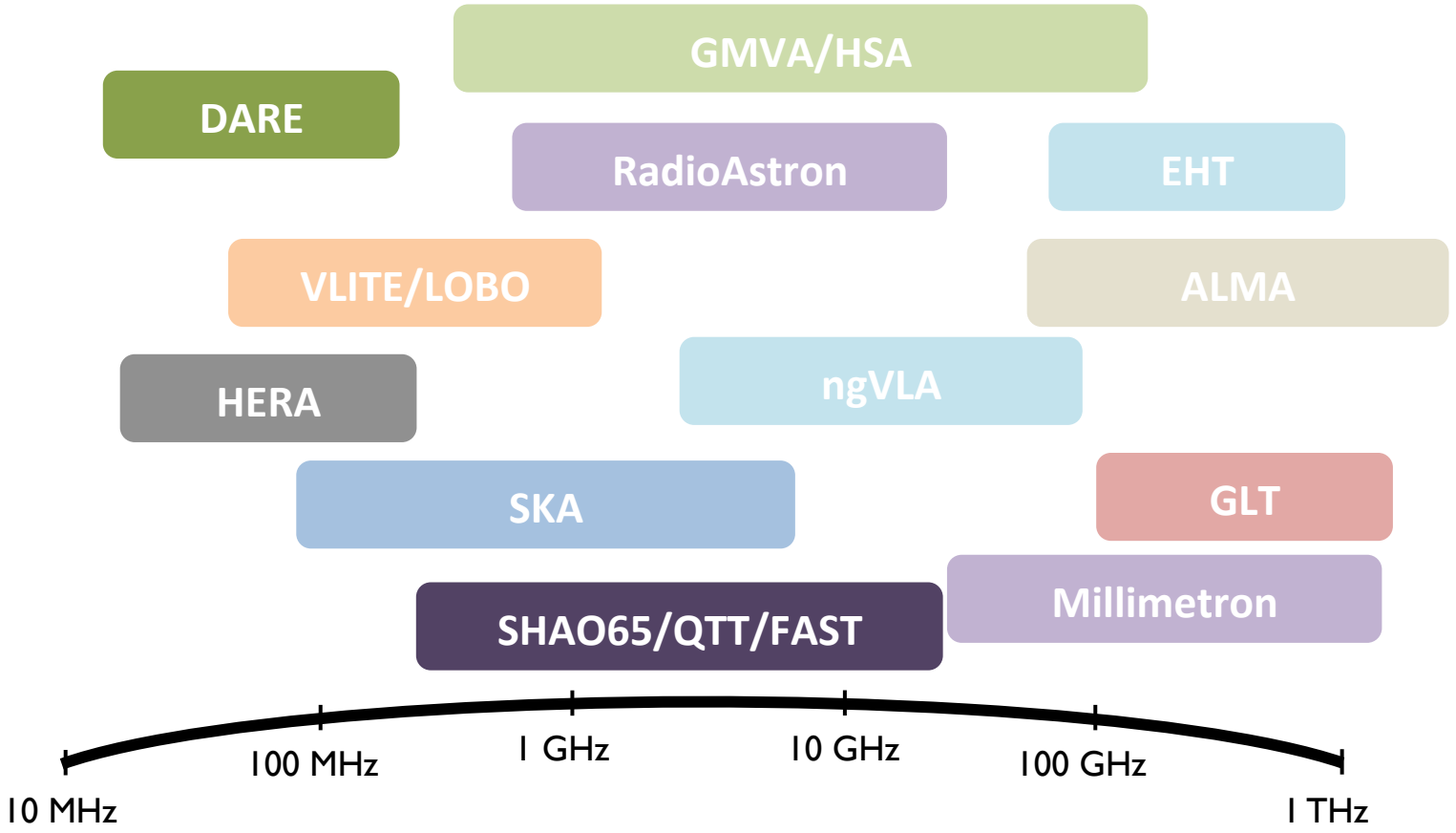
LOBO-LWA

World-class meter-decameter, high angular resolution imaging *user-facility*, commensal w/ NGVLA

$20 < \nu < 86$ MHz [mJy, arc-sec]
$220 < \nu < 480$ MHz [sub-mJy, sub-arc-sec]

VLITE: VLA Low Band Ionospheric & Transient Experiment
LOBO: VLA Low Band Observatory

University & National Lab/DoD Partnership: NRL, NRAO, UNM



Community input on future initiatives needed

Kavli Meetings

- Planning three community-wide meetings over next two years to discuss future of US astronomy/radio astronomy
- Kavli Foundation & AUI sponsorship – travel support
- Goals: examine science opportunities over next decade across radio spectrum, interactions with OIR/other initiatives, develop a community strategy
- Organizing committee being formed – call for participation soon
- When? stay tuned. Fall 2015…

Summary

- NRAO operates four world-class instruments for the astronomy community, enabling leading-edge science – exciting 2015 ahead..
- Monitor significant external factors: Portfolio Review, Federal budget/politics, evolving community needs, global landscape
- Priority initiatives: SRDP, major science opportunities, larger STEM/Diversity footprint, strategic planning
- NRAO (with AUI) will continuing our work to overcome external challenges and make necessary internal changes to improve the Observatory and maintain a high level of service to our users
- Appreciate the support of NSF and the community that inspires us
- Many thanks to the NRAO crew that makes it all happen.

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science.nrao.edu

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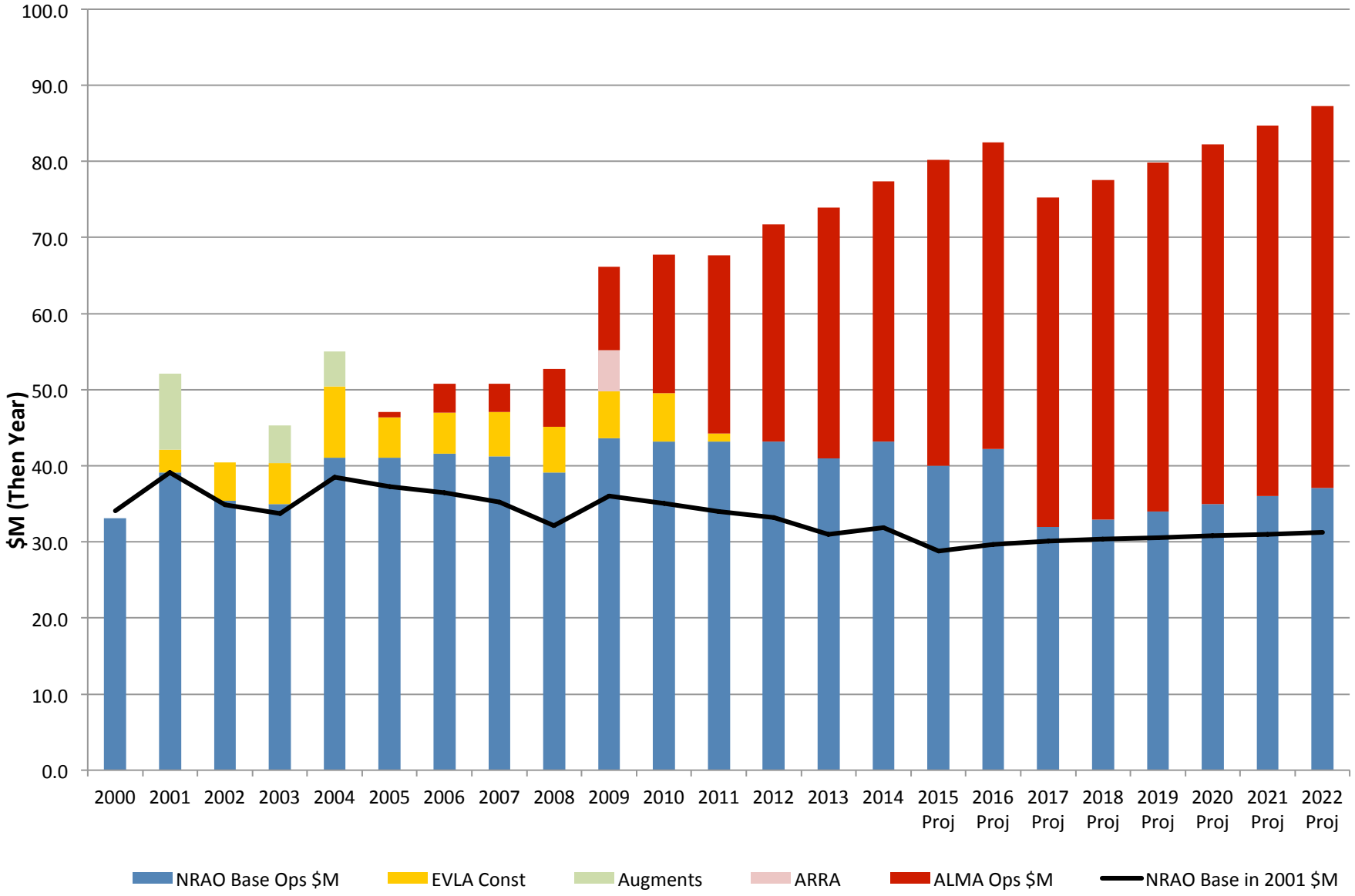
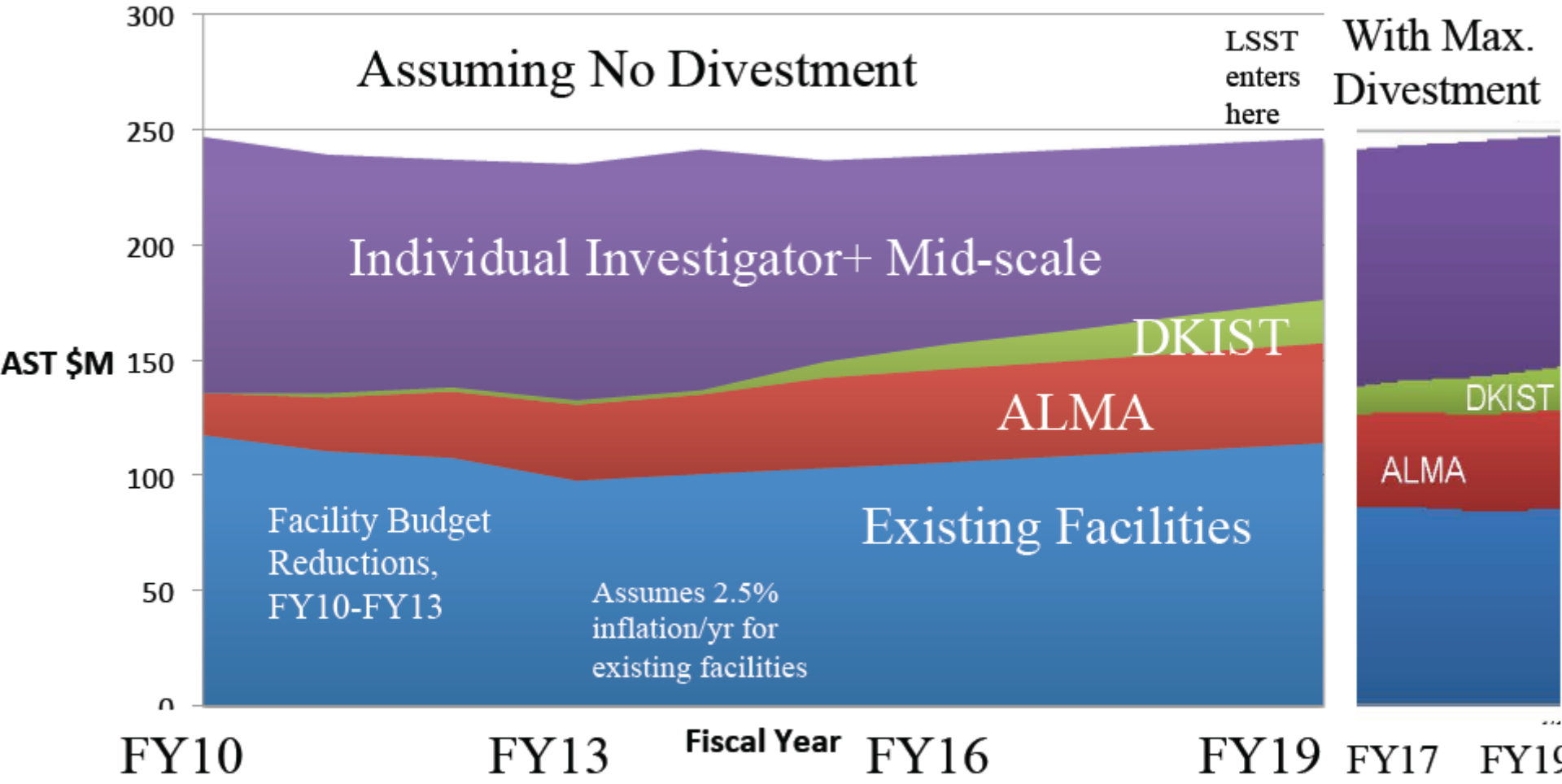
NRAO Budget History & Projection



AST Portfolio Scenarios



AST budget assumption: FY15=Request, 1%/yr growth thereafter

SURVIVAL

When you are in deep trouble,
say nothing, and try to look like
you know what you're doing.