

Observing Summary

2001



National Radio
Astronomy
Observatory

A facility of the National
Science Foundation operated
under cooperative agreement
by Associated Universities, Inc.

NRAO

NATIONAL RADIO ASTRONOMY OBSERVATORY

**Observing Summary
2001 Statistics**



April 2002

Scientific Highlights



Observing Summary 2001

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- **GBT Maps Venus with Bi-Static Radar.** The Green Bank Telescope's first new scientific results, conducted March 24-26, 2001, were bi-static radar observations of Venus and a close-passing asteroid, in participation with Arecibo. Both GBT and Arecibo received the return echo of S-band delay Doppler radar signals transmitted by Arecibo. The objective was to image high reflectivity areas of Maxwell Montes and Beta Region. The GBT/Arecibo system provides altimetry measurements at a spatial resolution about 5-15 times that of the 1990 Magellan orbiter mission. Imaging information comes from a combination of the delay Doppler echo and interferometric fringes between Arecibo and GBT. Venus was at inferior conjunction, an ideal time. The north-south baseline between Arecibo and GBT aligned with the spin axis of Venus, allowing best interpretation of the radar echos. In addition, radar images of a close-passing asteroid, 1001 EC 16, were obtained only two weeks after its discovery. It was passing by Earth at about 8 times the Earth-Moon distance.
- **Gamma-Ray Burst Host Galaxy Detected.** Observers have made the first detection of radio emission from the host galaxy of a gamma-ray burst (GRB), long after the GRB afterglow has faded away. The detection required more than 70 hours of VLA integration at several frequencies, over a time period between 1-3 years after the burst. The combination of the non-variable radio emission with optical spectroscopy provides evidence that the persistent radio source comes from a starburst galaxies which is forming massive stars at a rate of about 500 solar masses per year, more than 25 times the rate indicated by optical observations. The difference is explained by dust extinction. This result offers the possibility of using GRB-selected galaxies to make an unbiased study of the history of star formation in the universe.
- **VLBA Finds Time-Variable Rotation Measures in Quasar Cores.** Observers have demonstrated for the first time that Faraday Rotation Measures in the nuclei of the quasars 3C273 and 3C279 change significantly on time scales of months. The discovery was made possible by the very high angular resolution, frequency agility, and good polarization characteristics of the VLBA. Previous, lower resolution, observations were dominated by the emission from the less variable jet components far removed from the central engine. The observed variations can tell us about the magnetic fields and density in the immediate environment of the central engine in quasars.
- **The Orion Nebula at 3.6 cm: First Combination of VLA and GBT Data.** This is the first such combination of images and results in a final image that is sensitive to emission on all angular scales down to a resolution of 8.4 arcsec. The GBT image was taken in "on-the-fly" mode on November 1, 2001, and covers a field of about 90 x 90 arcmin. The dynamic range of the image is 11,900:1 and is believed to be the highest dynamic range ever achieved with a single-dish telescope. All flux from the source within the observed bandwidth is retrieved by the GBT, and the image reveals the large scale structure of the nebula. The VLA image is a 3 x 3 mosaic taken in D Array configuration on October 4, 2000. The mosaic covers about 7 x 7 arcmin with a synthesized beam of 8.4 arcsec. The high-resolution VLA image reveals numerous filaments and bright rims of emission. The combination of the two images, performed with AIPS++ software, provides a complete image for full interpretation of both small- and large-scale features. This is a powerful new imaging capability and is expected to be the first of many combinations of GBT and VLA data.

- **VLA-Pie Town Link Reveals Accretion Disk of Massive Young Star.** The disk is solar-system-sized and circumscribes the young stellar object G192.16-3.82. This object powers one of the largest stellar outflows in the Galaxy. The accretion disk found around this 8-10 solar mass object contains about 20 solar masses. In addition to revealing the inner accretion disk, the VLA showed the inner portion of the outflow and also revealed that the young star has a companion. This is the first time an inner accretion disk has been observed around a massive young star.
- **Six-Image Gravitational Lens System Discovered.** Using the VLBA and Hubble Space Telescope, observers have found the first gravitational lens in which the image of a single background galaxy has been split into six individual images. The lensing is produced by the gravitational field of three intermediate galaxies along the line of sight to Earth. The system is of considerable interest as an intermediate case between lensing produced by single galaxies and that produced by clusters of more numerous galaxies, and thus can be used as a test bed for computational models. VLBA spectral index data on the individual components was critical to confirming the system as a lens.
- **GBT Discovers Three New Binary Millisecond Pulsars** in the globular cluster M62. Discovery observations at 1.4 GHz were made for four hours on August 16, 2001, with the Berkeley-Caltech Pulsar Machine, and confirming results were made in early December. Pulsars were searched at the dispersion measure of the three previously known pulsars in the cluster. PSR J1701-3006D has a spin period of 3.418 ms, an orbital period of 1.118 days, and a minimum companion mass of 0.12 solar masses. PSR J1701-3006E has a 3.234 ms spin period and is orbited by a companion of at least 0.03 solar masses every 0.16 days. PSR J1701-3006F has a 2.295 ms spin period, an orbital period of 0.2 days, and a minimum companion mass of 0.02 solar masses. M62 is the third globular cluster containing six or more known radio pulsars.
- **Black-Hole Microquasar may be Relic of Early Globular-Cluster Star.** An X-ray binary including a 7-solar-mass black hole and an 0.3 solar-mass companion has been shown to have an orbit in the Galaxy's halo, leading researchers to conclude that the black hole is the relic of a very massive star that formed in a globular cluster in the early stages of the Galaxy's history. VLBA observations revealed the object's proper motion, and its proper-motion history later was extended back 43 years by use of digitized Palomar Observatory Sky Survey data produced by Space Telescope Science Institute (STScI). The halo orbit is believed to be the result of the black hole's ejection from the globular cluster through gravitational interaction with other cluster black holes. The companion, now stripped of its outer layers by the black hole, is presumed to have been captured prior to the ejection. This is the first direct evidence of a blackhole remnant of one of the Galaxy's very early supermassive stars.
- **New VLA 74 MHz System Detects Radio Relics.** With the new 74 MHz array, observers have been able to detect steep-spectrum radio emission straddling the center of the merging cluster system Abell 754. Because of the steep spectrum of the radiation it was detected only at 74 MHz and not with the 330 MHz system of the VLA. The location, morphology, and spectrum of the radio emission, as well as the merger shock waves identified at X-ray wavelengths, support the identification of the steep-spectrum radio sources as "radio relics" whose particle acceleration may have resulted from the cluster mergers.

Observing Hours



Observing Summary 2001

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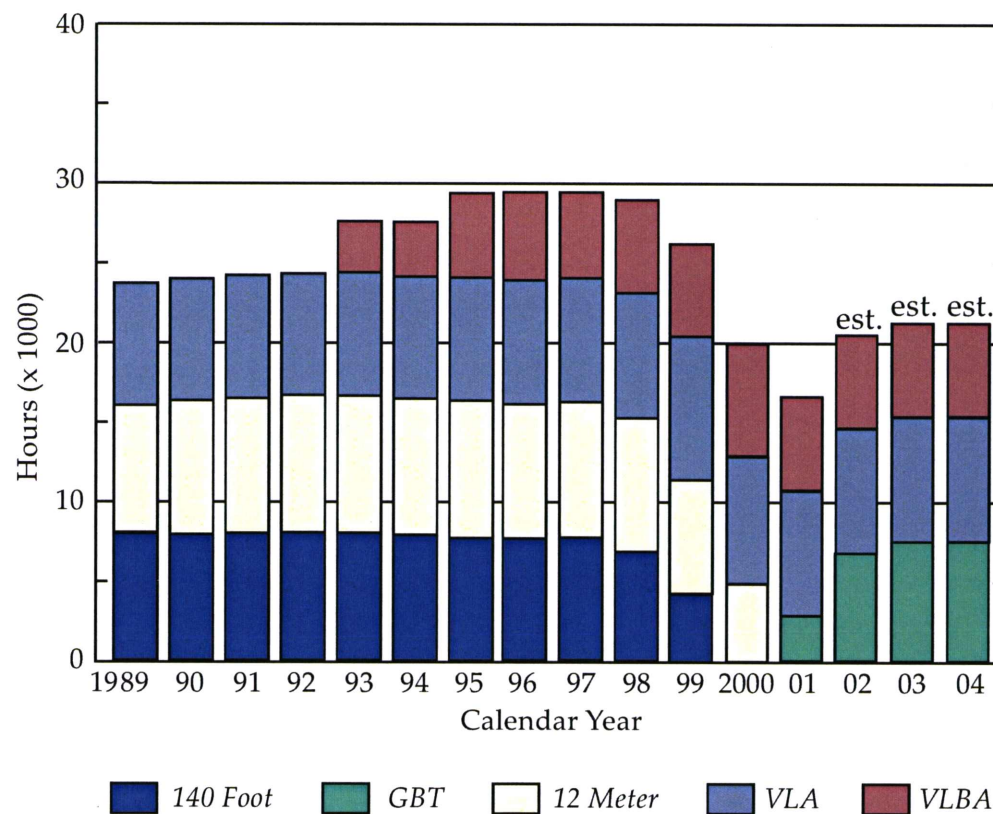


Figure 1. This figure shows the hours for observing on each telescope during the last 16 years. It includes astronomical observing, testing, calibration and commissioning.

Distribution of Scheduled Observing Time

Observing Summary 2001



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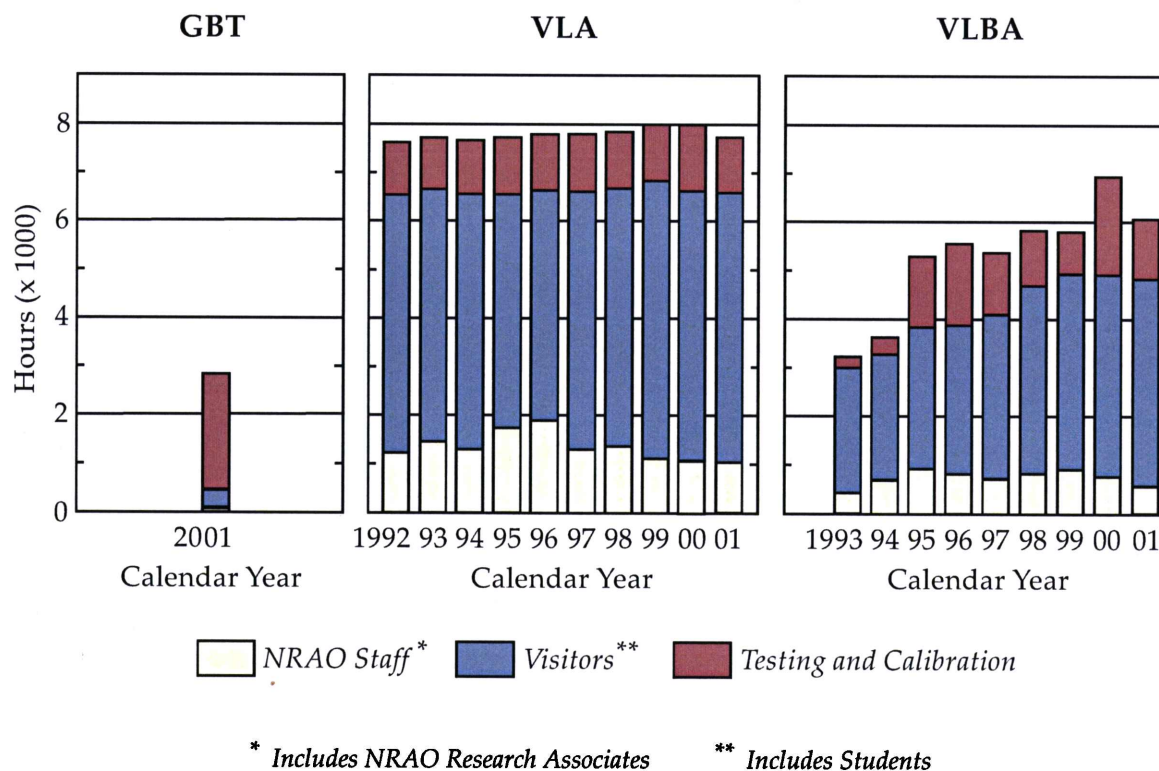


Figure 2. These graphs show the number of hours scheduled for testing and calibration, and for observing by the NRAO staff and by visitors on each telescope system.

Green Bank Telescope Summary



Observing Summary 2001

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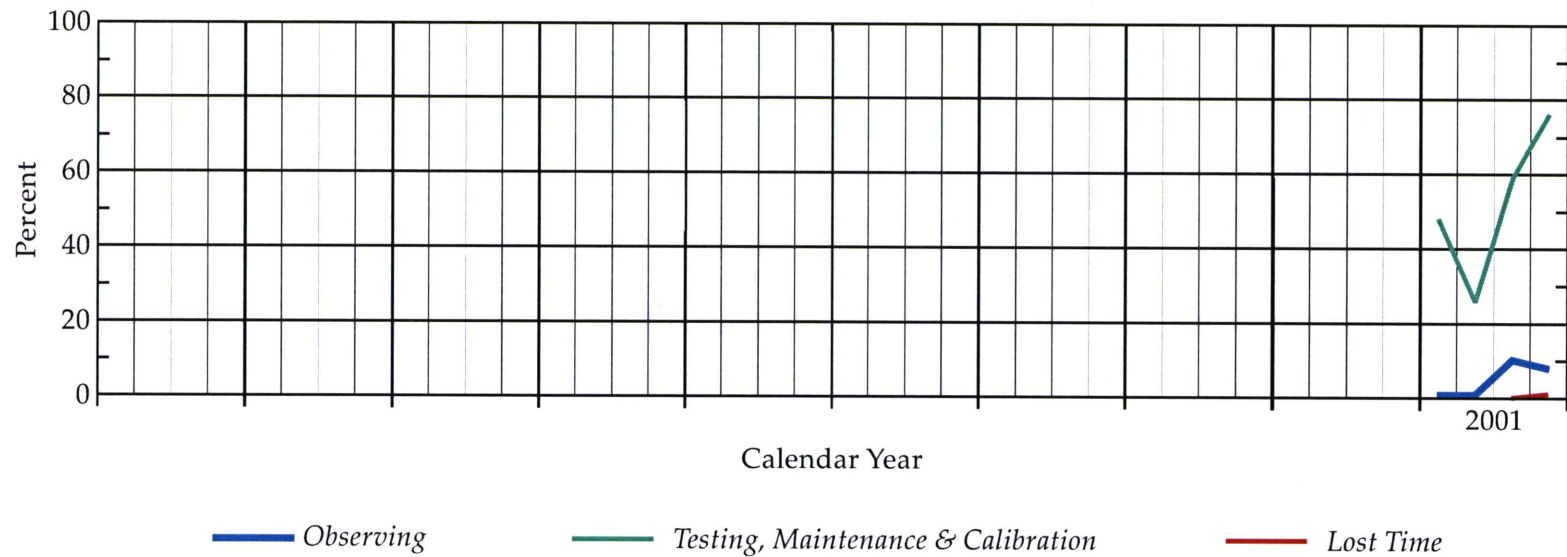


Figure 3. This summary for each quarter of the calendar year shows the percentage of the total time in the year (8760 hours) that the telescope was scheduled for observing; for commissioning, maintenance, and calibration; and the percentage of time lost due to equipment failure, bad weather, and radio interference.

Very Large Array Telescope Summary



Observing Summary 2001

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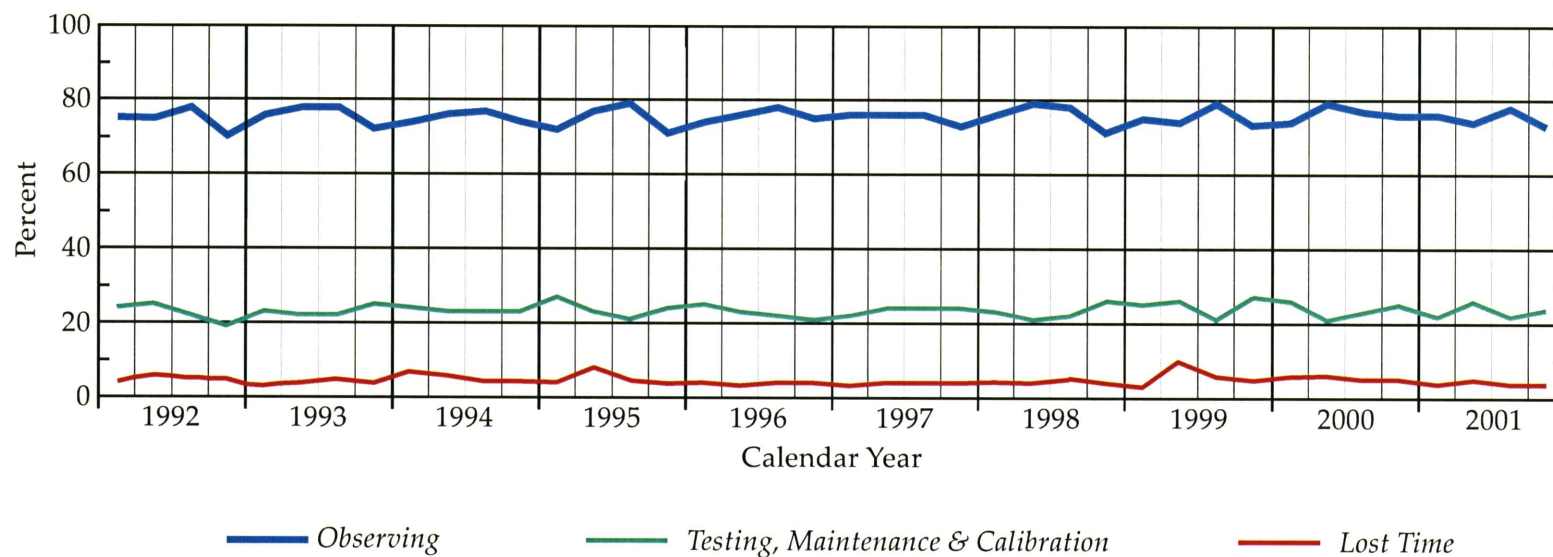


Figure 4. This summary for each quarter of the calendar year shows the percentage of the total time in the year (8760 hours) that the telescope was scheduled for observing; for routine system testing, maintenance, and calibration; and the percentage of time lost due to equipment failure, bad weather, and radio interference.

Very Long Baseline Array Telescope Summary

Observing Summary 2001



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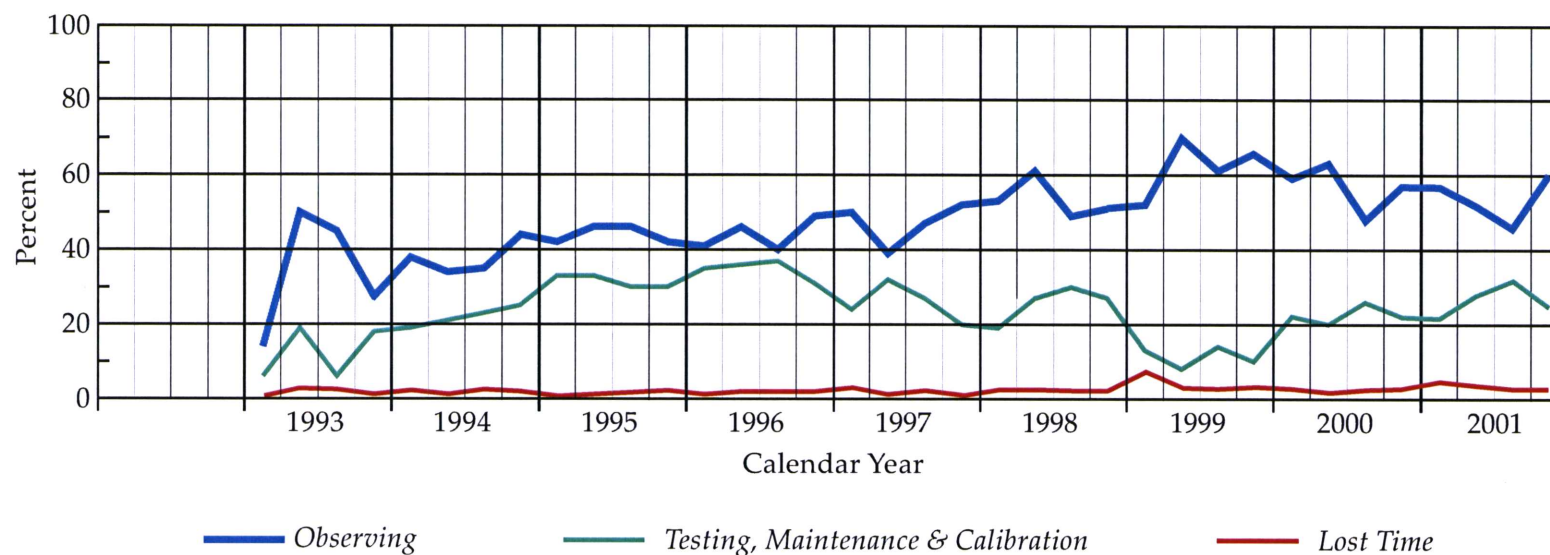


Figure 5. This summary for each quarter of the calendar year shows the percentage of the total time in the year (8760 hours) that the telescope was scheduled for observing; for routine calibration, maintenance, and installation of new experiments; and the percentage of time lost due to equipment failure, bad weather, and radio interference. It should be noted that about 15 percent of the time cannot be scheduled as it results from the time difference across the array; this is reflected as a difference in the time between the end of one program and the start of the next.

Full-Time Employees



Observing Summary 2001

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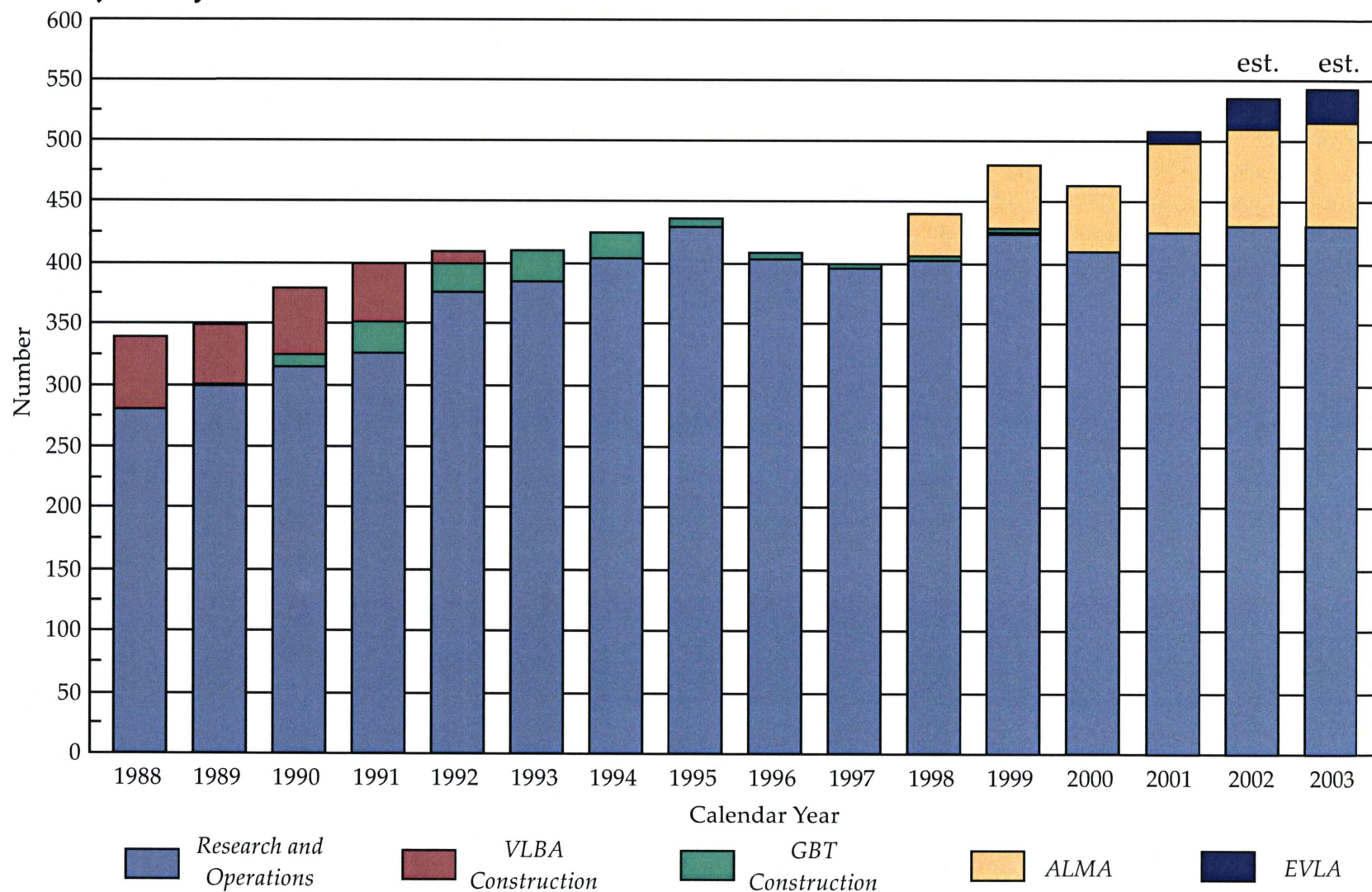


Figure 6. This figure shows the total number of NRAO full-time employees at the end of each year, projected into the future.

Number of People Observing with NRAO Telescopes

Observing Summary 2001



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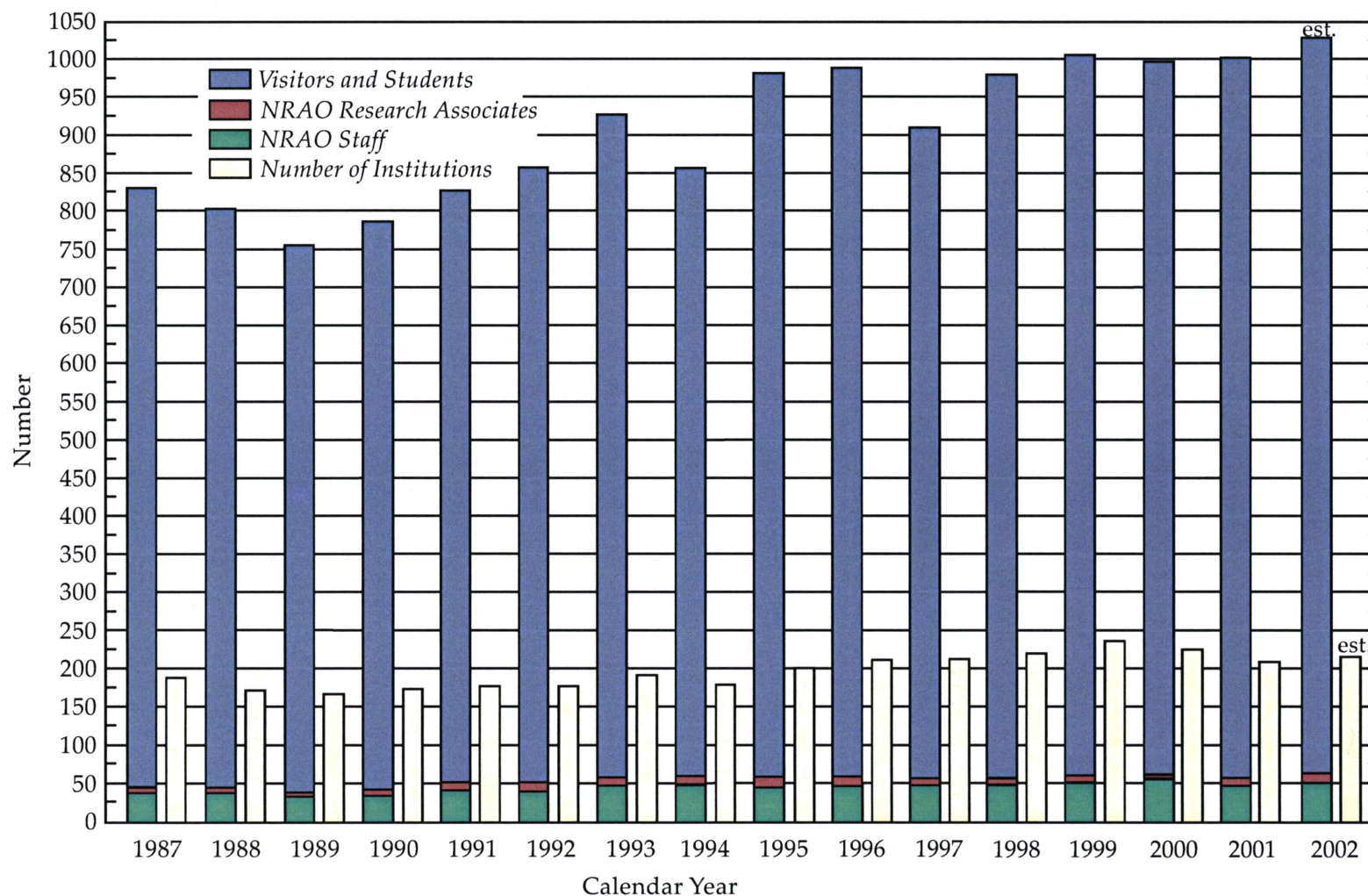


Figure 7. The bar chart shows for each calendar year the number of NRAO research staff and the number of NRAO research associates who used the telescopes. In addition, it shows the total number of visitor-users of NRAO telescopes and the number of institutions from which the NRAO visitors came.

Distribution of Scheduled Observing Programs



Observing Summary 2001

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In Various Research Areas, by Percent

	GBT	VLA	VLBA	Overall
I. SOLAR SYSTEM — Sun, Planet, Satellites, and Comets	10%	7%	0%	4%
II. STELLAR — Pulsars, X-ray Sources, Planetary Nebulae, Circumstellar Shells, Supernova Remnants, Masers, Novae, Supernovae, and Stars	61%	10%	17%	15%
III. GALACTIC — Galactic Structure, Center, Molecular Clouds, H II Regions, Star Formation, Molecules, and Interstellar Medium	29%	21%	12%	18%
IV. EXTRAGALACTIC — Normal and Active Galaxies, Radio Galaxies, Clusters, Quasars, VLBA Studies, Extragalactic Molecules, and Cosmology	0%	62%	71%	63%

Distribution of Telescope Time by Percent



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	GBT	VLA	VLBA	2001 Summary
Visitors	3%	56%	44%	34%
Students	1%	7%	4%	4%
NRAO Staff	0%	9%	6%	5%
Research Associates at NRAO	1%	3%	1%	2%
Test and Calibration	27%	13%	14%	18%
Maintenance and Installation	25%	11%	12%	16%
Holidays and Unscheduled	43%	1%	20%	21%

Institutions Whose Visitors Used NRAO Telescopes in 2001



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		VLA	VLBA	GBT
1	Academia Sinica, IAA (Taiwan)	X		
2	Adelaide University (Australia)		X	
3	Agnes Scott College (GA)	X		
4	Alabama, University of (AL)		X	
5	Amsterdam, University of - Astronomy Institute (Netherlands)	X	X	
6	Anglo Australian Observatory - UKSTU (Australia)	X		
7	Arcetri Astrophysical Observatory (Italy)	X	X	
8	Arizona State University (AZ)	X	X	
9	Arizona, University of - Steward, LPL, SMTO (AZ)	X		
10	Astrofisica, Optica y Electronica, Instituto Nacional de (INAOE) (Mexico)	X		
11	Astronomical Society of Rowan County (NC)	X		
12	Astrophysical Institute, Potsdam (Germany)	X		
13	Astrophysique de Paris, Institute d' (IAP) (France)	X	X	
14	Australian National University (Australia)	X		
15	Barcelona, University of (Spain)	X	X	
16	Beijing Astronomical Observatory (China)	X	X	
17	Bochum, Ruhr-Universitat (Germany)	X		
18	Bologna, Istituto di Radioastronomia, CNR - Stazione VLBI di Noto (Italy)	X		
19	Bologna, Universita degli Studi Di (Italy)	X	X	
20	Bonn University (Germany)	X		

Institutions Whose Visitors Used NRAO Telescopes in 2001



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		VLA	VLBA	GBT
21	Bordeaux, Observatoire de (France)	X	X	
22	Boston College (MA)		X	
23	Boston University (MA)	X		
24	Brandeis University (MA)	X	X	
25	Bristol - Cantock Close (UK)	X		
26	Byurakan Astrophysical Observatory (Armenia)	X		
27	Calgary, University of (Canada)	X		
28	California, University of, Berkeley - Hat Creek (CA)	X	X	X
29	California, University of, Davis (CA)	X	X	
30	California, University of, Los Angeles (CA)	X	X	
31	California, University of, Santa Barbara (CA)	X	X	
32	California, University of, Santa Cruz - Lick Obs. (CA)	X	X	X
33	Caltech - OVRO, Palomar, Big Bear Solar (CA)	X	X	X
34	Cambridge University - Cavendish, MRAO, IoA (UK)	X	X	
35	Canada-France-Hawaii Telescope (HI)	X		
36	Canada, Royal Military College (Canada)	X		
37	Cantabria, Instituto de Fisica (Spain)	X	X	
38	Case Western Reserve University (OH)	X		
39	Catania University (Italy)		X	
40	CEA/DSM/DAPNIA (France)	X		

Institutions Whose Visitors Used NRAO Telescopes in 2001



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		VLA	VLBA	GBT
41	Chalmers-Onsala Space Observatory (Sweden)	X	X	
42	Chicago, University of - Yerkes Obs. (IL)	X	X	
43	Chile, University of (Chile)	X	X	
44	CNRS - CEN, Saclay (France)	X	X	
45	Cologne, University of (Germany)	X		
46	Colorado, University of - JILA, CASA, LASP (CO)	X	X	
47	Columbia University (NY)	X	X	
48	Connecticut, University of (CT)		X	
49	Copenhagen University Observatory (Denmark)	X		
50	Cornell University (NY)	X	X	X
51	CSIRO - ATNF, Parkes Obs. (Australia)	X	X	X
52	Dartmouth College (NH)	X		
53	Delaware, University of (DE)	X		
54	Denison University (OH)	X		
55	Dominion Astrophysical Obs (Canada)	X		
56	Dominion Radio Astrophys Obs (Canada)	X		
57	Durham, University of (UK)	X	X	
58	Edinburgh, University of (UK)	X	X	
59	European Southern Obs (Chile, Germany)	X		
60	European Space Agency - ESTEC, EXOSAT (Netherlands)	X		

Institutions Whose Visitors Used NRAO Telescopes in 2001



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		VLA	VLBA	GBT
61	Fermi National Accelerator Lab (IL)		X	
62	Florida International University (FL)	X		
63	Florida, University of (FL)	X		
64	Furman University (SC)	X		
65	George Mason University (VA)		X	
66	Graduate University for Advanced Studies (Japan)	X	X	
67	Groningen, University of - Kapteyn Institute (Netherlands)	X	X	
68	Guanajuato, Universidad de (Mexico)	X	X	
69	Hartebeesthoek Radio Astronomy Observatory (South Africa)		X	
70	Harvard-Smithsonian Center for Astrophysics - Harvard, SAO, Whipple (MA)	X	X	X
71	Haverford College (PA)	X		
72	Hawaii, U. of - Institute for Astronomy (HI)	X		
73	Haystack Observatory - NEROC (MA)	X	X	
74	Helsinki University of Tech. - Metsahovi Radio Obs. (Finland)		X	
75	IAFE - Buenos Aires (Argentina)	X		
76	Ibaraki University (Japan)	X		
77	IBM Research Division (NY)	X		
78	Illinois, University of - Vermillion River Obs (IL)	X	X	
79	Imperial College (London)	X		
80	Indiana, University of (IN)	X		

Institutions Whose Visitors Used NRAO Telescopes in 2001



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		VLA	VLBA	GBT
81	Infrared Processing and Analysis Center (CA)	X	X	
82	Inst Space & Aeronautical Sciences (Japan)	X	X	
83	Institute Radio Astronomie Millimetrique (France)	X		
84	Instituto Argentino de Radioastronomia (Argentina)	X		
85	Instituto de Astrofisica Canarias (IAC) (Spain)	X	X	
86	Instituto de Astrofisica de Andalucia (IAA) (Spain)	X	X	
87	Ioannina, University of (Greece)	X		
88	Iowa, University of (IA)		X	
89	Jaen University (Spain)		X	
90	Jagellonian University (Poland)	X		
91	Jet Propulsion Laboratory - Goldstone (CA)	X	X	X
92	Johns Hopkins University (MD)	X		
93	Kagoshima University (Japan)		X	
94	Keele, University of (UK)	X		
95	Kent, University of (UK)	X		
96	Kentucky, University of (KY)	X	X	
97	Kyoto University (Japan)	X		
98	La Plata, Universidad Nacional de (Argentina)	X		
99	Lancashire, University of Central (UK)	X	X	
100	Lawrence Livermore National Laboratory (CA)	X		

Institutions Whose Visitors Used NRAO Telescopes in 2001



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	VLA	VLBA	GBT
101 Lebedev Physics Institute - ASC (Russia)		X	
102 Leeds, University of (UK)		X	
103 Leicester, University of (UK)	X		
104 Leiden University - Huygens Labs (Netherlands)	X	X	
105 Lisbon, University of (Portugal)	X	X	
106 Liverpool John Moores University (UK)	X		
107 Lowell Observatory (AZ)	X		
108 Madeira University (Portugal)	X	X	
109 Manchester, University of - Jodrell Bank, NRAL (UK)	X	X	X
110 Manitoba, University of (Canada)	X		
111 Maryland, University of - Clark Lake Obs (MD)	X	X	
112 Massachusetts Institute of Technology - Lincoln Labs (MA)	X	X	
113 Massachusetts, University of - FCRAO (MA)	X	X	
114 McGill University (Canada)			X
115 Mexico, University of - UNAM (Mexico)	X	X	
116 Michigan, University of (MI)	X	X	
117 Milano, Osservatorio Astronomico di Brera, (Italy)	X		
118 Minnesota, University of (MN)	X		
119 Montreal, University of (Canada)	X		
120 Moscow State U - Sternberg State Astronomy Institution (Russia)	X	X	

Institutions Whose Visitors Used NRAO Telescopes in 2001



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		VLA	VLBA	GBT
121	MPIA Heidelberg (Germany)	X		
122	MPIAP Munich (Germany)	X		
123	MPIfEP Garching (Germany)	X		
124	MPIR Bonn (Germany)	X	X	
125	NASA/Goddard Space Flight Center (MD)	X	X	X
126	National Astron & Ionosphere Ctr - Arecibo Observatory (NY)	X	X	
127	National Research Council (Canada)	X		
128	National Astronomical Observatory of Japan (Japan)	X	X	
129	National Center for Radio Astrophysics (India)	X	X	
130	National Central University, IoA (Taiwan)	X		
131	National Optical Astronomy Observatory (AZ)	X	X	
132	National Radio Astronomy Observatory (VA,NM,AZ,WV)	X	X	X
133	National Science Foundation (DC)	X		
134	Naval Research Laboratory (DC)	X	X	
135	New Jersey Inst. of Technology (NJ)	X		
136	New Mexico Inst. of Mining Technology (NM)	X		
137	New Mexico State University (NM)	X	X	
138	New Mexico, University of (NM)	X	X	
139	New South Wales, University of (Australia)	X	X	
140	Newcastle, University of (UK)	X		

Institutions Whose Visitors Used NRAO Telescopes in 2001



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		VLA	VLBA	GBT
141	NFRA - JIVE, Dwingeloo, Zwiggelte, Westerbork (Netherlands)	X	X	
142	Nicolaus Copernicus University - Torun Centre for Astronomy (Poland)		X	
143	Nobeyama Observatory (Japan)		X	
144	North Carolina State University (NC)	X		
145	Northwestern University (IL)	X		
146	Obs. Carnegie Instit. of Washington - Santa Barbara Street, DTM (CA, DC)	X	X	
147	Observatory Astronomico Nacional (Spain)	X	X	
148	Ohio State University (OH)	X		
149	Oxford University (UK)	X		
150	Padova, University of (Italy)	X		
151	Palermo, University of (Italy)		X	
152	Paris, Observatoire de (Meudon) - DEMIRM (France)		X	
153	Paris, Observatoire de (Paris) (France)	X		
154	Paul Scherrer Institute (Switzerland)	X		
155	Pennsylvania State University (PA)	X		
156	Pennsylvania, University of (PA)	X	X	
157	Potchefstroom, University of (South Africa)		X	
158	Princeton University (NJ)	X		X
159	Puerto Rico University (Puerto Rico)	X		
160	Purple Mountain Observatory, Nanjing (China)		X	

Institutions Whose Visitors Used NRAO Telescopes in 2001



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		VLA	VLBA	GBT
161	Queens University (Canada)	X		
162	Radiometrics, Inc. (MD)		X	
163	Raman Research Institute (India)	X	X	
164	Rome Astronomical Observatory (Italy)	X	X	
165	Royal Observatory of Belgium (Belgium)	X		
166	Rutgers, State University of New Jersey (NY)	X		
167	Sao Paulo, University - IAG (Brazil)		X	
168	Satellite Geodetic Observatory (FOMI SGO) (Hungary)		X	
169	Seoul National University (Korea)	X		
170	SETI Institute (CA)		X	
171	Shanghai Observatory (China)	X	X	
172	Sheffield, University of (UK)	X	X	
173	Smithsonian Institute - Laboratory for Astrophysics (DC)			X
174	Southampton, University of (UK)	X	X	
175	Space Telescope Science Institute (MD)	X	X	
176	St. Petersburg State University (Russia)		X	
177	Stanford University (CA)	X		
178	Stockholm Observatory (Sweden)	X		
179	Swiss Federal Institute of Tech - ETH (Switzerland)	X	X	
180	Sydney, University of (Australia)	X	X	

Institutions Whose Visitors Used NRAO Telescopes in 2001



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		VLA	VLBA	GBT
181	Tasmania, University of (Australia)		X	
182	Tata Institute Fundamental Research - GMRT, RAC (India)	X		
183	Thuringer Landessternwarte - Karl Schwarzschild Observatory (Germany)	X		
184	Tohoku University (Japan)	X	X	
185	Tokyo, University of - Tokyo Astronomy Observatory (Japan)	X		
186	Torino University (Italy)	X	X	
187	Toronto, University of - David Dunlap Observatory CITA (Canada)	X		
188	Trieste, Osservatorio Astronomico (Italy)	X		
189	Trinity College (TX)		X	
190	Tufts University (MA)	X		
191	Turku, University of - Tuorla Observatory (Finland)	X	X	
192	Union College (NY)		X	
193	United States Naval Academy (MD)	X		
194	United States Naval Observatory (DC)	X	X	
195	University College London - MLSS (UK)	X	X	
196	Utrecht, Universiteit (Netherlands)	X	X	
197	Valencia, University of (Spain)		X	
198	Vassar College (NY)	X		
199	Vienna University (Austria)	X		
200	Villanova University (PA)	X		

Institutions Whose Visitors Used NRAO Telescopes in 2001



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		VLA	VLBA	GBT
201	Virginia, University of (VA)	X	X	
202	Wales, University of, Cardiff (Wales)	X	X	
203	Washington, University of (WA)	X		
204	Wesleyan University (CT)	X		
205	Wisconsin, University of - Washburn Observatory (WI)	X	X	
206	Yale University (CT)	X	X	
207	York University (Canada)	X	X	
208	Yunnan Observatory (China)		X	
NUMBER OF INSTITUTIONS		176	114	13
NUMBER OF VISITORS		669	397	16
NUMBER OF STUDENTS		69	39	2
NUMBER OF RESEARCH ASSOCIATES AT NRAO		7	4	2
NUMBER OF PERMANENT STAFF		41	35	0
TOTAL OBSERVERS		711	432	20

All told, 942 visitors, including 90 students, from 208 institutions.

NRAO Student Program



Observing Summary 2001

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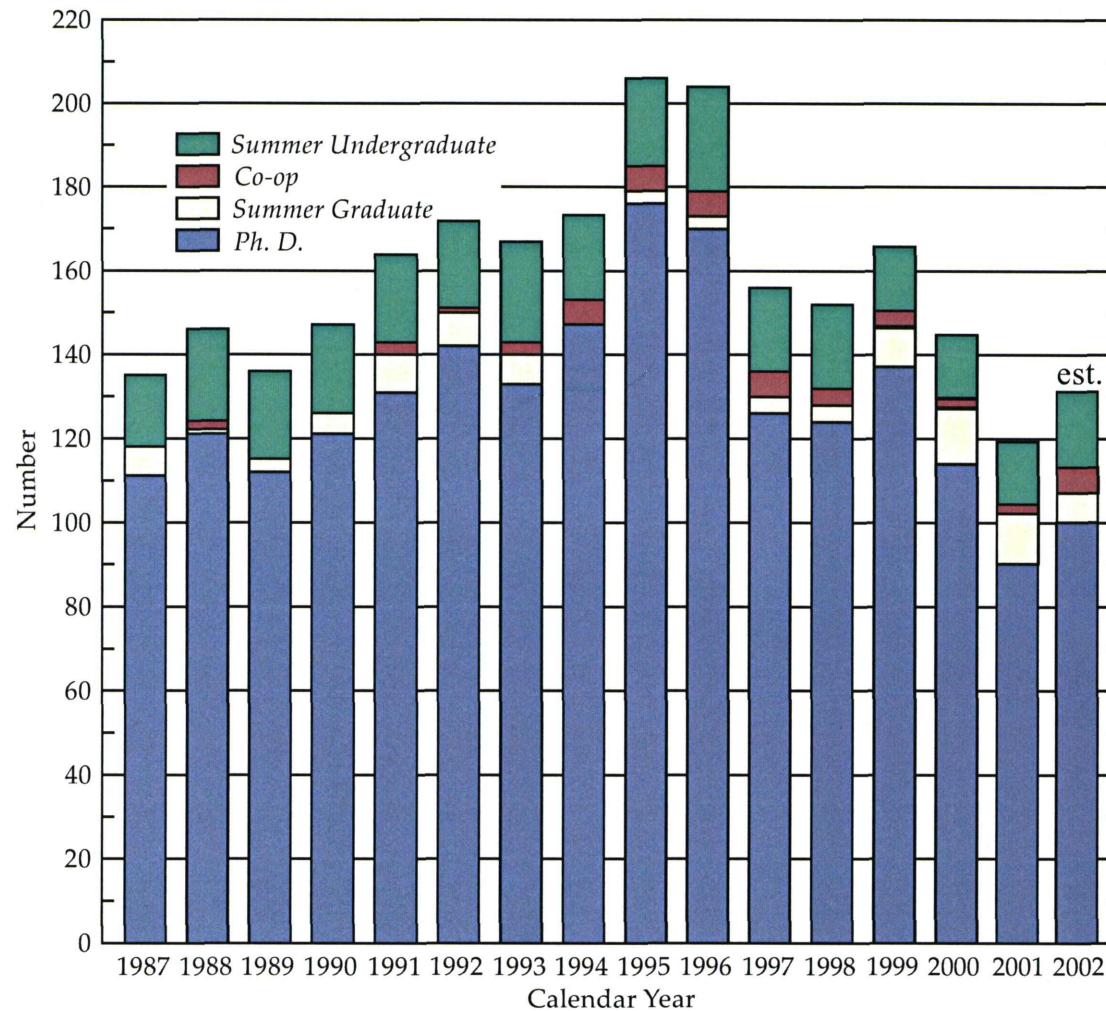


Figure 8. This figure shows for each calendar year the number of PhD students (salaried at NRAO and non-salaried), co-op students, and summer undergraduate and graduate students who observed or worked at the NRAO during that year. Beginning in 1987 the majority of the undergraduate summer students were funded by a separate NSF Grant for Research Experience for Undergraduates.

NRAO Front-End Status - Very Long Baseline Array



Observing Summary 2001

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March-02

FREQUENCY (MHz)	AMPLIFIER TYPE	SYSTEM TEMPERATURE (KELVIN)	3 db BANDWIDTH (MHz)	FEED TYPE	POLARIZATION	CALIBRATION VALUE	SWITCHING SYSTEM	REMARKS	PERSON(S) IN CHARGE
312 - 342	UNCOOLED FET	200	30	PRIME FOCUS	DUAL ORTHOGONAL CIRCULAR	10	NOISE INJECTION 80 Hz 50 PERCENT CYCLE		MERTELY
596 - 622	UNCOOLED FET	200	30 OR 4	PRIME FOCUS	DUAL ORTHOGONAL CIRCULAR	5	NOISE INJECTION 80 Hz 50 PERCENT CYCLE		MERTELY
1350 - 1750	COOLED FET	30	128	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	2	NOISE INJECTION 80 Hz 50 PERCENT CYCLE		MERTELY
2150 - 2350	COOLED FET	35	128	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	2	NOISE INJECTION 80 Hz 50 PERCENT CYCLE		MERTELY
4600 - 5100	COOLED FET	40	128	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	2	NOISE INJECTION 80 Hz 50 PERCENT CYCLE		MERTELY
8000 - 8800	COOLED FET	37	128	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	3	NOISE INJECTION 80 Hz 50 PERCENT CYCLE		MERTELY
12000 - 15400	COOLED FET	60	128	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	4	NOISE INJECTION 80 Hz 50 PERCENT CYCLE		MERTELY
21700 - 24100	COOLED FET	100	128	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	5	NOISE INJECTION 80 Hz 50 PERCENT CYCLE		MERTELY
41000 - 45000	COOLED FET	120	128	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	8	NOISE INJECTION 80 Hz 50 PERCENT CYCLE		MERTELY
80000 - 96000	COOLED FET	110	128	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	50	NOISE INJECTION 80 Hz 50 PERCENT CYCLE	PT, MK, FD, KP, OV & NL LA ONLY 80000 - 90000	MERTELY

NRAO Front-End Status - Very Large Array



Observing Summary 2001

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March-02

FREQUENCY (MHz)	AMPLIFIER TYPE	SYSTEM TEMPERATURE (KELVIN)	3 db BANDWIDTH (MHz)	FEED TYPE	POLARIZATION	CALIBRATION VALUE	SWITCHING SYSTEM	REMARKS	PERSON(S) IN CHARGE
74	UNCOOLED FET	~1200	0.8	PRIME FOCUS	DUAL ORTHOGONAL CIRCULAR	120	NOISE INJECTION 9.6 Hz 50 PERCENT CYCLE	INSTALLED BETWEEN 001208 - 010313	MERTELY
308 - 343	UNCOOLED FET	150	3 MHz (LIMITED BY INTERFERENCE)	PRIME FOCUS	DUAL ORTHOGONAL CIRCULAR	10	NOISE INJECTION 9.6 Hz 50 PERCENT CYCLE		MERTELY
1340 - 1730	COOLED FET	35	55	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	4	NOISE INJECTION 9.6 Hz 50 PERCENT CYCLE		MERTELY
4500 - 5000	COOLED FET	60	55	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	4	NOISE INJECTION 9.6 Hz 50 PERCENT CYCLE		MERTELY
8000 - 8800	COOLED FET	35	55	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	4	NOISE INJECTION 9.6 Hz 50 PERCENT CYCLE		MERTELY
14400 - 15400	COOLED FET	110	55	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	7	NOISE INJECTION 9.6 Hz 50 PERCENT CYCLE		MERTELY
22000 - 24000	COOLED FET	130/35	55	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	10/4	NOISE INJECTION 9.6 Hz 50 PERCENT CYCLE	35K Tsys ON ANTENNAS 1, 2, 3, 5, 9, 10, 11, 17, 18, 19, 20, 21, 23, 24, 25, 26 & 28	MERTELY
40000 - 50000	COOLED FET	60	55	CASSEGRAIN	DUAL ORTHOGONAL CIRCULAR	7	NOISE INJECTION 9.6 Hz 50 PERCENT CYCLE	ALL EXCEPT 7, 9 & 15 EFFICIENCY LOW, DEPENDS ON FREQ	MERTELY

NRAO Front-End Status - Green Bank Telescope



Observing Summary 2001

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March-02

RECEIVER NAME	FREQUENCY (GHz)	AMPLIFIER TYPE	SYSTEM TEMP KELVIN (ESTIMATED)	MAXIMUM BANDWIDTH (MHz)	FEED TYPE	POLARIZATION	CALIBRATION VALUE (APPROXIMATE)	SWITCHING SYSTEM	REMARKS	PERSON(S) IN CHARGE
PFI 340 MHz	290 - 395 MHz	COOLED HFET	70	80	PRIME SHORT BACKFIRE	LIN/CIRC	2/40K	FREQUENCY	DUAL POLARIZATION	ANDERSON ELLISON
PFI 450 MHz	385 - 520 MHz	COOLED HFET	57	80	PRIME SHORT BACKFIRE	LIN/CIRC	2/40K	FREQUENCY	DUAL POLARIZATION	ANDERSON ELLISON
PFI 600 MHz	510 - 690 MHz	COOLED HFET	48	80	PRIME SHORT BACKFIRE	LIN/CIRC	2/40K	FREQUENCY	DUAL POLARIZATION	ANDERSON ELLISON
PFI 800 MHz	680 - 920 MHz	COOLED HFET	25	240	PRIME CONICAL	LIN/CIRC	2/40K	FREQUENCY	DUAL POLARIZATION	ANDERSON ELLISON
PF2	0.910 - 1.23	COOLED HFET	22	240	PRIME CONICAL	LIN/CIRC	2/40K	FREQUENCY	UNDER CONSTRUCTION	ANDERSON ELLISON
L-BAND	1.15 - 1.73	COOLED HFET	18	580	GREGORIAN	LIN/CIRC	2/20K	FREQUENCY	DUAL POLARIZATION	STENNES DUNBRACK
S-BAND	1.73 - 2.80	COOLED HFET	20	870	GREGORIAN	LIN/CIRC	2/20K	FREQUENCY	DUAL POLARIZATION	STENNES DUNBRACK
C-BAND	3.95 - 5.85	COOLED HFET	25	2000	GREGORIAN	LIN/CIRC	3/30K	FREQUENCY	DUAL POLARIZATION	NORROD SIMON
X-BAND	8 - 10.1	COOLED HFET	25	2100	GREGORIAN	CIRC	2.5/25K	FREQUENCY	DUAL POLARIZATION	STENNES DUNBRACK
Ku-BAND	12 - 15.4	COOLED HFET	30	3500	GREGORIAN	CIRC	3/30K	FREQUENCY, BEAM	2 BEAMS, SEPARATED BY 5 AMIN DUAL POLARIZATION	STENNES DUNBRACK
K-BAND	18 - 28.5	COOLED HFET	40	4000	GREGORIAN	CIRC	4/40K	FREQUENCY, BEAM	2 BEAMS, SEPARATED BY 4 AMIN DUAL POLARIZATION	STENNES DUNBRACK
Q-BAND	40 - 52	COOLED HFET	50	4000	GREGORIAN	CIRC	5K	FREQUENCY, BEAM	4 BEAMS ON 1 AMIN SQUARE, DUAL POLARIZATION	NORROD WATTS



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