

SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE BY RADIO OBSERVATIONS

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This is a list of observing programs till June 1990. We quote the (initial) year of observation, names of observers, institute, size of receiver, frequency and frequency resolution, sensitivity, object, duration of observation.

- 1960 Drake "OZMA"; NRAO, Greenbank, USA
26m; 1420 MHz; 100 Hz; $> 4 \cdot 10^{-22} \text{W/m}^2$; two stars, 80 hours
- 1964 Kardashev, Sholomitskii; Crimea, USSR
8 antennas of 16m; 923 MHz; 10 mHz; $> 2 \cdot 10^{-20} \text{W/m}^2$; 2 quasars; 80 hours
- 1966 Kellerman; CRIRO, Australia
64 m; many bands between 350-5000 MHz; $> 10^{-18} \text{W/m}^2$; 1 galaxy
- 1968 Troitskii, Gershtein, Starobutsev, Rakhlin; Zimenkie, USSR
5m; 926-928 and 1421-1423 MHz; 13 Hz; $> 2 \cdot 10^{-21} \text{W/m}^2$; 11 stars+M31; 12 hours
- 1968 Troitskii, Gorky, USSR
dipole; ~ 1000 MHz; continuing all sky survey
- 1969 Troitski et al, Gorky, Crimea, Murmansk, Primovskij, USSR
dipoles; ~ 1000 MHz; $> 10^{-22} \text{W/m}^2/\text{Hz}$; all sky, 1200 hours per year
- 1970 Slish, Pashchenko, Rudnitskii, Leleht; Nancay, France
40 x 240m; 1667 and 1665 MHz; 4 kHz; 5 OH masers; 2 hours
- 1970 Slyph; Nancay, France
40 x 240 m; 1667 and 1665 MHz; 4 kHz; 10 nearest stars
- 1971 Verschuur "OZPA", NRAO, USA
91 and 43 m; 1420, 1410 MHz; 490, 6900 Hz; $> 10^{-21} \text{W/m}^2$ 9 stars; 13 hours
- 1972 Kardashev et al; Caucasus, Pamir, Kamchatka, Mars spacecraft, USSR
38 and 60 m, 371-408-458-535 MHz; 5 MHz; $> 10^{-15} \text{W/m}^2$; 150 hours
- 1972 Kardashev et al; Crimea RT-22, USSR
22 m; 8570 MHz; galactic center
- 1972 Palmer, Zuckerman "OZMA II"; NRAO, USA
91 m; 1413-1425 & 1420 MHz; 4000 Hz; $> 10^{-23} \text{W/m}^2$; 674 stars; 500 hours
- 1973 Dixon, Ehman, Raub, Kraus; Ohio State U, USA
53 m; 1420 MHz; 10000 Hz; $> 10^{-21} \text{W/m}^2$; continuing all sky
- 1972 Bridle, Feldman "QUI APPELLE?"; Algonquin, Canada
46m; 22235 MHz; 30000 Hz; $> 10^{-22} \text{W/m}^2$; 70 stars; 140 hours
- 1974 Wishnia; Copernicus satellite
1 m; $3 \cdot 10^9$ MHz; 3 stars; search for UV laser lines
- 1973 Shvartsman et al "MANIA"; Ratan-600 Observatory, USSR
0.6 m; 550 nm; 10^{-7} nm; 21 peculiar objects, short optical pulses

- 1978 Shvartsman et al "MANIA"; Ratan-600 USSR
6 m; 550 nm; 10^{-7} nm; 93 objects, 250 hours, short optical pulses
- 1975 Drake, Sagan; Arecibo, Puerto Rico
305 m; 1420, 1667, 2380 MHz; 1 kHz; $> 3 \cdot 10^{-25}$ W/m²; 4 galaxies; 100 hours
- 1975 Israel, de Ruiter; Westerbork, the Netherlands
1500 m base; 1415 MHz; 4 MHz; $> 2 \cdot 10^{-23}$ W/m²; 50 fields; 400 hours
- 1976 Bowyer et al "SERENDIP"; Hat Creek, Canada; California, USA
26 m; 917, 1410, 1602, 1853, 5000 MHz; 500 Hz; $> 10^{-22}$ W/m²; all sky
- 1976 Clark, Black, Cuzzi, Tarter; NRAO, USA
43 m; 8522-8523 MHz; 5Hz; $> 2 \cdot 10^{-24}$ W/m²; 4 stars, VLBI
- 1977 Black, Clark, Cuzzi, Tarter; NRAO, USA
91 m; 1665-1667 MHz; 5 Hz; $> 10^{-24}$ W/m²; 200 stars, 100 hours; VLBI
- 1977 Drake, Stull; Arecibo, Puerto Rico
305 m; 1664-1668 MHz; 0.5 Hz; $> 10^{-26}$ W/m²; 6 stars; 10 hours
- 1977 Wielebinski, Seiradakis; Max Planck Institute, Germany
100 m; 1420 MHz; 20 MHz; $> 4 \cdot 10^{-23}$ W/m²; 3 stars; 2 hours
- 1978 Horowitz; Arecibo, Puerto Rico
305 m; 142 MHz; 0.015 Hz; $> 8 \cdot 10^{-28}$ W/m²; 185 stars; 80 hours
- 1978 Harris; Pioneer Venus and Venera spacecrafts
20 keV-1 MeV; gamma bursts
- 1978 Cohen, Malkan, Dickey; Arecibo, Westford, USA; Australia
305, 36, 64 m; 1665, 22235, 1612 MHz; $> 10^{-24}$ W/m²; 25 clusters; 80 hours
- 1978 Knowles, Sullivan; Arecibo, Puerto Rico
305 m; 150-500 MHz; 1 Hz; $> 2 \cdot 10^{-24}$ W/m²; 2 stars; 5 hours
- 1976 Makovetskij et al; Ratan-600, USSR
7.4x450m; Barnard's star; 6 days
- 1979 Cole, Ekers; Epping, Australia
64km; 5000 MHz; 1-10 MHz; $> 4 \cdot 10^{-18}$ W/m²; F,G,K stars; 50 hours
- 1979 Freitas, Valdes; Leuschner Observatory, USA
0.76 m; 550 nm; <14 magnitude; Earth-Moon libration points 30 hours
- 1979 "SERENDIP"; Jet Prop-Lab, Univ. Cal Berkeley, USA
64m; S and X band; 500 Hz; $> 8 \cdot 10^{-24}$ W/m²; spacecraft position; 400 hours
- 1979 Tarter, Clark, Duquet, Lesyna; Arecibo, Puerto Rico
305 m; 1420, 1666 MHz; 600 Hz; $> 10^{-25}$ W/m²; 200 stars; 100 hours
- 1980 Witteborn; Mt. Lemon, USA
1.5 m; 8.5-13.5 μ m; 1 μ m; 20 stars; 50 hours; Dyson spheres
- 1981 Suchkin et al; Gorkii etc, USSR
9.3 MHz; 1.5 MHz; 1.5 MHz; Earth-Moon libration points; 20 hours
- 1981 Lord, O'dea; Univ. Massachusetts, USA
14 m; 115 GHz; 20 kHz; $> 10^{-21}$ W/m²; galactic rotation axis; 50 hours

- 1981 Israel, Tarter; Westerbork, the Netherlands
3000 m base; 1420 MHz; 4 MHz; $>10^{-23} \text{W/m}^2$; 85 fields; 60 hours
- 1981 Birand, Tarter; Nancay, France
40x240m; 1.42, 1.66 MHz; 49Hz; $>10^{-24} \text{W/m}^2$; 343 stars; 600 hours
- 1981 Shostak, Tarter "SIGNAL"; Westerbork, the Netherlands
3000m base; 1420 MHz; 1.2 MHz, $> 10^{-24} \text{W/m}^2$; galactic center; 4 hours
- 1981 Talent; Kitt Peak, Arizona, USA
2.1 m; 357-535 nm; 1nm; 3 stars; 0.2 hours; Pr, Nd, Zr lines
- 1981 Valdes, Freitas "SETA"; Kitt Peak, Arizona, USA
0.61 m; 550 nm; <19 magnitude; Earth-Moon libration; 70 hours
- 1982 Horowitz et al "SUITCASE SETI"; Arecibo, Puerto Rico
305 m; 2840, 1420 MHz; 0.03 Hz; $> 10^{-27} \text{W/m}^2$; 400 stars; 75 hours
- 1982 Vallee, Simard-Nordamin; Algonquin, Canada
46 m; 10.5 MHz; 185 Hz; $> 10^{-19} \text{W/m}^2$ galactic center meridian; 72 hours
- 1983 Horowitz "SENTINEL"; Oak Ridge, Harvard USA
26 m; 1420 and 1667 MHz; 0.03 Hz; $> 5 \cdot 10^{-25} \text{W/m}^2$; sky survey
- 1983 Damashek NRAO, USA
92 m; 390 MHz; 2 MHz; $> 2 \cdot 10^{-22} \text{W/m}^2$; pulsar sky survey; 700 hours
- 1983 Valdes, Freitas; Hat Creek, Canada
26 m; 1516 MHz; 4.9 kHz; $> 3 \cdot 10^{-24} \text{W/m}^2$; 92 stars; 100 hours
- 1983 Gulkis; NASA, Australia
64 m; 8, 2.38 GHz; 40 kHz; $> 2 \cdot 10^{-22} \text{W/m}^2$ southern sky; 800 hours;
- 1983 Gray; Small Seti Observatory, USA
4 m; 1420 MHz; 1 Hz; $> 10^{-22} \text{W/m}^2$; continuing sky survey
- 1983 Cullers; AMSETI, USA
2 m; 1420 MHz; continuing
- 1983 Stephens; Hay River, NWT
28 m; 1415-1425 MHz; 30 kHz; $>75\text{K}$; northern sky
- 1984 Slich; satellite radiometer
37 GHz; 400 MHz; all sky 6000 hours; Dyson infrared spheres;
- 1985 Horowitz "META SETI"; Oak Ridge, Harvard, USA 26 m; 1420-1665-1667-2840 MHz;
0.05 Hz; $> 10^{-24} \text{W/m}^2$; sky survey
- 1985 Bowyer, Werthimer, Lampton "SERENDIP II"; NRAO, USA
92 m; 400 to 3500 MHz; 1 Hz; $> 4 \cdot 10^{-24} \text{W/m}^2$; selected areas, continuing
- 1986 Mirabel; NRAO, USA
43 m; 4829 GHz; 76 Hz; $> 10^{-24} \text{W/m}^2$; 33 stars, galactic centre;
- 1986 Colomb, Martin, Lemarchand; Argentina
30 m; 1415-1425-1667 MHz; 2.5 kHz; $> 5 \cdot 10^{-23} \text{W/m}^2$; 34 southern stars; 320 hours
- 1986 Arkhipov; USSR
408 MHz; HD-21899, HD-100633, HD-187691, HD-187923

- 1987 Tarter, Kardashev, Slyph; VLA
9 antennas of 26 m; 1.6 GHz; 6 kHz; G357.3-1.3; 1 hour
- 1987 Gray; Oak Ridge, Harvard, USA
26 m; 1.42 MHz; 0.05 Hz; $> 10^{-24} \text{ W/m}^2$; 1977 "WOW" signal position; 16 hours
- 1989 Filippova et al "ZODIAC"; Ratan-600, USSR
6 m; 400-600 nm and 1420 MHz; 29 solar type stars
- 1990 Blair; Parkes, Australia
64 m; 4.46 GHz; 100 Hz; 100 stars; 72 hours; frequency at $\pi^* \text{HI}$

DECLARATION OF PRINCIPLES

concerning activities following the detection of extraterrestrial intelligence (accepted by the IAU Commission 51 and by the International Academy of Astronautics Academy)

We, the institutions and individuals participating in the search for extraterrestrial intelligence,

Recognizing that the search for extraterrestrial intelligence is an integral part of space exploration and is being undertaken for peaceful purposes and for the common interest of all mankind,

Inspired by the profound significance for mankind of detecting evidence of extraterrestrial intelligence, even though the probability of detection may be low,

Recalling the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, which commits States Parties to the Treaty "to inform the Secretary General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and result" of their space exploration activities (Article XI),

Recognizing that any initial detection may be incomplete or ambiguous and thus require careful examination as well as confirmation, and that it is essential to maintain the highest standards of scientific responsibility and credibility,

Agree to observe the following principles for disseminating information about the detection of extraterrestrial intelligence:

1. Any individual, public or private research institution, or governmental agency that believes it has detected a signal from or other evidence of extraterrestrial intelligence (the discoverer) should seek to verify that the most plausible explanation for the evidence is the existence of extraterrestrial intelligence rather than some other natural phenomenon or anthropogenic phenomenon before making any public announcement. If the evidence cannot be confirmed as indicating the existence of extraterrestrial intelligence, the discoverer may disseminate the information as appropriate to the discovery of any unknown phenomenon.

2. Prior to making a public announcement that evidence of extraterrestrial intelligence has been detected, the discoverer should promptly inform all other observers or research organizations that are parties to this declaration, so that those other parties may seek to

confirm the discovery by independent observations at other sites and so that a network can be established to enable continuous monitoring of the signal or phenomenon. Parties to this declaration should not make any public announcement of this information until it is determined whether this information is or is not credible evidence of the existence of extraterrestrial intelligence. The discoverer should inform his/her or its relevant national authorities.

3. After concluding that the discovery appears to be credible evidence of extraterrestrial intelligence, and after informing other parties to this declaration, the discoverer should inform observers throughout the world through the Central Bureau for Astronomical Telegrams of the International Astronomical Union, and should inform the Secretary General of the United Nations in accordance with Article XI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Bodies. Because of their demonstrated interest in and expertise concerning the question of the existence of extraterrestrial intelligence, the discoverer should simultaneously inform the following international institutions of the discovery and should provide them with all pertinent data and recorded information concerning the evidence: the International Council of Scientific Unions, the International Astronautical Federation, the International Academy of Astronautics, the International Institute of Space Law, Commission 51 of the International Astronomical Union and Commission J of the International Radio Science Union.

4. A confirmed detection of extraterrestrial intelligence should be disseminated promptly, openly, and widely through scientific channels and public media, observing the procedures in this declaration. The discoverer should have the privilege of making the first public announcement.

5. All data necessary for confirmation of detection should be made available to the international scientific community through publications, meetings, conferences, and other appropriate means.

6. The discovery should be confirmed and monitored and any data bearing on the evidence of extraterrestrial intelligence should be recorded and stored permanently to the greatest extent feasible and practicable, in a form that will make it available for further analysis and interpretation. These recordings should be made available to the international institutions listed above and to members of the scientific community for further objective analysis and interpretation.

7. If the evidence of detection is in the form of electromagnetic signals, the parties to his declaration should seek international agreement to protect the appropriate frequencies by exercising the extraordinary procedures established within the World Administrative Radio Council of the International Telecommunication Union.

8. No response to a signal or other evidence of extraterrestrial intelligence should be sent until appropriate international consultations have taken place. The procedures for such consultations will be the subject of a separate agreement, declaration or arrangement.

9. The SETI Committee of the International Academy of Astronautics, in coordination with Commission 51 of the International Astronomical Union, will conduct a continuing

review of procedures for the detection of extraterrestrial intelligence and the subsequent handling of the data. Should credible evidence of extraterrestrial intelligence be discovered, an international committee of scientists and other experts should be established to serve as a focal point for continuing analysis of all observational evidence collected in the aftermath of the discovery, and also to provide advice on the release of information to the public. This committee should be constituted from representatives of each of the international institutions listed above and such other members as the committee may deem necessary. To facilitate the convocation of such a committee at some unknown time in the future, the SETI Committee of the International Academy of Astronautics should initiate and maintain a current list of willing representatives from each of the international institutions listed above, as well as other individuals with relevant skills, and should make that list continuously available through the Secretariat of the International Academy of Astronautics. The International Academy of Astronautics will act as the Depositary for this declaration and will annually provide a current list of parties to all the parties to this declaration.