

# Penn State Graduate Course in SETI

Spring 2018 Astro 585

## Observational SETI Programs (Through the Decades)

Below is a master list for observable SETI programs through September 2017. This was largely inspired by the work of [Jill Tarter in her 2001 review](#). A brief description of the values for each entry:

- Time
- Observers
- Site
- Instrument size (assumed to be the diameter of a telescope)
- Search Frequency (in Megahertz, for radio searches)
- Search Wavelength (in nanometers, for optical searches)
- Frequency Resolution (in hertz, for radio searches)
- Other Resolution (for non-radio searches, can be temporal, angular, spectral resolution, etc)
- Objects observed (a description of what was observed)
- Flux limits (in watts per square meter)
- Total hours (hours observed)
- References (Citation information)
- Link (Link to the published paper)
- Comments (Usually a summary of the program)

[A link to download the Google sheets version is here.](#)

**The units in the written cells take precedence over those in the row headers. The cells may have addition comments as well.**

Search by decade:

<a href="#"><u>1960s</u></a>	<a href="#"><u>1970s</u></a>	<a href="#"><u>1980s</u></a>	<a href="#"><u>1990s</u></a>	<a href="#"><u>2000s</u></a>	<a href="#"><u>2010s</u></a>
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Date	1960
Observer(s)	DRAKE "OZMA"
Site	NRAO
Instrument Size (m)	26
Search Frequency (MHz)	1420 – 1420.4
Search Wavelength (nm)	
Frequency Resolution (Hz)	100
Other Resolution	
Objects (Hz)	2 STARS
Flux Limit ( $W m^{-2}$ )	$1 \times 10^{-22}$
Total Hours	200
Reference	DRAKE, F.D., Sky & Telescope, 39, p. 140 (1960).
Link	
Comments	Single channel receiver.
Date	1964 – 1965
Observer(s)	KARDASHEV & SHOLOMITSKII
Site	CRIMEA DEEP SPACE STATION

Instrument Size (m)	16 (8 ANTENNAS)
Search Frequency (MHz)	923
Search Wavelength (nm)	
Frequency Resolution (Hz)	$10 \times 10^6$
Other Resolution	
Objects (Hz)	2 QUASARS
Flux Limit ( $W m^{-2}$ )	$2 \times 10^{-20}$
Total Hours	80
Reference	<p>KARDASHEV, N.S., Soviet A.J., 217 (1964). SHOLOMITSKII, G.B., IAU Information Bulletin on Variable Stars (February 27, 1965). New York Times editorial, p. 36 (April 13, 1965).</p> <p>GINDILIS, L.M., DUBINSKIJ, B.A. and RUDNITSKIJ, G.M., "SETI Investigations in the USSR," paper #IAA-88-544, presented at IAF Congress, Bangalore, India (1988).</p>
Link	
Comments	Reported detection of CTA102 as possible Type III civilization.
Date	1966
Observer(s)	KELLERMAN
Site	CSIRO
Instrument Size (m)	64

Search Frequency (MHz)	MANY BETWEEN 350 & 5000
Search Wavelength (nm)	
Frequency Resolution (Hz)	FULL BANDWIDTH FOR EACH FEED
Other Resolution	
Objects (Hz)	1 GALAXY (1934-63)
Flux Limit ( $W m^{-2}$ )	$1 \times 10^{-18}$
Total Hours	
Reference	KELLERMAN, K.I., Australian Journal of Physics, 19, p. 195 (1966).
Link	
Comments	No "notch" of ETI origin was detected in galaxy 1934-63.
Date	1968 – 1982
Observer(s)	TROITSKII
Site	GORKY
Instrument Size (m)	DIPOLE
Search Frequency (MHz)	
Search Wavelength (nm)	$30 \times 10^7$ , $16 \times 10^7$ , $8 \times 10^7$ , $3 \times 10^7$
Frequency Resolution (Hz)	

Other Resolution	
Objects (Hz)	ALL SKY SEARCH
Flux Limit ( $W m^{-2}$ )	
Total Hours	CONTINUING
Reference	Interview in Leningradskaya Pravda (Nov. 2, 1982).
Link	
Comments	Search over all sky visible by single dipole.
Date	1968 – 1969
Observer(s)	TROITSKII, STARODUBTSEV, GERSHTEJIN & RAKHLIN
Site	ZIMENKIE, USSR
Instrument Size (m)	5
Search Frequency (MHz)	926 – 928, 1421 – 1423
Search Wavelength (nm)	
Frequency Resolution (Hz)	13
Other Resolution	
Objects (Hz)	11 STARS + M31
Flux Limit ( $W m^{-2}$ )	$2 \times 10^{-21}$
Total Hours	12
Reference	TROITSKII, V.S., STARODUBTSEV, A.M., GERSHTEIN, L.I., and RAKHLIN, V.L., Soviet AJ, 15, p. 508 (1971).

Link	
Comments	20 filters of width 100 KHz divided into 25 channels with $F = 13$ Hz spaced 4 KHz apart and stepped in frequency.
Date	1969 – 1983
Observer(s)	TROITSKII, BONDAR, & STARODUBTSEV
Site	GORKII, CRIMEA, MURMANSK AND PRIMORSKIJ REGIONS
Instrument Size (m)	DIPOLES
Search Frequency (MHz)	1863, 927, 600
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	ALL SKY SEARCH FOR SPORADIC PULSES
Flux Limit ( $W m^{-2}$ )	$10^{-22} W/m^2/Hz$
Total Hours	1200 PER YEAR (ON AVERAGE)
Reference	TROITSKII, V.S., BONDAR, L.N., and STRODUBTSEV, A.M., Soviet Phys.-Usp., 17, p. 607 (1975).
Link	
Comments	Network of isotropic detectors: cross correlation from 2 or 4 sites over 8000 km.

Date	1970 – 1972
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Observer(s)	SLYSH
Site	NANÇAY
Instrument Size (m)	40 x 240
Search Frequency (MHz)	1667, 1665
Search Wavelength (nm)	
Frequency Resolution (Hz)	4000
Other Resolution	
Objects (Hz)	10 NEAREST STARS
Flux Limit ( $W m^{-2}$ )	
Total Hours	
Reference	
Link	
Comments	Looked for signals at OH frequency between observations of OH Masers.
Date	1970 – 1972
Observer(s)	SLYSH, PASHCHENKO, RUDNITSKII, & LEKHT
Site	NANÇAY
Instrument Size (m)	40 x 240
Search Frequency (MHz)	1667, 1665
Search Wavelength	

(nm)	
Frequency Resolution (Hz)	4000
Other Resolution	
Objects (Hz)	5 OH MASERS
Flux Limit ( $W m^{-2}$ )	
Total Hours	2
Reference	<p>Pashchenko, et al., "Measurement of One-Dimensional Function of Distribution for Signals from Galactic Sources," <i>Astronomicheskii Tsirkulyar</i>, No. 626, pp. 1-3 (1971).</p> <p>Pashchenko, et al., "Investigation of the Density of Probability for Interstellar Hydroxyl Radio Lines," <i>Uchebynykh Zavedenii-Radio Fizika</i>, 16, pp. 1344-1349 (1973).</p> <p>Lekht, et al., "Investigations of Statistical Properties of OH Maser Sources," <i>Pis'ma V Astronomicheskii Zhurnal</i>, 1, pp. 29-32 (1975).</p>
Link	
Comments	Searched for deviation from Gaussian Emission statistics in 5 OH Maser sources that might indicate transmissions from another civilization.
Date	1971 – 1972
Observer(s)	VERSCHUUR "OZPA"
Site	NRAO
Instrument Size (m)	91, 43



Search Frequency (MHz)	1419.8 – 1421, 1410 – 1430
Search Wavelength (nm)	
Frequency Resolution (Hz)	490, 6900
Other Resolution	
Objects (Hz)	9 STARS
Flux Limit ( $W m^{-2}$ )	$5 \times 10^{-24}$ , $2 \times 10^{-23}$
Total Hours	13
Reference	VERSCHUUR, G.L., Icarus, 19, p. 329 (1973).
Link	
Comments	384 channel correlator online.
Date	1972
Observer(s)	KARDASHEV, POPOV, SOGLASNOV ET AL.
Site	CRIMEA, RT-22
Instrument Size (m)	22
Search Frequency (MHz)	8570
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	

Objects (Hz)	GALACTIC CENTER
Flux Limit ( $\text{W m}^{-2}$ )	
Total Hours	
Reference	GINDILIS, L.M., DUBINSKIJ, B.A. and RUDNITSKIJ, G.M., “SETI Investigations in the USSR,” paper #IAA-88-544, presented at IAF Congress, Bangalore, India (1988).
Link	
Comments	Looked for statistical anomalies in continuum emission from galactic center.
Date	1972 – 1974
Observer(s)	KARDASHEV, GINDILIS, POPOV, SOGLASNOV, SPANGENBERG, STEINBERG ET AL.
Site	CAUCASUS, PAMIR, KAMCHATKA, MARS 7 SPACECRAFT
Instrument Size (m)	38, 60
Search Frequency (MHz)	371, 408, 458, 535
Search Wavelength (nm)	
Frequency Resolution (Hz)	$5 \times 10^6$
Other Resolution	
Objects (Hz)	OMNI-DIRECTIONAL
Flux Limit ( $\text{W m}^{-2}$ )	$2 \times 10^{-16}$ , – $7 \times 10^{-15}$
Total Hours	150

Reference	GINDILIS, L.M., DUBINSKIJ, B.A. and RUDNITSKIJ, G.M., “SETI Investigations in the USSR,” paper #IAA-88-544, presented at IAF Congress, Bangalore, India (1988).
Link	
Comments	“Eavesdropping” search for pulses. Synchronous dispersion reception.
Date	1972 – 1976
Observer(s)	BRIDLE & FELDMAN “QUI APPELLE?”
Site	ARO
Instrument Size (m)	46
Search Frequency (MHz)	22230.08 – 22240.08
Search Wavelength (nm)	
Frequency Resolution (Hz)	$3 \times 10^4$
Other Resolution	
Objects (Hz)	70 STARS
Flux Limit ( $W m^{-2}$ )	$10^{-22}$
Total Hours	140
Reference	
Link	
Comments	70 solar-type stars within 45 light years have been observed to date.

Date	1972 – 1976
Observer(s)	PALMER & ZUCKERMAN “OZMA II”
Site	NRAO
Instrument Size (m)	91
Search Frequency (MHz)	1413 – 1425, 1420.1 – 1420.7
Search Wavelength (nm)	
Frequency Resolution (Hz)	$6.4 \times 10^4$ , 4000
Other Resolution	
Objects (Hz)	674 STARS
Flux Limit ( $W m^{-2}$ )	$10^{-23}$
Total Hours	500
Reference	PALMER, P. and ZUCKERMAN, B., The NRAO Observer, 13, No.6, p. 26 (1972). SHEAFFER, R., Spaceflight, 19, No.9, p. 307 (1977).
Link	
Comments	384 channel correlator online.
Date	1973 – 1974
Observer(s)	SHVARTSMAN ET AL. “MANIA”
Site	SPECIAL ASTROPHYSICAL OBSERVATORY
Instrument Size (m)	0.6
Search Frequency	

(MHz)	
Search Wavelength (nm)	550
Frequency Resolution (Hz)	
Other Resolution	$D = 10^{-6} \text{ \AA}$
Objects (Hz)	21 PECULIAR OBJECTS
Flux Limit ( $\text{W m}^{-2}$ )	
Total Hours	
Reference	SHVARTSMAN, V.F., Communications of the Special Astrophysical Obser., 19, p. 39 (1977).
Link	
Comments	Optical search for short pulses of length $3 \times 10^{-7}$ to 300 seconds, & narrow laser lines. Prototype for later system on 6m telescope.
Date	1973 – 1986
Observer(s)	DIXON, EHMAN, RAUB & KRAUS
Site	OSURO
Instrument Size (m)	53
Search Frequency (MHz)	1420.15 – 1420.65
Search Wavelength (nm)	
Frequency Resolution (Hz)	-328443

Other Resolution	
Objects (Hz)	ALL SKY SEARCH
Flux Limit ( $W m^{-2}$ )	$1.5 \times 10^{-21}$
Total Hours	100000
Reference	DIXON, R.S. and COLE, D.M., Icarus, 30, p. 267 (1977). KRAUS, J.D., "We Wait and Wonder," Cosmic Search, 1, No. 3, p. 32 (1979).
Link	
Comments	Receiver is tuned to hydrogen rest frequency relative to Galactic Center (as a function of direction).
Date	1973 – 1998
Observer(s)	Brown, ; Klein, ; Dixon, R.; Ehman, ; Raub, ; Kraus, ; Childers, Cole, D. M.; et. al
Site	OSURO
Instrument Size (m)	53
Search Frequency (MHz)	1421.75 – 1424.25
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.6, 100, 10
Other Resolution	
Objects (Hz)	ALL SKY SEARCH
Flux Limit ( $W m^{-2}$ )	$1.5 \times 10^{-21}$

Total Hours	5
Reference	(1.) "The Ohio Sky Surveys," Big Ear Radio Observatory, (2005). (2.) Dixon, R. S.; Cole, D. M.; et. al "A modest all-sky search for narrowband radio radiation near the 21-cm hydrogen line" American Association for the Advancement of Science, Symposium on the Search for Extraterrestrial Intelligence, Boston, Mass., Feb. 18-24, 1976. Icarus, vol. 30, Feb. 1977, p. 267-273, 02/1977.
Link	*** <a href="http://www.setileague.org/articles/bigear.htm#to">http://www.setileague.org/articles/bigear.htm#to</a> *** *** <a href="http://adsabs.harvard.edu/abs/1977Icar...30..267">http://adsabs.harvard.edu/abs/1977Icar...30..267</a> ***
Comments	Using SERENDIP processor. Have searched declinations +8 to -36. By 1989 it had searched declinations +62 to -22 and was continuing to -36. The receiver was tuned in to hydrogen's rest frequency relative to the Galactic Center (as a function of direction). Program ended when OSU sold observatory site to golf course developer. It was the longest running sky-survey with improving capabilities over time. This survey of the entire sky between the telescope declination limits of +63 ° and -36 ° is continuous in direction, making no assumptions as to where an extraterrestrial transmitter might be located in space. Out to a distance of 1000 light years, there are an average of three F-, G-, and K-type stars in the beam of the telescope at all times. The telescope is a meridian transit instrument, with half-power beamwidths at 21 cm of 8 arcmin in right ascension and 40 arcmin in declination. The system temperature is approximately 100° K, and an integration time of 10 sec was used. No confirmed narrowband extraterrestrial signals have been found.
Date	1974
Observer(s)	WISHNIA

Site	“COPERNICUS SATELLITE”
Instrument Size (m)	1
Search Frequency (MHz)	$3 \times 10^9$
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	3 STARS
Flux Limit ( $\text{W m}^{-2}$ )	
Total Hours	
Reference	MORRISON, P., letter to directors of Radio Observatories dated 08/29/75 which appears in NASA SP-419, p. 204 (1975).
Link	
Comments	Search for UV laser lines.
Date	1975 – 1979
Observer(s)	ISRAEL & DE RUITER
Site	WRST
Instrument Size (m)	1500 MAX BASELINE
Search Frequency (MHz)	1415
Search Wavelength	



(nm)	
Frequency Resolution (Hz)	$4 \times 10^6$
Other Resolution	
Objects (Hz)	50 STAR FIELDS
Flux Limit ( $\text{W m}^{-2}$ )	$2 \times 10^{-23}$
Total Hours	400
Reference	
Link	
Comments	Searches of “cleaned” maps prepared for the WRST background survey. Looked for positional coincidence between residual signals & AGK2 stars.
Date	1975 – 1976
Observer(s)	SAGAN & DRAKE
Site	NAIC
Instrument Size (m)	305
Search Frequency (MHz)	1420, 1667, 2377 – 2383
Search Wavelength (nm)	
Frequency Resolution (Hz)	1000
Other Resolution	
Objects (Hz)	FOUR GALAXIES

Flux Limit ( $\text{W m}^{-2}$ )	$3 \times 10^{-25}$
Total Hours	100
Reference	SAGAN, C. and DRAKE, F., Scientific American, 232, p. 80 (1974).
Link	
Comments	Search for type II civilizations in local group galaxies.
Date	1976
Observer(s)	CLARK, BLACK, CUZZI & TARTER
Site	NRAO
Instrument Size (m)	43
Search Frequency (MHz)	8522 – 8523
Search Wavelength (nm)	
Frequency Resolution (Hz)	5
Other Resolution	
Objects (Hz)	4 STARS
Flux Limit ( $\text{W m}^{-2}$ )	$2 \times 10^{-24}$
Total Hours	7
Reference	
Link	
Comments	VLBI high speed tape recorder combined with software direct Fourier transformation to produce extreme

	frequency resolution (non-real time).
Date	1976 – 1985
Observer(s)	BOWYER ET AL. (U.C. BERKELEY) “SERENDIP”
Site	HCRO
Instrument Size (m)	26
Search Frequency (MHz)	917 – 937, 1410 – 1430, 1602 – 1605, 1853 – 1873, 5000
Search Wavelength (nm)	
Frequency Resolution (Hz)	1000
Other Resolution	
Objects (Hz)	ALL SKY SURVEY
Flux Limit ( $W m^{-2}$ )	$1.15 \times 10^{-22}$
Total Hours	
Reference	BOWYER, S, ZEITLAND, G.M., TARTER, J., LAMPTON, M., and WELCH, W.J., “The Berkeley Parasitic SETI Program,” Icarus, 53 pp.147-155 (1983).
Link	
Comments	Automated survey parasitic to radio astronomical observations.
Date	1977
Observer(s)	STULL & DRAKE

Site	NAIC
Instrument Size (m)	305
Search Frequency (MHz)	1664 – 1668
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.5
Other Resolution	
Objects (Hz)	6 STARS
Flux Limit ( $\text{W m}^{-2}$ )	$10^{-26}$
Total Hours	10
Reference	TARTER, J., CUZZI, J., BLACK, D., CLARK, T., STULL, M., and DRAKE, F., “SETI: High Sensitivity Search at NASA with High Speed Tape Recorders,” paper #79-A-43 presented at 30th IAF Congress in Munich, Germany (1979).
Link	
Comments	High speed tape combined with optical processor to produce extreme frequency resolution (non-real time).
Date	1977
Observer(s)	TARTER, BLACK, CUZZI & CLARK
Site	NRAO
Instrument Size (m)	91
Search Frequency	1665 – 1667

(MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	200 STARS
Flux Limit ( $W m^{-2}$ )	$10^{-24}$
Total Hours	100
Reference	TARTER, J., BLACK, D., CUZZI, J., and CLARK, T., Icarus, 42, p. 136 (1980).
Link	
Comments	VLBI high speed recorder combined with software direct Fourier transformation to produce extreme frequency resolution (non-real time).
Date	1977 – ON
Observer(s)	WIELEBINSKI & SEIRADAKIS
Site	MPIFR
Instrument Size (m)	100
Search Frequency (MHz)	1420
Search Wavelength (nm)	
Frequency Resolution (Hz)	20000000

Other Resolution	
Objects (Hz)	3 STARS
Flux Limit ( $W m^{-2}$ )	$4 \times 10^{-23}$
Total Hours	2
Reference	
Link	
Comments	Candidate stars inserted into ongoing program which searches for pulsed signals with periods of 0.3 to 1.5 sec.
Date	1978
Observer(s)	COHEN, MALKAN & DICKEY
Site	NAIC, HRO, CSIRO
Instrument Size (m)	305, 36, 64
Search Frequency (MHz)	1665, 1667, 22235.08, 1612.231
Search Wavelength (nm)	
Frequency Resolution (Hz)	9500, 65000, 4500
Other Resolution	
Objects (Hz)	25 GLOBULAR CLUSTERS
Flux Limit ( $W m^{-2}$ )	$1.8 \times 10^{-25}$ , $1.1 \times 10^{-22}$ , $1.5 \times 10^{-24}$
Total Hours	40, 20, 20
Reference	COHEN, N., and MALKAN, M., and DICKEY, J., Icarus, 41, p. 198 (1980).

Link	
Comments	Passive search for Type II & III civilizations using astronomical data originally observed to detect H <sub>2</sub> O & OH masers in globular clusters.
Date	1978
Observer(s)	HOROWITZ
Site	NAIC
Instrument Size (m)	305
Search Frequency (MHz)	1420
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.015
Other Resolution	
Objects (Hz)	185 STARS
Flux Limit (W m <sup>-2</sup> )	8 x 10 <sup>-28</sup>
Total Hours	80
Reference	HOROWITZ, P., Science, 201, p. 733 (1978). HOROWITZ, P. and FORSTER, J., "Project Sentinel: Ultra-Narrowband SETI at Harvard/Smithsonian," The Search for Extraterrestrial Life: Recent Developments, M.D. Papagiannis (ed.), D. Reidel Publishing Co., Dordrecht, pp. 291- 303 (1985).
Link	

Comments	Assumes that signal frequency was corrected at the source to arrive at rest in Heliocentric or barycentric laboratory frame.
Date	1978
Observer(s)	KNOWLES & SULLIVAN
Site	NAIC
Instrument Size (m)	305
Search Frequency (MHz)	130 – 500 (SPOT)
Search Wavelength (nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	2 STARS
Flux Limit ( $W m^{-2}$ )	$2 \times 10^{-24}$
Total Hours	5
Reference	SULLIVAN, W.T. III, BROWN, S., and WETHERHILL, C., Science, 199, p. 377 (1978).
Link	
Comments	Attempted “eavesdropping” using MKI VLBI tapes as in Black, et al., 1977.
Date	1978
Observer(s)	MAKOVETSKIJ, GINDILIS, ET AL.



Site	ZELENCHUKSKAYA, RATAN-600
Instrument Size (m)	7.4 x 450 (ONE SECTOR)
Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	BARNARD'S STAR
Flux Limit ( $W m^{-2}$ )	
Total Hours	6 DAYS
Reference	Gindilis, L.M., "Radio Astronomy and Search for Extraterrestrial Civilizations—Development of Investigations in the USSR," Trudy Gaish, 58, pp. 87-118 (1986).
Link	
Comments	In accordance with "Magic Time" prediction by Makovetskij for Barnard's Star and Nova Cygni 1975, signals were searched for in September, 1978.
Date	1978 – 1980
Observer(s)	MICHAEL J. HARRIS
Site	INTERPLANETARY NETWORK DATA
Instrument Size (m)	PIONEER VENUS & VENERA 11 & 12 SPACECRAFT
Search Frequency	

(MHz)	
Search Wavelength (nm)	20 keV – 1 MeV
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	54 GAMMA RAY BURST EVENTS
Flux Limit ( $W m^{-2}$ )	
Total Hours	
Reference	HARRIS, M.J., “A Search for Linear Alignments of Gamma Ray Burst Sources,” JBIS 43, p. 551 (1990).
Link	
Comments	Attempt to find 3 GRB events in a straight line, each having same velocity (from $e \pm e -$ annihilation line) that could indicate trajectory of an interstellar spacecraft.
Date	1978 – 1996
Observer(s)	SHVARTSMAN ET AL. “MANIA”
Site	SPECIAL ASTROPHYSICAL OBSERVATORY
Instrument Size (m)	6
Search Frequency (MHz)	
Search Wavelength (nm)	550
Frequency Resolution (Hz)	

Other Resolution	$D = 10^{-6} \text{ \AA}$
Objects (Hz)	93 OBJECTS
Flux Limit ( $\text{W m}^{-2}$ )	$3 \times 10^{-4}$
Total Hours	250
Reference	SCHVARTSMAN, V.F., "SETI in Optical Range with the 6M Telescope (MANIA)," in Bioastronomy: The Next Steps, G. Marx (ed.), Kluwer Academic Publishers, pp. 389-390 (1988), BESHIN ET. AL., "Methods and Results of an Optical Search for Extraterrestrial Civilizations," Astrophysics and Space Science 252: 51-57 (1997).
Link	
Comments	Have searched 30 Radio Objects with Continuous Optical Spectra to date, looking for optical pulses from potential Kardashev type II or III civilizations.
Date	1979
Observer(s)	COLE & ETERS
Site	CSIRO
Instrument Size (m)	64
Search Frequency (MHz)	4995 - 5005, 4999 - 5001
Search Wavelength (nm)	
Frequency Resolution (Hz)	$10^7, 10^6$
Other Resolution	

Objects (Hz)	NEARBY F, G & K STARS
Flux Limit ( $W m^{-2}$ )	$4 \times 10^{-18}$
Total Hours	50
Reference	COLE, T.N. and EKERS, R.D., Proc-ASA, 3, p. 328 (1979).
Link	
Comments	Simultaneous pulsed events in both 2 MHz & 10 MHz filters are sought detectors having time resolution of 4 $\mu$ seconds.
Date	1979
Observer(s)	FREITAS & VALDES
Site	LEUSCHNER OBSERVATORY, UCB
Instrument Size (m)	0.76
Search Frequency (MHz)	
Search Wavelength (nm)	550
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	STABLE "HALO ORBITS" ABOUT L4 & L5 LIBRATION POINTS IN EARTH-MOON SYSTEM
Flux Limit ( $W m^{-2}$ )	$m_v \leq 14$ (magnitude)
Total Hours	30
Reference	FREITAS, R.A. and VALDES, F., Icarus, 42, p. 442 (1980).
Link	

Comments	Attempt to discover evidence of discrete objects (such as interstellar probes) in stable orbits about L4, L5 by study of 90 photographic plates.
Date	1979 – 1980
Observer(s)	Tarter, Jill C.; Black, D.; Cuzzi, J; Clark, T.
Site	NRAO
Instrument Size (m)	91
Search Frequency (MHz)	1665 – 1667
Search Wavelength (nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	200 stars
Flux Limit ( $W m^{-2}$ )	$1.1 \times 10^{-23}$
Total Hours	100
Reference	Tarter, J., Black, D., Cuzzi, J., Clark, T., “A high-sensitivity search for extraterrestrial intelligence at lambda 18 CM”, <i>Icarus</i> , 42, p. 136 (1980).
Link	
Comments	VLBI high speed recorder combined with software direct Fourier transformation to produce extreme frequency resolution (non-real time). This was the first search at the frequency of the OH lines.

Date	1979 – 1981
Observer(s)	TARTER, CLARK, DUQUET & LESYNA
Site	NAIC
Instrument Size (m)	305
Search Frequency (MHz)	1418.4 – 1422.4, 1664 – 1668
Search Wavelength (nm)	
Frequency Resolution (Hz)	5, 600
Other Resolution	
Objects (Hz)	200 STARS
Flux Limit ( $\text{W m}^{-2}$ )	$1 \times 10^{-25}$
Total Hours	100
Reference	TARTER, J.C., CLARK, T.A., DUQUET, R., and LESYNA, L., Acta Astronautica, 10, p. 277 (1983).
Link	
Comments	Rapid 1-bit sampler & high speed tape recorder run in parallel with 1008 channel correlator. Software direct Fourier transformation as in Black, et al., 1977.
Date	1979 – 1982
Observer(s)	JPL, UCB “SERENDIP”
Site	DSS 14
Instrument Size (m)	64

Search Frequency (MHz)	S & X BAND (B=10 MHz)
Search Wavelength (nm)	
Frequency Resolution (Hz)	1000
Other Resolution	
Objects (Hz)	APPARENT POSITIONS OF NASA SPACECRAFT
Flux Limit ( $W m^{-2}$ )	$8 \times 10^{-24}$
Total Hours	400
Reference	BOWYER, S, ZEITLAND, G.M., TARTER, J., LAMPTON, M., and WELCH, W.J., "The Berkeley Parasitic SETI Program," Icarus, 53 pp.147-155 (1983).
Link	
Comments	Automated survey parasitic to spacecraft tracking operations using 512 channel auto-correlator & 100 channel correlator micro-processor control.

Date	1980
Observer(s)	WITTEBORN
Site	NASA – U OF A, MT. LEMON
Instrument Size (m)	1.5
Search Frequency (MHz)	
Search Wavelength	8500 – 13500

(nm)	
Frequency Resolution (Hz)	
Other Resolution	1 $\mu$
Objects (Hz)	20 STARS
Flux Limit ( $W m^{-2}$ )	N MAGNITUDE EXCESS < 1.7
Total Hours	50
Reference	
Link	
Comments	Search for IR excess due to Dyson spheres around solar type stars. Target stars were chosen because too faint for spectral type.
Date	1980 – 1981
Observer(s)	SUCHKIN, TOKAREV ET AL.
Site	NIRFI, GORKII, GAISH, MOSCOW
Instrument Size (m)	
Search Frequency (MHz)	9.3
Search Wavelength (nm)	
Frequency Resolution (Hz)	1500
Other Resolution	
Objects (Hz)	L <sub>4</sub> & L <sub>5</sub> LIBRATION POINTS OF EARTH-MOON SYSTEM



Flux Limit ( $W m^{-2}$ )	
Total Hours	20
Reference	Presented at SETI-81 International Symposium held in Tallinn, Estonia (1981).
Link	
Comments	Radar reflections sought from artifacts in parking orbits.
Date	1981
Observer(s)	LORD & O'DEA
Site	U. MASS
Instrument Size (m)	14
Search Frequency (MHz)	115000
Search Wavelength (nm)	
Frequency Resolution (Hz)	20000, 125000, $4 \times 10^8$
Other Resolution	
Objects (Hz)	NORTH GALACTIC ROTATION AXIS $b = 5^\circ \rightarrow 90^\circ$
Flux Limit ( $W m^{-2}$ )	$10^{-21}$
Total Hours	50
Reference	
Link	
Comments	Search for signals J=1-0 CO line from a transmitter somewhere along the Galactic rotation axis.

Date	1981
Observer(s)	SHOSTAK & TARTER “SIGNAL”
Site	WRST
Instrument Size (m)	3000 MAX BASELINE
Search Frequency (MHz)	1420.24 – 1420.56
Search Wavelength (nm)	
Frequency Resolution (Hz)	1200
Other Resolution	
Objects (Hz)	GALACTIC CENTER
Flux Limit ( $W m^{-2}$ )	$10^{-24}$
Total Hours	4
Reference	SHOSTAK, S. and TARTER, J., “SIGNAL (Search for Intelligence in the Galactic Nucleus with the Array of the Lowlands),” paper #IAA-82-262 presented at IAF Congress, Paris, France (1982).
Link	
Comments	Use of interferometer to search for pulsed signals from Galactic Center in range of periods from 40 seconds to 2 hours.
Date	1981
Observer(s)	TALENT

Site	KPNO
Instrument Size (m)	2.1
Search Frequency (MHz)	
Search Wavelength (nm)	357.5 – 535
Frequency Resolution (Hz)	
Other Resolution	10 Å
Objects (Hz)	3 STARS
Flux Limit ( $W m^{-2}$ )	
Total Hours	0.2
Reference	1982 preprint “21 cm Radio Emissions with Geometric Fine Structure” by Gray, Dixon, Ehman and Talent. Cited by Freitas in JBIS 38, p. 106 (1985).
Link	
Comments	Search for enhanced stellar lines of praseodymium, neodymium, zirconium as evidence for dumping of nuclear wastes into stellar atmospheres.
Date	1981
Observer(s)	TARTER & ISRAEL
Site	WRST
Instrument Size (m)	3000 MAX BASELINE
Search Frequency (MHz)	1420

Search Wavelength (nm)	
Frequency Resolution (Hz)	$4 \times 10^6, 10 \times 10^6$
Other Resolution	
Objects (Hz)	85 STAR FIELDS
Flux Limit ( $\text{W m}^{-2}$ )	$6 \times 10^{-22} - 6 \times 10^{-24}$
Total Hours	600
Reference	TARTER, J. and ISRAEL. F.P., Acta Astronautica, 9, p. 415 (1982).
Link	
Comments	Parasitic search similar to Israel & DeRuiter using “uncleaned” maps stored at Groningen & Leiden, & AGK3 catalog.
Date	1981 – 1981
Observer(s)	Shostak, S., Tarter, J.
Site	WRST
Instrument Size (m)	3000 MAX BASELINE
Search Frequency (MHz)	1420.24 – 1420.56
Search Wavelength (nm)	
Frequency Resolution (Hz)	1200
Other Resolution	

Objects (Hz)	GALACTIC CENTER
Flux Limit ( $W m^{-2}$ )	$10^{-24}$
Total Hours	4
Reference	Shostak, S., Tarter, J., "SIGNAL (Search for Intelligence in the Galactic Nucleus with the Array of the Lowlands)," paper #IAA-82-262 presented at IAF Congress, Paris, France (1982).
Link	
Comments	Use of interferometer to search for pulsed signals from Galactic Center in range of periods from 40 seconds to 2 hours.
Date	1981 – 1982
Observer(s)	VALDES & FREITAS "SETA"
Site	KPNO
Instrument Size (m)	0.61
Search Frequency (MHz)	
Search Wavelength (nm)	550
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	EARTH-MOON THROUGH L5, SUN-EARTH L1, L2
Flux Limit ( $W m^{-2}$ )	$10 \leq m_v \leq 19$ (magnitude)
Total Hours	70

Reference	VALDES, F. and FREITAS, R.A. Jr., Icarus 53, p. 453 (1983).
Link	
Comments	Attempt to see discrete artifacts ( $\geq$ few m in size) in stable orbits near Lagrange points. Studies 137 III aF photographic plates.
Date	1981 – 1982
Observer(s)	Lord, S.; O’Dea,
Site	U. Mass
Instrument Size (m)	14
Search Frequency (MHz)	115000
Search Wavelength (nm)	
Frequency Resolution (Hz)	20000, 125000, $4 \times 10^8$
Other Resolution	
Objects (Hz)	NORTH GALACTIC ROTATION AXIS $b = 5^\circ \rightarrow 90^\circ$
Flux Limit ( $W m^{-2}$ )	$10^{-21}$
Total Hours	50
Reference	Tarter, J., “SETI Observations World Wide,” The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18–21, 1984 (A86–38126 17–88). Dordrecht, D. Reidel Publishing Co., 1985, p. 271–290 (1985).
Link	<a href="http://adsabs.harvard.edu/full/1985IAUS..112..271">http://adsabs.harvard.edu/full/1985IAUS..112..271</a>

Comments	Search for signals J=1-0 CO line from a transmitter somewhere along the Galactic rotation axis
Date	1981 – 1988
Observer(s)	BIRAUD & TARTER
Site	NANÇAY
Instrument Size (m)	40 x 240
Search Frequency (MHz)	1420.08 – 1420.72, 1665 – 1667
Search Wavelength (nm)	
Frequency Resolution (Hz)	48.8
Other Resolution	
Objects (Hz)	343 STARS
Flux Limit ( $W m^{-2}$ )	$1 \times 10^{-24}$
Total Hours	~600
Reference	TARTER, J.C., “Statistics of ‘Excess’ Observatory Noise at the Nançay Telescope and Elsewhere,” paper #IAA-85-473, presented at 36th IAF Congress in Stockholm, Sweden (1985). Biraud, F., Acta Astronautica, 10, p. 759 (1985).
Link	
Comments	Eight level, 1024 channel auto-correlator, with stepped first LO to extend frequency coverage at 48 Hz resolution.
Date	1982

Observer(s)	HOROWITZ, TEAGUE, LINSKOTT, CHEN & BACKUS, “SUITCASE SETI”
Site	NAIC
Instrument Size (m)	305
Search Frequency (MHz)	2840.8, 1420.4
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.03
Other Resolution	
Objects (Hz)	250 STARS & 150 STARS
Flux Limit ( $W m^{-2}$ )	$4 \times 10^{-26} - 6 \times 10^{-28}$
Total Hours	75
Reference	HOROWITZ, P. and FORSTER, J., “Project Sentinel: Ultra-Narrowband SETI at Harvard/Smithsonian,” The Search for Extraterrestrial Life: Recent Developments, M.D. Papagiannis (ed.), D. Reidel Publishing Co., Dordrecht, pp. 291- 303 (1985).
Link	
Comments	Dual 64K channel real time microprocessor based spectrum analyzer with video archiving & swept LO frequency to test “magic frequencies.”
Date	1982
Observer(s)	VALLEE & SIMARD-NORMANDIN



Site	ARO
Instrument Size (m)	46
Search Frequency (MHz)	10522
Search Wavelength (nm)	
Frequency Resolution (Hz)	$185 \times 10^6$
Other Resolution	
Objects (Hz)	GALACTIC CENTER MERIDIAN
Flux Limit ( $\text{W m}^{-2}$ )	$10^{-19}$
Total Hours	72
Reference	VALLEE, J.P., "Search for Strongly Polarized Radio Emission from E.T.I. and an Optimistic Approach to the Great Silence (Fermi's Paradox)," The Search for Extraterrestrial Life: Recent Developments, M.D. Papagiannis (ed.), D. Reidel Publishing Co., Dordrecht, pp. 321-325 (1985).
Link	
Comments	Search for strongly polarized signals by mapping field $1/4'$ x $25'$ along $l = 0^\circ$ .
Date	1983
Observer(s)	DAMASHEK
Site	NRAO
Instrument Size (m)	92

Search Frequency (MHz)	382 – 398
Search Wavelength (nm)	
Frequency Resolution (Hz)	$2 \times 10^6$
Other Resolution	
Objects (Hz)	SKY SURVEY (PULSARS)
Flux Limit ( $W m^{-2}$ )	$2 \times 10^{-22}$
Total Hours	700
Reference	
Link	
Comments	Sixteen MHz sampled at 60 Hz; 8 contiguous frequency channels. Search for single dispersed pulses and telemetry (bit stream) signals.
Date	1983
Observer(s)	VALDES & FREITAS
Site	HCRO
Instrument Size (m)	26
Search Frequency (MHz)	1514 – 1518
Search Wavelength (nm)	
Frequency Resolution (Hz)	4.9, 76000

Other Resolution	
Objects (Hz)	80 STARS & 12 NEARBY STARS
Flux Limit ( $W m^{-2}$ )	$3 \times 10^{-24}$
Total Hours	100
Reference	VALDES, F. and FREITAS, R.A. Jr., Icarus 65, pp. 152-157 (1986).
Link	
Comments	Search for radioactive tritium line from Nuclear fusion by another technology.
Date	1983 – 1983
Observer(s)	GULKIS
Site	DSS 43
Instrument Size (m)	64
Search Frequency (MHz)	8000, 2375 – 2385
Search Wavelength (nm)	
Frequency Resolution (Hz)	40000
Other Resolution	
Objects (Hz)	PARTIAL SOUTHERN SKY
Flux Limit ( $W m^{-2}$ )	$2 \times 10^{-22}$
Total Hours	800 – ON
Reference	KUIPER, T. and GULKIS, S., The Planetary Report, 3, p. 17

	(1983).
Link	
Comments	Sky survey of constant declination strips (3 from -28.9 to -34.3 by April 1983) whenever antenna stowed.
Date	1983 – 1984
Observer(s)	CULLERS
Site	AMSETI
Instrument Size (m)	2
Search Frequency (MHz)	~1420, ≤ 1000
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	
Flux Limit ( $W m^{-2}$ )	
Total Hours	CONTINUING
Reference	
Link	
Comments	Low noise GaAs FETS and micros with satellite TV dishes, by Silicon Valley Hams, with NASA Ames consultation.
Date	1983 – 1985

Observer(s)	HOROWITZ "SENTINEL"
Site	OAK RIDGE (HARVARD UNIVERSITY)
Instrument Size (m)	26
Search Frequency (MHz)	1420.40575, 1667.3590
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.03
Other Resolution	
Objects (Hz)	SKY SURVEY
Flux Limit ( $W m^{-2}$ )	$5 \times 10^{-25}$
Total Hours	CONTINUING
Reference	HOROWITZ, P. and FORSTER, J., "Project Sentinel: Ultra-Narrowband SETI at Harvard/Smithsonian," The Search for Extraterrestrial Life: Recent Developments, M.D. Papagiannis (ed.), D. Reidel Publishing Co., Dordrecht, pp. 291- 303 (1985).
Link	
Comments	"Suitcase SETI" as the backend of automated sky survey at 2 magic frequencies over a 3 year observing period.
Date	1983 – 1988
Observer(s)	GRAY
Site	SMALL SETI OBSERVATORY
Instrument Size (m)	4

Search Frequency (MHz)	1419.5 – 1421.5
Search Wavelength (nm)	
Frequency Resolution (Hz)	1 – 40
Other Resolution	
Objects (Hz)	SKY SURVEY & -27 $\alpha$
Flux Limit ( $W m^{-2}$ )	$10^{-22}$
Total Hours	CONTINUING
Reference	GRAY, R.H., published in The Search for Extraterrestrial Intelligence: Proceedings of NRAO Workshop at NRAO, Green Bank, West Virginia, May 1985, K. Kellermann and G. Seielstad (eds.), NRAO/AUI Publishers, p. 205 (1986).
Link	
Comments	Dedicated meridian transit search system constructed by amateurs, operated during evenings.
Date	1983 – 1988
Observer(s)	STEPHENS
Site	INTERSTELLAR ELECTRO-MAGNETICS INSTITUTE AT HAY RIVER, NWT
Instrument Size (m)	TWO 18m x 18m (28m EQUIVALENT)
Search Frequency (MHz)	1415 – 1425
Search Wavelength	

(nm)	
Frequency Resolution (Hz)	30000
Other Resolution	
Objects (Hz)	NORTHERN SKY SURVEY
Flux Limit ( $W m^{-2}$ )	T sys ~75K
Total Hours	CONTINUING
Reference	
Link	
Comments	Two sixty four foot square surplus tropo-scatter dishes combined for use as dedicated amateur SETI observatory. Coverage is $30^{\circ}$ -> $45^{\circ}$ declination. Discontinued due to lack of funding.
Date	1984
Observer(s)	SLYSH
Site	SATELLITE
Instrument Size (m)	RADIOMETER
Search Frequency (MHz)	37000
Search Wavelength (nm)	
Frequency Resolution (Hz)	$4 \times 10^8$
Other Resolution	

Objects (Hz)	ALL SKY 3° K BB
Flux Limit (W m <sup>-2</sup> )	T/T ≤ .01
Total Hours	6000
Reference	SLYSH, V.I., "A Search in the Infrared to Microwave for Astroengineering Activity," The Search for Extraterrestrial Life: Recent Developments, M.D. Papagiannis (ed.), D. Reidel Publishing Co., Dordrecht, p.p. 315-319 (1985).
Link	
Comments	Lack of fluctuations 3 ≥ K background radiation on angular scales of 10 <sup>-2</sup> Strd. rules out optically thick Dyson spheres radiating more than 1 L o within 100 pc.
Date	1985 – 1992
Observer(s)	BOWYER, WERTHEIMER & LAMPTON "SERENDIP II"
Site	NRAO
Instrument Size (m)	92
Search Frequency (MHz)	400 – 3500
Search Wavelength (nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	SKY AREAS OBSERVED BY ASTRONOMERS
Flux Limit (W m <sup>-2</sup> )	4 x 10 <sup>-24</sup>
Total Hours	CONTINUING



Reference	BOWYER, S., WERTHEIMER, D. and LINDSAY, V., "The Berkeley Piggyback SETI Program: Serendip II" in Bioastronomy: The Next Steps, G. Marx (ed.), Kluwer Academic Publishers, Dordrecht (1988).
Link	
Comments	Automated search that piggybacks on radioastronomical observations. Scans available 3.5 MHz of available IF 65 KHz at a time, recording events above threshold for off line processing.
Date	1985 – 1995
Observer(s)	HOROWITZ "META SETI"
Site	OAKRIDGE (HARVARD UNIVERSITY)
Instrument Size (m)	26
Search Frequency (MHz)	1420.4, 1665.4, 1667.3, 2840.8
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.05
Other Resolution	
Objects (Hz)	SKY SURVEY
Flux Limit ( $W m^{-2}$ )	$1.3 \times 10^{-24}$
Total Hours	CONTINUING
Reference	HOROWITZ, P., published in The Search for Extraterrestrial Intelligence: Proceedings of NRAO Workshop at NRAO, Green Bank, West Virginia, May 1985,

	K. Kellermann and G. Seielstad (eds.), NRAO/AUI Publishers, p. 99 (1986).
Link	
Comments	Signal Processing Hardware from “SENTINEL” was replicated 128 times to produce $8.4 \times 10^6$ channels. Six sequential observations of each patch of sky are made to cover 2 orthogonal circular polarizations & 3 rest frames (Sun/Earth, Galactic Center, 3 K Background).
Date	1986
Observer(s)	ARKHIPOV
Site	
Instrument Size (m)	
Search Frequency (MHz)	408
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	HD 21899, HD 100623, HD 187691 & HD 187923
Flux Limit ( $\text{W m}^{-2}$ )	
Total Hours	
Reference	Arkhipov, A.V., Academy of Sciences Ukranian SSR Institute of Radiophysics and Electronics, preprint No. 303 (1986).

Link	
Comments	Search through 408 MHz Molonglo Survey Catalog of Radio Sources found 4 solar-type stars within 130" of radio source position. Suggested as leakage emission from orbital industrial processing facility ~1000 AU from star.
Date	1986
Observer(s)	MIRABEL
Site	NRAO
Instrument Size (m)	43
Search Frequency (MHz)	4829.620 – 4829.776
Search Wavelength (nm)	
Frequency Resolution (Hz)	76
Other Resolution	
Objects (Hz)	GALACTIC CENTER & 33 NEARBY STARS
Flux Limit ( $W m^{-2}$ )	$6 \times 10^{-25}$ to $10^{-24}$
Total Hours	144
Reference	
Link	
Comments	Search at H 2 CO frequency. Included star HD170493 located in front of dark “anti-maser” cloud.
Date	1986 – 1989

Observer(s)	DIXON & BOLINGER
Site	OSURO
Instrument Size (m)	53
Search Frequency (MHz)	1400 – 1700
Search Wavelength (nm)	
Frequency Resolution (Hz)	100, 10, 2000
Other Resolution	
Objects (Hz)	ALL SKY SEARCH
Flux Limit ( $W m^{-2}$ )	$1.5 \times 10^{-22}$
Total Hours	20000
Reference	
Link	
Comments	
Date	1986 – ON
Observer(s)	COLOMB, MARTIN & LEMARCHAND
Site	IAR
Instrument Size (m)	30
Search Frequency (MHz)	1415.4057, 1425.4057, 1667
Search Wavelength (nm)	

Frequency Resolution (Hz)	2500
Other Resolution	
Objects (Hz)	78 SOLAR-TYPE STARS
Flux Limit ( $W m^{-2}$ )	$5 \times 10^{-23}$
Total Hours	320
Reference	Colomb, F.R., Martin, M.C. and LEMARCHAND, G.A., "SETI Observational Program in Argentina," Acta Astronautica, 26, 3/4, pp. 211-212 (1992).
Link	
Comments	34 of 78 Southern Hemisphere solar-type stars have been examined at 21cm to date. All stars will be searched at 21 cm & 18 cm within 1 yr.
Date	1987
Observer(s)	GRAY
Site	OAK RIDGE (HARVARD UNIVERSITY)
Instrument Size (m)	26
Search Frequency (MHz)	1220.41 – 1620.41
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	0.05"

Objects (Hz)	SKY POSITION CORRESPONDING TO OSURO's 1977 "WOW" SIGNAL
Flux Limit ( $W m^{-2}$ )	$1.5 \times 10^{-24}$
Total Hours	16
Reference	GRAY, R.H., "A Search of the 'WOW' Locale for Intermittent Radio Signals," Icarus 112, pp. 485-489 (1994).
Link	
Comments	Used "META SETI" system (see Ref.27) to track position on sky that produced the "WOW" signal at OSURO in 1977.
Date	1987
Observer(s)	TARTER, KARDASHEV & SLYSH
Site	VLA
Instrument Size (m)	26 (9 ANTENNAS)
Search Frequency (MHz)	1612.231
Search Wavelength (nm)	
Frequency Resolution (Hz)	6105
Other Resolution	
Objects (Hz)	G357.3-1.3
Flux Limit ( $W m^{-2}$ )	
Total Hours	1

Reference	
Link	
Comments	Remote observation (by VLA staff) of IRAS source near galactic center to determine if source could be nearby Dyson sphere. Source confirmed as OH/IR star.
Date	1988
Observer(s)	BANIA & ROOD
Site	NRAO
Instrument Size (m)	43
Search Frequency (MHz)	8665
Search Wavelength (nm)	
Frequency Resolution (Hz)	305
Other Resolution	
Objects (Hz)	24 "VEGA-LIKE" STARS WITH 60 MICRON EXCESSES (IRAS)
Flux Limit ( $W m^{-2}$ )	1 Jy
Total Hours	50
Reference	BANIA, T.M and ROOD, R.T., "Search for Interstellar Beacons at the $3He+$ Hyperfine Transition Frequency," Third Decennial US-USSR Conference on SETI, Santa Cruz, August 1991. ASP Conf. Series 47, S. Shostak (ed.), Astronomical Society of the Pacific, San Francisco, pp. 357-365 (1993).

Link	
Comments	Searching for narrow band, obviously artificial, signal at the frequency of $^3\text{He}^+$ spin-flip, being radiated by advanced civilizations that have colonized their planetary systems.
Date	1989 – ON
Observer(s)	CHILDERS & DIXON
Site	OSURO
Instrument Size (m)	53
Search Frequency (MHz)	1400 – 1700
Search Wavelength (nm)	
Frequency Resolution (Hz)	100, 10, 2000
Other Resolution	
Objects (Hz)	ALL SKY SEARCH
Flux Limit ( $\text{W m}^{-2}$ )	$1.5 \times 10^{-22}$
Total Hours	60000
Reference	
Link	
Comments	Have searched declinations +62 to –22 so far. Continuing to –36.



Date	1990
Observer(s)	BLAIR ET AL.
Site	CSIRO
Instrument Size (m)	64
Search Frequency (MHz)	4461.98 – 4462.03
Search Wavelength (nm)	
Frequency Resolution (Hz)	100
Other Resolution	
Objects (Hz)	100 SOLAR-TYPE STARS VISIBLE ONLY FROM SOUTHERN HEMISPHERE
Flux Limit ( $W m^{-2}$ )	2 Jy
Total Hours	60
Reference	BLAIR, D.G., NORRIS, R., WELLINGTON, K.J., WILLIAMS, A. and WRIGHT, A., “A Test for the Interstellar Contact Channel Hypothesis in SETI,” <i>Bioastronomy: The Search for Extraterrestrial Life</i> , J. Heidmann and M. Klein (eds.), Springer-Verlag, Berlin, LNP 390, pp. 271-279 (1991).
Link	
Comments	Magic frequency search at pi times hydrogen line frequency. 1280 channels were arranged to sample three reference frames: solar barycenter, stellar barycenter and geocenter.
Date	1990

Observer(s)	GRAY
Site	OAK RIDGE (HARVARD UNIVERSITY)
Instrument Size (m)	26
Search Frequency (MHz)	1420.2 – 1420.6
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.05
Other Resolution	
Objects (Hz)	M31 AND M33
Flux Limit ( $W m^{-2}$ )	
Total Hours	50
Reference	
Link	
Comments	Long integrations (5 hours per HPBW) on 10 11 stars at once, looking for low duty cycle signals.
Date	1990 – 1995
Observer(s)	GRAY
Site	SMALL SETI OBSERVATORY
Instrument Size (m)	4
Search Frequency (MHz)	1419.5 – 1420.5
Search Wavelength	

(nm)	
Frequency Resolution (Hz)	1 – 100
Other Resolution	
Objects (Hz)	
Flux Limit ( $\text{W m}^{-2}$ )	$10^{-21}$
Total Hours	ONGOING ~6 HOURS/NIGHT
Reference	GRAY, R.H., “Small SETI Radio Telescope Mark II: 8,192 Channels,” SETI Quest Vol. 2 No. 4 (November 1995).
Link	
Comments	Dedicated meridian transit search system constructed by amateurs, automated operation at night.
Date	1990 – ON
Observer(s)	BETZ
Site	MT. WILSON
Instrument Size (m)	1.65 M ELEMENT OF TOWNES IR INTERFEROMETER
Search Frequency (MHz)	
Search Wavelength (nm)	10000
Frequency Resolution (Hz)	$3.5 \times 10^6$
Other Resolution	
Objects (Hz)	100 NEARBY SOLAR-TYPE STARS

Flux Limit ( $W m^{-2}$ )	1 MW TRANSMITTER OUT TO 20pc
Total Hours	CONTINUING
Reference	BETZ. A.L., "A Search for Infrared Laser Signals," Third Decennial US-USSR Conference on SETI, ASP Conference Series Vol. 47, S. Shostak (ed.), pp. 373-379 (1993).
Link	
Comments	Search for IR beacons at CO 2 laser frequency using narrowband acousto-optical spectrometer.
Date	1990 – 2010
Observer(s)	LEMARCHAND "META II"
Site	INSTITUTE FOR ARGENTINE RADIOASTRONOMY (IAR)
Instrument Size (m)	30 (ONE OF TWO)
Search Frequency (MHz)	1420.4, 1667, 3300
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.05
Other Resolution	
Objects (Hz)	SKY SURVEY OF SOUTHERN SKIES AND 90 TARGET STARS, AND OH MASERS
Flux Limit ( $W m^{-2}$ )	$10^{-23} - 7 \times 10^{-25}$
Total Hours	ONGOING
Reference	COLOMB, F.R., HURRELL, E.E., LEMARCHAND, G.A., AND olade, j.c., "Results of Two Years of SETI Observations with

	META II”, Progress in the Search for Extraterrestrial Life, ASP Conference Series Vol. 74, S. Shostak (ed.), Astronomical Society of the Pacific, San Francisco, pp. 345-352 (1995).
Link	
Comments	Search for signals that have been Doppler compensated to rest frame of SS barycenter, Galactic Center or CMB. A duplicate of META system build by Argentinian engineers under the guidance of Prof. Horowitz at Harvard and financed by the Planetary Society. Simultaneous observations with META over declination range $-10^{\circ}$ to $-30^{\circ}$ . Major upgrades in 1996 to permit long integration times, and switching between antennas. Search through OH masers looking for amplified signals.
Date	1992 – 1993
Observer(s)	NASA “HRMS” SKY SURVEY
Site	GOLDSTONE, CA
Instrument Size (m)	26, 34
Search Frequency (MHz)	1700, 8300 – 8700
Search Wavelength (nm)	
Frequency Resolution (Hz)	19
Other Resolution	
Objects (Hz)	72 SKY FRAMES AT X-BAND AND 130 SKY FRAMES REPEATEDLY MAPPING 3 GALACTIC PLANE REGIONS AT L-BAND IN SEQUENTIAL CIRCULAR POLARIZATION

Flux Limit ( $\text{W m}^{-2}$ )	$9.8 \times 10^{-23}$
Total Hours	1386
Reference	LEVIN, S., OLSEN, E.T., BACKUS, C., and GULKIS, S., "The NASA HRMS Sky Survey X-B and Observations: A Progress Report," Progress in the Search for Extraterrestrial Life, ASP Conference Series Vol. 74, S. Shostak (ed.), Astronomical Society of the Pacific, San Francisco, pp. 470-477 (1995).
Link	
Comments	No detection of non-human technology.
Date	1992 – 1993
Observer(s)	NASA "HRMS" TARGETED SEARCH
Site	ARECIBO, PR
Instrument Size (m)	305
Search Frequency (MHz)	1300 – 2400
Search Wavelength (nm)	
Frequency Resolution (Hz)	46759
Other Resolution	
Objects (Hz)	25 STARS
Flux Limit ( $\text{W m}^{-2}$ )	$5 \times 10^{-24}$
Total Hours	200

Reference	TARTER, J. , “HRMS: Where We’ve Been, and Where We’re Going,” Progress in the Search for Extraterrestrial Life, ASP Conference Series Vol. 74, S. Shostak (ed.), Astronomical Society of the Pacific, San Francisco, pp. 456-469 (1995).
Link	
Comments	No detection of non-human technology.
Date	1992 – 1993
Observer(s)	Oliver, ; Levin, S.; Olsen, E.T.; Backus, C.; Gulkis, S.; HRMS Sky Survey,
Site	GOLDSTONE, CA
Instrument Size (m)	34
Search Frequency (MHz)	8300 – 8600
Search Wavelength (nm)	
Frequency Resolution (Hz)	$40 \times 10^6$
Other Resolution	
Objects (Hz)	X-band survey
Flux Limit ( $W m^{-2}$ )	$5 \times 10^{-22}$
Total Hours	
Reference	Levin, S., Olsen, E.T., Backus, C., Gulkis, S., “The NASA HRMS Sky Survey X-Band Observations: A Progress Report,” Progress in the Search for Extraterrestrial Life

	ASP Conference Series, Vol. 74, p. 471, G. Seth Shostak (ed.) (1995).
Link	*** <a href="http://articles.adsabs.harvard.edu/cgi-bin/nph-iarticle_query?1995ASPC...74..471L&amp;data_type=PDF_HIGH&amp;whole_paper=YES&amp;type=PRINTER&amp;filetype=.pdf">http://articles.adsabs.harvard.edu/cgi-bin/nph-iarticle_query?1995ASPC...74..471L&amp;data_type=PDF_HIGH&amp;whole_paper=YES&amp;type=PRINTER&amp;filetype=.pdf</a> ***
Comments	The SSPS, or Sky Survey Prototype System is a distinct subdivision of the NASA HRMS survey. The prototype system is working well. It is being used to gain experience which will be applied in the running of the Operation system, SSOS. The search looks for Singlets and Doublets. The strongest of these targets are kept and reobserved within two hours of initial detection. During the lookbacks, several sky frames are observed at once to increase accuracy. Thus far no anomalies which might indicate ETI signals have been found.
Date	1992 – 1997
Observer(s)	BOWYER, WERTHIMER & DONNELLY “SERENDIP III”
Site	ARECIBO
Instrument Size (m)	305
Search Frequency (MHz)	424 – 436
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.6
Other Resolution	
Objects (Hz)	SURVEY OF 30% OF SKY



Flux Limit ( $\text{W m}^{-2}$ )	$5 \times 10^{-25}$
Total Hours	CONTINUING
Reference	DONNELLY, C., BOWYER, S., WERTHIMER, D. and MALINA, R.F., "Forty Trillion Signals from SERENDIP: The Berkeley SETI Program," Progress in the Search for Extraterrestrial Life, ASP Conference Series Vol. 74, S. Shostak (ed.), Astronomical Society of the Pacific, San Francisco, pp. 284-290 (1995).
Link	
Comments	4 million channels are under observation. Commensal search occurring at twice sidereal rate in backwards direction while radio astronomers track targets using the feeds and receivers on carriagehouse 1.
Date	1993
Observer(s)	JUGAKU, NOGUCHI & NISHIMURA
Site	INFRARED TELESCOPE OF INSTITUTE OF SPACE AND ASTRONAUTICAL SCIENCE, JAPAN AND INFRARED TELESCOPE AT XINGLONG STATION OF THE BEIJING ASTRONOMICAL OBSERVATORY
Instrument Size (m)	1.3, 1.26
Search Frequency (MHz)	
Search Wavelength (nm)	2200, 12000
Frequency Resolution (Hz)	
Other Resolution	

Objects (Hz)	180 SOLAR-TYPE STARS
Flux Limit ( $W m^{-2}$ )	
Total Hours	
Reference	JUGAKU, J., NOGUCHI, K., NISHIMURA, S., "A Search for Dyson Spheres Around Late-Type Stars in the Solar Neighborhood," Progress in the Search for Extraterrestrial Life, ASP Conference Series Vol. 74, S. Shostak (ed.), Astronomical Society of the Pacific, San Francisco, pp. 381-385 (1995).
Link	
Comments	Searched for 12 $\mu$ excess radiation from IRAS catalog stars by using K-[12] color index in attempt to find Dyson Spheres.
Date	1993
Observer(s)	STEFFES & DeBOER
Site	NRAO/TUCSON
Instrument Size (m)	12
Search Frequency (MHz)	203000
Search Wavelength (nm)	
Frequency Resolution (Hz)	32
Other Resolution	
Objects (Hz)	40 STARS + 3 LOCATIONS NEAR GALACTIC CENTER

Flux Limit ( $W m^{-2}$ )	$2.3 \times 10^{-19}$
Total Hours	25
Reference	Steffes, P.G. and DeBOER, D.R., "A SETI Search of Nearby Solar-Type Stars at the 203 GHz Positronium Hyperfine Resonance," Icarus 107, pp. 215-218 (1994).
Link	
Comments	No artificial signals detected near positronium line.
Date	1993 – 1995
Observer(s)	LEMARCHAND ET AL. "META II TARGET SEARCH"
Site	INSTITUTO ARGENTINO DE RADIOASTRONOMIA (IAR)
Instrument Size (m)	30
Search Frequency (MHz)	1420
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.05
Other Resolution	
Objects (Hz)	TARGETED SEARCH $< 8 - 10^\circ$
Flux Limit ( $W m^{-2}$ )	$10^{-24}$
Total Hours	290
Reference	LEMARCHAND, G.A., "SETI From the Southern Hemisphere," SETI Quest, Vol. 2, No. 2, pp. 13-18 (1996).
Link	

Comments	All * < 5 pc and solar type * -> 50 ly yr. 80 stars total.
Date	1994
Observer(s)	MAUERSBERGER, WILSON, ROOD, BANIA, HEIN & LINHART
Site	IRAM/PICO VELETA
Instrument Size (m)	30
Search Frequency (MHz)	203000
Search Wavelength (nm)	
Frequency Resolution (Hz)	$10^6$ , 9700
Other Resolution	
Objects (Hz)	16 STARS + GALACTIC CENTER
Flux Limit ( $W m^{-2}$ )	$0.2 - 20 \times 10^{15}$
Total Hours	~5
Reference	MAUERSBERGER, R., WILSON, T.L., ROOD, R.T., BANIA, T.M., HEIN, H. and LINKART, A., "SETI at the Spin - Flip Line Frequency of Positronium," <i>Astron. Astrophys.</i> 306, pp. 141-144 (1996).
Link	
Comments	Search at Positronium line towards nearby stars and stars with IR excess that might be Dyson spheres.
Date	1995

Observer(s)	GRAY
Site	NRAO/VLA
Instrument Size (m)	27-ELEMENT ARRAY of 26M ANTENNAS
Search Frequency (MHz)	1420
Search Wavelength (nm)	
Frequency Resolution (Hz)	6104, 381
Other Resolution	
Objects (Hz)	OSU "WOW" LOCALE
Flux Limit ( $W m^{-2}$ )	10 & 100 mJy/beam/channel
Total Hours	4
Reference	
Link	
Comments	Search of the OSU "WOW" locale with 4 arcsec synthesized beam.
Date	1995
Observer(s)	NORRIS (PHOENIX COOPERATIVE SCIENCE)
Site	ATNF/PARKES and MOPRA
Instrument Size (m)	64, 22
Search Frequency (MHz)	1200 – 3000
Search Wavelength	

(nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	GALACTIC CENTER
Flux Limit ( $W m^{-2}$ )	$1.3 \times 10^{-25}$
Total Hours	24
Reference	
Link	
Comments	Galactic Center searched for beacon.
Date	1995
Observer(s)	SETI INSTITUTE PROJECT PHOENIX
Site	ATNF/PARKES and MOPRA
Instrument Size (m)	64, 22
Search Frequency (MHz)	1200 – 3000
Search Wavelength (nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	206 STARS, 1200 – 1750 MHz 105 STARS, 1750 – 3000 MHz
Flux Limit ( $W m^{-2}$ )	$1.32 \times 10^{-25}$ FOR HALF of 1750 – 3000 MHz OBSERVATIONS. $1.82 \times 10^{-25}$ FOR ALL OTHER

	OBSERVATIONS
Total Hours	2600
Reference	BACKUS, P., "The Phoenix Search Results at Parkes," <i>Acta Astronautica</i> 42, No. 10-12, pp. 651-654 (1998). Dreher, J., "The Phoenix Signal Detection System," <i>Acta Astronautica</i> 42, No. 10-12, pp. 635-640 (1998).
Link	
Comments	Immediate two-site, pseudo-interferometric follow-up observations of candidate signals. Targets were solar-type stars visible only from southern hemisphere. No detection of non-human technology.
Date	1995
Observer(s)	SHOSTAK, EKERS, and VAILE (PHOENIX COOPERATIVE SCIENCE)
Site	ATNF/PARKES
Instrument Size (m)	64
Search Frequency (MHz)	1200 – 1750
Search Wavelength (nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	3 FIELDS IN THE SMC
Flux Limit ( $W m^{-2}$ )	$1.9 \times 10^{-25}$

Total Hours	24
Reference	Shostak, S., Ekers, R., and Vaile, R., "A Search for Artificial Signals from the Small Magellanic Cloud", A.J. 112, pp 164-166 (1996).
Link	
Comments	Search of > 10 <sup>7</sup> stars contained within the three fields of the SMC. Limit on detectable transmitters of 1.5×10 <sup>18</sup> W EIRP.
Date	1995
Observer(s)	SULLIVAN, WELLINGTON, SHOSTAK, BACKUS, AND CORDES (PHOENIX COOPERATIVE SCIENCE)
Site	ATNF/PARKES
Instrument Size (m)	64
Search Frequency (MHz)	1415 – 1425
Search Wavelength (nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	GALACTIC CENTER AND 5° HIGH STRIP +/-15°LONGITUDE ALONG GALACTIC PLANE
Flux Limit (W m <sup>-2</sup> )	1.5 – 10 x 10 <sup>-25</sup>
Total Hours	48
Reference	Sullivan, III, W.T., Wellington, K.J., Shostak, G.S., Backus,



	P.R., and Cordes, J.M., "A Galactic Center Search for Extraterrestrial Intelligent Signals." Poster paper #P4-17 presented at 5th International Conference on Bioastronomy, IAU Colloquium No. 161, Capri, Italy (July 1-5, 1996).
Link	
Comments	Multiple 30-second observations of strip along Galactic Plane and the Galactic Center, looking for repetitive signals.
Date	1995
Observer(s)	TE LINTEL HEKKERT AND TARTER (PHOENIX COOPERATIVE SCIENCE)
Site	ATNF/PARKES and MOPRA
Instrument Size (m)	64, 22
Search Frequency (MHz)	1200 – 3000
Search Wavelength (nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	4 POTENTIAL DYSON SPHERES
Flux Limit ( $W m^{-2}$ )	$1.9 \times 10^{-25}$
Total Hours	48
Reference	

Link	
Comments	Candidate Dyson Sphere selection criteria: IRAS PSC sources with temperatures from 300–500K, that were not identified in OH/IR or CO(1–0) surveys, and had galactic latitudes $> 5^\circ$ .
Date	1995
Observer(s)	ZADNIK ET AL. (PHOENIX COOPERATIVE SCIENCE)
Site	ATNF/PARKES
Instrument Size (m)	64
Search Frequency (MHz)	4462, 4532, 8295, 8393, 8666
Search Wavelength (nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	49 STARS CLOSER THAN 11.5 pc
Flux Limit ( $\text{W m}^{-2}$ )	3.5 AND 5.0 Jy
Total Hours	48
Reference	Zadnik, M.G., Winterflood, J., Williams, A.J., Wellington, K.J., Vaile, R. Tarter, J., Norris, R., Heiligman, G., Blair, D.G., and Backus, P., “Interstellar Communication Channel Search of Solar-Type Targets Closer than 11 pc.” Poster paper #P4-21 presented at 5th International Conference on Bioastronomy, IAU Colloquium No. 161, Capri, Italy (July 1–5, 1996).

Link	
Comments	Magic Frequency search at $\pi^*HI$ , $e^*OH$ , $2\pi^*HI$ , $e^*(OH + H)$ , $3 H e$
Date	1995 – 1998
Observer(s)	BROWN, KLEIN & DIXON
Site	OSURO
Instrument Size (m)	53
Search Frequency (MHz)	1421.75 – 1424.25
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.6
Other Resolution	
Objects (Hz)	ALL SKY SEARCH
Flux Limit ( $W m^{-2}$ )	UNKNOWN AS YET
Total Hours	5000
Reference	
Link	
Comments	Using SERENDIP processor. Have searched declinations +8 to -36. Program ended when OSU sold observatory site to golf course developer.
Date	1995 – 1998

Observer(s)	KINGSLEY
Site	COLUMBUS OPTICAL SETI OBSERVATORY, OHIO
Instrument Size (m)	0.25
Search Frequency (MHz)	
Search Wavelength (nm)	550
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	NEARBY SOLAR-TYPE STARS
Flux Limit ( $W m^{-2}$ )	TRANSMITTERS WITH PEAK INSTANTANEOUS POWER > $10^{18} W$
Total Hours	
Reference	KINGSLEY, S. "Prototype Optical SETI Observatory" in Proceedings of the Search for Extraterrestrial Intelligence (SETI), in the Optical Spectrum II, Jan 31 – Feb 1, 1996, Proc. SPIE 2704:102. < <a href="http://www.coseti.org">http://www.coseti.org</a> >
Link	
Comments	Broadband optical search for short pulses (~1 nanosecond) that instantaneously outshine the host star.
Date	1995 – 1999
Observer(s)	HOROWITZ ET AL. (BETA)
Site	OAK RIDGE OBSERVATORY
Instrument Size (m)	26

Search Frequency (MHz)	1400 – 1720
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.5
Other Resolution	
Objects (Hz)	SKY SURVEY FROM $-30^{\circ}$ to $+60^{\circ}$ DECLINATION
Flux Limit ( $\text{W m}^{-2}$ )	$2.2 \times 10^{-22}$
Total Hours	SUSPENDED IN SPRING 1999
Reference	LEIGH, d. AND HOROWITZ, p. “Strategies, Implementation And Results Of BETA” in Bioastronomy ‘99 – A New Era in Bioastronomy, Proceedings of a Conference held on the Kohala Coast, Hawaii, 2–6 Aug. 1999, ASP Conference Series 213, p. 459 (2000).
Link	
Comments	Waterhole search, using dual-beams and omni antenna to discriminate against RFI. Project BETA (Billion channel ExtraTerrestrial Assay) is follow-on to META. Project interrupted when wind blew antenna off its mount. Repairs are under way.
Date	1995 – 2010
Observer(s)	SETI LEAGUE PROJECT ARGUS
Site	MULTIPLE SITES WORLD-WIDE (CURRENTLY ~100)
Instrument Size (m)	~3 – 10 (SATELLITE TV DISHES)
Search Frequency	1420 – 1720

(MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	ALL SKY
Flux Limit ( $W m^{-2}$ )	$10^{-21}$
Total Hours	ONGOING
Reference	SETI League Project Argus. < <a href="http://www.setileague.org">http://www.setileague.org</a> >
Link	
Comments	Plan to organize up to 5000 radio amateurs to provide continuous sky coverage for strong, transient signals using systems that can be bought and built by individuals. SETI League currently has 1257 members running 105 sites in 19 countries.
Date	1996
Observer(s)	BIRAUD AND AIRIEAU
Site	NANÇAY OBSERVATORY
Instrument Size (m)	40 x 240
Search Frequency (MHz)	1419.7 – 1420.3, 1657.8 – 1662.2
Search Wavelength (nm)	
Frequency	50

Resolution (Hz)	
Other Resolution	
Objects (Hz)	4 STARS WITH GIANT PLANETS (51 Peg, 47 UMa, 70 Vir, Gl 229)
Flux Limit ( $W m^{-2}$ )	$10^{-24}$
Total Hours	40
Reference	
Link	
Comments	Search of newly discovered extrasolar planetary systems using observing protocol from Biraud and Tarter 1981-1988 SETI program at Nançay.
Date	1996
Observer(s)	LOCKETT, BLAIR & ZADNIK
Site	PERTH OPTICAL OBSERVATORY
Instrument Size (m)	1
Search Frequency (MHz)	
Search Wavelength (nm)	572
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	24 NEARBY STARS
Flux Limit ( $W m^{-2}$ )	

Total Hours	
Reference	
Link	
Comments	Search for microsecond laser pulses.
Date	1996 – 1998
Observer(s)	SETI INSTITUTE PROJECT PHOENIX
Site	NRAO AND WOODBURY, GA
Instrument Size (m)	43, 30
Search Frequency (MHz)	1200 – 3000 DUAL POL
Search Wavelength (nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	195 STARS
Flux Limit ( $\text{W m}^{-2}$ )	$1.3 \times 10^{-25}$
Total Hours	4200
Reference	CULLERS, D.K., “Project Phoenix And Beyond” in Bioastronomy ‘99 – A New Era in Bioastronomy, Proceedings of a Conference held on the Kohala Coast, Hawaii, 2–6 Aug. 1999, ASP Conference Series 213, p. 451 (2000).
Link	



Comments	Longer observations provided same ensitivity as achieved Australia.
Date	1996 – 1998
Observer(s)	TILGNER, HEINRICHSEN, KRUGER, PACHER, WALKER, WOLSTENCROFT
Site	ISO (INFRARED SPACE OBSERVATORY) SATELLITE, ISOPHOT PHOTOPOLARIMETER
Instrument Size (m)	0.6
Search Frequency (MHz)	
Search Wavelength (nm)	3000 – 100000
Frequency Resolution (Hz)	
Other Resolution	0.2 MICRONS (3 MICRON FILTER BAND) 51 MICRONS (90 MICRON FILTER BAND)
Objects (Hz)	6 SOLAR-TYPE STARS AND 1 INFRARED-EXCESS TARGET STAR
Flux Limit ( $W m^{-2}$ )	$30 - 90 \times 10^{-29}$ (S/N = 10)
Total Hours	1.3 HOURS (GUARANTEED SCHEDULE)
Reference	Tilgner, C.N. and Heinrichsen, I., “A Program to Search for Dyson Spheres With the Infrared Space Observatory,” paper #IAA-95-IAA.9.1.11, IAF Congress, Oslo, Norway (October 1995).
Link	
Comments	Search for astro-engineering products like Dyson Spheres

	and rings by separation of their infrared spectra from that of the host star.
Date	1996 – 1998
Observer(s)	Cullers, D.K.; SETI Institute Project Phoenix,
Site	NRAO; Woodbury
Instrument Size (m)	43, 30
Search Frequency (MHz)	1200 – 3000 dual pol
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.7
Other Resolution	
Objects (Hz)	195 stars
Flux Limit ( $W m^{-2}$ )	$1.3 \times 10^{-25}$
Total Hours	4200
Reference	Cullers, D.K., “Project Phoenix And Beyond,” Bioastronomy “~99 “” A New Era in Bioastronomy, Proceedings of a Conference held on the Kohala Coast, Hawaii, 2–6 Aug. 1999, ASP Conference Series 213, p. 451 (2000).
Link	<a href="http://adsabs.harvard.edu/full/2000ASPC..213..451">http://adsabs.harvard.edu/full/2000ASPC..213..451</a>
Comments	Continuation for NASA HRMS targeted search of nearby stars, using real-time data

Date	1996 – ON
Observer(s)	WERTHIMER ET AL. (SERENDIP IV)
Site	ARECIBO
Instrument Size (m)	305
Search Frequency (MHz)	1370 – 1470
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.6
Other Resolution	
Objects (Hz)	SURVEY OF 30% OF SKY VISIBLE FROM ARECIBO
Flux Limit ( $W m^{-2}$ )	$5 \times 10^{-24}$
Total Hours	ONGOING
Reference	Werthimer, D., Bowyer, S., Ng, D., Donnelly, C., Cobb, J., Lampton, M., and Airieau, S., “The Berkeley SETI Program: SERENDIP IV Instrumentation.” Poster paper #P4-20 presented at 5th International Conference on Bioastronomy, IAU Colloquium No. 161, Capri, Italy (July 1-5, 1996).
Link	
Comments	Commensal search occurring at twice sidereal rate in backwards direction while radio astronomers track targets using Gregorian system.
Date	1997 (A), 1999 (B)

Observer(s)	BAMBI (BOB AND MIKE'S BIG INVESTMENT), SARA (SOCIETY OF AMATEUR RADIO ASTRONOMERS) MEMBERS
Site	A IN CALIFORNIA, B IN COLORADO
Instrument Size (m)	2.6 (A); 3 (B)
Search Frequency (MHz)	3700 – 4200
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.6
Other Resolution	
Objects (Hz)	NORTHERN SKY SURVEY
Flux Limit ( $W m^{-2}$ )	NO FORMAL OBSERVING PROGRAM HAS YET BEGUN
Total Hours	ONGOING
Reference	Lash,R. and Fremont, M. "Up and running at 4 GHz: the SETI-capable Radio Telescope" in Radio Astronomy, the journal of the Society of Amateur Radio Astronomers, June/July 1994, pp1-6.
Link	
Comments	Amateur radio enthusiasts using TVRO components and software FFTs to try coordinated search.
Date	1997 – 2009
Observer(s)	Cobb, Jeff; Lebofsky, M.; Werthimer, D.; Bowyer, S.; Lampton, M.; SERENDIP IV,

Site	NAIC, Arecibo
Instrument Size (m)	305
Search Frequency (MHz)	1420
Search Wavelength (nm)	
Frequency Resolution (Hz)	20
Other Resolution	
Objects (Hz)	Sky Survey
Flux Limit ( $W m^{-2}$ )	
Total Hours	
Reference	Cobb, Jeff, Lebofsky, M., Werthimer, D., Bowyer, S., Lampton, M., "SERENDIP IV: Data Acquisition, Reduction, and Analysis," Bioastronomy 99: A New Era in the Search for Life (2000).
Link	<a href="http://articles.adsabs.harvard.edu/cgi-bin/nph-iarticle_query?2000ASPC..213..485C&amp;data_type=PDF_HIGH&amp;whole_paper=YES&amp;type=PRINTER&amp;filetype=.pdf">http://articles.adsabs.harvard.edu/cgi-bin/nph-iarticle_query?2000ASPC..213..485C&amp;data_type=PDF_HIGH&amp;whole_paper=YES&amp;type=PRINTER&amp;filetype=.pdf</a>
Comments	Pigyback search from upgraded Gregorian feed platform at Arecibo Observatory, similar to previous versions of SERENDIP. It ran with around the clock observation. 40 spectrum analysis/post-processing boards worked at the same time. The calculated power spectra was normalized with an 8000 channel boxcar. Every five seconds, the telescope's pointing coordinates were taken. The spectra was calculated and the normal slew rates were passed on. Any RFI was removed. Algorithms detected signal patterns,

	persistence, pulsing, and high-power events. SERENDIP IV looked for persistence in frequency over time. Candidates were reobserved.
Date	1997 (A), 2000 (B), 2004 (C)
Observer(s)	Jugaku and Nishimura
Site	Archival from IRAS
Instrument Size (m)	
Search Frequency (MHz)	
Search Wavelength (nm)	2200 – 12000
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	(A) 50 stars (B) 135 stars (C) 19 stars
Flux Limit ( $W m^{-2}$ )	
Total Hours	
Reference	(A) Jugaku and Nishimura 1997 at the IAU Colloquium 161 (B) Jugaku and Nishimura 2000 in Bioastronomy 1999 (C) Jugaku and Nishimura 2004 in Bioastronomy 2002
Link	(A) <a href="http://adsabs.harvard.edu/abs/1997abos.conf..707">http://adsabs.harvard.edu/abs/1997abos.conf..707</a> (B) <a href="http://adsabs.harvard.edu/full/2000ASPC..213..581">http://adsabs.harvard.edu/full/2000ASPC..213..581</a> (C) <a href="http://adsabs.harvard.edu/abs/2004IAUS..213..437">http://adsabs.harvard.edu/abs/2004IAUS..213..437</a>
Comments	Search for 12 $\mu$ excess radiation from IRAS catalog stars by

using K-[12] color index in attempt to find Dyson Spheres.

Date	1998 – 2002
Observer(s)	MARCY, REINES, BUTLER, VOGT
Site	LICK, KECK
Instrument Size (m)	10
Search Frequency (MHz)	
Search Wavelength (nm)	400 – 500
Frequency Resolution (Hz)	
Other Resolution	$\lambda/\Delta\lambda = 50000$
Objects (Hz)	600 FGK STARS WITHIN 100 pc
Flux Limit ( $\text{W m}^{-2}$ )	$1 \times 10^{-13}$
Total Hours	500
Reference	Butler, R.P., Marcy, G. W., Williams, E., McCarthy, C., Dosanjh, P., Vogt, S. S “Attaining Doppler Precision of 3 meters/sec,” PASP v.108, p.500
Link	
Comments	Search through archival data for narrowband continuous optical laser emission lines.
Date	1998 – 2004
Observer(s)	SETI INSTITUTE PROJECT PHOENIX

Site	ARECIBO OBSERVATORY AND LOVELL TELESCOPE AT JODRELL BANK
Instrument Size (m)	305, 76
Search Frequency (MHz)	1200 TO 3000 DUAL POL
Search Wavelength (nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	1000 NEARBY STARS (500 OBSERVED TO DATE)
Flux Limit ( $W m^{-2}$ )	$1 \times 10^{-26}$
Total Hours	1300 HOURS TO DATE
Reference	SHOSTAK, S. and TARTER, J. "Project Phoenix Enters Adulthood," paper #IAA-99-IAA.9.1.01, IAF Congress, Amsterdam, The Netherlands (October 1999).
Link	
Comments	Continuation of NASA HRMS targeted search of 1000 nearby stars, using real-time data reduction and a pair of widely separated observatories to help discriminate against RFI.
Date	1998 – 2005
Observer(s)	HOROWITZ ET AL. (HARVARD OPTICAL SETI)
Site	OAK RIDGE OBSERVATORY
Instrument Size (m)	1.5



Search Frequency (MHz)	
Search Wavelength (nm)	350 – 700
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	13000 SOLAR-TYPE STARS OF WHICH 4000 OBSERVED TO DATE
Flux Limit ( $W m^{-2}$ )	$4 \times 10^{-9}$ PEAK IN $< 5$ ns PULSE, OR $4 \times 10^{-20}$ AVERAGE PER 500 SECOND OBSERVATION
Total Hours	ONGOING
Reference	HOWARD, A., ET AL., “Optical SETI at Harvard-Smithsonian” in Bioastronomy ‘99 – A New Era in Bioastronomy, Proceedings of a Conference held on the Kohala Coast, Hawaii, 2-6 Aug. 1999, ASP Conference Series 213, p. 545 (2000)
Link	
Comments	Search for nanosecond laser pulses, with hybrid avalanche photodiodes in coincidence. Piggybacks on nightly searches for extrasolar planets. Soon to be operated in coincidence with cloned detector on 0.9 m telescope at Princeton.
Date	1998 – 2010
Observer(s)	WERTHIMER
Site	LEUSCHNER OBSERVATORY

Instrument Size (m)	0.8
Search Frequency (MHz)	
Search Wavelength (nm)	300 – 650
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	800 SOLAR-TYPE STARS
Flux Limit ( $W m^{-2}$ )	$1.5 \times 10^{-9}$ PEAK DURING 1ns PULSE, OR $1.5 \times 10^{-20}$ AVERAGE PER 100 SECOND OBSERVATION
Total Hours	200 (ONGOING)
Reference	LAMPTON, M., “Optical SETI: The Next Search Frontier” in Bioastronomy ‘99 – A New Era in Bioastronomy, Proceedings of a Conference held on the Kohala Coast, Hawaii, 2-6 Aug. 1999, ASP Conference Series 213, p. 565 (2000)
Link	
Comments	First optical search to use two high time resolution photomultiplier tubes in coincidence to look for nanosecond pulses.
Date	1998 – ON
Observer(s)	SETI AUSTRALIA SOUTHERN SERENDIP
Site	PARKES
Instrument Size (m)	64

Search Frequency (MHz)	1411.59 – 1429.23
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.6
Other Resolution	
Objects (Hz)	SOUTHERN SKY SURVEY
Flux Limit ( $W m^{-2}$ )	$4 \times 10^{-24}$
Total Hours	ONGOING
Reference	STOOTMAN, F. ET AL., “The Southern SERENDIP Project” in Bioastronomy ‘99 – A New Era in Bioastronomy, Proceedings of a Conference held on the Kohala Coast, Hawaii, 2–6 Aug. 1999, ASP Conference Series 213, p. 491 (2000).
Link	
Comments	Comensal search that uses 2 out of 13 beams of Parkes focal plane anrray to discriminate against RFI.
Date	1999 – ON
Observer(s)	WERTHIMER AND ANDERSON (SETI@HOME)
Site	ARECIBO
Instrument Size (m)	305
Search Frequency (MHz)	1419.16 – 1421.66
Search Wavelength	

(nm)	
Frequency Resolution (Hz)	0.6
Other Resolution	
Objects (Hz)	DATA TAKEN FROM SERENDIP IV – SKY VISIBLE FROM ARECIBO
Flux Limit ( $W m^{-2}$ )	$5 \times 10^{-25}$
Total Hours	ONGOING
Reference	ANDERSON, D. “Internet Computing for SETI” in Bioastronomy ‘99 – A New Era in Bioastronomy, Proceedings of a Conference held on the Kohala Coast, Hawaii, 2–6 Aug. 1999, ASP Conference Series 213, p. 511 (2000).
Link	
Comments	Hugely successful experiment in distributed computing. Permits more sophisticated processing of a fraction of SERENDIP IV data by harnessing idle CPU cycles of 3 million personal and corporate computers.

Date	2000 – 2005
Observer(s)	Howard, Andrew; Horowitz, P.; Coldwell, C.; Klein, S.; Sung, A.; Wolff, J.; Caruso, J.; Latham, D.; Papaliolios C., ; Stefanik, R.; Zajac, J.; Harvard OSETI Targeted Search,
Site	Oak Ridge Observatory
Instrument Size (m)	1.5
Search Frequency	

(MHz)	
Search Wavelength (nm)	350 – 720
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	~11,000 F, G, and K dwarfs.
Flux Limit ( $W m^{-2}$ )	100 photons/ $m^2$
Total Hours	2378
Reference	Howard, A.W.; Horowitz, P.; Wilkinson, D.T.; Coldwell, C.M.; Groth, E.J.; Jarosik, N.; Latham, D.W.; Stefanik, R.P.; Willman, A.J. Jr.; Wolff, J.; Zajac, J.M., “Search for Nanosecond Optical Pulses from Nearby Solar-Type Stars,” The Astrophysical Journal, Vol. 613, Issue 2, pg. 1270–1284 (2004).
Link	*** <a href="http://iopscience.iop.org/0004-637X/613/2/1270/pdf/60101.web.pdf">http://iopscience.iop.org/0004-637X/613/2/1270/pdf/60101.web.pdf</a> ***
Comments	A beamsplitter followed by a pair of fast hybrid avalanche detectors is triggered in coincidence to record the time and intensity profile of large pulses. In 2001 this search partnered with Princeton to create the Harvard-Princeton OSETI collaborated search for some time. However, Harvard Targeted OSETI continued to observe throughout and afterwards.
Date	2000 – 2010
Observer(s)	MONTEBUGNOLI (SETItalia)
Site	MEDICINA

Instrument Size (m)	32
Search Frequency (MHz)	1415 – 1425, 4255 – 4265
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.6
Other Resolution	
Objects (Hz)	NORTHERN SKY
Flux Limit ( $W m^{-2}$ )	
Total Hours	ONGOING
Reference	MONTEBUGNOLI, S. < <a href="http://www-radiotelescopio.bo.cnr.it/setiweb/home.htm">http://www-radiotelescopio.bo.cnr.it/setiweb/home.htm</a> >
Link	
Comments	Commensal sky survey using Medicina telescope and SERENDIP signal processing boards.
Date	2000 – ON
Observer(s)	BHATHAL AND DARCY
Site	CAMPBELLTOWN ROTARY OBSERVATORY, OZ OSETI
Instrument Size (m)	0.4, 0.3
Search Frequency (MHz)	
Search Wavelength (nm)	550

Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	200 SOLAR-TYPE STARS AND 25 GLOBULAR CLUSTERS
Flux Limit ( $W m^{-2}$ )	$6 \times 10^{-9}$ PEAK DURING 1ns PULSE
Total Hours	ONGOING
Reference	Bhatal, R. < <a href="http://www.coseti.org/ragbir00.htm">http://www.coseti.org/ragbir00.htm</a> >
Link	
Comments	Dedicated telescope built for SETI. Uses high time resolution photodiodes in coincidence to search for laser pulses, and coincidence between two telescopes separated by 20 m to bring down false alarm rate. Soon to be teamed with microwave search of same objects.
Date	2001
Observer(s)	Werthimer, Dan; SEVENDIP,
Site	Leuschener Observatory
Instrument Size (m)	0.76
Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	2500 nearby stars + globular clusters and nearby galaxies

Flux Limit ( $\text{W m}^{-2}$ )	
Total Hours	
Reference	Werthimer, Dan, Anderson, David, Bowyer, Stuart, Cobb, Jeff, Demorest, Paul, "Searching for ET with Help from Three Million Volunteers: The SETI@home, Serendip, Sevendip and Spock SETI Programs," IAF abstracts, 34th COSPAR Scientific Assembly, The Second World Space Congress, held 10-19 October, 2002 in Houston, TX, USA. (2002).
Link	***2002iaf.confE.365W***
Comments	A search for nanosecond optical laser pulses using 3 PMTs in coincidence to reduce false positive rates. Running since 2001.
Date	2001 – ON
Observer(s)	DRAKE ET AL., LICK OPTICAL SETI
Site	LICK OBSERVATORY, UC SANTA CRUZ
Instrument Size (m)	1 (NICKEL REFLECTOR)
Search Frequency (MHz)	
Search Wavelength (nm)	550
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	5039 SOLAR-TYPE STARS PLANNED
Flux Limit ( $\text{W m}^{-2}$ )	$1 \times 10^{-9}$ PEAK DURING 1 ns PULSE, OR $1 \times 10^{-20}$ AVERAGE



	PER 100 SECOND OBSERVATION
Total Hours	SUSPENDED IN SPRING 1999
Reference	DRAKE, ET AL., Lick Optical SETI < <a href="http://seti.ucolick.org/optical">http://seti.ucolick.org/optical</a> >
Link	
Comments	Uses three photodiodes in coincidence to eliminate background events.
Date	2002
Observer(s)	Amy E. Reines and Geoffrey W. Marcy
Site	Keck-I/HIRES
Instrument Size (m)	10
Search Frequency (MHz)	
Search Wavelength (nm)	400 – 500
Frequency Resolution (Hz)	
Other Resolution	$\lambda/\Delta\lambda = 70000$
Objects (Hz)	577 F, G, K, and M stars
Flux Limit ( $W m^{-2}$ )	$3.4 \times 10^{-17}$
Total Hours	Not specified, used 4 years of data with ~20 spectra per star
Reference	Reines A. and Marcy G. 2002 PASP 114 416
Link	<a href="http://iopscience.iop.org/article/10.1086/342496/meta">http://iopscience.iop.org/article/10.1086/342496/meta</a>

Comments	Search for emission lines having widths too narrow to be natural from the host star, as well as for lines broadened by astrophysical mechanisms
Date	2002 – 2004
Observer(s)	Blair, David G.; Zadnik, Marjan G.
Site	Perth-Lowell Telescope
Instrument Size (m)	0.61
Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	1
Other Resolution	
Objects (Hz)	60 solar-type stars
Flux Limit ( $W m^{-2}$ )	~1 mJy
Total Hours	
Reference	Blair, David G., Zadnik, Marjan G., “A Search for Optical Beacons: Implications of Null Results,” <i>Astrobiology</i> , Volume 2, Issue 3, pp. 305-312 (2002).
Link	
Comments	Search for optical beacons in the vicinity of 60 solar-type stars with null results.
Date	2002

Observer(s)	Werthimer, Dan; Anderson, David; Bowyer, Stuart; Cobb, Jeff; Demorest, Paul; SPOCK,
Site	Leuschener Observatory
Instrument Size (m)	0.76
Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	
Flux Limit ( $W m^{-2}$ )	
Total Hours	
Reference	Werthimer, Dan, Anderson, David, Bowyer, Stuart, Cobb, Jeff, Demorest, Paul, "Searching for ET with Help from Three Million Volunteers: The SETI@Home, Serendip, Sevendip and Spock SETI Programs," IAF abstracts, 34th COSPAR Scientific Assembly, The Second World Space Congress, held 10-19 October, 2002 in Houston, TX, USA., p.IAA-9-1-09 IAF abstracts, 34th COSPAR Scientific Assembly, The Second World Space Congress, held 10-19 October, 2002 in Houston, TX, USA., p.IAA-9-1-09, meeting abstract (2002).
Link	***2002iaf.confE.365W***
Comments	Using optical spectra acquired at Keck as part of a planet search run by Marcy, Et al., SPOCK searches for narrow-band continuous signals.

Date	2004
Observer(s)	Conroy, Charlie; Werthimer, Dan; Dyson Sphere Search ,
Site	Leuschner Observatory; optical SETI pulse search; Serendip IV; SETI@home
Instrument Size (m)	0.76
Search Frequency (MHz)	1420
Search Wavelength (nm)	390 – 700
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	32 stars from IRAS and 2MASS catalog
Flux Limit ( $W m^{-2}$ )	~ 3 sigma above mean
Total Hours	
Reference	Conroy, Charlie, Werthimer, Dan, “Optical and Radio Searches on Dyson Sphere Candidates” preprint; personal communication.
Link	
Comments	A search for advanced civilizations exploiting Dyson Sphere type technology, that is the employment of shells around stars to extract solar energy. Partial Dyson Spheres are theorized to radiate waste heat. The infrared excess is gone by 60 micrometers, indicating that the excess is intrinsic to the system and not to systematic error. 33 Dyson Sphere candidates with excess 12 micron radiation no 60 micron excess ages greater than a gigayear were

observed for SETI signals with the Leuschner Optical Telescope, SERENDIP IV at Arecibo and the SETI@home program. Stars were observed with measured ages of above  $10^9$  years, such that there is no protoplanetary disk, a known source of infrared radiation. This search is significant enough to warrant further investigation. [Data were taken with OSETI pulse detection system at Leuschner, and SERENDIP IV and SETI@home systems at Arecibo Observatory]

Date	2004-2009
Observer(s)	Narusawa
Site	NAYUTA telescope at Nishi-Harima Astronomical Observatory (NHAO)
Instrument Size (m)	2
Search Frequency (MHz)	
Search Wavelength (nm)	487 - 577
Frequency Resolution (Hz)	
Other Resolution	0.6 Angstrom
Objects (Hz)	13 F, G, K, M stars
Flux Limit ( $W m^{-2}$ )	$10^{16} W$
Total Hours	56 nights
Reference	
Link	<a href="https://ndlonline.ndl.go.jp/#!/detail/R300000004-">https://ndlonline.ndl.go.jp/#!/detail/R300000004-</a>

	<u>I10487843-00</u> <a href="http://www.nhao.jp/research/annual_report/docs/ar2007-1.pdf">http://www.nhao.jp/research/annual_report/docs/ar2007-1.pdf</a> <a href="http://www.nhao.jp/research/annual_report/docs/ar2011-1.pdf">http://www.nhao.jp/research/annual_report/docs/ar2011-1.pdf</a>
Comments	Search for ns pulses
Date	2005
Observer(s)	Holder et. al.
Site	VERITAS (Whipple)
Instrument Size (m)	10
Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	Temporal resolution: a few ns
Objects (Hz)	HIP 107395
Flux Limit ( $W m^{-2}$ )	10 photons $m^{-2}$
Total Hours	0.467
Reference	Holder et. al 2015
Link	<a href="https://arxiv.org/abs/astro-ph/0506758">https://arxiv.org/abs/astro-ph/0506758</a>
Comments	A search for optical pulses
Date	2005

Observer(s)	Stone, R.P.S.; Wright, S.A.; Drake, F.; Munoz, M; Treffers, R.; Werthimer, Dan
Site	Lick Observatory
Instrument Size (m)	
Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	4,605 stars of spectral types F and M within 200 light-years of Earth
Flux Limit ( $W m^{-2}$ )	
Total Hours	4.5
Reference	Stone, P.R.S., Wright, S.A., Drake, F., Munoz, M., Treffers, R., Werthimer, Dan, "Lick Observatory Optical SETI: Targeted Search and New Directions," <i>Astrobiology</i> , Volume 5, Issue 5, pp. 604-611 (2005).
Link	
Comments	Lick Observatory's Optical SETI. They observed 14 candidate signals ("triple coincidences"), all but one of which are explained by transient local difficulties. Additional observations of the remaining candidate have failed to confirm arriving pulse events.
Date	2006 – 2010

Observer(s)	Montebugnoli, S.; Bortolotti, C.; Cattani, A.; Maccaferri, A.; Orlati, A.; Poloni, M.; Poppi, S.; Monari, J.; Roma, M.; Pari, P. P.; Teodorani, M.; Righini, S.; Maccone, C.; Caliendo, D.; Cosmovici, C. B.; D'Amico, N.; SETI-Italia,
Site	Medicina
Instrument Size (m)	32
Search Frequency (MHz)	1400 – 23500
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	Target stars
Flux Limit ( $W m^{-2}$ )	
Total Hours	
Reference	Montebugnoli, S.; Bortolotti, C.; Cattani, A.; Maccaferri, A.; Orlati, A.; Poloni, M.; Poppi, S.; Monari, J.; Roma, M.; Pari, P. P.; Teodorani, M.; Righini, S.; Maccone, C.; Caliendo, D.; Cosmovici, C. B.; D'Amico, N., "SETI-Italia 2003 status report and first results of a KL transform algorithm for ETI signal detection," Acta Astronautica, Volume 58, Issue 4, p. 222-229 (2006).
Link	<a href="http://setiitalia.altervista.org/">http://setiitalia.altervista.org/</a>
Comments	Ongoing since early 1998, SETI-Italia is the only continuous European SETI endeavor, and is run by the Istituto di Radioastronomia. Unlike other SETI programs, it uses the KLT, not the FFT.



Date	2006 – 2015
Observer(s)	Howard, Andrew; Horowitz, Paul; Mead, Curtis; Sreetharan, Pratheev; Gallicchio, Jason; Howard, Steve; Coldwell, Charles; Zajac, Joe; Sliski, Alan; Harvard OSETI Survey,
Site	Oak Ridge Observatory
Instrument Size (m)	1.8
Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	Survey of 80% of the sky
Flux Limit ( $W m^{-2}$ )	10 photons per square meter per nanosecond
Total Hours	150
Reference	Howard, Andrew; Horowitz, Paul; Mead, Curtis; Sreetharan, Pratheev; Gallicchio, Jason; Howard, Steve; Coldwell, Charles; Zajac, Joe; Sliski, Alan “Initial results from Harvard all-sky optical SETI” Acta Astronautica, Volume 61, Issue 1-6, p. 78-87, 06/2007.
Link	
Comments	
Date	2006 – 2010

Observer(s)	Von Korff, J.; Demorest, P.; Heien, E.; Korpela, E.; Werthimer, D.; Cobb, J.; Lebofsky, M.; Anderson, D.; Bankay, B.; Siemion, A.
Site	Arecibo
Instrument Size (m)	
Search Frequency (MHz)	1420
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	452 pulsars
Flux Limit ( $W m^{-2}$ )	
Total Hours	21600
Reference	
Link	<a href="http://adsabs.harvard.edu/abs/2013ApJ...767...40">http://adsabs.harvard.edu/abs/2013ApJ...767...40</a>
Comments	
Date	2007
Observer(s)	Rampadarath, Hayden
Site	Long Baseline Array; 64-m Parkes antenna of Australia Telescope National Facility (ATNF); ATNF Australia Telescope Compact Array; ATNF Mopra
Instrument Size (m)	

Search Frequency (MHz)	1262, 1312, 1362, 1412, 1462, 1512
Search Wavelength (nm)	
Frequency Resolution (Hz)	1953
Other Resolution	
Objects (Hz)	Gliese 581
Flux Limit ( $W m^{-2}$ )	7 MW/Hz
Total Hours	8
Reference	
Link	<a href="http://adsabs.harvard.edu/abs/2014PhDT.....255">http://adsabs.harvard.edu/abs/2014PhDT.....255</a>
Comments	
Date	2007 – 2010
Observer(s)	Harp, G.R.; Backus, P.R.; Kilsdonk, T.N.; Jordan, J.C.; Tarter, J.C.
Site	Allen Telescope Array
Instrument Size (m)	6.1 (42 antennas)
Search Frequency (MHz)	1400 – 1700, 2800 – 3400
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.7

Other Resolution	
Objects (Hz)	HabCat stars that could host habitable planets
Flux Limit ( $W m^{-2}$ )	100 Jy
Total Hours	95.795
Reference	(1.) Harp, Backus, Kilsdonk, Jordan, and Tarter, “Recent SETI Results with Observations at the ATA” Astrobiology Science Conference 2010: No. 1538, p.5558. (2.) Peter R. Backus, Jill C. Tarter, Gerry R. Harp, John Dreher, Jane Jordan, Ken Smolek, Tom Kilsdonk, John Ross, Jon Richards, Rob Ackermann, Samantha Blair, et al “SETI Observations of Exoplanets with the Allen Telescope Array: First Results” (Private Communication – unpublished as of yet...)
Link	
Comments	The HabCat search uses algorithms for narrow band sine waves and simple pulses. Two times the frequency of the Waterhole (1.4- 1.7 GHz) is a “magic frequency” search which starts with the frequencies of Hydrogen and Hydroxyl multiplied by a “magic” number
Date	2007 – 2015
Observer(s)	Von Korff, J.; Siemion, A.; Korpela, E.; Werthimer, D.; McMahan, P.; Cobb, J.; Lebofsky, M.; Anderson, D.; Bankay, B.; Bower, G.; Foster, G.; van Leeuwen, J.; Mallard, W.; Wagner, M.; Astropulse,
Site	NAIC, Arecibo
Instrument Size (m)	305
Search Frequency (MHz)	2.5

Search Wavelength (nm)	
Frequency Resolution (Hz)	0.075
Other Resolution	
Objects (Hz)	Microsecond- millisecond radio pulses. Sensitive sky survey.
Flux Limit ( $W m^{-2}$ )	$60 \times 10^{-26} J/m^2$
Total Hours	
Reference	Von Korff, J., Siemion, A., Korpela, E., Werthimer, D., McMahon, P., Cobb, J., Lebofsky, M., Aanderson, D., Bankay, B., Bower, G., Foster, G., Van Leeuwen, J., Mallard, W., Wagner, M., “New SETI Sky Surverys for Radio Pulses” eprint arXiv:0811.3046 (2008).
Link	*** <a href="http://arxiv.org/PS_cache/arxiv/pdf/0811/0811.3046v2.pdf">http://arxiv.org/PS_cache/arxiv/pdf/0811/0811.3046v2.pdf</a> *** *** <a href="http://www.seti.org/seti-institute/project/details/seti-ata-galactic-center-survey">http://www.seti.org/seti-institute/project/details/seti-ata-galactic-center-survey</a> ***
Comments	Sources for the pulses may include black holes, neutron stars, cosmic strings, or ETI. Data from the 7 beam ALFA receiver at Arecibo is reduced by a distributed computing application that uses a coherent de-dispersion technique to look for short broad-pulses. The multibeam data is sent over the internet to the computers of millions of volunteers to be analyzed.
Date	2008
Observer(s)	Von Korff, J.; Siemion, A.; Korpela, E.; Werthimer, D.;

	McMahon, P.; Cobb, J.; Lebofsky, M.; Anderson, D.; Bankay, B.; Bower, G.; Foster, G.; van Leeuwen, J.; Mallard, W.; Wagner, M.; Fly's Eye,
Site	Allen Telescope Array
Instrument Size (m)	6.1 (42 antennas)
Search Frequency (MHz)	210
Search Wavelength (nm)	
Frequency Resolution (Hz)	1600
Other Resolution	
Objects (Hz)	Microsecond-millisecond radio pulses in 100 square degree field
Flux Limit ( $\text{W m}^{-2}$ )	$60 \times 10^{-26} \text{ J/m}^2$
Total Hours	450
Reference	Von Korff, J., Siemion, A., Korpela, E., Werthimer, D., McMahon, P., Cobb, J., Lebofsky, M., Aanderson, D., Bankay, B., Bower, G., Foster, G., Van Leeuwen, J., Mallard, W., Wagner, M., "New SETI Sky Surveys for Radio Pulses" eprint arXiv:0811.3046 (2008).
Link	*** <a href="http://arxiv.org/PS_cache/arxiv/pdf/0811/0811.3046v2.pdf">http://arxiv.org/PS_cache/arxiv/pdf/0811/0811.3046v2.pdf</a> ***
Comments	Sources for these pulses may include black holes, neutron stars, cosmic strings, or ETI. Each antenna points in a different direction. So far three pulsars (B0329+54, B0355+54, B0950+08) and six giant pulses from the Crab pulsar have been found.

Date	2009
Observer(s)	Richard A. Carrigan Jr
Site	Archival from IRAS
Instrument Size (m)	
Search Frequency (MHz)	
Search Wavelength (nm)	12000, 25000, 60000
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	1527 sources
Flux Limit ( $W m^{-2}$ )	
Total Hours	
Reference	Carrigan 2009 ApJ 698 2
Link	<a href="http://iopscience.iop.org/article/10.1088/0004-637X/698/2/2075">http://iopscience.iop.org/article/10.1088/0004-637X/698/2/2075</a>
Comments	A search for Dyson spheres (IR excess) in IRAS
Date	2009
Observer(s)	Narusawa, S.; Fujishita, M.; Inoue, Takeshi; Morimoto, Masaki; Team SAZANAKA,
Site	Yamaguchi Univ.; Wakayama Univ./Misato Obs.; Takahasi Obs.; Kagami Obs.; Matsuo Obs.; Nishi-Harima Astro. Obs.

	Tokai Univ., Agawa Jovian Radio Obs. of Kochi College of Technology
Instrument Size (m)	13 radio telescopes (some with 2 antennas) (1.3, 2, 11, 5, 32, 8, 6, 1), 26 optical telescopes. Including 2 m Nayuta. 11m & 5m, 32m, 8m, 6m, Yagi antenna & Discone antenna, 1m & Dipole antenna, Log periodic antenna, Dipole & Yagi antenna.
Search Frequency (MHz)	Yamaguchi and Wakayama- 8300 MHz, Takahashi- 1420 MHz, Kagami- 1420 and 31 MHz, Matsuo- 1420 and 38.2 MHz, Kochi- 30-35 and 38.2 MHz, Nishi-Harima- 38.0 and 22.0 MHz
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.05
Other Resolution	
Objects (Hz)	30 arc-minute field of the Cassiopia constellation
Flux Limit ( $W m^{-2}$ )	$3.21 \times 10^{-14}$
Total Hours	5
Reference	Narusawa and Fujishita, Astrobiology Science Conference 2010 (2010) Narusawa, Shin-ya, Fujishita, Mitsumi, Inoue, Takeshi, Morimoto, Masaki, "Project SAZANKA," (2009). <a href="http://www.nhao.jp/%7Enarusawa/oseti/project-sazanka.html">http://www.nhao.jp/%7Enarusawa/oseti/project-sazanka.html</a>
Link	*** <a href="http://adsabs.harvard.edu/cgi-bin/nphdata_query?bibcode=2010LPICo1538.5074N&amp;link_type=ARTICLE&amp;db_key=AST&amp;high=">http://adsabs.harvard.edu/cgi-bin/nphdata_query?bibcode=2010LPICo1538.5074N&amp;link_type=ARTICLE&amp;db_key=AST&amp;high=</a> *** ***2010LPICo1538.5074***
Comments	It is thought that a narrow carrier signal is the most



possible kind of signal from an Extra-Terrestrial Intelligence (ETI), because it needs only one parameter “frequency”. Therefore, it may be a possibility that other types of signals are used to inform their existence. For example, an Ultra-Wide Band (UWB) signal is one of the possible signals, because generally it is advantageous on the standpoint of signal to noise ratio as shown by the Global Positioning System. We carried out multisite and multi-frequency SETI observations based on similar idea. We also did the multi-site optical monitoring observations simultaneously. If radio antennas detect the candidate signals, we check these optical (CCD, Digital camera and Video) images. It gives a clue of clarification of radio events {e.g. natural phenomenon (flare of surface of the star, nova, GRB, meteor, microlens etc.), artificial signals (aircraft, artificial satellite, reflection off space debris etc.) and ETI}. This is the world’s first multi-site and multi-wavelength simultaneous SETI observation with 12 radio and 26 optical systems in Japan. World’s first multi-site and multi-wavelength simultaneous SETI observation. Detected radio signals were checked by optical images. Strategy: UWB signals may be used by ETI as narrow carrier signals have not yet yielded information. Data under reduction. No radio or optical candidate signals were detected.

Date	2009 – 2015
Observer(s)	Harp et. al.
Site	Allen Telescope Array
Instrument Size (m)	6.1 (42 antennas)
Search Frequency (MHz)	1000 – 9000

Search Wavelength (nm)	
Frequency Resolution (Hz)	0.7
Other Resolution	
Objects (Hz)	9293 stars
Flux Limit ( $\text{W m}^{-2}$ )	$1.8 - 3.1 \times 10^{-26}$
Total Hours	19000
Reference	Harp et. al. 2016 AJ 152 6
Link	<a href="http://iopscience.iop.org/article/10.3847/0004-6256/152/6/181">http://iopscience.iop.org/article/10.3847/0004-6256/152/6/181</a>
Comments	A search for narrowband radio signals from 9293 stars, including 2015 exoplanet stars and Kepler objects of interest and an additional 65 whose planets may be close to their habitable zones.
Date	2009
Observer(s)	Hanna et al.
Site	Solar Tower Atmospheric Cherenkov Effect Experiment (STACEE)
Instrument Size (m)	64 heliostats, $37\text{m}^2$ area
Search Frequency (MHz)	
Search Wavelength (nm)	420
Frequency	

Resolution (Hz)	
Other Resolution	Temporal resolution: 12 ns
Objects (Hz)	187 stars
Flux Limit ( $\text{W m}^{-2}$ )	10 photons $\text{m}^{-2}$
Total Hours	31.17
Reference	Hanna et. al. 2009
Link	<a href="https://www.liebertpub.com/doi/abs/10.1089/ast.2008.0256">https://www.liebertpub.com/doi/abs/10.1089/ast.2008.0256</a>
Comments	A search for fast blue-green laser pulses
Date	2009 – 2015
Observer(s)	Siemion, A.; Werthimer, D.; Chen, H.; Cobb, J.; Filiba, T.; Fries, A.; Howard, A.; Korpela, E.; Lebofsky, M.; Mallard, W.; Spitler, L.; Wagner, M.
Site	NAIC, Arecibo; Leuschner Observatory
Instrument Size (m)	305, 0.762
Search Frequency (MHz)	1420
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	Multiple search strategies
Flux Limit ( $\text{W m}^{-2}$ )	

Total Hours	
Reference	Siemion, A., Werthimer, D., Chen, H., Cobb, J., Filiba, T., Fries, A., Howard, A., Korpela, E., Lebofsky, M., Mallard, W., Spitler, L., Wagner, M.. “Current and Nascent SETI Instruments in the Radio and Optical: SERENDIP V. v, OSPOSH and HRSS,” Astrobiology Conference 2010: Evolution and Life: Surviving Catastrophes and Extremes on Earth and Beyond, held April 20–26 2010 in League City, Texas. LPI Contribution No. 1538, p. 5378 (2010).
Link	<a href="http://www.lpi.usra.edu/meetings/abscicon2010/pdf/5378.pdf">http://www.lpi.usra.edu/meetings/abscicon2010/pdf/5378.pdf</a>
Comments	This article describe ongoing efforts to develop high-performance and sensitive information to be used in SETI searches. These efforts are SERENDIP V.v, HRSS (Heterogenous Radio SETI Spectrometer) and OSPOSH (Open Source Pulsed Optical SETI Hardware). SERENDIP V.v uses an FPGA (field programmable gate array) based spectrometer. It looks for narrow-band signals and observes 2 billion channels across seven 3 arc-minute beams. OSPOSH looks for nanosecond scale light pulses that are not known to occur naturally. HRSS uses a high-speed analog-to-digital converter along with an FPGA. It digitizes, packets, and transmits CPUs and GPUs (graphic processing units) for spectroscopy. It will be available to researchers and students around the world.

Date	2010–2013
Observer(s)	Project Dorothy
Site	29 institutions world wide
Instrument Size (m)	

Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	
Flux Limit ( $W m^{-2}$ )	
Total Hours	29 nights
Reference	
Link	<a href="http://www.nhao.jp/~narusawa/osesti/project-dorothy.html">http://www.nhao.jp/~narusawa/osesti/project-dorothy.html</a>
Comments	Multifrequency search for artificial signatures
Date	2010
Observer(s)	Montebugnoli, S.; Bartolini, M.; Bianchi, G.; Cosmovici, C.; Monari, J.; Orlati, A.; Perini, F.; Pluchino, S.; Pupillo, G.; Salerno, E.; Schillirò, F.; Zoni, L.
Site	Medicina Radioastronomical Station
Instrument Size (m)	32
Search Frequency (MHz)	1400 – 22000
Search Wavelength (nm)	

Frequency Resolution (Hz)	0.6
Other Resolution	
Objects (Hz)	
Flux Limit ( $W m^{-2}$ )	
Total Hours	
Reference	
Link	<a href="http://adsabs.harvard.edu/abs/2010AcAau..67.1350">http://adsabs.harvard.edu/abs/2010AcAau..67.1350</a>
Comments	
Date	2010
Observer(s)	Williams, Peter K. G.; Bower, G. C.; Allen Telescope Array Team
Site	Allen Telescope Array
Instrument Size (m)	6.1 (42 antennas)
Search Frequency (MHz)	1430, 2010
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	Galactic Center
Flux Limit ( $W m^{-2}$ )	
Total Hours	Typically 3 hours per night / running ~4 nights per week

	for over six months
Reference	
Link	<a href="http://adsabs.harvard.edu/abs/2010AAS...21540303">http://adsabs.harvard.edu/abs/2010AAS...21540303</a>
Comments	ATA Galactic Center Survey
Date	2010 – 2011
Observer(s)	Harp et. al.
Site	Allen Telescope Array
Instrument Size (m)	6.1 (25 antennas)
Search Frequency (MHz)	1000 – 10000
Search Wavelength (nm)	
Frequency Resolution (Hz)	$7 \times 10^6$
Other Resolution	
Objects (Hz)	243 sources including quasars, pulsars, supernova remnants, and masers
Flux Limit ( $W m^{-2}$ )	$6.3 - 11.2 \times 10^{-22}$
Total Hours	~ 40.5 hours
Reference	Harp et. al. 2015
Link	<a href="https://arxiv.org/abs/1506.00055">https://arxiv.org/abs/1506.00055</a>
Comments	A search for artificial nonsinusoidal periodic signals
Date	2010 – 2011

Observer(s)	Bonin, Samuel; Barott, W. C.; Catanach, T.
Site	Allen Telescope Array
Instrument Size (m)	
Search Frequency (MHz)	6700
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	53 targets
Flux Limit ( $W m^{-2}$ )	
Total Hours	Short (10 min) and long (60 minute) observations
Reference	
Link	<a href="http://adsabs.harvard.edu/abs/2012AAS...22052302">http://adsabs.harvard.edu/abs/2012AAS...22052302</a>
Comments	
Date	2011
Observer(s)	Siemion, Andrew P. V.; Demorest, Paul; Korpela, Eric; Maddalena, Ron J.; Werthimer, Dan; Cobb, Jeff; Howard, Andrew W.; Langston, Glen; Lebofsky, Matt; Marcy, Geoffrey W.; Tarter, Jill
Site	Green Bank Telescope
Instrument Size (m)	
Search Frequency	1100, 1900



(MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	5
Other Resolution	
Objects (Hz)	86 KOIs in Kepler field
Flux Limit ( $\text{W m}^{-2}$ )	$2 \times 10^{-23} \text{ erg s}^{-1} \text{ cm}^{-2}$
Total Hours	
Reference	
Link	<a href="http://adsabs.harvard.edu/abs/2013ApJ...767...94">http://adsabs.harvard.edu/abs/2013ApJ...767...94</a>
Comments	
Date	2011
Observer(s)	Davies, P.C.W.; Wagner, R.V.
Site	Archival from Lunar Reconnaissance Orbiter
Instrument Size (m)	
Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	5 meters
Objects (Hz)	lunar surface

Flux Limit ( $\text{W m}^{-2}$ )	
Total Hours	
Reference	
Link	<a href="https://www.sciencedirect.com/science/article/pii/S0094576511003249?via%3Dihub">https://www.sciencedirect.com/science/article/pii/S0094576511003249?via%3Dihub</a>
Comments	Search for artifacts on Moon
Date	2011 – ON
Observer(s)	SETI Team at the SETI Institute
Site	ATA
Instrument Size (m)	array is equivalent in area to single dish 39m in diameter
Search Frequency (MHz)	$1 \times 10^9 - 10 \times 10^9$
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.7
Other Resolution	
Objects (Hz)	exoplanets
Flux Limit ( $\text{W m}^{-2}$ )	80 Jy
Total Hours	13140
Reference	
Link	<a href="http://setiquest.info/data/obsreports">http://setiquest.info/data/obsreports</a>
Comments	observations made with 3 beamformers simultaneously. Total bandwidth per beam has increased from 20 MHz to

	70 MHz due to the addition of more computers.
Date	2011
Observer(s)	(1.) Siemion, Andrew P. V.; Demorest, Paul; Korpela, Eric; Maddalena, Ron J.; Werthimer, Dan; Cobb, Jeff; Howard, Andrew W.; Langston, Glen; Lebofsky, Matt; Marcy, Geoffrey W.; Tarter, Jill. (2.) Gautam, Abhimat Krishna; Siemion, Andrew; Korpela, Eric J.; Cobb, Jeff; Lebofsky, Matt; Werthimer, Dan
Site	GBT
Instrument Size (m)	100
Search Frequency (MHz)	1100 – 1900
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.75
Other Resolution	
Objects (Hz)	86 stars in the Kepler field including stars hosting candidates with $380 \text{ K} > T_{\text{eq}} > 230 \text{ K}$ , stars with five or more detected candidates or stars with a super-Earth ( $R_p < 3 R_{\oplus}$ ) in a $>50$ day orbit
Flux Limit ( $\text{W m}^{-2}$ )	10 Jy
Total Hours	700
Reference	(1.) Siemion, Andrew P. V.; Demorest, Paul; Korpela, Eric; Maddalena, Ron J.; Werthimer, Dan; Cobb, Jeff; Howard, Andrew W.; Langston, Glen; Lebofsky, Matt; Marcy, Geoffrey W.; Tarter, Jill “A 1.1-1.9 GHz SETI Survey of the

Kepler Field. I. A Search for Narrow-band Emission from Select Targets” The Astrophysical Journal, Volume 767, Issue 1, article id. 94, 13 pp. (2013). (2.)Gautam, Abhimat Krishna; Siemion, Andrew; Korpela, Eric J.; Cobb, Jeff; Lebofsky, Matt; Werthimer, Dan “SETI Searches for Radio Transients from Kepler Field Planets and Astropulse Candidates” American Astronomical Society, AAS Meeting #224, #405.06, 06/2014.

Link

\*\*\*[http://iopscience.iop.org/0004-637X/767/1/94/pdf/apj\\_767\\_1\\_94.pdf](http://iopscience.iop.org/0004-637X/767/1/94/pdf/apj_767_1_94.pdf)  
 \*\*\*2013ApJ...767...94S\*\*\*  
 \*\*\*2014AAS...22440506\*\*\*

Comments

(1.) The stars searched were chosen based on the properties of their putative exoplanets, including stars hosting candidates with  $380 \text{ K} > T_{\text{eq}} > 230 \text{ K}$ , stars with five or more detected candidates or stars with a super-Earth ( $R_p < 3 R_{\oplus}$ ) in a  $>50$  day orbit. It is estimated that fewer than  $\sim 1\%$  of transiting exoplanet systems host technological civilizations that are radio loud in narrow-band emission between 1 and 2 GHz at an equivalent isotropically radiated power (EIRP) of  $\sim 1.5 \times 10^{21} \text{ erg s}^{-1}$ , approximately eight times the peak EIRP of the Arecibo Planetary Radar, and we limit the number of 1-2 GHz narrow-band-radio-loud Kardashev type II civilizations in the Milky Way to be  $< 10^{-6} M^{-1} \odot$ . (2.) We present a search for fast radio transients in targeted observations of planet candidates in the Kepler Field and candidate Astropulse sources. Kepler Field observations were conducted in the band 1.1 and 1.9 GHz using the Green Bank Telescope in Green Bank, West Virginia and are centered on 86 stars hosting candidate planets identified by the Kepler spacecraft. These stars were chosen based on the properties of their putative planetary system thought to be

conducive to the development of advanced life, including all systems known (as of May 2011) hosting a Kepler Object of Interest (KOI) with a calculated equilibrium temperature between 230 and 380 K, at least 4 KOIs or a KOI with an inferred radius  $< 3.0 r$  and a period  $> 50$  d. The Kepler Field is centered at an intermediate galactic latitude,  $b = 13.5^\circ$ , which presents an additional opportunity to detect signals from the older population of millisecond and recycled pulsars located above the galactic plane.

Date	2011
Observer(s)	Narusawa, S.; Fujishita, M.; Team Sazanka
Site	Japan – 12 radio and 26 optical systems
Instrument Size (m)	
Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	30 arc-minute field of the Cassiopeia constellations
Flux Limit ( $W m^{-2}$ )	
Total Hours	
Reference	
Link	<a href="http://adsabs.harvard.edu/abs/2010LPICo1538.5074">http://adsabs.harvard.edu/abs/2010LPICo1538.5074</a>
Comments	

Date	2013
Observer(s)	Covault, Corbin
Site	Scanning Observatory for Optical SETI (SOFOS)
Instrument Size (m)	3.5 x 3.5
Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	
Flux Limit ( $\text{W m}^{-2}$ )	10 photons/ $\text{m}^2$
Total Hours	
Reference	
Link	<a href="http://adsabs.harvard.edu/abs/2013APS..APR.S2002">http://adsabs.harvard.edu/abs/2013APS..APR.S2002</a>
Comments	search for nanosecond light pulses
Date	2014
Observer(s)	Tingay et. al.
Site	Murchison Widefield Array
Instrument Size (m)	3000
Search Frequency (MHz)	103 – 133

Search Wavelength (nm)	
Frequency Resolution (Hz)	10000
Other Resolution	
Objects (Hz)	38 planetary systems towards the Galactic center
Flux Limit ( $\text{W m}^{-2}$ )	$4 - 5 \times 10^{-23}$
Total Hours	115 minutes
Reference	Tingay et. al. 2016 ApJ 827 2 L22
Link	<a href="http://iopscience.iop.org/article/10.3847/2041-8205/827/2/L22">http://iopscience.iop.org/article/10.3847/2041-8205/827/2/L22</a>
Comments	
Date	2014
Observer(s)	Michael Hippke, John G. Learned <sup>2</sup> , A. Zee <sup>3</sup> , William H. Edmondson <sup>4</sup> , John F. Lindner <sup>5,6</sup> , Behnam Kia <sup>6</sup> , William L. Ditto <sup>6</sup> , and Ian R. Stevens <sup>7</sup>
Site	Archival from Kepler data
Instrument Size (m)	
Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	

Other Resolution	
Objects (Hz)	KIC 5520878
Flux Limit ( $\text{W m}^{-2}$ )	
Total Hours	
Reference	
Link	<a href="http://iopscience.iop.org/article/10.1088/0004-637X/798/1/42/meta">http://iopscience.iop.org/article/10.1088/0004-637X/798/1/42/meta</a>
Comments	search for irregular variability in RR Lyrae star
Date	2014
Observer(s)	Gautam, Abhimat Krishna; Siemion, Andrew; Korpela, Eric J.; Cobb, Jeff; Lebofsky, Matt; Werthimer, Dan
Site	Green Bank Telescope; Arecibo ALFA
Instrument Size (m)	
Search Frequency (MHz)	1100, 1900, 1214 – 1536
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	86 KOIs in Kepler field
Flux Limit ( $\text{W m}^{-2}$ )	
Total Hours	
Reference	



Link	<a href="http://adsabs.harvard.edu/abs/2014AAS...22440506">http://adsabs.harvard.edu/abs/2014AAS...22440506</a>
Comments	
Date	2014 – 2015
Observer(s)	Robert H. Gray and Kunal Mooley
Site	Jansky VLA
Instrument Size (m)	25 (27 antennas)
Search Frequency (MHz)	1450, 1640
Search Wavelength (nm)	
Frequency Resolution (Hz)	1953, 122 Hz, 15 Hz
Other Resolution	
Objects (Hz)	M31 (Andromeda) M33 (Triangulum)
Flux Limit ( $W m^{-2}$ )	$1.995 - 2.93 \times 10^{-25}$
Total Hours	200 minutes: 8 observations for 20 minutes and 8 observations at 5 minutes
Reference	Gray and Mooley 2017 AJ 153 3
Link	<a href="http://iopscience.iop.org/article/10.3847/1538-3881/153/3/110">http://iopscience.iop.org/article/10.3847/1538-3881/153/3/110</a>
Comments	Searched 70% of the waterhole for narrowband radio signals

Date	2014 – 2016
Observer(s)	Wright et. al.
Site	Archival from WISE
Instrument Size (m)	
Search Frequency (MHz)	
Search Wavelength (nm)	3400, 4600, 12000, 22000
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	~ 10 <sup>5</sup> galaxies
Flux Limit (W m <sup>-2</sup> )	
Total Hours	
Reference	
Link	<a href="http://adsabs.harvard.edu/abs/2014ApJ...792...26">http://adsabs.harvard.edu/abs/2014ApJ...792...26</a>
Comments	A search for waste-heat in the infrared
Date	2015
Observer(s)	Schuetz et. al.
Site	Boquete Optical SETI Observatory
Instrument Size (m)	0.5
Search Frequency (MHz)	

Search Wavelength (nm)	350 – 600
Frequency Resolution (Hz)	
Other Resolution	Temporal resolution: 25 ns
Objects (Hz)	KIC 8462852
Flux Limit ( $\text{W m}^{-2}$ )	67 photons $\text{m}^{-2}$
Total Hours	< 6 hours
Reference	Schuetz et. al. 2016 ApJ 825 1 L5
Link	<a href="http://iopscience.iop.org/article/10.3847/2041-8205/825/1/L5">http://iopscience.iop.org/article/10.3847/2041-8205/825/1/L5</a>
Comments	A search for optical pulses from KIC 8462852
Date	2015
Observer(s)	Harp et. al.
Site	Allen Telescope Array
Instrument Size (m)	6.1 (42 antennas)
Search Frequency (MHz)	1000 – 10000
Search Wavelength (nm)	
Frequency Resolution (Hz)	1, 100000
Other Resolution	
Objects (Hz)	KIC 8462852

Flux Limit ( $\text{W m}^{-2}$ )	$1.8 - 3 \times 10^{-24}, 10^{-20}$
Total Hours	95.26 hours
Reference	Harp et. al. 2016 ApJ 825 2
Link	<a href="http://iopscience.iop.org/article/10.3847/0004-637X/825/2/155">http://iopscience.iop.org/article/10.3847/0004-637X/825/2/155</a>
Comments	A search for narrowband radio signals from KIC 8462852
Date	2015
Observer(s)	Abeysekara et. al.
Site	VERITAS
Instrument Size (m)	12
Search Frequency (MHz)	
Search Wavelength (nm)	300 – 500
Frequency Resolution (Hz)	
Other Resolution	Temporal resolution: 1 ns
Objects (Hz)	KIC 8462852
Flux Limit ( $\text{W m}^{-2}$ )	1 photons $\text{m}^{-2}$
Total Hours	526 minutes
Reference	Abeysekara et. al. 2016 ApJ 818 2 L33
Link	<a href="http://iopscience.iop.org/article/10.3847/2041-8205/818/2/L33">http://iopscience.iop.org/article/10.3847/2041-8205/818/2/L33</a>
Comments	A search for optical pulses from KIC 8462852

Date	2015
Observer(s)	Zackrisson et. al.
Site	Archival from SFI++
Instrument Size (m)	
Search Frequency (MHz)	
Search Wavelength (nm)	$21 \times 10^8$
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	1359 disk galaxies
Flux Limit ( $W m^{-2}$ )	
Total Hours	
Reference	Zackrisson et. al. 2015 ApJ 810 1
Link	<a href="http://iopscience.iop.org/article/10.1088/0004-637X/810/1/23">http://iopscience.iop.org/article/10.1088/0004-637X/810/1/23</a>
Comments	A search for Kardashev type III civilizations based on outliers from the Tully-Fisher relationship
Date	2015 – ON
Observer(s)	Breakthrough Listen Team
Site	Automated Planet Finder (Lick Observatory) Green Bank Telescope Parkes Telescope

Instrument Size (m)	2.4, 100, 64
Search Frequency (MHz)	300 – 100000, 1200 – 1500
Search Wavelength (nm)	374 – 950
Frequency Resolution (Hz)	3
Other Resolution	$\lambda/\Delta\lambda = 10^5$ , Temporal Resolution: 18 seconds
Objects (Hz)	1649 main sequence and giant stars 123 galaxies of varying morphology: spirals, ellipticals, dwarf spheroidals, and irregulars
Flux Limit ( $\text{W m}^{-2}$ )	$> 10^{13}$ W at 1.1–1.9 GHz, $1.7 \times 10^{-25}$
Total Hours	Ongoing, 400 hours published
Reference	Isaacson, H. et. al. 2017 PASP 129 975 Enriquez, E. et. al. 2017 ApJ 849 2
Link	<a href="http://iopscience.iop.org/article/10.1088/1538-3873/aa5800">http://iopscience.iop.org/article/10.1088/1538-3873/aa5800</a> <a href="http://iopscience.iop.org/article/10.3847/1538-4357/aa8d1b">http://iopscience.iop.org/article/10.3847/1538-4357/aa8d1b</a>
Comments	Searches for both continuous narrow-band transmission over a very broad range of frequencies, and for optical and near infrared laser light
Date	2015 – ON
Observer(s)	SETIBURST (ALFABURST/SERENDIP VI)
Site	Arecibo L-band Feed Array (ALFA) Green Bank Telescope

Instrument Size (m)	305100
Search Frequency (MHz)	1225 – 1525
Search Wavelength (nm)	
Frequency Resolution (Hz)	1,300 x 10 <sup>6</sup>
Other Resolution	
Objects (Hz)	Northern Sky (AGES) and Galactic Plane (PALFA)
Flux Limit (W m <sup>-2</sup> )	SERENDIP VI: 1 x 10 <sup>-25</sup> ALFABURST: 7.8 x 10 <sup>-21</sup>
Total Hours	ONGOING
Reference	Chennamangalam et. al. 2017 ApJS 228 2 Foster et. al. 2018 MNRAS 474 3847
Link	<a href="http://iopscience.iop.org/article/10.1086/498335">http://iopscience.iop.org/article/10.1086/498335</a> <a href="https://academic.oup.com/mnras/article/474/3/3847/4662633">https://academic.oup.com/mnras/article/474/3/3847/4662633</a>
Comments	Looks at data from ALPHABURST (a search for pulsars and fast radio burst transients) and SERENDIP VI (search for narrowband signals)
Date	2015 (A), 2017 (B)
Observer(s)	Nathaniel K. Tellis and Geoffrey W. Marcy
Site	Keck-I/HIRES
Instrument Size (m)	10
Search Frequency	

(MHz)	
Search Wavelength (nm)	364 – 789
Frequency Resolution (Hz)	
Other Resolution	$\lambda/\Delta\lambda = 60000$ (5.6 km/s)
Objects (Hz)	(A) 2796 F, G, K and M stars (B) 5600 F, G, K and M stars
Flux Limit ( $\text{W m}^{-2}$ )	(A) $> 90 \text{ W}$ and $< 100$ lightyears or $> 1\text{kW}$ if $< 1000$ lightyears (B) $> 3 \text{ kW} - 13 \text{ MW}$ (independent of distance)
Total Hours	(A) Varying, SNR $\sim 100-200$ (B) Varying, decade worth of data
Reference	(A) Tellis N. and Marcy G. 2015 PASP 127 540 (B) Tellis N. and Marcy G. 2017 AJ 153 6
Link	(A) <a href="http://iopscience.iop.org/article/10.1086/681966">http://iopscience.iop.org/article/10.1086/681966</a> (B) <a href="http://iopscience.iop.org/article/10.3847/1538-3881/aa6d12">http://iopscience.iop.org/article/10.3847/1538-3881/aa6d12</a>
Comments	Search for laser emission: extremely narrow emission lines that are monochromatic and coming from an unresolved point in space
Date	2016
Observer(s)	Ermanno F. Borra and Eric Trottier
Site	Archival from Sloan Digital Sky Survey spectra
Instrument Size (m)	
Search Frequency (MHz)	



Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	Solar-type stars
Flux Limit ( $\text{W m}^{-2}$ )	
Total Hours	
Reference	
Link	<a href="http://iopscience.iop.org/article/10.1088/1538-3873/128/969/114201/meta">http://iopscience.iop.org/article/10.1088/1538-3873/128/969/114201/meta</a>
Comments	search for periodic spectral modulations
Date	2016 – ON
Observer(s)	Gerald R. Harp/SETI Institue
Site	Allen Telescope Array
Instrument Size (m)	6.1 (20 antennas)
Search Frequency (MHz)	1000 – 10000
Search Wavelength (nm)	
Frequency Resolution (Hz)	0.7
Other Resolution	
Objects (Hz)	20000 red dwarfs

Flux Limit ( $\text{W m}^{-2}$ )	$1.5 \times 10^{-24}$
Total Hours	12 Hr/Day every day
Reference	Harps 2017, Presentation at AASTCS 5
Link	<a href="http://files.aas.org/aastcs5/aastcs__5__300__04.pdf">http://files.aas.org/aastcs5/aastcs__5__300__04.pdf</a>
Comments	Three methods: look for narrowband signals, observe planets during transit/occultation, observe multipplanet systems during conjunction
Date	2016 – ON
Observer(s)	Maire et. al. (NIROSETI)
Site	Lick Observatory/Nickel Telescope
Instrument Size (m)	1
Search Frequency (MHz)	
Search Wavelength (nm)	950 – 1650
Frequency Resolution (Hz)	
Other Resolution	Temporal resolution: 0.4 ns
Objects (Hz)	1340 objects, including main-sequence and giant stars, 20 spirals, 36 ellipticals, 15 dwarf spheroidals, 9 irregulars, and 2 SO galaxies
Flux Limit ( $\text{W m}^{-2}$ )	380 photons $\text{m}^{-2}$
Total Hours	ONGOING
Reference	Maire et. al. 2016 SPIE 91474K

Link	<a href="https://www.spiedigitallibrary.org/conference-proceedings-of-spie/9908/1/A-near-infrared-SETI-experiment-commissioning-data-analysis-and/10.1117/12.2232861.short?SSO=">https://www.spiedigitallibrary.org/conference-proceedings-of-spie/9908/1/A-near-infrared-SETI-experiment-commissioning-data-analysis-and/10.1117/12.2232861.short?SSO=</a>
Comments	A search for nanosecond pulsed near-infrared pulses
Date	2016 – ON
Observer(s)	Villarroel et. al. (VASCO)
Site	Archival from USNO-B1.0
Instrument Size (m)	
Search Frequency (MHz)	
Search Wavelength (nm)	
Frequency Resolution (Hz)	
Other Resolution	
Objects (Hz)	~2.9 x 10 <sup>5</sup> stars published
Flux Limit (W m <sup>-2</sup> )	
Total Hours	ONGOING
Reference	Villarroel et. al. 2016 AJ 152 3
Link	<a href="http://iopscience.iop.org/article/10.3847/0004-6256/152/3/76/meta">http://iopscience.iop.org/article/10.3847/0004-6256/152/3/76/meta</a>
Comments	A search for disappearing stars present in POSS plates but missing in SDSS and recent photometric surveys

