**[](http://setileague.org/index.html) SETI League Technical Manual --**[**Software**](http://setileague.org/software/index.html)

**SETI Spreadsheet Templates**

This page provides SETI enthusiasts with a collection of downloadable Microsoft Excel ® spreadsheets for performing some of the more common radio astronomy and SETI computations. With most browsers operating under the more popular operating systems, you may run any spreadsheet by left-clicking on the title, or save to hard disk by right-clicking.

Like all SETI League software, we consider these spreadsheets shareware. That means you are encouraged to download, distribute, modify, and experiment, but you are *not*permitted to sell these templates, or to commercialize them in any way. Violators will be ostracized.

Many other spreadsheet programs will also import and run Excel ® templates. It shouldn't be necessary to have Excel on your computer to download these files. Try this: use the "save as" option of your Web browser to save the files to disk. They are *not*executables, so should save as straight ASCII. Then use the "import" option of your existing spreadsheet program to open them. I've done this successfully with Microsoft Works, and *presume*it will work with Lotus 123, Quattro Pro, SuperCalc, VisiCalc, etc.

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| **Revised** | **Title** | **Description** |
| 06 Jun 1998 | [cooling.xls](http://setileague.org/software/cooling.xls) | This spreadsheet helps you to determine system performance improvements achieved by lowering the physical temperature of your low-noise preamplifier. The example values come from this [article](http://setileague.org/askdr/cooling.htm). |
| 29 Jun 2003 | [g-t.xls](http://setileague.org/software/g-t.xls) | A method for quantifying SETI receive system performance, this spreadsheet computes G/T Ratio, a common figure of merit for space communications systems. G/T is the ratio of antenna gain to system noise temperature, typically converted to dB: the higher, the better. Contributed by Ed Cole, AL7EB, SETI League volunteer coordinator for Alaska, based upon [equations](http://setileague.org/articles/g-t.htm)collected by R.S. Flagg, AH6NM, of Hawaii. See Ed's paper in [*Proceedings of SETICon01*](http://setileague.org/seticon/proceed1.htm). |
| 19 May 2001 | [cascade.xls](http://setileague.org/software/cascade.xls) | Calculates the overall gain and noise figure of any receiver system, given the characteristics of the individual stages being cascaded. Allows the user to explore the performance of various system configurations. Contributed by Ed Cole, AL7EB, SETI League volunteer coordinator for Alaska. See Ed's paper in [*Proceedings of SETICon01*](http://setileague.org/seticon/proceed1.htm). |
| 12 Feb 2000 | [Tcalc.xlt](http://setileague.org/software/Tcalc.xlt) | Another approach to analyzing receiver systems consisting of cascaded stages. Contributed by Roger Blackwell, G4PMK. Computes overall station gain and noise figure from the pertinent parameters of the individual stages. Click the "help" button to get started. |
| 13 Dec 1997 | [ra\_dec.xls](http://setileague.org/software/ra_dec.xls) | An astronomical calculator for determining Right Ascension and Declination, given user's location, time, and antenna aiming coordinates (azimuth and elevation). Contributed by Ian Drummond, VE6IXD, based upon equations collected by Dan Fox, KF9ET. The example values depict the conditions which prevailed during the detection of the Ohio State University "Wow!" signal. |
| 13 Dec 1997 | [doppler.xls](http://setileague.org/software/doppler.xls) | For a specified frequency, observer's latitude, source hour angle and declination, computes instantaneous Doppler shift in Hertz, as well as rate of change of Doppler shift (df/dt) in Hertz per minute and Hertz per second, which an extra-terrestrial signal will undergo as a function of the Earth's rotation. Also determines how long a truly extra-terrestrial signal will remain within your antenna pattern, given the antenna diameter, right ascension and declination (it may be necesssary to first run ra\_decl.xls, above, to determine these values). Doppler rate and transit time are good checks for whether a given source is indeed exhibiting sidereal motion. |
| 6 Aug 2016 | [stars.xls](http://setileague.org/software/stars.xls) | Calculates the number of stars within a given distance from Earth, and provides a rough estimate of the number of stars within the beamwidth of a specified antenna at any given time. Assumes uniform stellar density, and (depending upon the direction in which the antenna is aimed) is probably valid only out to about 1000 light-years. |
| 13 Dec 1997 | [sensitiv.xls](http://setileague.org/software/sensitiv.xls) | Determines the sensitivity (in Janskys for continuum measurements, and Watts per square meter for narrow-band signal detection) of any radio telescope, given its pertinent receiver and antenna parameters. Also shows the flux density of any received signal as a function of observed Signal-to-Noise Ratio (SNR). The sample caclulations seen in this spreadsheet show the sensitivity of the Ohio State University "Big Ear" radio telescope at the time the "Wow!" signal was detected. See this [article](http://setileague.org/articles/calibwow.htm) for an example of sensitivity analysis. |
| 13 Dec 1997 | [linkanal.xls](http://setileague.org/software/linkanal.xls) | Determines the Signal-to-Noise Ratio (SNR) for any communications system, given the operating characteristics of the transmitter, receiver, and the intervening free-space propagation path. The sample spreadsheet calcuations show that the typical *Project Argus* station could easily receive a 1 MW hydrogen-line signal into a 100 meter dish, at a range of 1 parsec (3.26 LY), with just 10 seconds of integration. These normalized values may be used for comparison of various systems. See this [article](http://setileague.org/articles/oseti.htm) for more examples of link analysis. |
| 13 Dec 1997 | [ranganal.xls](http://setileague.org/software/ranganal.xls) | Performs range analysis of an electromagnetic communications system, assuming identical antennas at both ends. The example shows that the range over which a 1 MW hydrogen-line signal can be detected with existing receivers, assuming 100 meter dishes at both ends of the path, is on the order of 9 parsecs (28 LY). This spreadsheet may be used for range comparison of various systems. |
| 15 Jun 2004 | [feedhorn.xls](http://setileague.org/software/feedhorn.xls) | Determines dimensions for cylindrical waveguide feedhorns with choke rings, and feedhorn placement with respect to focal point of the parabolic reflector. You specify a waveguide diameter, an operating frequency, and the F/D ratio of the parabolic reflector you wish to illuminate. The sample caclulations seen here are for the SETI League Hydrogen Line Feedhorn, as discussed in this [article](http://setileague.org/hardware/feedchok.htm). |
| 13 Dec 1997 | [parabola.xls](http://setileague.org/software/parabola.xls) | Calculates the electrical performance of a parabolic reflector antenna from specified physical dimensions. Also enables the user to determine focal length, F/D ratio and required feed illumination angle from dish diameter and depth. |
| 21 Aug 1999 | [feedblok.xls](http://setileague.org/software/feedblok.xls) | This spreadsheet, contributed by Edward R. Cole, estimates the gain of a parabolic antenna, taking into account aperture blockage by the feedhorn and its support arms. Assumes simple shadowing, and doesn't take into consideration diffraction effects. It assumes a circular feed structure and straight support arms from the edge of the dish. |
| 26 Sep 1998 | [helix.xls](http://setileague.org/software/helix.xls) | A collaboration between Don Latham, Ed Larsen (KI7WB), Dr. John Marcus (KE3SW), and others on the SETI email discussion list, this "work in progress" helps you to design and evaluate end-fire helix antennas. Short helices make attractive dish feeds, and long helices are good high-gain antennas. |
| 26 Jun 1999 | [drakenew.xls](http://setileague.org/software/drakenew.xls) | An elegant tool for quantifying our ignorance, the Drake Equation was developed by SETI pioneer Dr. Frank D. Drake as the agenda for the first modern SETI meeting in 1961. Its factors encompass cosmology, planetology, biology, anthropology, sociology, technology and psychology. This spreadsheet (contributed by Tom Field) allows you to insert you own personal estimates for the seven Drake Equation factors, and calculates for you the inferred number of communicative civilizations in the cosmos. It also estimates the average distance between communicative civilizations in the Milky Way galaxy. |
| 27 Feb 1999 | [noise.xls](http://setileague.org/software/noise.xls) | Used to analyze noise performance of a radio communications system. Converts between Noise Figure (in dB), Noise Factor (a unitless power ratio), and Noise Temperature (in Kelvins). |
| 27 Feb 1999 | [gain.xls](http://setileague.org/software/gain.xls) | Used to analyze the gain of radio communications system components. Converts between voltage gain, power gain, and dB. Assumes matched impedances. |
| 2 Mar 2002 | [elevdecl.xls](http://setileague.org/software/elevdecl.xls) | Contributed by Chuck Forster, WA9ACI, this spreadsheet allows you to enter the latitude of your station, and then converts between celestial declination and elevation above the horizon. Very useful for drift-scan meridian-transit radio telescopes. |
| 13 Apr 2002 | [emelink.xls](http://setileague.org/software/emelink.xls) | Originally by Chistoph Petermann DF9CY, with expanded noise figure calculation and formatting by Ed Cole, AL7EB. A complete end-to-end link analysis program for moonbounce (EME) communications in five specific amateur radio bands between 2 meters and 3cm. Very useful for those contemplating receiving The SETI League's W2ETI moonbounce beacon at 1296 MHz. |
| 18 Jan 2003 | [horngain.xls](http://setileague.org/software/horngain.xls) | Based upon a BASIC language program published in the 1980s, H. Paul Shuch submits this spreadsheet for analyzing the gain and beamwidth of pyramidal waveguide horn antennas, given their physical dimensions. The default values are for the horn built by Harold Ewen in 1951, used to first detect the 1420 MHz interstellar hydrogen emission line. |
| 07 Jun 2004 | [patch.xls](http://setileague.org/software/patch.xls) | Single microstrip patch antennas have radiation patterns similar to reflector-backed dipoles, and can thus be used as feeds for parabolic reflector antennas. Multiple patches can be etched on a single printed-circuit substrate for use as phased arrays. This spreadsheet by H. Paul Shuch determines dimensions for a single linearly-polarized microstrip patch on a user-specified substrate. |
| 07 Jun 2004 | [patch2fq.xls](http://setileague.org/software/patch2fq.xls) | A rectangular microstrip patch antenna can be made to operate at two different frequencies, if one dimension is resonant at one frequency, and the other dimension is resonant at the other frequendcy. Unfortunately, the calculations are highly iterative, as the width of the patch at each frequency equals the length at the other, and a patch's resonant length is in part a function of its selected width. This spreadsheet by H. Paul Shuch performs the calculations to excite a single patch in the TM01 mode at one frequency, and simultaneously in the TM10 mode at another. |
| 07 Jun 2004 | [mstrip.xls](http://setileague.org/software/mstrip.xls) | Microstrip transmission lines can be etched on a variety of substrates, providing desired characteristic impedance and propagation velocity as a function of dimensions and dielectric materials. This spreadsheet by H. Paul Shuch determines dimensions for microstriplines of desired characteristic impedance, when etched on a user-specified substrate. |
| 23 Feb 2004 | [farfield.xls](http://setileague.org/software/farfield.xls) | When testing antennas, it is important to know whether you are working in the near field, the far field, or the transition zone. This spreadsheet, based upon the December 1987 QEX article *Far Field Fallacy* by H. Paul Shuch, does the computations for you. |
| 30 April 2007 | [planck\_curve.xls](http://setileague.org/software/planck_curve.xls) | Allows you to determine the energy density per unit of frequency for a Planck blackbody curve of a specified temperature, and to determine the frequency at which the energy curve peaks. Implements the equation discussed in this [column](http://setileague.org/askdr/planck.htm). Spreadsheet by H. Paul Shuch. |

Members are encouraged to submit their own spreadsheets (in Microsoft Excel ® format) for posting to this page. Please send your submissions as email attachments to [paul\_at\_setileague\_dot\_org](javascript:mailto('paul','setileague.org',%20'%20?subject=spreadsheet%20posting%20via%20www.setileague.org%27)). All submitted material will be considered entered into the public domain.

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