

Some notes and Useful Links for H Line Observers.

F1EHN H Line video <https://www.youtube.com/watch?v=HGwkZY4E64k>

VLSR Calculators

http://mukhad.rian.kharkov.ua/vlsr_w75n_rt70.html

or

<http://www.jupiterspacestation.org/software/Vlsr.html>

Galactic to Celestial Coordinate converters:-

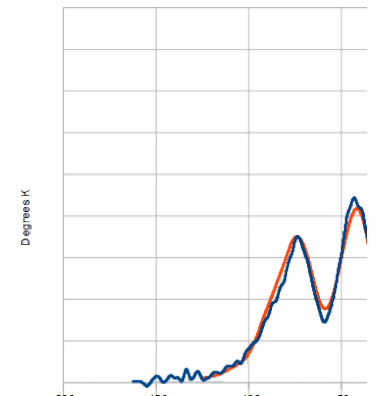
<http://www.jupiterspacestation.org/software/Galactic.html>

or

https://lambda.gsfc.nasa.gov/toolbox/tb_coordconv.cfm

The formulae from the spread sheet:-

| 1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|----|-------------|------|------------|----------|----------|-----------|-------------|-------|----------|-----------|----|--------------|------------|---|------------|
| 2 | Normal Scan | | 2014-04-02 | 10:38:42 | 1420.405 | Int. Secs | 3 | mV/dB | 210 | T Sys K | 50 | Std IAU VLSR | M & B VLSR | | Correction |
| 3 | MHz | km/s | DET 1 | Atten dB | | | Noise Floor | VLSR | Y Factor | Degrees K | | -25.99 | -23.08 | | 0 |
| 4 | 1420.1 | 64.4 | 1.98 | 8 | 1 | 1.984 | 1.983 | 90.4 | -0.02 | 0 | | | | | |
| 5 | 1420.11 | 62.3 | 1.97 | 8 | 2 | | 1.983 | 88.3 | -0.06 | -1 | | | | | |
| 6 | 1420.12 | 60.2 | 1.98 | 8 | 3 | | 1.982 | 86.2 | -0.01 | 0 | | | | | |
| 7 | 1420.13 | 58.1 | 1.99 | 8 | 4 | | 1.981 | 84.1 | 0.04 | 0 | | | | | |
| 8 | 1420.14 | 56.0 | 2 | 8 | 5 | | 1.981 | 82.0 | 0.09 | 1 | | | | | |
| 9 | 1420.15 | 53.9 | 2 | 8 | 6 | | 1.980 | 79.9 | 0.09 | 1 | | | | | |
| 10 | 1420.16 | 51.8 | 2 | 8 | 7 | | 1.979 | 77.7 | 0.10 | 1 | | | | | |
| 11 | 1420.17 | 49.6 | 1.99 | 8 | 8 | | 1.979 | 75.6 | 0.05 | 1 | | | | | |
| 12 | 1420.18 | 47.5 | 2 | 8 | 9 | | 1.978 | 73.5 | 0.10 | 1 | | | | | |
| 13 | 1420.19 | 45.4 | 2 | 8 | 10 | | 1.977 | 71.4 | 0.11 | 1 | | | | | |
| 14 | 1420.2 | 43.3 | 2 | 8 | 11 | | 1.977 | 69.3 | 0.11 | 1 | | | | | |
| 15 | 1420.21 | 41.2 | 2.01 | 8 | 12 | | 1.976 | 67.2 | 0.16 | 2 | | | | | |
| 16 | 1420.22 | 39.1 | 1.99 | 8 | 13 | | 1.975 | 65.1 | 0.07 | 1 | | | | | |
| 17 | 1420.23 | 37.0 | 2 | 8 | 14 | | 1.975 | 63.0 | 0.12 | 1 | | | | | |
| 18 | 1420.24 | 34.9 | 2 | 8 | 15 | | 1.974 | 60.8 | 0.12 | 1 | | | | | |
| 19 | 1420.25 | 32.7 | 2 | 8 | 16 | | 1.974 | 58.7 | 0.13 | 1 | | | | | |
| 20 | 1420.26 | 30.6 | 2.01 | 8 | 17 | | 1.973 | 56.6 | 0.18 | 2 | | | | | |
| 21 | 1420.27 | 28.5 | 2.01 | 8 | 18 | | 1.972 | 54.5 | 0.18 | 2 | | | | | |
| 22 | 1420.28 | 26.4 | 2.02 | 8 | 19 | | 1.972 | 52.4 | 0.23 | 3 | | | | | |
| 23 | 1420.29 | 24.3 | 2.02 | 8 | 20 | | 1.971 | 50.3 | 0.23 | 3 | | | | | |
| 24 | 1420.3 | 22.2 | 2.01 | 8 | 21 | | 1.970 | 48.2 | 0.19 | 2 | | | | | |
| 25 | 1420.31 | 20.1 | 2 | 8 | 22 | | 1.970 | 46.1 | 0.14 | 2 | | | | | |
| 26 | 1420.32 | 18.0 | 2.01 | 8 | 23 | | 1.969 | 43.9 | 0.20 | 2 | | | | | |
| 27 | 1420.33 | 15.8 | 2.01 | 8 | 24 | | 1.968 | 41.8 | 0.20 | 2 | | | | | |
| 28 | 1420.34 | 13.7 | 2.03 | 8 | 25 | | 1.968 | 39.7 | 0.30 | 4 | | | | | |
| 29 | 1420.35 | 11.6 | 2.04 | 8 | 26 | | 1.967 | 37.6 | 0.35 | 4 | | | | | |
| 30 | 1420.36 | 9.5 | 2.04 | 8 | 27 | | 1.966 | 35.5 | 0.35 | 4 | | | | | |
| 31 | 1420.37 | 7.4 | 2.01 | 8 | 28 | | 1.966 | 33.4 | 0.21 | 2 | | | | | |
| 32 | 1420.38 | 5.3 | 2.01 | 8 | 29 | | 1.965 | 31.3 | 0.21 | 3 | | | | | |
| 33 | 1420.39 | 3.2 | 2.07 | 8 | 30 | | 1.964 | 29.2 | 0.50 | 6 | | | | | |
| 34 | 1420.4 | 1.1 | 2.09 | 8 | 31 | | 1.964 | 27.0 | 0.60 | 7 | | | | | |



Topocentric velocity $B3 = (300/A3) * (A3 - \$E\$1) * 10^3$... $\$E\1 is the Rest frequency for H1.

VLSR $H3 = B3 - \$L\2 $\$L\2 is calculated for the date time, direction of the observation

Y Factor $I3 = (C3 - G3) / (\$I\$1 / 1000) + D3 - \$D\3 ... $\$I\1 is the detector slope.

Antenna temperature $= (10^{(I3/10)}) * \$K\$1 - \$K\$1 + \$O\2 ... $\$K\1 is T Sys $\$O\2 is zero.

Noise floor in column G is calculated as a straight line from the average of the first 5 lines of DET Volts to the average of the last 5 lines of DET voltage.

Other useful Links

Milky Way Fully annotated link:- <https://apod.nasa.gov/apod/ap080606.html>

F1EHN H Line movie:- <https://www.youtube.com/watch?v=HGwkZY4E64k>

Mapping the Galaxy + Dark matter:- <https://www.youtube.com/watch?v=-UrzmAa62ho>

University of Bonn all sky H Line survey.

<https://www.astro.uni-bonn.de/hisurvey/profile/index.php> This can be used to verify your calibration it even allows you to set the beam width to that of your antenna.