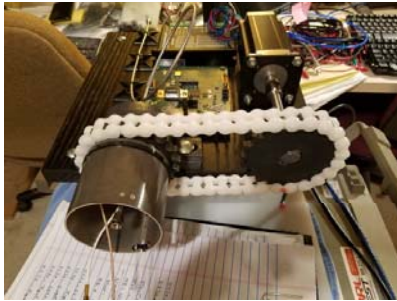


Processing GPS L1 from a Haigh-Farr Antenna
Larry Wurtz, Phd
21 December 2020

Test Setup to Process GPS L1 from Haigh-Farr Antenna



Haigh-Farr Antenna Rotation Assembly



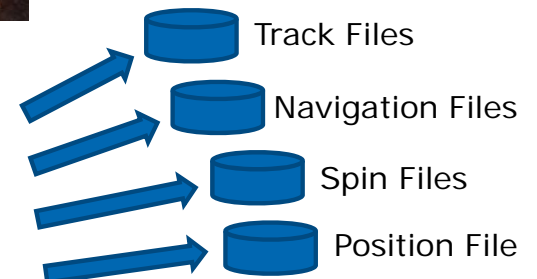
Clear conditions on
21 December 2020
4:21 P.M. Central Time



Multiband GNSS IF Recorder



GNSS Analysis Program



Displays

GPS L1 Satellites Acquired using Haigh-Farr Antenna

GPS L1 Analysis Tool

PRN Codes | Acquisition 1 | Acquisition 2 | Acq Plots | Track | Track Plots 1 | Track Plots 2 | Track Plots 3 | Nav Filter | Navigation | RX Position | RX Position Plots | Spin

PRN Correlation Output Filename

Start PRN Correlation

Close Program

Record Satellite PRN Correlation Data

Record Satellite No

Acquisition Step Freq = 25 Hz

GPS L1 Satellites Found

Sat 1	Sat 2	Sat 3	Sat 4	Sat 5	Sat 6	Sat 7	Sat 8	Sat 9	Sat 10	Sat 11
Sat 12	Sat 13	Sat 14	Sat 15	Sat 16	Sat 17	Sat 18	Sat 19	Sat 20	Sat 21	Sat 22
Sat 23	Sat 24	Sat 25	Sat 26	Sat 27	Sat 28	Sat 29	Sat 30	Sat 31	Sat 32	

Processing Notes

Wurtz, Thursday, 23 July 2020, 11:56 A.M.

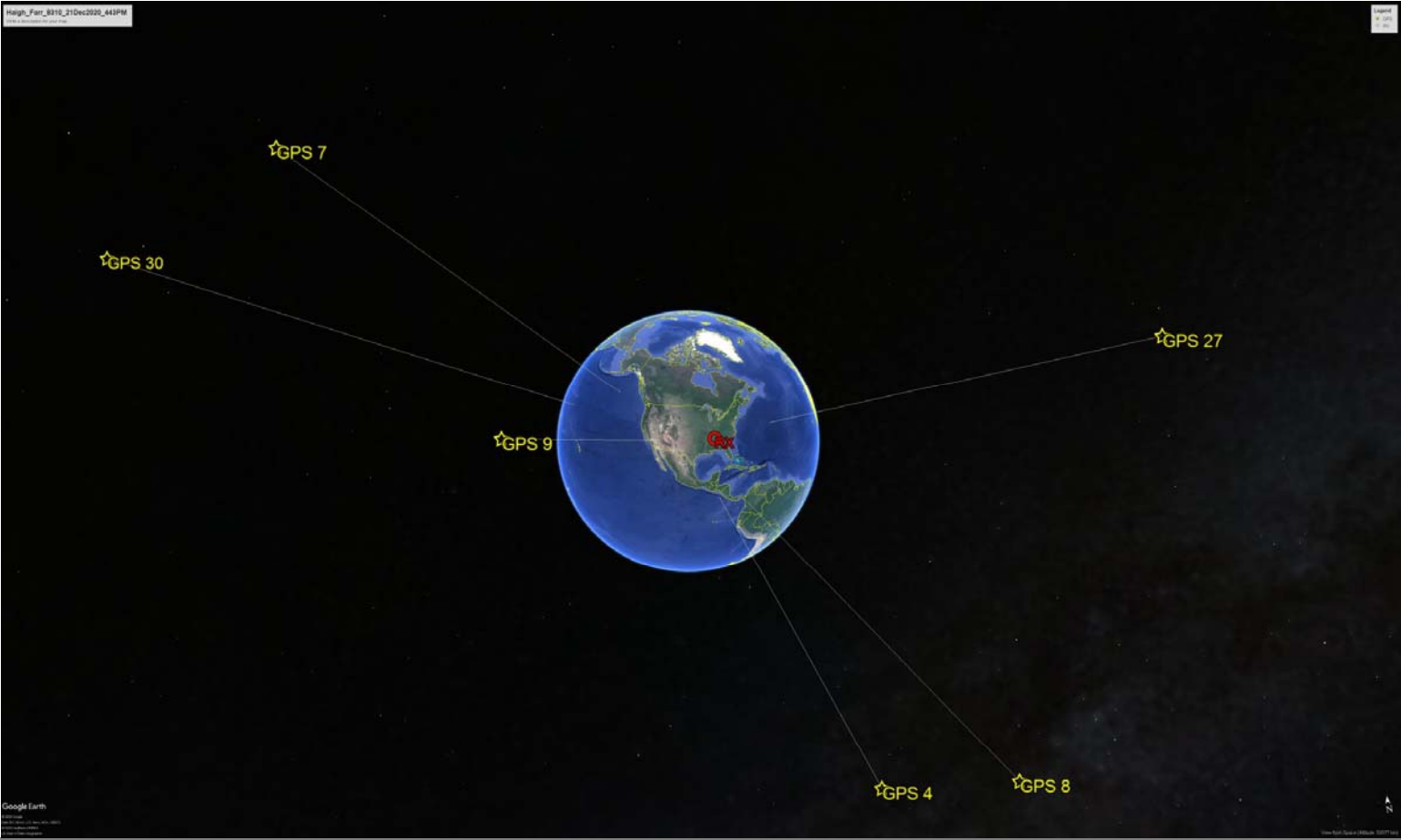
Sample 4 => Magnitude = 16.809, Delta Freq (Hz) = -9650, PRN Chip Ptr = 429.375
 Sample 5 => Magnitude = 18.649, Delta Freq (Hz) = 2725, PRN Chip Ptr = 810.5625
 Sample 6 => Magnitude = 15.912, Delta Freq (Hz) = -3750, PRN Chip Ptr = 745.5625
 Sample 7 => Magnitude = 16.027, Delta Freq (Hz) = -8425, PRN Chip Ptr = 370.8125
 Sample 8 => Magnitude = 16.836, Delta Freq (Hz) = -8075, PRN Chip Ptr = 34
 Sample 9 => Magnitude = 16.758, Delta Freq (Hz) = -1350, PRN Chip Ptr = 771.0625
 Sample 10 => Magnitude = 16.825, Delta Freq (Hz) = -4925, PRN Chip Ptr = 475.6875
 Sample 11 => Magnitude = 17.236, Delta Freq (Hz) = -6300, PRN Chip Ptr = 103.9375
 Sample 12 => Magnitude = 17.899, Delta Freq (Hz) = 8075, PRN Chip Ptr = 531.9375

Satellite 32 =>

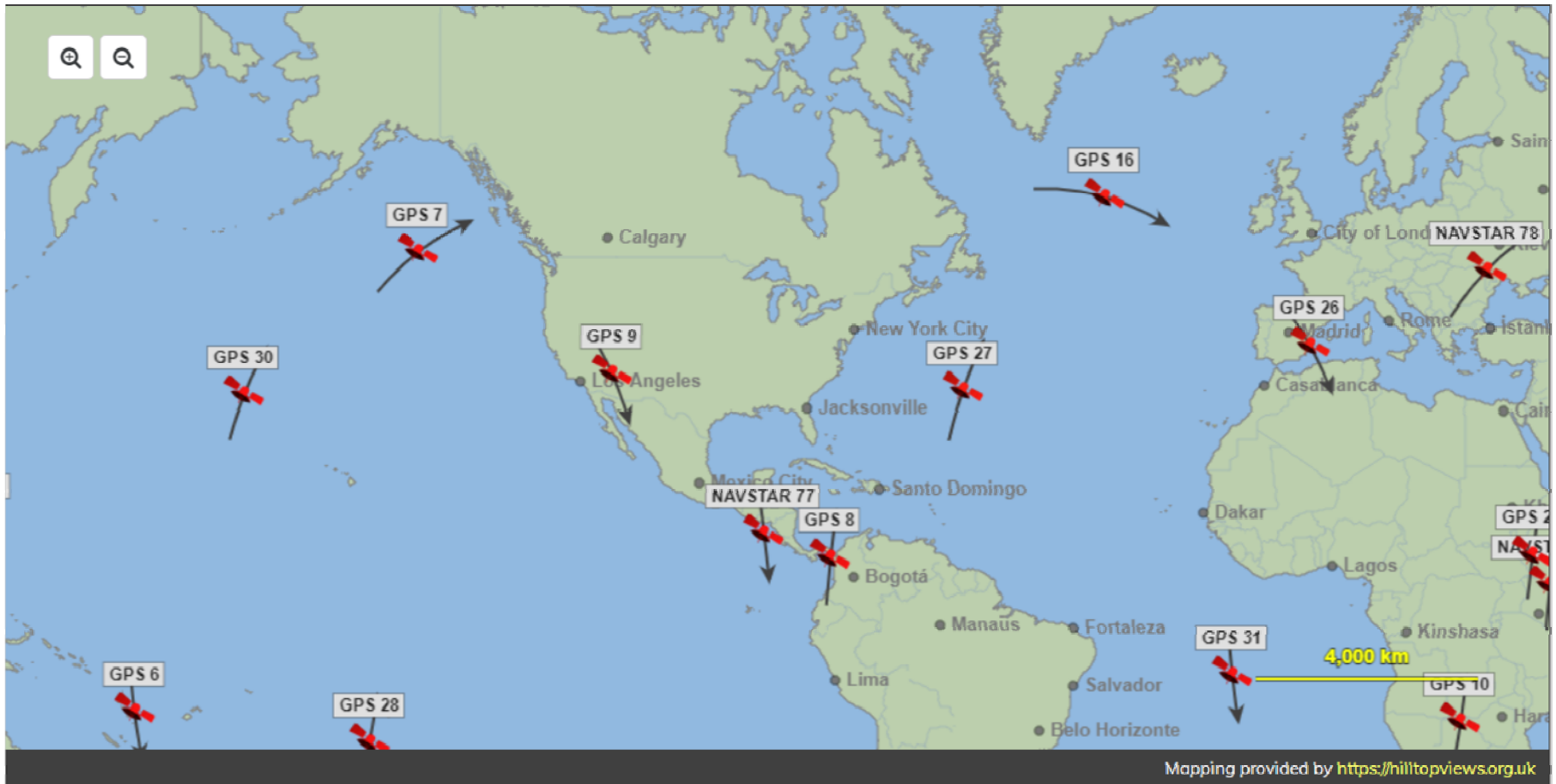
Sample 1 => Magnitude = 16.418, Delta Freq (Hz) = 750, PRN Chip Ptr = 673.625
 Sample 2 => Magnitude = 17.043, Delta Freq (Hz) = -7325, PRN Chip Ptr = 852.0625
 Sample 3 => Magnitude = 18.589, Delta Freq (Hz) = 6925, PRN Chip Ptr = 802.125
 Sample 4 => Magnitude = 16.372, Delta Freq (Hz) = 3175, PRN Chip Ptr = 164.25
 Sample 5 => Magnitude = 16.939, Delta Freq (Hz) = -8625, PRN Chip Ptr = 128.75
 Sample 6 => Magnitude = 16.433, Delta Freq (Hz) = 7900, PRN Chip Ptr = 464.1875
 Sample 7 => Magnitude = 17.779, Delta Freq (Hz) = -3525, PRN Chip Ptr = 777.125
 Sample 8 => Magnitude = 17.083, Delta Freq (Hz) = -8250, PRN Chip Ptr = 603.75
 Sample 9 => Magnitude = 16.961, Delta Freq (Hz) = -5200, PRN Chip Ptr = 303.3125
 Sample 10 => Magnitude = 17.585, Delta Freq (Hz) = -4550, PRN Chip Ptr = 505.8125
 Sample 11 => Magnitude = 16.569, Delta Freq (Hz) = 9775, PRN Chip Ptr = 604.4375
 Sample 12 => Magnitude = 19.169, Delta Freq (Hz) = -5250, PRN Chip Ptr = 894.9375

GPS L1 Parallel PRN Code Cross Correlation Completed

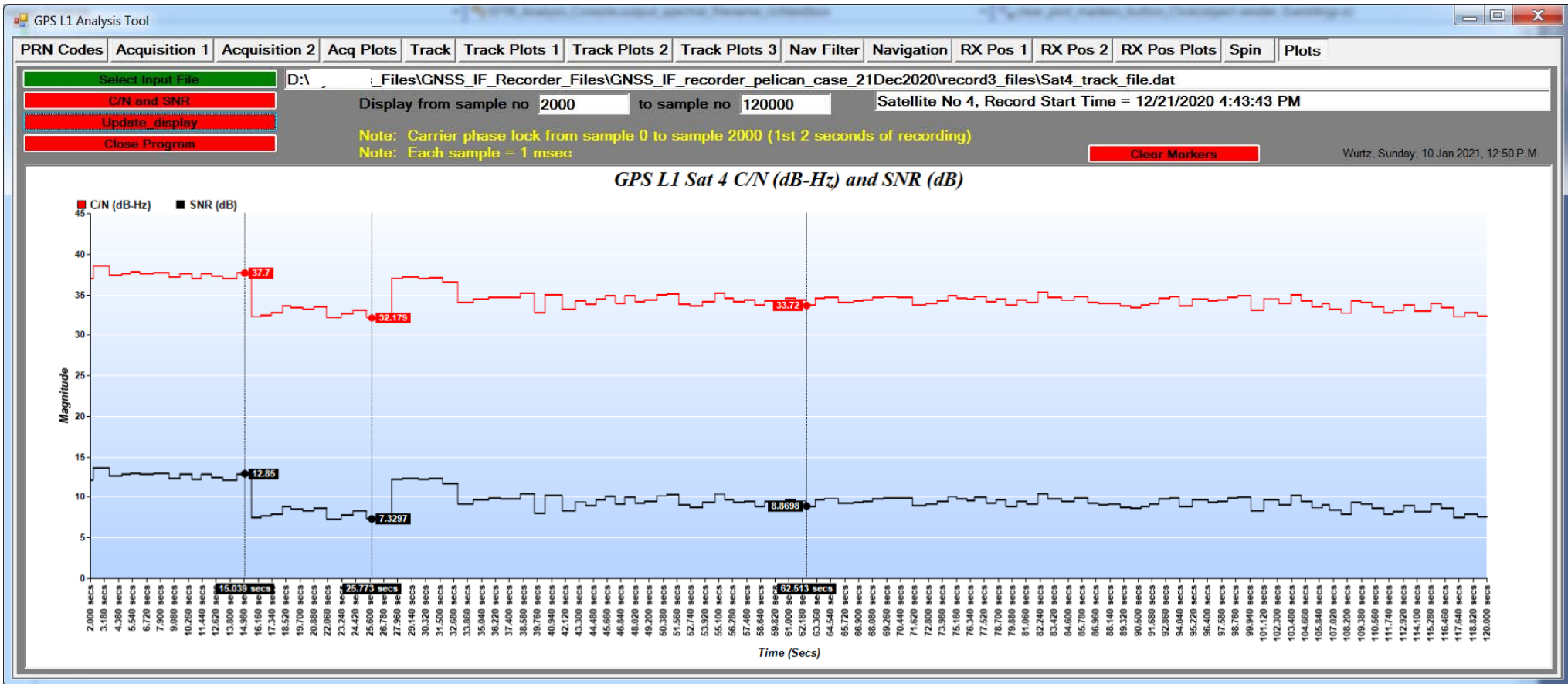
GPS L1 Satellites Acquired using Haigh-Farr Antenna



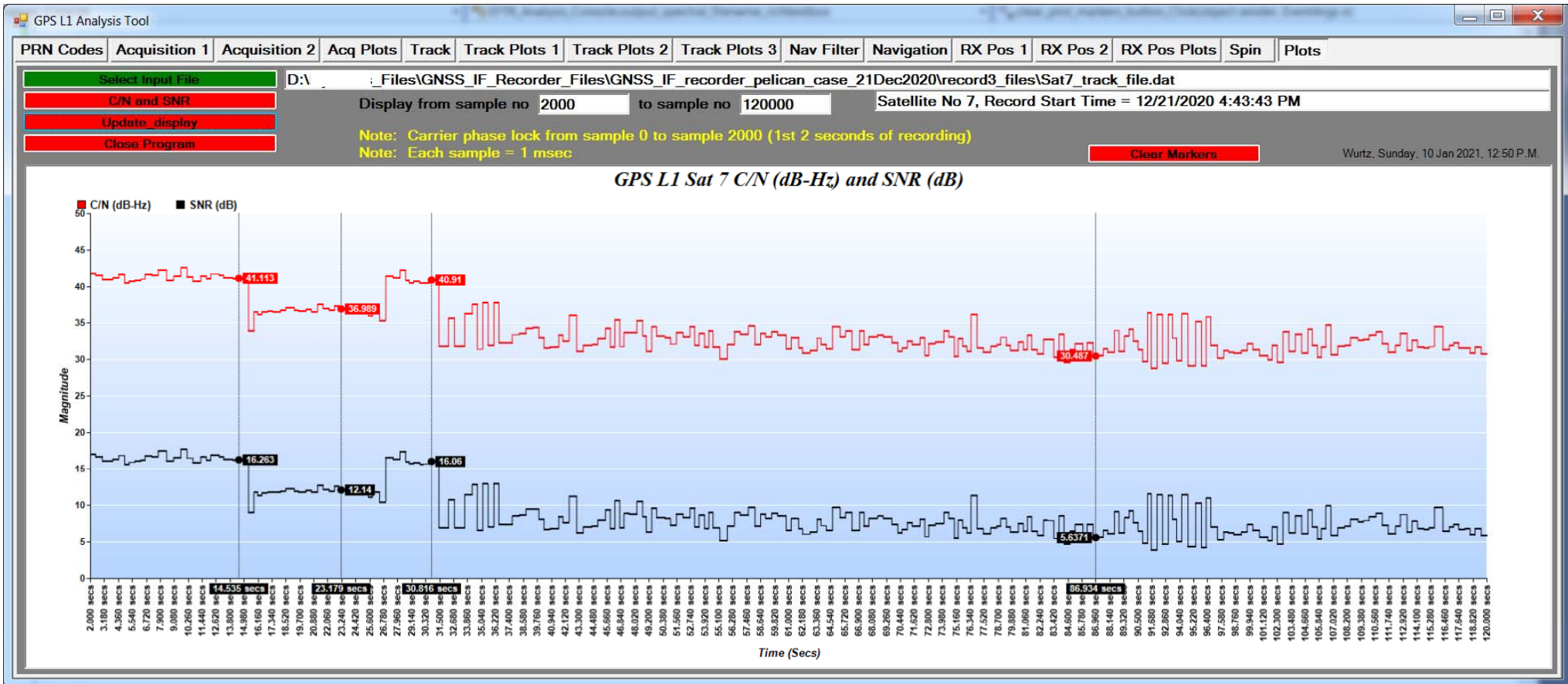
GPS L1 Satellite Coverage on 21 Dec 2020, 4:21 P.M.



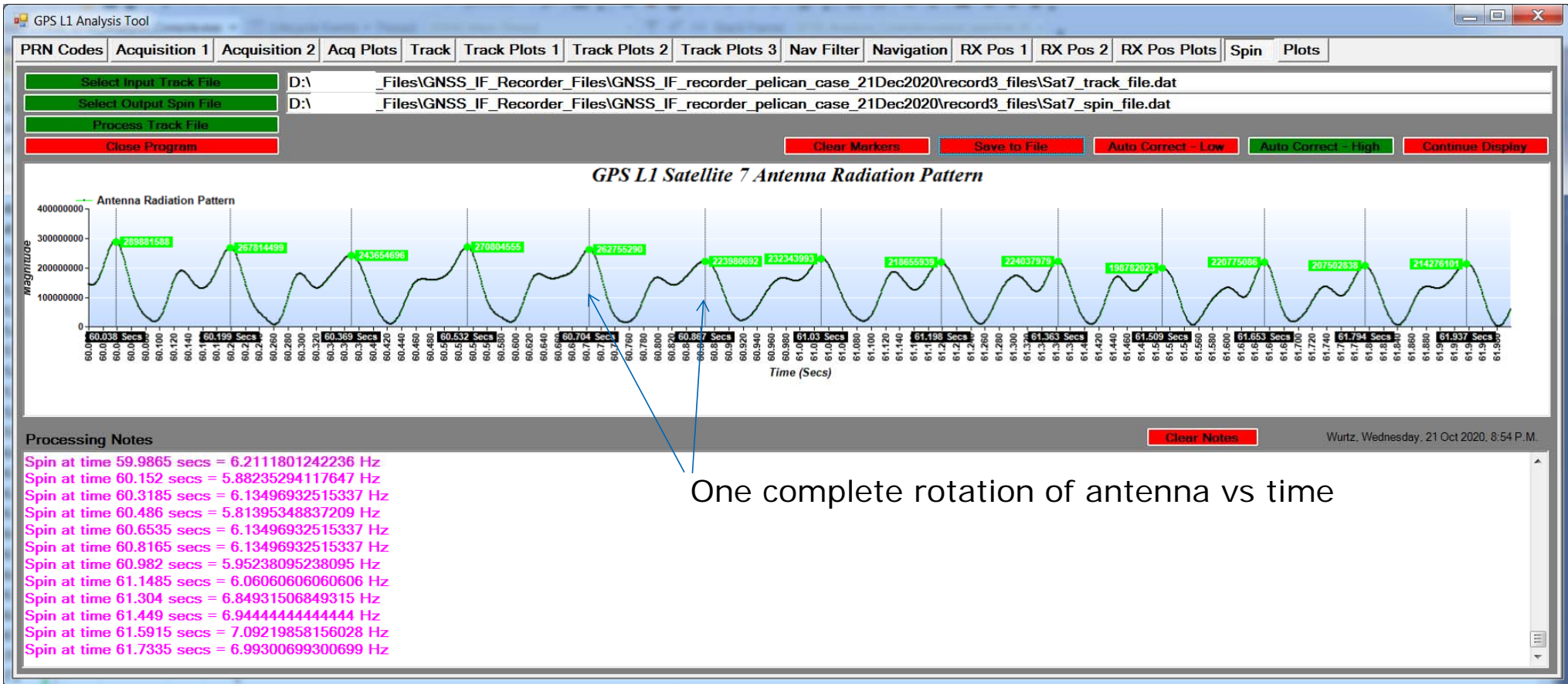
GPS L1 Sat 4 C/N and SNR as antenna is rotated 0 to 7 Hz



GPS L1 Sat 7 C/N and SNR as antenna is rotated 0 to 7 Hz

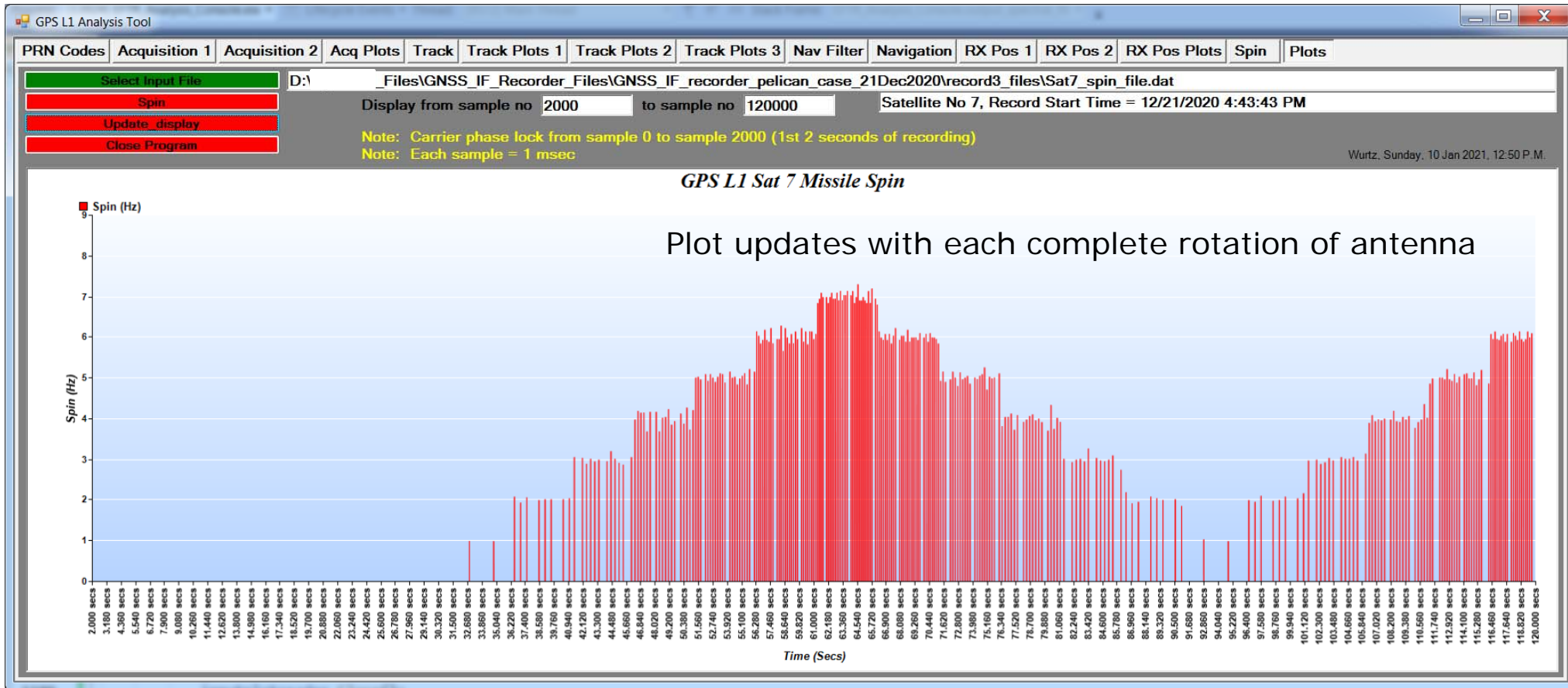


GPS L1 Sat 7 energy level from in-phase armature of code tracking loop



One complete rotation of antenna vs time

Antenna spin plot from GPS L1 Sat 7



Future Improvements to GNSS Analysis Process

- 1. Improve robustness of GNSS Analysis program to detect and correct phase carrier cycle slips,
- 2. Improve code and carrier-phase tracking loops for reduced noise,
- 3. Incorporate GPS L2 and Galileo E1 Satellite processing into the GNSS Analysis Program.