

Lab 4 – GPS Receiver Processing

Due: 4/26/2024

This lab utilizes the IFEN IF data

Part I: IF Simple Data Analysis

Read in a subset of sampled IF data (maybe 0.1 seconds to 1 second)

- a) Provide a plot of the IF data (vs. time)
- b) Provide the histogram of the data
- c) Provide spectral analysis of the data

Part II: Acquisition

Write software to acquire GPS satellites from the sampled IF data

- d) Provide a 3D plot of the autocorrelation vs. code phase and Doppler for SV #7 using 1 ms of data
- e) Repeat part a) with 10 ms of data. How does the performance improve or degrade. Repeat with the next 10 ms of data.
- f) Add random noise with a $1\sigma=6$ and $1\sigma=12$. Can you acquire the SV with 1 ms of data? What about with more data?
- g) Repeat part b) for at least 3 more SVs (1, 14, 17, 21, 30 are good choices).
- h) **(Optional)**. Using information from Part II, remove the databit(s) and repeat part a) over 40 ms set of data and compare the results.

Part III: Tracking

Write software to track the GPS signal and decode the data message

- a) Decode the data bits for SV#7. What is the zcount following the first preamble?
- b) Plot the Doppler and carrier measurement vs. time for SV #8
- c) How much noise can you add to the IF and still track the GPS signal? How does this compare to the noise value to which you could acquire the satellite?
- d) Calculate the delta psuedorange from SV #7 and at least 3 additional SVs to compute the position and receiver clock offset. Using that time calculate the psuedorange for the 4 SVs. How does your position solution and psuedoranges compare to the Novatel or Trimble receivers?