



**Hardware/Software Codesign for Wireless Systems
(E168b)**

Lab 4: Satellite Tracking

Signal Tracking

In order to receive the data from a satellite, the carrier signal and the code signal must be tracked so that the correlations represent the data and the data boundaries can be determined. In this lab you will calculate the control parameters necessary for stable tracking loops. You will write an m-file that takes the inputs QE, QP, QL, IE, IP, and IL, and outputs the adjustments to the carrier and code tracking loops. You will then use your tracking system to track a satellite signal, and you will observe the error in the locked signal vs. time.

Carrier/Code Tracking

You have been provided with 37 ms of data taken from Trimble, and an m-file that is set up to track satellite 5 except with the PLL code missing. These files are in the course folder. Your task is to write a PLL.m file that takes as inputs the results from the correlations and the previous carrier and code NCO frequencies and returns the adjusted frequencies. The results are stored in a structure called “trackingResults.” Look through the code and make sure that you understand how it works; debugging will be very difficult if you do not.

Use a bandwidth of 25 Hz for the carrier loop and 2 Hz for the code loop. Use a damping factor of 0.7 for both loops. Use a gain of 0.25 for the carrier loop and 1 for the code loop.

What to Turn in

- 1) The Matlab code for your PLL.m function.
- 2) How long does it take to get a lock on the signal? Show plots of the error vs. time for both the carrier and code tracking loops.
- 3) How do the bandwidth and damping factors affect the PLL behavior?
Make plots showing the effects of varying these parameters to support your Hypothesis.
- 4) How long did you spend on the lab?