# ECE 6390 Homework 7: GPS

1. A typical, open-sky GPS receiver picks up 8 approximately equal-powered satellite signals when operated near Hartsfield-Jackson International Airport. These signals (the GPS C/A codes) are 50 bit/sec identification and timing data that are spread at 1.023 Mcps to an RF bandwidth of 2 MHz. You are hired by the department of homeland security to evaluate the ability to jam GPS receivers near the airport. If a malevolent agent has a 7 dBi-gain Yagi antenna connected to a jammer/transmitter and aims this device at a plane beginning a landing approach from 5 kilometers away, how much jamming power is required to make the C/A code have a C/I $<$ 6 dB after despreading? Assume GPS receivers with 0 dBi antennas. (5 points)

2. Below are the satellite subpoint coordinates and psuedo-ranges for the 4 GPS satellites whose signals are received by a positioning radio:

| | Sat 1 | Sat 2 | Sat 3 | Sat 4 |
|---|---|---|---|---|
| Lon | -62.3256° | -89.9320° | -92.8388° | -95.5607° |
| Lat | 7.8520° | 45.1053° | 19.7326° | 40.3333° |
| PR/c | 0.000000000 s | -0.003743566 s | -0.003297881 s | -0.003845926 s |

   Note that all pseudo-ranges are given relative to the first satellite position (absolute time delay, of course, is unknown). Calculate the longitude, latitude, and altitude for the GPS receiver based on this data. Use 6380.20 km as the mean earth radius, 20,200.00 km as the GPS satellite altitude, and $c = 299860.00$ km/s in your calculations. Hint: check some of the *Radiolocation Scavenger Hunt* GPS assignments on the website if you have trouble solving the range equations. (10 points)