Satellite Navigation Techniques and Applications
Assignment #5 Satellite Communications

1) Programming Exercises and Link Margin Calculations

Add the following capability to your satellite simulation.

a) Write a function that calculates the azimuth, elevation and range from the ground station to the satellite position.

1) This should be a generic function that could run in the ground station or on the satellite.
2) A satellite with a GPS or orbit propagator is able to calculate this, and anticipate ground station events.

b) Calculate the down link margin using the maximum and minimum range calculated above and the following parameters:

Downlink Frequency: 1800 MHz
Satellite Transmit Power: 3 dB
Satellite Transmit Antenna Gain: 9 dB
Satellite Transmit Line Losses: 1 dB
Atmospheric Losses: 2 dB
Receive Antenna Gain: 20 dB
System Noise Temperature: 700K
Receive System Noise Figure: 2 dB
Data Rate: 256 kbps
Required S/N = 10 dB

c) Repeat the calculations above for the uplink using the following parameters:

Uplink Frequency: 2000 MHz
Ground Station Transmit Power: 9 dB
Ground Station Transmit Antenna Gain: 20 dB
Ground Station Transmit Line Losses: 2 dB
Atmospheric Losses: 2 dB
Receive Antenna Gain: 2 dB
System Noise Temperature: 300K
Receive System Noise Figure: 3 dB
Data Rate: 128 kbps
Required S/N = 10 dB