

EE 567

Homework 11

Due Tuesday, November 19, 2019

Work all 2 problems.

Problem 1 (from Sklar, Digital Communications, 2nd ed.). Suppose an airplane terminal communicating with a satellite is equipped with a frequency hopping spread spectrum system transmitting with an EIRP of 20 dBW (dB Watts). The data rate is $R = 100$ bits/sec. The jammer is transmitting wideband Gaussian noise continually with $\text{EIRP}_J = 60$ dBW. Assume that $(E_b/J_0)_{reqd} = 10$ dB and that the path loss is identical for both the airplane terminal and the jammer.

- a. Should the communicators be more concerned with jammer trying to jam the uplink or the downlink?
- b. If it is desired to have an AJ margin of 20 dB, what should be the value of the hopping bandwidth W_{ss} ?

Problem 2. Suppose we detect a signal as shown in class and now we wish to noncoherently integrate the detected samples. Using Albersheim's equation plot the probability of detection vs. SNR (dB) for a probability of false alarm of 10^{-6} and number of independent samples noncoherently integrated is $N = 32$. Repeat this for probability of false alarm of 10^{-4} and show both curves on the same graph. In each case your probability of detection should range from 0.1 to 0.9.