

EE 334 Homework: Wideband Modulation

1. Frequency Hopping: A PN generator for a frequency hopping system has a 7 bit shift register. Assume the feedback is correctly setup to generate a maximal length sequence. Find the number of PN codes that will occur before the sequence repeats itself.

2. Direct Sequence Spread Spectrum: In DSSS, each data bit is split into several parts known as chips. For simple DSSS transmitter and receiver pairs, the same chip sequence is used to modify each bit. Thus, from the standpoint of bandwidth requirements, the symbol rate is the chip rate.

By carefully choosing different chip sequences different transmitters can broadcast into the same bandwidth without interfering with each other.

Given: A particular cellular phone has an 8-bit ADC that performs 20 thousand samples per second. It broadcasts on a center frequency of 2.4 GHz. The broadcast spectrum is spread by using 2048 chips per bit.

Find:
a. Data rate in bits per second
b. Chip rate in chips per second

3. A spread spectrum communication system needs a processing gain of at least 42dB and have a nominal bandwidth of 4 MHz. What data rate can this system achieve?

4. How does a spread spectrum signal appear to a conventional receiver?

5. True or False? In DSSS the chip rate is faster than the data rate.

6. Name two important benefits of spread spectrum.