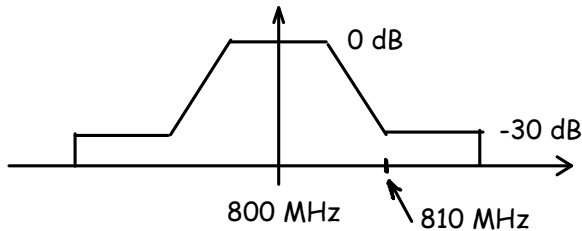


Assignment 2

Due Tuesday, April 1. Show your work. Hand in your assignment using the appropriate dropbox on the course web site. Assignments submitted after the solutions are made available will be given a mark of zero.

Question 1

What is the -10 dB bandwidth of the following channel? Is this a low-pass or band-pass channel?



Question 2

What is the 99% power bandwidth of an ideal (“brick wall”) 250 kHz low-pass filter?

Question 3

A transmission line with a velocity factor of 0.66 causes a phase shift of 35 degrees at a frequency of 1 MHz. What is the shortest possible length? What is the next longest possible length?

Question 4

You measure the phase shift through a channel as 30 degrees at 1 MHz and 40 degrees at 2 MHz. Is this channel likely to distort a 1 μ s pulse transmitted over it? Why or why not? Assume the phase measurements did not “wrap.”

Question 5

You test an amplifier by applying a signal with two sinusoids with frequencies of 1 and 1.1 kHz at the input. What are the two frequencies closest to the input frequencies that you would check if you wanted to detect non-linear distortion?

Question 6

The LNA (low-noise amplifier) for a radio receiver has a noise figure of 2dB. What is the output noise power in a 10 MHz bandwidth? If the received signal power is -100 dBm, what is the SNR? Assume a temperature of 290K.

Question 7

A data signal using a bipolar NRZ line code with voltages of ± 2 V has noise superimposed on it with an RMS voltage of 0.8V. What is the noise margin? What is the probability of an error?

Question 8

You are looking for the cause of high error rates on data links that run over twisted pair in a shared conduit. You notice that the error rate increases as the number of active circuits increases. What is a probable cause of the errors?

Question 9

You measure the RTS and DTR pins on an RS-232 interface and measure +5V. Is this connector wired as a DTE or DCE? Could you connect it up to a typical PC? If not, what would you need to do?

Question 10

An RS-232 interface transmits the character 'E' at 9600 bps with 7 data bits and no parity. Draw the output waveform, including all start, data, and stop bits and indicating the duration of one bit and the minimum allowed voltage levels.