

Exercise 2: Using the Link Equation and GNU Radio Filters

Part 1. Link Equation

The USRP can only deliver 100mW. As shown in the presentation, this is not enough power to satisfy the requirements of the example ($P_e \leq 10^{-6}$ and $d = 5\text{km}$). What can we do to satisfy the requirements of this link example assuming that we are constrained to 100 mW of transmitter power? What would be the power required if we used FSK instead of PSK?

Part 2. Filtering

- a. Run filter_test2 (as it is) with an amplitude of 0.5 for each of the sine waves. How many taps does the low pass filter require?
- b. Modify filter_test2 so that the sources are at 1000 Hz and 1500 Hz. Modify the filter design so that the 1000 Hz signal is still passed and the 1500 Hz signal is blocked. Run the program for a few seconds and import the output files into MATLAB. Did your filter work? How many taps are required now?
- c. Vary the stopband attenuation in part b to be 20 dB (instead of 60 dB), how does this affect the number of taps required? Examine the output in MATLAB and compare the delay in the output to that obtained in part b.