Wireless Communications (ELEC464/6141)

This project has a value of 15%. This is a two-student group project and each group has to write their own distinct report with a distinct MATLAB program attached to the report.

Project description:

Consider a QPSK communication system with the information rate of 1Mb/s. Assume that in this system, which is perfectly synchronized, a transmitter with one antenna element is sending data to a receiver with two antenna elements (single input multiple output (SIMO) system). The receiver applies maximum ratio combining (MRC) processing to detect the transmitted symbol.

a) Simulate and draw the bit error rate of the uncoded system (bit error rate versus Eb/N0) if we have a Doppler Spread due to mobile movement in the channel. In your simulation, assume that the carrier frequency equals 5GHz, and the maximum mobile speed is 80 Km/Hour. Also, the channel is flat and perfect channel state information (CSI) is available at the receiver.
b) Apply a (15, 11, 1) Hamming code with below generator matrix into the system. Draw the bit error rate versus Eb/N0 and discuss the results.

$$G = \begin{bmatrix} 111110000000000 \\ 011101000000000 \\ 101100100000000 \\ 110100010000000 \\ 111000001000000 \\ 001100000100000 \\ 010100000010000 \\ 011000000001000 \\ 101000000000100 \\ 100100000000010 \\ 110000000000001 \end{bmatrix}$$