EE 6340/3861 Wireless Communications
InClass Assignment 2
27/2/2023 due at 1:30 pm

This Assignment is a Matlab exercise for which we will need Matlab. The Institute provides an academic license

We will do simulations for two well-known modulation techniques for BER in Rayleigh and Nakagami- m narrowband fast-fading environments with diversity. The baseband equivalent representation is given by $y_k = h_k a_k + v_k$, where a_k and y_k are the baseband equivalent transmitted and received signal, with v_k being noise and h_k being the fading coefficient.

Do stepwise as follows in Matlab:
1. Generate random binary data (of length 2 ×100000).
2. Map the data to the QPSK signal constellation with Gray Mapping.
3. Generate the random fading coefficient for SIMO with two receivers and add AWGN noise to this signal.
4. Vary the noise variance to have SNR range between [0 dB, 30 dB].
4. Use Selection Combing to get combined noisy signal for each time instant.
5. Use the combined noisy signal to detect the transmitted bits per threshold-based rule.
6. Compare the detected bits with the transmitted ones and plot the BER.
7. Repeat for SIMO with MRC

Generate the following two plots.

• Figure 1

1. BER of SC Rayleigh Fading with QPSK
2. BER of SC Nakagami- m Fading with QPSK
3. BER of SIMO AWGN with QPSK
4. Plot the BER for SIMO with 3 and 4 receive antennas

• Figure 2

1. BER of MRC Rayleigh Fading with QPSK
2. BER of MRC Nakagami- m Fading with QPSK
3. BER of SIMO AWGN with QPSK
4. Plot the BER for SIMO with 3 and 4 receive antennas

Analyse the Figures, and provide insights and interpretation.

Mohammed Zafar Ali Khan
zafar@ee.iith.ac.in
EE 6340/3861
Phone: +91-40 2301 6454