

In this course project, you will apply the turbo encoder/decoder programs that you have developed to implement joint multiple-input multiple-output (MIMO) detection and turbo decoding. The MIMO detector you will implement is the optimal maximum a posteriori (MAP) detector, and the turbo code is the rate **1/2 (7,5) turbo code**. You need to generate a simulation curve similar to that of the curve for the QPSK, 2x2 channel as shown in Fig. 6 of the paper “Achieving near-capacity on a multiple-antenna channel” by B. Hochwald and S. Brink. Refer to this paper for detailed simulation setup. **The length of the information bit sequence is 9216. For each transmitted block (codeword), four (outer) iterations are performed over the MIMO detection loop, and eight (inner) iterations are performed within the turbo decoder.** Show your BER for **$E_b/N_0 = 0, 1, 2, 2.1, 2.2, 2.3, 2.4$ dB**. Note that the definition of E_b/N_0 follows equation (31) of the paper, given by

$$\frac{E_b}{N_0}(\text{dB}) = \frac{E_s}{N_0}(\text{dB}) + 10 \log_{10} \frac{N}{RMM_c}.$$

Note that you will need to transmit **4000** or more codewords for obtain accurate BER for $E_b/N_0 = 2, 2.1, 2.2, 2.3, 2.4$ dB.