MATLAB Project for MobCom

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1 Problem 1

2 Problem 2

We want to simulate the 1×2 SIMO model $\mathbf{y} = \mathbf{h}x + \mathbf{w}$ (where $\mathbf{h} = [h_1 h_2]$) to establish the probability of deep fade:

$$P(||\mathbf{h}||^2 < SNR^{-1})$$

We generated $\mathbf{h} = [h_1 h_2]$ using the MATLAB function rand 100'000 times and we compared the resulted $||\mathbf{h}||$ with the SNR from 0 to 10 dB. We have done this when $h_i \sim \mathbb{C}\mathcal{N}(0,1)$ i.i.d and we repeated the procedure in the case in which $h_2 = h_1 h_3; h_1, h_2 \sim \mathbb{C}\mathcal{N}(0,1)$ i.i.d and when $h_2 = \frac{1}{2}(h_1 + h_3); h_1, h_2 \sim \mathbb{C}\mathcal{N}(0,1)$. We obtained the plot in Fig. 1.

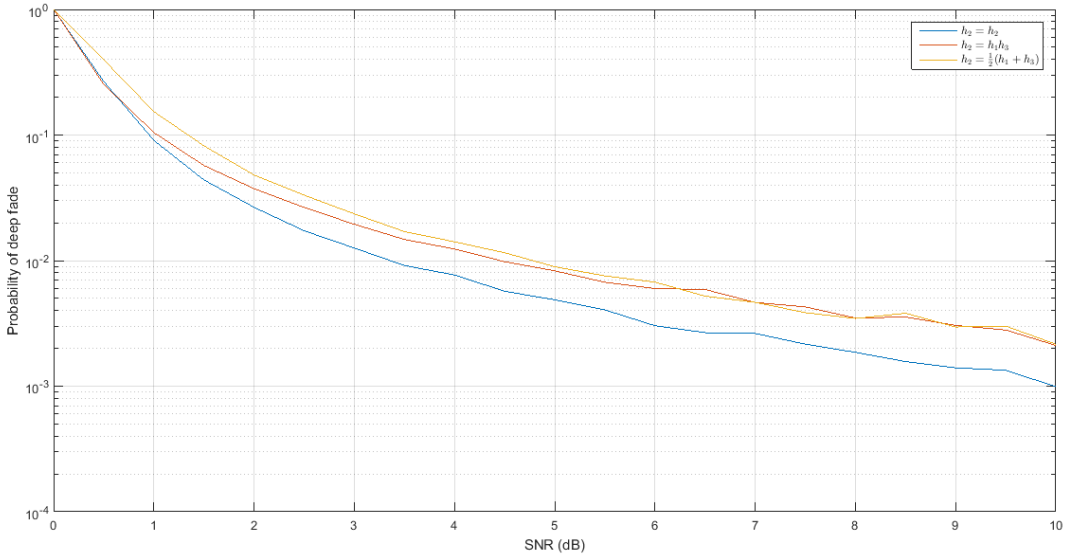

Figure 1

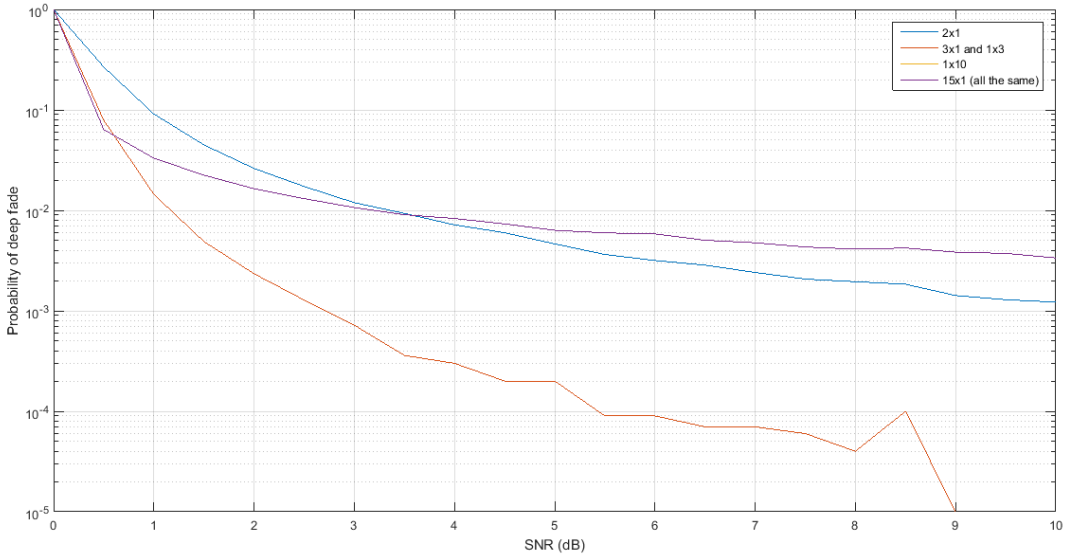

Figure 2

3 Problem 3

4 Problem 4

We created different experiments to check the validity of some assumptions.

- The far tail for the Gaussian random variable $h_r \sim \mathcal{N}(0,1)$ is approximated by the exponential $e^{-x^2/2}$

  As we can see in Fig. 3 when x is big the complementary cumulative distribution function is very near to the exponential and the difference between them is negligible.

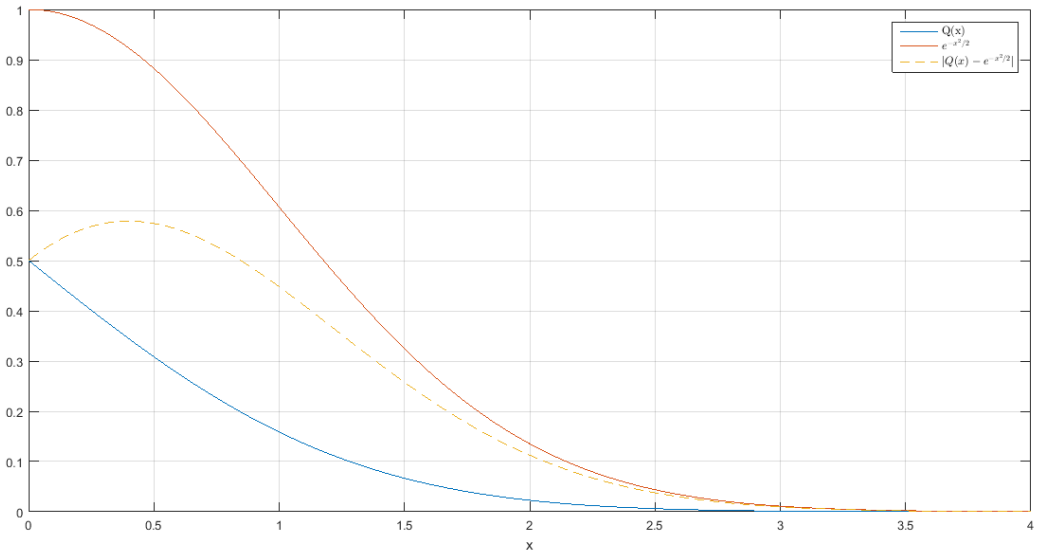

Figure 3