UNIVERSITY OF TEXAS AT DALLAS
Department of Electrical Engineering

EE 6391 - Signaling and Coding for Wireless Communication Systems
Solutions to Problem Set #3: Mobile Radio Propagation

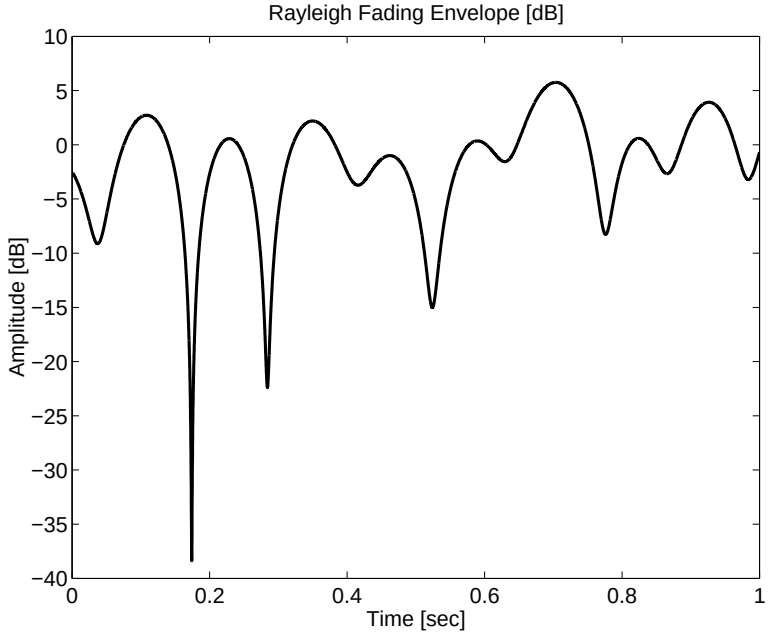
Date assigned:
Date due:

Reading: "Comparison of the N-path Rayleigh fading uncorrelated scattering model with measured characteristics on land mobile radio channels," R.J.C. Bultitude. Proc. Universal Personal Communications Conf., 1993.

Solution 3.1

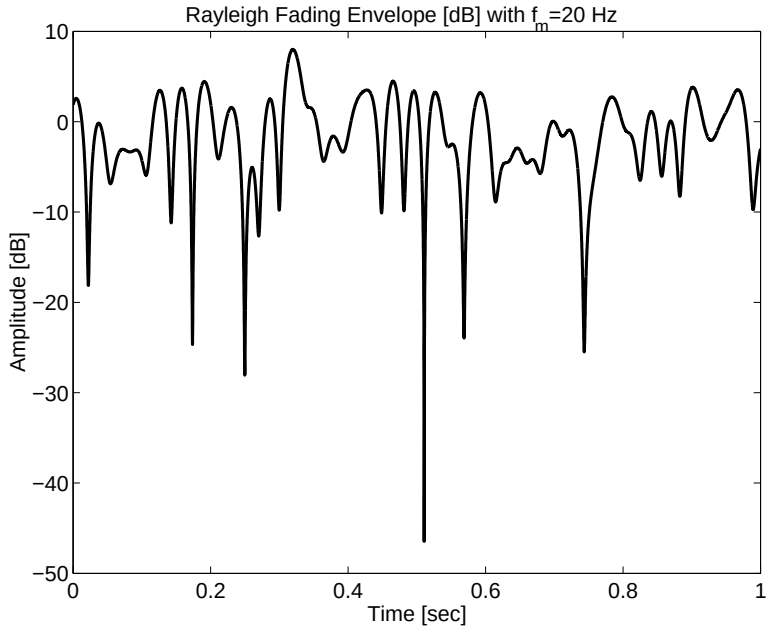
- Using the simulated data for $f_m = 5$ Hz, LCR=3 and AFD=0.021 when the rms]threshold is set to be -10 dB. Based on LCR and AFD equations, we find

$$N_R = 3.52 \quad \bar{\tau} = 0.0260$$



- Using the simulated data for $f_m = 5$ Hz, LCR= 9 and AFD= 0.0055 when the rms threshold is set to be -10 dB. Based on LCR and AFD equations, we find

$$N_R = 14 \quad \bar{\tau} = 0.0065$$



Since the simulated data is relatively short, the simulated results can be somewhat different from the theoretical results. Therefore, more simulated data should be used to match the theoretical results.

Solution 3.2

(a) Maximize capacity given by

$$C = \max_{S(\gamma):\int S(\gamma)p(\gamma)d\gamma=\bar{S}} \int_{\gamma} B\log\left(1+\frac{S(\gamma)\gamma}{\bar{S}}\right)p(\gamma)d\gamma$$

Construct the Langrangian function

$$\mathcal{L} = \int_{\gamma} B\log\left(1+\frac{S(\gamma)\gamma}{\bar{S}}\right)p(\gamma)d\gamma - \lambda\int\frac{S(\gamma)}{\bar{S}}p(\gamma)d\gamma$$