

ECE6604 Personal & Mobile Communications
Assignment #3

Date Assigned: February 11, 2010

Date Due: February 18, 2010

- 1) Text Problem 2.9
- 2) Text Problem 2.13
- 3) Consider a fading channel with multipath intensity profile

$$\phi_g(\tau) = e^{-\tau/T}, \quad \tau \geq 0$$

Assuming that $T = 10 \mu\text{s}$, determine

- a the average delay
 - b the rms delay spread
 - c the coherence bandwidth of the channel.
- 4) Consider a WSSUS channel with scattering function

$$\psi_S(\tau, \nu) = \psi_1(\tau) \cdot \psi_2(\nu)$$

where

$$\psi_1(\tau) = \begin{cases} 1, & 0 \leq \tau \leq 100 \text{ ms} \\ 0, & \text{otherwise} \end{cases}$$
$$\psi_2(\nu) = \begin{cases} \frac{1}{\nu_m} [1 - (\nu/\nu_m)^2], & 0 \leq |\nu| \leq \nu_m \\ 0, & \text{otherwise} \end{cases}$$

Assume $\nu_m = 10 \text{ Hz}$. Find

- a the delay psd
- b the Doppler psd
- c the mean delay and the rms delay spread
- d the maximum Doppler shift, the mean Doppler shift, the rms Doppler shift

- 5) Suppose that the spaced-time spaced-frequency correlation function of a WSSUS channel has the following form:

$$\phi_T(\Delta f; \Delta t) = \exp \{-b|\Delta t|\} \frac{1}{a + j2\pi\Delta f}$$

- a) Find the corresponding channel correlation function $\psi_g(\Delta t; \tau)$.
- b) Find the corresponding scattering function $\psi_S(\nu; \tau)$.
- c) What is the average delay spread, μ_τ , and rms delay spread σ_τ ?