

ECE6604 Personal & Mobile Communications  
Assignment #4

Date Assigned: February 26, 2009

Date Due: March 10, 2009

- 1) Consider a system where the area mean signal strength is described by the equation

$$\Omega_p \text{ (dBm)}(d) = \mu_{\Omega_p \text{ (dBm)}}(d_o) - 10\beta \log_{10}(d/d_o) + \epsilon_{\text{(dB)}} \text{ (dBm)}$$

where  $d_o = 1$  m,  $\mu_{\Omega_p \text{ (dBm)}}(d_o) = 0$  dBm,  $\beta = 3.5$ , and  $\epsilon_{\text{(dB)}}$  is a zero-mean Gaussian random variable with standard deviation  $\sigma_{\Omega} = 8$  dB.

- a) Suppose that a mobile station is 1 km from its serving base-station and at distances 3 km and 4 km from two co-channel base-stations. Using the Fenton Wilkinson method derive the probability density function of the received interference power  $I$  in decibel units.
- a) What is the probability density function of the received carrier-to-interference ratio  $C/I$  in decibel units.

- 2) Text problem 3.2

- 3) For the case of a Rician faded desired signal and a single Rayleigh faded interferer, show that the co-channel interference outage probability is given by

$$O_I = \frac{\lambda_{\text{th}}}{\lambda_{\text{th}} + A_1} \exp \left\{ -\frac{KA_1}{\lambda_{\text{th}} + A_1} \right\},$$

where  $K$  is the Rice factor of the desired signal,  $A_1 = \Omega_0/(K + 1)\Omega_1$ , and  $\Omega_k = E[s_k]$  where  $s_i = \alpha_i^2$  and  $\alpha_i^2$  is the squared-envelope.

- 4) Text problem 4.5