Topic 7: Propagation

Academic Year 2013 - 2014

P1.- Suppose a ground with relative permittivity ε_r = 15 and conductivity $\sigma = 12 \cdot 10^{-3}$. Obtain the reflection coefficient (vertical and horizontal) with frequency f = 1MHz and incidence angle $\psi = 40^{\circ}$.

P2.- Suppose a link with antenna heights h_t = 60m and h_r = 30m, with distance d = 800m, frequency f = 1MHz over a flat ground with reflection coefficient R = $0.74 \cdot \exp(j \cdot \pi/12)$. Obtain:

a) The propagation losses with the flat earth model.
b) The propagation losses with the flat earth model for long distances with d = 5km.

P3.- Suppose a wireless link with distance d = 10km, frequency f = 2.4GHz. Obtain:

a) The radius of the first Fresnel's zone to distances 2.5Km, 5Km y 7.5Km from the transmitter.
b) The radius of the second Fresnel's zone to distances 2.5Km, 5Km y 7.5Km from the transmitter.

P4.- Suppose a wireless link with P_{Tx} = 1W, frequency f = 2.4GHz, with a sharp obstacle located at distances d_1 = 5Km and d_2 = 4Km, respectively from the transmitter and the receiver. Suppose a propagation losses model in free space plus diffraction losses and obtain the received power:

a) If the height margin is h = -5.9m.
b) If the height margin is h = 11.78m.

P5.- Suppose a wireless link with frequency f = 2.4GHz and distance d = 20Km, with two obstacles located at distances s_1 = 5Km and s_3 = 7Km, respectively from the transmitter and the receiver. Obtain the diffraction losses:

a) If the normalized margins are ν_1 = -0.35 and ν_2 = -0.25.
b) If the normalized margins are ν_1 = 0.35 and ν_2 = 0.25.

P6.- Suppose a wireless link with frequency f = 0.7GHz distance d = 5Km, with transmitter height h_b = 30m and receiver height h_m = 2m. Obtain the propagation losses with the Okumura-Hata model:

a) In a metropolitan area.
b) In a small city.
c) In a suburban environment.
d) In a rural area.

P7.- Suppose a wireless link in a metropolitan area, with frequency f = 0.7GHz, with transmitter height h_b = 30m and receiver height h_m = 2m. If the transmitted power is P_{Tx} = 1W and the sensitivity is S = -130dBm, obtain the maximum link distance.