

Topic 7: <u>Propagation</u>

Academic Year 2013 - 2014



P1.- Suppose a ground with relative permittivity $\varepsilon_r = 15$ 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 $h_t = 60$ m and $h_r = 30$ m, with distance d = 800m, frequency f = 1MHz over a flat ground with reflection coefficient R = 0.74 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 $d_1 = 5$ Km and $d_2 = 4$ Km, 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 $s_1 = 5$ Km and $s_3 = 7$ Km, respectively from the transmitter and the receiver. Obtain the diffraction losses:

- a) If the normalized margins are $v_1 = -0.35$ and $v_2 = -0.25$.
- b) If the normalized margins are $v_1 = 0.35$ and $v_2 = 0.25$.

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

- a) In a metropolitan area.
- b) In a small city.



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