Sheet (1)

Wireless Channel Characteristics

1. Suppose, in an office building, a 2.4 GHz transmitter located at a workstation is separated from the network access node (receiver) by a distance of 35 m. The transmission must pass through 5m of an office, through a plasterboard wall, and then through a large open area. The propagation is modeled as free space for the first 5m and with a loss exponent of 3.1 for the reminder of the distance. The plasterboard wall causes 6-db attenuation of the signal. The isotropic transmitter radiates 20 dBm. Can the link be closed if the receiver has sensitivity of -75 dBm?

2. A measurement campaign in a large city indicates that the propagation can be reasonably well modeled with loss exponent of \(n=2.9\). The shadowing deviation about this loss is 6 dB. What is the range of coverage if 99% availability is required for public-safety radio application? Assume that the receiver sensitivity is -100 dBm and the measured power at 10 meters is 2 milliwatts.

3. A brief measurement campaign indicates that the medium propagation loss at 420 MHz is a midsize North American city can be modeled with \(n = 2.8\) and a fixed loss (\(\beta\)) of 25 dB; that is, \(L_r = 25 dB + 10 \log_{10} (r^{2.8})\) Assuming a cell phone receiver sensitivity of -95 dBm, what transmitter power is required to service a circular area of radius 10 Km? Suppose the measurements were optimistic and \(n=3.1\) is more appropriate. What is the corresponding increase in transmit power that would be required?