

Homework # 2 (due April 7)

1. Consider an LTE base station communicating to mobile subscribers, with the channel parameters :

path loss exponent $n = 3$; $d_0 = 1 \text{ m}$, $\beta_0 = 31 \text{ dB}$;

$\sigma_{\text{dB}} = 6 \text{ dB}$ for lognormal slow fading.

The following assumptions are made for the communication :

16-QAM modulation is employed for signal transmission

Transmit power $P_T = 10 \text{ Watt}$

The receiver has a noise figure $F = 5 \text{ dB}$ and requires $E_b/N_0 = 14 \text{ dB}$ for error- correction purpose .

If the outage probability is required to be less than 5% , what is the service range of this system ?

2. In an office building , a 2.5 GHz transmitter located at a workstation is separated from the network access node (receiver) by a distance 40 m .

The transmitter must pass through 5 m of an office , through a plasterboard wall , and then a large open space.

The propagation is modeled as free space for the first 5m and with a loss exponent of 3.1 for the remainder of the distance. The plasterboard wall causes 5 dB attenuation of the signal. The isotropic transmitter radiates 25 dBm power. How much is the power received at the receiver ?