Exercise 3

Task 1. A transmitter is supplied with 10 **W of power and has an antenna with a** 9 **dBi gain and** 4 **dB of line losses. The receiver is located at a** 21 **km distance from the transmitter, and has an antenna with a** 30 **dBi gain and** 4 **dB of line losses. The system operating frequency is** 4 **GHz. Calculate the EIRP and the unfaded RSL.**

Task 2. An UHF cellular system operator has decided that in order to guarantee minimum service quality the RSL at user mobile terminals must be no less than -45 **dBm. The chosen operating frequency is 1 GHz.**

a) **Considering that at the Base Station the transmitted power is** 40 **W, the feeder losses are** 8 **dB, and the antenna gain is** 5 **dBi, while the typical user device has antenna gain** 0 **dBi and feeder losses at** 2 **dB, calculate the maximum cell radius which meets the transmission quality requirement for all users in the cell.**

b) **Find out how much larger area coverage can be obtained by the same Base Station if the operating frequency is changed to 800 MHz.**

Task 3. Calculate (a) the free space loss and (b) the plane earth loss (two-ray model) assuming a frequency of 2 **GHz, antenna heights of** 15 **m and** 1.5 **m, and distance between transmitter and receiver** 21 **km.**

Task 4. What level of input signal S_I **is required for an output** S_O/N_O **=** 10 **dB in a receiver with noise figure equal to** 6 **dB, and effective noise bandwidth of** 0.1 **MHz? Assume room temperature (**20 **ºC).**