# Exercise 6

**Task 1. Consider the SIR (signal-to-interference) model for hexagonally-shaped cells based on the simplified path loss model and applied to a GSM system with total system bandwidth W = 10 MHz, frequency channels of B = 200 kHz, and 8 time slots for each frequency channel.**

**Calculate the number of supported users per cell when:**

   a) **target SIR = 18 dB in suburban propagation environment**
   b) **target SIR = 18 dB in flat rural propagation environment**
   c) **target SIR = 9 dB in suburban propagation environment**

**Task 2. A cellular network mobile user is traveling with a speed of 70 km/h along a path passing through the centers of the cells. Assuming that a hard handover occurs each time the mobile user crosses a cell boundary, estimate the number of handovers per call if the average call duration is 1 minute when:**

   a) **cell radius R = 1 km**
   b) **cell radius R = 50 m**

**Task 3. Calculate the cell radius for the following systems, using the COST 231 Okumura-Hata propagation model with the parameters below:**

   a) **TETRA 400 MHz**
   b) **GSM 900 MHz**
   c) **UMTS 2100 MHz**

- Transmission power = 40 dBm
- Receiver sensitivity = -110 dBm
- BTS antenna height = 20 m
- Tunable parameter, C = 45
- Correction factor, K = 0

|   | 150–1500 MHz | 1500–2000 MHz |
|---|---|---|
| A | 69.55 | 46.3 |
| B | 26.16 | 33.9 |

**Task 4. Based on the COST 231 Okumura-Hata propagation model, how much does the coverage area of a circular cell changes when the base station antenna height is increased from 30 m to 60 m? Assume that the link budget allows 155 dB of attenuation, the carrier frequency is 1880 MHz, and the tunable parameter in the model is C = 45.**