Exercise 7

Task 1.

a) **A mobile phone subscriber generates on average** 1.2 min **of voice traffic during the busy hour. How many subscribers in a cell with** 30 **traffic channels will cause a blocking probability of** 0.5 %**,** 5 % **or** 50 %**?**

b) **How many subscribers can be served per hour, at the different blocking levels?**

c) **What is the average channel load at the different blocking levels?**

Task 2.

A wireless network operator wants to provide its services to a prospect number of 12500 **users in a certain geographical area, and each user is expected to generate the same amount of traffic as in Task 1. The SIR requirement for the system is** 14 dB**, and the wanted blocking probability is** 1 %**. The operator has** 48 **carrier frequencies available, each of which is subdivided into** 8 **TDMA slots. Each slot (or "channel" in this context) serves exactly one user, but** 1 **channel every** 2 **carrier frequencies needs to be reserved for signalling network information. With different environments in consideration (***n = 3.5***,** *n = 2.5* **and** *n = 2*), **how many cells are required in each case?**

Task 3.

a) **A GSM900 operator has** 36 **frequency carriers available,** 8 **TDMA slots per carrier, and frequency reuse factor** 9**. Using the same rule of thumb as in Task 2 for signalling, how much traffic per cell can this operator serve with** 2 % **blocking probability?**

b) **To meet an increasing capacity demand the operator opens up a GSM1800 network with** 108 **frequency carriers, given the same coverage and using the same base stations as its GSM900 network, and also the same frequency reuse factor. How much traffic the operator can now serve with the same** 2 % **blocking probability?**

c) **Calculate again the traffic capacity with** 2 % **blocking probability, this time assuming that all user terminals are dual-band, i.e. capable to utilize a channel in either frequency bands. How larger is the capacity, compared to the situation in b) where only single-band devices are used?**