

TD GSM

Exercise 1:

A total of 33 MHz bandwidth is allocated to a Cellular System. If the simplex Voice/Control Channel bandwidth is 25 KHz, Find the total number of Channels available per Cell if the System uses.

- 4-Cell Frequency Reuse Plan.
- 7-Cell Frequency-Reuse Plan.

Exercise 2:

In order to determine voice traffic on a line, we collected the following data during a period of 90 minutes

Call N°	1	2	3	4	5	6	7	8	9	10
Duration of the call	60	74	80	90	92	70	96	48	64	126

Calculate the traffic intensity in Erlangs.

Exercise 3:

We consider a GSM network formed of hexagonal cells with a radius R. The distance D of frequency reuse is related to the size of the cluster by, $D/R = \sqrt{3N}$; with N the number of cells in the cluster.

- If $N = 4$, calculate the number of GSM carriers that an operator with 12.5MHz can theoretically assign to each cell.
- Estimate the maximum number of subscribers which can expect to accommodate in a cell knowing that an average subscriber has a traffic of 0.03E per hour.

Exercise 4:

- What is the minimum number of channels needed to serve an area where the potential demand is estimated at 1600 Erlangs for a 1% blocking rate?
- What is the minimum number of base stations required and their respective capabilities (throughput) when the operator has 63 frequencies for a reuse cluster of 9?
- What is the total number of channels?

It will be assumed that in each cell 1 IT is reserved for the BCCH (Broadcast channel) channel and 2 ITs are reserved for the SDCCH (Dialog channel to attribute a traffic channel) channels).

Exercise 5:

An operator serves an area where the potential demand is estimated at 50 000 subscribers. The consumption average of all subscribers at the rush hour is 50 mErlangs for a quality of service of 1%.

1. What is the minimum number of channels used by the operator?
2. Calculate the minimum number of base stations and the throughput when the operator has 63 frequencies for a reuse pattern of 9?
3. What is the total number of channels?

We suppose that in each cell, 1 slot time is reserved for the channel BCCH and 2 slot times are reserved for SDCCH channels.

Exercise 6:

We consider a base station of a GSM network. This BS manages the radio interface for mobiles of its cell. The radio interface uses the TDMA radio channel access technique, in which the frame contains 16 carriers (available frequencies).

The duration of the frame is 4.615ms, and each is divided into 8 time slots.

1. If a compressed speech in GSM represents 12 Kbit/s, how many simultaneous communications a cell can it contains at most?
2. If a customer wishes to obtain a communication with 64 kbit/s, how much slot times he needs on each frame to arrive at this flow?
3. Assuming that it is allowed to users to achieve 1 megabits/s as throughput, how many subscribers are taken in charge simultaneously?
4. Suppose that two cells overlap each other in order to avoid a break in communications. Can a mobile pick up the same frequency on the two cells?
5. Assume that the mobile captures frequencies these two cells. How must he choose his cell in the GSM?