



## 2G, 3G Network Planning and Optimization...

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### 3 GSM Frequency Planning

#### 3.1 Overview

Frequency resource is scarce for the mobile communication, so how to maximize the spectrum utilization ratio is a great concern for many carriers, equipment providers, and scholars. And their research into this problem has accelerated the development of the communication technologies. By now, the mobile communication has experienced three phases: analog TACS/AMPS, GSM/CDMA IS95, and WCDMA/CDMA2000.

The purpose to enhance the spectrum utilization ratio is to expand the network capacity based on the limited spectrum resource while ensuring the network quality. If not considering adding frequencies to the network, you can expand the capacity of a GSM network using the two methods. One is to increase the number of base stations in the network; the other is to use the frequency reuse technologies. This chapter mainly describes the GSM frequency reuse technologies, namely, frequency planning technologies.

To expand the network capacity, you must reuse the limited frequency resources. Though frequency reuse is beneficial for network expansion, it brings into another problem. That is, it deteriorates the conversation quality. The more aggressive the frequencies are reused, the greater the interference will arise in the network. Therefore, how to seek a balance between network capacity and conversation quality is a demanding task in frequency planning.

Currently, the 4 x 3, 3 x 3, 2 x 6, 1 x 3, 1 x 1, MRP, and concentric circles are the GSM frequency technologies in common use. For the 4 x 3 frequency reuse pattern, the frequency utilization ratio is relatively low, but the higher carrier-to-interference ratio (C/I) can be obtained, so you can enjoy better conversation quality. Compared with the 4 x 3 frequency reuse pattern, the 1 x 3 frequency reuse pattern ensures a relatively high frequency utilization ratio, but the reuse distance is shorter, so interference is greater and the conversation quality is poorer. In this case, you should take some measures, such as the frequency hopping and DTX, against the interference.

The frequency planning is a key technology for GSM network, so the quality of the frequency planning will determine the network quality.

This chapter introduces the rules of frequency reuse based on the frequency reuse patterns and the network requirement. Meanwhile, it also provides examples to detail the frequency division, C/I, frequency reuse degree under each reuse pattern.

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