ABSTRACT

The multiuser orthogonal frequency division multiplexing (OFDM) is a very promising technique for broadband wireless networks. The orthogonality characteristic among the subcarriers is another very important feature of OFDM technique, since it combats intra-cell interference inside a cell. Anyway, in a multi-cell environment inter-cell interference exist and plays an important role for the outcome performance of the network. To be more specific, interference in OFDM based systems arises when the same frequency resources are used near another cell. For example, when two users in different cells use the same frequency block instantaneous, then the signal to interference and noise ratio (SINR) associated with these blocks can drop to a very low value resulting in a bad resource utilization and lower performance.

In order to tackle this problem three methods are currently being considered, ICI Randomization, ICI cancellation, and ICIC. The first method aims at randomizing the interfering signal and thus allowing interference suppression at the mobile terminal either by applying (pseudo) random scrambling after channel coding or using different kinds of frequency hopping. The second method based on interference suppression which can be achieved by spatial suppression using multiple antennas. The last method aims at applying conditions to the downlink resource management in a coordinated way between cells.

In this book, a simulation is designed to show you how a fractional frequency reuse technique using vertical beamforming takes effect. The result of the simulation indicates that the more complex the antennas you use, the better performance it will be. Which can be proven by the SINR of this simulation that shows that by the 3x3 antenna array, the result is around -52,4 dB while on the other hand, if you use a 7x7 antenna, you can get a much better result, say, a -27,6 dB.

Keywords: fractional frequency reuse (FFR), beamforming, LTE, antenna array.