

## Research Article

# Microstrip Antenna Design for Femtocell Coverage Optimization

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A microstrip antenna is designed for multielement antenna coverage optimization in femtocell network. Interference is the foremost concern for the cellular operator in vast commercial deployments of femtocell. Many techniques in physical, data link and network-layer are analysed and developed to settle down the interference issues. A multielement technique with self-configuration features is analyzed here for coverage optimization of femtocell. It also focuses on the execution of microstrip antenna for multielement configuration. The antenna is designed for LTE Band 7 by using standard FR4 dielectric substrate. The performance of the proposed antenna in the femtocell application is discussed along with results.

## 1. Introduction

Femtocell, also known as femtocell access point (FAP), is a short-ranged, low-powered, and low-cost base station that has been shrunk down to the size of a paperback book. Femtocell is similar to a wireless internet router and easy to install in offices and residences. It is a mini base station for the indoor coverage purpose and an extension of outdoor network. It provides high quality indoor coverage and increases the capacity of the network by diverting a portion of the traffic through wired-backhaul connection [1]. Cellular operators throughout the world are facing challenges in increasing system capacity, coverage, and residential connectivity in suburban and urban environments due to the huge investment that follows. Femtocell offers an economically appealing way to improve the quality, coverage, and the service of the existing network. However, dense deployment of femtocell induces interference concern, which remains a strong challenge so far [2, 3]. Moreover, the indoor wireless environment and short distances among the cells have made the situation more complex. Since the cellular operators prefer cochannel deployment for better spectral efficiency, femtocell increases

the capacity without considering the fairness of per femtocell user capacity.

Network planner has no control over femtocells deployment. Femtocell has extensive autoconfiguration capability to ensure plug and play deployment [4]. For successful residential deployment, several technical challenges need to be overcome. Large-scale deployment of femtocell in dense area increases the mobility events and overshoots the network subscribers in an unwanted level. Femtocell is usually placed in the corner of any residential places or offices where the wire connection is easier. Therefore, instead of omnidirectional antenna, multielement antenna is better to optimize the coverage area. Such a switched based multielement antenna configuration is proposed in [5]. Switching between the antennas makes it easy to optimize the coverage by controlling a simple circuit. Femtocell switches off the antenna at that direction where there is no user, thus lowering the chances of intercell interferences. Another coverage optimization tactic using multielement antenna with tunable attenuator is shown in [6]. Tunable attenuator is a reliable option for coverage optimization. It tunes up the radiation power to confirm the required radiation pattern. Since a power amplifier for