

Research Article

Multiband Patch Antenna for Femtocell Application

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A microstrip patch antenna for multiple LTE (long term evaluation) frequency bands for femtocell application is proposed in this paper. Distributed antenna solution (DAS) has been introduced in cellular network to achieve homogenous indoor coverage. Femtocell is the latest extension to these solutions. It is a smart solution to both coverage and capacity scales. Femtocell operation in LTE band is occupied by higher frequency bands. For multiband femtocell application, miniature antenna design is quite essential. The antenna proposed here is composed of basic monopole structure with two parasitic elements at both sides of the active element. A rectangular slot is introduced at the ground plane of the proposed antenna. The antenna is designed using ElnoS HK light CCL substrate material of relative permittivity of 9.4, dielectric loss-tangent of 0.003 and thickness of 3 mm. The S_{11} response of the antenna is shown to have a bandwidth of 1.01 GHz starting from 1.79 GHz to 2.8 GHz. The characteristics of the antenna are analysed using Ansoft HFSS software.

1. Introduction

Distributed antenna solution (DAS) boosts the mobile coverage to improve reliability in deep indoor areas and enhance network capacity, easing the pressure on networks at busy hours. Femtocell, which is a new addition to this DAS, is the latest explored field in the development of networking system with huge prospect. It has the potential to outrun the capacity and coverage problems. Femtocell is an extension of existing outdoor micro- and macrocell for indoor coverage. It is similar to a wireless internet router, except it operates in licensed spectrum owned by the network operators. It is a mini-indoor base station for personal use. It provides quality coverage in absence of macrocell and fills up the coverage whole of the network. It is connected to the core network through a backhaul internet connection, like cable or digital subscriber line (DSL) [1, 2]. It communicates with the end user through the same signalling protocols that outdoor-cell uses. It diverts the traffic load from the macrocell through the wire connection. The received signal in femtocell is sent

via wired connection to femtogateway. Voice services are provided by the same “mobile switching center” and data services by the same “GPRS support node” that are used in the existing outdoor network [3].

The connection diagram of the femtocell with the existing network is illustrated in Figure 1.

The new multimedia devices and applications are responsible for vast voice and data traffic. Moreover, huge portions of this demand are in indoor environment. For the existing outdoor cell, it is not possible to give high quality of service, especially in urban and suburban areas. Femtocell possess the huge potential to turn out network capacity and attain more economical development plan with less risk and liability as user shares a substantial amount of the initial cost. It also ensures proper utilization of valuable spectra. Cellular operators nowadays prefer cochannel deployment in femtocell level for better spectral efficiency [4, 5]. With high quality access to existing services, femtocells are targeted initially for better coverage in home environments. However, operator has drawn the expansion to the office and public places.