

Research Article

Design and Optimization of LTE 1800 MIMO Antenna

Huey Shin Wong,¹ Mohammad Tariqul Islam,² and Salehin Kibria¹

¹ Center for Space Science, Universiti Kebangsaan Malaysia (UKM), 43600 Bangi, Malaysia

² Department of Electrical, Electronic and Systems Engineering, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia (UKM), 43600 Bangi, Malaysia

Correspondence should be addressed to Mohammad Tariqul Islam; titareq@gmail.com

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A multiple input and multiple output (MIMO) antenna that comprises a printed microstrip antenna and a printed double-L sleeve monopole antenna for LTE 1800 wireless application is presented. The printed double-L sleeve monopole antenna is fed by a 50 ohm coplanar waveguide (CPW). A novel T-shaped microstrip feedline printed on the other side of the PCB is used to excite the waveguide's outer shell. Isolation characteristics better than -15 dB can be obtained for the proposed MIMO antenna. The proposed antenna can operate in LTE 1800 (1710 MHz–1880 MHz). This antenna exhibits omnidirectional characteristics. The efficiency of the antenna is greater than 70% and has high gain of 2.18 dBi.

1. Introduction

In recent years, advances in wireless technology have led to the insatiable demand for wireless broadband. The LTE standard can solve this problem by supporting higher data rates, higher capacity, and lower latency [1–3]. LTE 1800 has gained a lot of interests among wireless broadband operators. This is primarily due to the 1800 MHz band that is already being used for GSM 1800. The spectrum refarming from GSM 1800 to LTE 1800 is very cost effective. A lot of researches have been done to develop LTE antennas [4, 5], but there is lack of research for LTE 1800 MIMO antenna. As the deployments of LTE 1800 continue to accelerate, the development and optimization of LTE 1800 antenna are beneficial to meet the modern demands of wireless terminals.

Printed sleeve monopole antennas are low profile with its planar structure. The sleeves that are added to the ground plane of the monopole antenna act as a parasitic element to generate additional resonant mode [6]. This additional resonant mode combines with the fundamental resonant mode to generate wide bandwidth. Various types of sleeves have been proposed such as L-shaped sleeves [7] and tilted sleeves [8].

Several challenges are faced in order to integrate multiple antennas into a laptop. One of the main challenges in MIMO

antenna design is to obtain good isolation characteristics between two antennas [9]. In order to reduce mutual coupling between multiple antennas, a lot of research has been done in order to overcome this challenge. In [10], a dual feed single element antenna for 4G MIMO devices is proposed. Isolated mode antenna technology is used to reduce the mutual coupling between the two ports. It occupies an area of 88.4×64.2 mm². In this paper, the proposed antenna is a combination of printed microstrip and a printed double-L sleeve monopole antenna. This proposed antenna can cover LTE 1800 frequency band for laptop or tablets application. It has a smaller size as compared to [10]. The structure of the proposed antenna is described in detail in the following section. The effects of the varying parameters of the proposed MIMO antenna on the antenna performance are also presented in this paper.

2. Antenna Design

The proposed antenna design as shown in Figure 1 occupies the size of 80×50 mm². The material chosen for the antenna is a FR4 substrate with dielectric permittivity of 4.6 and thickness of 1.6 mm. Figure 2 shows the front and back view of the prototyped antenna. A printed double-L sleeve