

# 小型化内置多频段 LTE 天线的研究设计与仿真

Design and simulation of miniaturized built-in multi-band LTE antenna

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## 摘 要

随着现在 4G LTE(Long Term Evolution)移动通信技术的急速发展,同时由于用户对于移动通信的要求提高,如高速度、多频段以及多功能等要求,促使着移动端天线向着更小体积、更多频段、更大带宽的方向高速发展,同时随着 4G LTE 移动通信的引入,普通手机能够操作的频带增加了,这又要求对器件的收发模块以及射频前端和天线的设计提出了一些挑战。

从天线设计的角度来看,新增加的频段尤其是 LTE 频段降至 700MHz,带来了主要的设计挑战:在低频段覆盖 700-960MHz(30%带宽),同时考虑到与 GSM850/900 等原有技术的向后兼容。由于预留给天线的空间在这个频率范围内很小,因此需要特殊的设计技术来获得一般移动终端天线所需的带宽。

在设计阶段也应该考虑到,天线需要适合在数据速率增强技术中操作。此外,考虑到移动终端的实际使用情况,还应该研究用户本身(手、头和两者)对天线性能的影响。

本文着重探讨了 LTE 天线小型化、多频段和宽带化技术,研究了介质材料、槽线、馈电方式等因素对天线性能的影响,并将探讨结果运用在手机天线设计中。通过研究,设计了基于介质基座的八频段天线,该天线实现了八频段的覆盖:LTE700/GSM850/GSM900/DCS1800/PCS1900/UMTS/LTE2300/LTE 2500,并对该天线进行了加工与测试,实测的各项天线性能指标均表现良好。

关键字: 4G LTE 多频段 宽带化

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## Abstract

With the rapid development of the current 4G LTE(Long Term Evolution) mobile communication technology, and due to the increasing requirements of users for mobile communication, such as high speed, multi-band and multi-function, mobile terminal antenna is developing at a high speed in the direction of smaller size and wider bandwidth. At the same time, with the introduction of 4G LTE mobile communication, the bandwidth that ordinary mobile phones can operate is increased. In addition, the design of transceiver module, RF front-end and antenna of the device is challenged.

From the perspective of antenna design, the new band, especially LTE band, is reduced to 700 MHz, which brings the main design challenges: covering 700-960 MHz (30% bandwidth) in low frequency band, and considering backward compatibility with the original technology such as GSM850/900. Because the space reserved for the antenna is very small in this frequency range, special design techniques are needed to obtain the bandwidth required for the general mobile terminal antenna.

These aspects should be considered when design: one hand, antennas need to be suitable for operation in data rate enhancement technologies; on the other hand, we should also study the influence of users themselves (hand, head and both) on antenna performance.

This paper focuses on the miniaturization, multi-band and broadband technology of LTE antenna for mobile phones. The effects of dielectric materials, slots, branches, feeding modes and parasitic elements on the performance of antenna are studied and applied to the design of mobile phone antenna. Based on the above research, this paper designs an eight-band antenna based on dielectric base. The antenna has realized the coverage of eight frequency bands: LTE 700/GSM 850/GSM 900/DCS 1800/PCS 1900/UMTS /LTE2300/LTE 2500. Besides, and the antenna has been processed and tested. The performance of the antenna performs well after measuring.

Key word: 4G LTE Multi-band Broadband

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