Chapter 1

Recent Trends in Antennas for Modern Wireless Communications

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ABSTRACT

The rapid development in wireless communications has demanded multiband or wideband antennas to support wireless communication devices such as smart phones, tablets, laptop computers, radar system, satellite communication, airplane, and unmanned airborne vehicle (UAV) radar. It has also demanded compact wireless devices that allow more space to integrate other electronic components. The aim of this chapter is to provide an idea of current R&D trends and novel approaches in design, analysis and synthesis of broadband, multiband and reconfigurable antennas for the new generation of mobile communication devices, as well as for UWB communications, radars and so on.

1. INTRODUCTION

The world is undergoing a major wireless revolution both in terms of wireless and mobile technology that provides ubiquitous communication access to citizens (Matin, 2012). As the society moves forward to the informationcentricity, the wireless communication industry brings new product with advance feature to support wireless services at any where, any time. The huge competition in the wireless industry and the mass acceptance of wireless devices have caused costs associated with the
terminals and air time to come down significantly in the last 10 years. However, the rapid development of the communication technology such as wearable computers, cell phone technology, Personal Area Networks (PANs) for remote retrieval and monitoring of surroundings information has demanded for antennas suitable to operate with dual or multi-bands characteristics in wireless communication devices. For example, mobile communication system which operates in different frequency ranges require multiband antenna. Concurrently, ultrawideband (UWB) systems used in short range communications, remote sensing, and through-the-wall radar imaging require wideband antennas with stable gain and linear phase characteristics which creates a new arena of antenna design. Moreover, recently, there has been tremendous research interest in designing compact size of antenna in order to offer more space to integrate other electronic components for reduction the volume of wireless devices. All these desirable attributes push the researcher into challenge in designing new broadband, multiband and reconfigurable antennas for the new generation of mobile communication devices, as well as for UWB communications, radars and so on. This chapter provides an idea of current R&D trends in design, analysis and synthesis of broadband, multiband and reconfigurable antennas for modern wireless communications.

To facilitate the idea of current R&D trends towards different wireless applications, this chapter is organized as follows. In section 2, different design approaches are discussed for mobile and wireless applications. A low-profile multiband loop antenna design is presented for wireless routers and access points to cover the operation bands of 3G, 4G, WiMAX, and WLAN. This section also describes MIMO antenna on laptop for multiband LTE services. For radar applications, few antenna prototypes are presented in section 3. Section 4 describes the features of most recent antennas for UWB applications. In addition, this chapter also describes wearable antennas. The wearable antennas have gained a lot of attention due to its potential applications in healthcare, entertainment, identification systems, sport, smart home, and space in section 5. The presented antenna offers good integration features that make it suitable for on-body devices.

2. ANTENNAS FOR 3G, 4G, WiMAX AND WLAN

2.1 Antennas for Mobile Handheld Devices

Mobile phones available in the current markets support more and more features and applications that combine work, leisure and commercial aspects in an attractive way. This handheld device is becoming slimmer and lighter weight and has a large display with touch screen but still be small enough to fit inside a pocket. Moreover,
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