Hindawi
International Journal of Antennas and Propagation
Volume 2020, Article ID 6903268, 2 pages
https://doi.org/10.1155/2020/6903268

Editorial

Compact Antennas for Modern Communication Systems

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Received 9 January 2020; Accepted 9 January 2020; Published 10 February 2020

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Modern telecommunication systems such as radio links, radars, and mobile devices require antennas able to operate in different complex environments. In particular, new mobile devices such as smartphones, tablets, IoTs, and wireless sensor networks offer different complex services that require high gain beam-forming and steering capabilities in spite of the limited dimensions of the devices. In particular, in addition to usual voice and other services of standard previous systems, 5G generation devices offer ultrabroadband Internet connection, IP telephony, mobile web access, and other interesting multimedia applications. In such a framework, the design of a suitable radiating system could play a key role in the design of new generations of telecommunication systems. Antennas for these devices must be compact, light, cheap, and able to keep their performance at high levels in any kind of environment. In such a framework, the use of compact and multifunction antennas characterized by adaptive properties is mandatory to dramatically improve the performance of a telecommunication system. Moreover, these kinds of antennas can be used in several fields of practical military as well as civil applications. In particular, radars with these characteristics can be very useful for airport surveillance and security, collision avoidance, ground radar, and monitoring and tracking of unmanned aerial vehicles (UAVs). Concerning military applications, the use of smart antennas can be very useful for missile detection and tracking, antiaircraft defense artillery, and identification friend or foe (IFF) systems. The objective of this special issue was to provide an overview of the current research on smart antennas, the potential to adapt their characteristics to different scenarios, and to highlight the latest developments, innovations, challenges, and opportunities of their application.

This special issue collected five papers concerning compact antennas and their system applications. The first paper proposes uniform triangular arrays (UTAs) to construct multipanel 3D arrays for efficient MIMO transmission and present design examples to be used as next-generation base station antenna arrays. The work presents a specific array structure with different number of panels which can be chosen to be used under different given conditions of the transceiver, such as its location, cell size, and the user distribution [1]. In the second paper, a compact wideband printed antenna with deca-band 4G/5G/WLAN for mobile phone devices has been proposed. In particular, the antenna structure is composed of a monopole antenna and a coupling strip, occupying a small C-shape PCB area of about $27 \times 10.8\,\mathrm{mm}^2$ [2]. The antenna gain improvement has been achieved by using a Fabry–Perot cavity, which is constituted by the ground of the antenna and the PCM. Simulated and measured results show that approximately 46.4% of the operating bandwidth is in the range of 7.5–12 GHz (AR < 3 dB), and the gain of the antenna with MPCM is at least 5 dB higher than the reference antenna. Moreover, the monostatic RCS is reduced from 8 to 20 GHz. In the third paper, a novel slot antenna array based on mirror polarization conversion metasurfaces (MPCM) has been proposed [3]. The proposed antenna achieves circular polarization (CP), effectively reduces the radar cross section (RCS), and increases gain in the entire X-band. This antenna design makes use of the mirrored composition of the polarization conversion metasurfaces (PCM) on the top surface of the

substrate. The MPCM covers a 2×2 slot antenna array that is fed with by means of a sequentially rotating network. The CP radiation is realized by the polarization conversion characteristics of the PCM. The reduction of RCS is achieved by 180° ($\pm 30^\circ$) reflection phase difference between two adjacent PCMs, and the improvement in gain, also in this case, has been achieved by using a Fabry–Perot cavity, which is constituted by the ground of the antenna and the PCM. Also, the last two papers propose the MIMO antenna [4, 5]; in particular, in the fourth work, a compact planar multiple-input multiple-output (MIMO) antenna array for the 5G band has been proposed. To improve the isolation of the compact microstrip antenna array elements, an electromagnetic resonant ring method has been considered. The proposed antenna can cover both 3.3–3.6 GHz and 4.8–5 GHz bands proposed for the 5G band, and it consists of two symmetrical meandered monopole radiators, a grid structures, and a Y-shape element. The last paper presents a triple-band monopole antenna with a compact overall size for WLAN/WiMAX particularly suitable for multiple-input and multiple-output (MIMO) applications in the laptop computer. It comprises three monopole radiating elements, along with two rectangular open-ended tuning stubs. The proposed is able to excite 2.4/15.2/5.8 GHz WLAN and 2.3/3.3/5.5 GHz WiMAX bands [5].

Conflicts of Interest

The editors declare that they have no conflicts of interest regarding the publication of this special issue.

Acknowledgments

The guest editorial team would like to express their gratitude to all the authors for their interest in selecting this special issue for their publications.

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