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A dielectric resonator antenna with enhanced gain and bandwidth for 5G applications

Abstract

In this paper, a dielectric resonator antenna (DRA) with high gain and wide impedance bandwidth for fifth-generation (5G) wireless communication applications is proposed. The dielectric resonator antenna is designed to operate at higher-order $TE^{x}{}_{\delta 15}$ mode to achieve high antenna gain, while a hollow cylinder at the center of the DRA is introduced to improve bandwidth by reducing the quality factor. The DRA is excited by a 50Ω microstrip line with a narrow aperture slot. The reflection coefficient, antenna gain, and radiation pattern of the proposed DRAs are analyzed using the commercially available full-wave electromagnetic simulation tool CST Microwave Studio (CST MWS). In order to verify the simulation results, the proposed antenna structures were fabricated and experimentally validated. Measured results of the fabricated prototypes show a 10-dB return loss impedance bandwidth of 10.7% (14.3–15.9GHz) and 16.1% (14.1–16.5 GHz) for DRA1 and DRA2, respectively, at the operating frequency of 15 GHz. The results show that the designed antenna structure can be used in the Internet of things (IoT) for device-to-device (D2D) communication in 5G systems.

Keywords

5G communication; Bandwidth; Dielectric resonator antenna; Gain; Higher-order mode; Quality factor