ORIGINAL ARTICLE

Orthogonally polarized meandered fed multiple input multiple output antenna array for C-band sub-6GHz 5G and unlicensed Wi-Fi smart-phone applications

Insha Ishteyaq | Issmat Shah Masoodi 💿 | Khalid Muzaffar

Department of Electronics and Communication Engineering, Islamic University of Science and Technology, Awantipora, India

Correspondence

Khalid Muzaffar, Department of Electronics and Communication Engineering, Islamic University of Science and Technology, Awantipora, Jammu & Kashmir 192122, India. Email: khalid.muzaffar@ islamicuniversity.edu.in

Abstract

An eight-element meandered fed concentric annular ring slot resonator MIMO (multiple input multiple output) antenna array with dual-band operation is presented for sub-6 GHz 5G and unlicensed C-band Wi-Fi applications. The annular slot radiators are fed by meandered elements designed for operation at 3.15-3.9 and 6.27-6.6 GHz frequency bandwidth with enhanced isolation of more than 20 and 15 dB in the respective bands. The resonator rings are placed on the four corners of the smart-phone PCB with orthogonal meandered elements. The double-band operation is because of two rings and the isolation has been improved by meandered feed elements. The performances of the proposed MIMO antenna was analyzed and validated experimentally. The design offers sufficient gain of more than 5 dBi and efficiencies of upto 75% with better radiation coverages. The measured results of the MIMO antenna are found to be in good agreement with the simulated results. Further, the antenna has been studied for SAR effects as well as radiation coverages in the proximity of users head and handhead. The antenna housed on $130 \times 70 mm^2 (1.47\lambda_0 \times 0.79\lambda_0)$ common ground plane has provided good characteristics making it a potential candidate for sub-6 GHz C-Band 5G and unlicensed Wi-Fi smart-phone applications.

K E Y W O R D S

ASR radiator, C-band Sub-6GHz 5G and Unlicensed Wi-Fi, ECC (Envelop Correlation Coefficient), MIMO antenna, meandered feed elements, orthogonal polarization

1 | INTRODUCTION

The advancement of wireless communications have created a need of multi-band antennas for mobile devices incorporated with additional services and functions, thus supporting more standards of communication.¹ To upsurge the data rate transmission, channel capacity and to improve the characteristics of wireless systems of communication, the multiple antennas are being employed at the transmitting and receiving ends of the communication systems.^{2,3} The inclusion of multiple antennas possessing high isolation onto a single system at both ends of the user has been in high demand. The MIMO (multiple input multiple output) systems possess apparently increased data rates, high capacity, better isolation among the MIMO elements, good latency and service quality with low power loss in the distributed environment of future generation 5G technology.^{4,5} The fifth generation (5G) MIMO are able to deliver 100 times more faster data rates as compared to 4G-LTE along with promised latency of less than 1 milli-second. The 5G NR (new radio) bands are divided into two frequency ranges,