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Multi-Circled Planar MIMO Antenna on Flexible Substrate for 5G Applications [Плоска MIMO-антена з кількома овалами на гнучкій підкладці для 5G застосунків]

(2025) *Journal of Nano- and Electronic Physics*, 17 (1), art. no. 01010, pp. 1-6.

DOI: 10.21272/jnep.17(1).01010

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Abstract
In this article a planar microstrip multi-circle shaped antenna on flexible substrate (Kapton) has been designed and validated. The antenna is low profile with only 125 μm in hight. The antenna covers all 5G mid-bands from 3.17–6.42 GHz while exhibiting almost VSWR = 1 at 3.6 GHz. For biomedical application, the antenna has been realized on the human bio tissue fantom model. The estimated specific absorption rate (SAR) is within the standards with the highest value of 1.31 W/Kg at 6 GHz. Furthermore, to check the mobile application compatibility, 4 (4 × 4) and 6 (6 × 6)-element MIMO arrays are designed and validated. Both MIMO results show port to port (P2P) isolation of below – 18.7 dB. The efficiency is always above 90 % throughout the entire bandwidth (BW). Other MIMO parameters i.e., ECC and DG are always below 0.002 and almost 10, respectively. The far-field radiation results show that the array can radiate in all directions. In addition, the 6 × 6 is exposed with the hand and the head voxel phantom model to estimate the SAR. In each cases, the SAR values are well within the standard range. © (2025), (Sumy State University). All rights reserved.

Author Keywords
5G mid-band; Low profile; MIMO; MIMO; Planar microstrip; SAR; SAR; Низький профіль; Планарна мікросмужка; Середній діапазон 5G

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Publisher: Sumy State University

ISSN: 20776772
Language of Original Document: English; Ukrainian
Abbreviated Source Title: J. Nano. Electron. Phys.
2-s2.0-86000746032
Document Type: Article
Publication Stage: Final
Source: Scopus

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