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(57) Abstract :

To meet the demands of 5G communications, this study carefully designs and characterizes a Hexagonal Patch Antenna that operates in the single frequency band. Numerous antenna parameters, such as gain, bandwidth, S-parameters, azimuthal and elevation half-power beam width, and directivity efficiency, are thoroughly examined in this research. Employing a substrate with a thickness of 1.6 mm crafted from RTDuroid 5880, renowned for its advantageous properties in high-frequency applications, the antenna design exemplifies precision engineering. The antenna resonates at 28 GHz Frequency, strategically positioned to cater to the evolving needs of cutting-edge communication architectures. Noteworthy among its performance metrics is the directive gain of 4.92 dBi, signifying its ability to focus radiation efficiently, while the exceptional return loss of -24.62 dB underscores the antenna's impeccable impedance matching. Furthermore, the antenna showcases a notable bandwidth spanning 5.94 GHz, a testament to its capacity for facilitating robust data transmission and expanding network capabilities within the millimeter-wave landscape. The antenna's dimensions, substrate characteristics, and feed configuration are carefully adjusted through CST simulation to achieve the best possible performance characteristics.

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