

Title: Machine learning-based technique for directivity prediction of a compact and highly efficient 4-port MIMO antenna for 5G millimeter wave applications

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Abstract: Miniaturized Millimeter Wave (mm-wave) MIMO antenna arrays with an observed 10-dB impedance broad bandwidth of 3.7 GHz (25.785–29.485) are the focus of this study's design and analysis for a 5G application. Rogers RT/duroid 5880, a low-loss dielectric material, is utilized in the antenna's fabrication. For MIMO antenna design down to the lowest frequency, the substrate and ground must have dimensions of $3.3\lambda_0 \times 3.3\lambda_0$. Besides compact, the suggested design has a supreme gain of 8.9 dB, isolation greater than 29.24, and a maximum efficiency rating of 98.4 %. A Diversity Gain (DG) has a value that is greater than 9.99, whereas an Envelope Correlation Coefficient ECC) has a value that is less than 0.00005. The effectiveness of machine learning (ML) models can be estimated using a variety of different metrics, including the variance score, R square, mean square error (MSE), mean absolute error (MAE), and root mean square error (RMSE). Out of the five ML models, the one that has the greatest accuracy and has a low margin of error when predicting directivity is the Random Forest Regression model. In conclusion, the data from the CST and ADS modeling as well as the actual and expected outcomes from machine learning demonstrate that the recommended antenna is a potential candidate for use with 5G.

Keywords: 28 GHz, 5G technology, Mm-wave, MIMO antenna, Machine learning

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