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5G ANTENNA DESIGN FOR SMARTPHONES

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

With the rapid development in mobile communication technologies, rapid demands for efficient 5G antennas within smartphones at middle band frequency of 3.5 GHz are also on their market increase. Two of the major challenges involved are high costs of advanced dielectric material such as Duroid RT 5880 and size constraints within smartphone designs. The aim is to design a 5G antenna that resonates at 3.5Ghz antenna into smartphones using low-cost material that is FR-4 as substrate. Next, to observe and optimize the antenna design of rectangular and circular microstrip antennas to achieve efficient and compact mid band frequency for integration into smartphones using CST Studio Suite 2023. A couple of rectangular and circular microstrip patch antennas have been modelled and simulated using the CST Studio Suites 2023. Some of the cheaper alternatives are FR-4 lossy substrate with a dielectric constant $\varepsilon r = 4.3$ and $\varepsilon = 0.02$; this meets most of the performance specifications. Some of the parameters which have been studied are return loss, VSWR, gain, directivity, bandwidth, and size. Simulation results indicated that the best gain was provided by the rectangular patch antenna at 2.973 dBi and smallest in size, at 35.21×29.22 mm, which made it very appropriate for smartphones. The circular patch antenna showed a better bandwidth of about 0.1329 GHz with a VSWR of 1.0574 for impedance matching. In the end, the rectangular microstrip patch antenna presents a trade-off between performance and size, suitable for mid-band 5G smartphone integration. Future work should be done on optimizing designs for better performance with minimal size to meet the ever-evolving demands of next-generation communication devices.

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