

UNIVERSITI TEKNOLOGI MARA

**DESIGN OF MINKOWSKI FRACTAL
ANTENNA ON MULTILAYER
LTCC TECHNOLOGY**

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Thesis submitted in fulfillment
of the requirements for the degree of
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CONFIRMATION BY PANEL OF EXAMINERS

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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. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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

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ABSTRACT

Nowadays, demands for antenna which are smaller in size, low cost and low fabrication complexity have been increased. Antenna with higher gain, wider bandwidth and smaller size is a requirement for modern development in communication systems. In this context, a multilayer stacked patch antenna with a combination of Minkowski fractal patch is very attractive in order to meet all the demanding specification in terms of the antenna performances and also the size of the antenna. In this research project, a multilayer stacked patch antenna with eight layers of substrate with the dielectric constant, ϵ_r of 5.9 and loss tangent, $\tan \delta$ of 0.002 using LTCC substrate is chosen to fulfil the requirements of the antenna. This antenna can operate at 10.1 GHz. There are three designs of multilayer stacked patch antenna design which are a rectangular radiation patch, Minkowski fractal radiation patch and a technique of array. All of this design is added with parasitic element. In the rectangular radiation patch, a parametric study on the characteristic of the multilayer structure has been done. From the result, a parasitic element has been added in order to maximize the use of multilayer antenna. By introducing fractal concept into the basic rectangular patch, a reduction size of antenna can be achieved. It shows that, fractal patch gives a reduction of size to 33%. However, the bandwidth and the gain of antenna also need to be considered. To overcome the problem, an array technique has been implemented in the design in order to achieve higher gain. The gain of rectangular patch has increased about 77.77% by using fractal concept. In the nutshell, a combination of fractal patch with parasitic elements helps in order to minimize and gives better performance of antenna in terms of higher gain and wider bandwidth.

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