Faculty of Electronic and Computer Engineering

ENHANCEMENT PERFORMANCE OF SPLIT RING RESONATOR STRUCTURE ON MICROSTRIP PATCH ANTENNA

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Doctor of Philosophy

2016
ENHANCEMENT PERFORMANCE OF SPLIT RING RESONATOR STRUCTURE ON MICROSTRIP PATCH ANTENNA

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A thesis submitted in fulfillment of requirements for the degree of Doctor of Philosophy in Electronic Engineering

Faculty of Electronic and Computer Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2016
DECLARATION

I declare that this thesis entitled "Enhancement Performance of Split Ring Resonator Structure on Microstrip Patch Antenna" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature: ............................
Name: ............................
Date: ............................
APPROVAL

I hereby declare that I have read this report and in my opinion this report is sufficient in terms of scope and quality for the award of Doctor of Philosophy (PhD)

Signature :é é é é é ...................................................
Supervisor Name :é é é é é é é é é é é ....................................
Date :é é é é é é é é .............................................
DEDICATION

Thanks to Allah S.W.T and Rasulullah S.A.W. Thanks also to my beloved mother, Puan Asmah bt Abu, my father, Mej (B) Hassan b. Mahadi and to all my siblings.
Metamaterial is a type of artificial structure that is not found in the nature. This structure has become an interest among many due to its extraordinary response to electromagnetic waves. The split ring resonator is an example of a metamaterial structure, which has the potential to improve the performances of components in microwaves without changing the materials or with additional radiators. First, the possibility to reduce the size of patch antenna while maintaining the acceptable performance at 2.4 GHz with various split ring resonator configurations studied. Next, the ability to produce multi bandwidth performance for Minkowski Island antenna with Minkowski Island split ring resonator had performed. The antenna had designed and simulated with Microwave CST software. Then, the proposed antenna had been fabricated and measured. Meanwhile, the Minkowski Island split ring resonator possessed the ability to reduce the overall physical size of Minkowski patch antenna up to 75.6 % compare with basic rectangular antenna. Then, the Minkowski Island split ring resonator could create multiband resonant frequency at 2.4 GHz, 3.5 GHz, and 5.2 GHz for the Minkowski Island antenna with return loss of - 21.945 dB, - 17.154 dB and - 16.536 dB with gain of 0.874 dB, 1.410 dB and 2.940 dB, respectively. Besides, the resonant frequency could also be controlled by using different combinations size and location of Minkowski Island split ring resonators. The overall size of the antenna still could be maintained although additional split ring resonators were used. Therefore, the multiband system with compact design can be realized to improve the mobility of wireless communication system devices.
ACKNOWLEDGEMENT

In preparing this thesis, I was in contact with many people, researchers, academicians and practitioners. They have contributed towards my understanding and thought. In particular, I wish to express my sincere appreciation to my main thesis supervisor, Professor Madya Dr. Badrul Hisham Ahmad, for encouragement, guidance critics and friendship. I am also very thankful to my co-supervisors Professor Madya Dr. Abdul Rani Othman for their guidance, advices and motivation. I also would like to express my deep and sincere thanks to Dr. Mohamad Zoinol Abidin Abd Aziz and Dr. Mohd Ridhuan Ahmad for his guidance, support and encouragement. His door has always been opened and I could always talk to them no matter how busy they were. I also wanted to say thanks to Prof Madya Dr. Fareq Malek from UniMAP for his helps. Without their continued support and interest, this thesis would not have been same as presented here. I am also indebted to government of Malaysia for funding, my UTeM also deserve special thanks for their assistance in supplying the relevant literatures. My fellow postgraduate students should also be recognized for their support ì Dr. Azwan, Saiful, Ammar, Jitvinder, Sam, Ariffin, Khairy Zahari, Mohan, En. Sani, Khairy Ismail, Zaki, Hafize, Fadhli, Hafiz, Haffiz, Hairi, Thoriq, Hanif, Zuhair, Syafiq, Yusof, Thailis, Hasbullah, Ong and Mizan. My sincere appreciation also extends to all my colleagues and others who have provided assistance at various occasions. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space. I am grateful to all my family members.
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