MICROWAVE ABSORBER WITH SPLIT RING RESONATOR (SRR)

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This report is written as a partial fulfillment of terms in achieving the awards for Bachelor of Electronic Engineering (Wireless Communication) With Honours

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Sesi Pengajian :

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ABSTRACT

Proper understanding of microwave and split ring resonator is important to design a microwave absorber with split ring resonator (SRR). Therefore, in this project, a method for designing a better reflection loss performance for truncated microwave absorber with split ring resonator has been investigated. Split ring resonator or 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 microwave without changing the material or with additional radiators. In this thesis, it present the investigation of reflection loss or S_{11} for the 1x1 truncated microwave absorber with the integration of different number of split ring resonator structure at the truncated absorber for a frequency range between 6 GHz to 15 GHz through design and simulation process by using CST studio Suite 2014 software. Various S_{11} performances are compared and simulation result for the integration of one double split ring resonator (D-SRR) structure on truncated pyramidal microwave absorber show improvement performance of reflection loss at most of frequency from 6GHz to 15GHz and give the best reflection loss at frequency of 7.39 GHz which is -58.61 dB. Then, the design split ring resonator been simulate for 3 different frequency and modeled using Matlab software. The truncated microwave absorber used in this project is made of agricultural waste, which is rice husk mixed with Urea Formaldehyde as it bonding agent with dielectric constant of 2.9. Thus, this will able to reduce the fabrication cost and more environments friendly.

ABSTRAK

Pemahaman yang betul mengenai gelombang mikro dan resonator cincin terbelah adalah penting dalam mereka bentuk penyerap gelombang mikro dengan resonator cincin terbelah (SRR). Oleh itu, dalam projek ini, satu kaedah untuk mereka bentuk prestasi kehilangan pantulan yang lebih baik untuk penyerap gelombang mikro dengan resonator cincin terbelah telah disiasat. Resonator cincin terbelah atau meta bahan adalah sejenis struktur buatan yang tidak dapat dijumpai secara semula jadi. Struktur ini telah menjadi subjek penting di kalangan ramai berikutan sambutan yang luar biasa terhadap gelombang elektromagnet. Resonator cincin terbelah adalah contoh struktur meta bahan yang mempunyai potensi untuk meningkatkan prestasi komponen gelombang mikro tanpa mengubah bahan atau dengan tambahan radiator. Dalam tesis ini, ia membentangkan siasatan kehilangan pantulan atau S_{11} untuk 1x1 penyerap gelombang mikro dengan jumlah integrasi berbeza bagi struktur resonator cincin terbelah bagi julat frekuensi antara 6 GHz hingga 15 GHz melalui reka bentuk dan simulasi proses menggunakan CST studio Suite perisian 2014. Pelbagai prestasi S_{11} dibandingkan dan keputusan simulasi bagi integrasi satu resonator cincin terbelah berkembar (D-SRR) pada struktur piramid gelombang mikro yang dipangkas menunjukkan peningkatan prestasikehilangan pantulan di kebanyakan frekuensi dari 6GHz kepada 15GHz dan memberikan kehilangan pantulan yang terbaik pada frekuensi 7.39 GHz dimana -58.61 dB. Kemudian, reka bentuk resonator cincin terbelahdisimulasi untuk 3 frekuensi yang berbeza dan dimodelkan menggunakan perisian Matlab. Penyerap gelombang mikro yang digunakan dalam projek ini diperbuat daripada bahan buangan pertanian, iaitu sekam padi dicampur dengan Urea Formaldehyde sebagai ejen penyambungan dimana mempunyai pemalar dielektrik 2.9. Oleh itu, ini dapat mengurangkan kos pembuatan dan memberi persekitaran yang lebih mesra alam.

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SRR	**-**	**Split Ring Resonator**
RCS	**-**	**Radar Cross Section**
RF	**-**	**Radio Frequency**
EMT	**-**	**Effective Medium Theory**
EM	**-**	**Electromagnetic**
EMC	**-**	**Electromagnetic Compatibility**
MMs	**-**	**Metamaterials**
MA	**-**	**Metamaterial Absorber**
AMC	**-**	**Artificial Magnetic Conductor**
EBG	**-**	**Electromagnetic Band Gap**
PBG	**-**	**Photonic Band Gap**
S-SRR	**-**	**Single Split Ring Resonator**
D-SRR	**-**	**Double Split Ring Resonator**
DUT	**-**	**Device Under Test**
LHMs	**-**	**Left-Handed Materials**

FSS	**-**	**Frequency Selective Space**
DMS	**-**	**Defect Microstrip Structure**
DGS	**-**	**Defect Ground Structure**
A-SRR	**-**	**Array Split Ring Resonator**
EC-SRR	**-**	**Edge Couple Split Ring Resonator**
BC-SRR	**-**	**Broadsid Couple Split Ring Resonator**
NC-SRR	**-**	**Nonbianistropic Couple Split Ring Resonator**