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DESIGN OF A SINGLE ORDER FILTER BY USING CIRCULAR SIW CAVITY FOR 2.4 GHZ APPLICATIONS

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DATE : 16 JANUARY 2015

ACKNOWLEDGEMENT

All praise to Almighty Allah s.w.t the merciful and the Most Beneficent for the strength and blessing throughout the entire time until completion of this thesis.

First and foremost I would like to express my sincere appreciation to my final year supervisor, Dr Aziati Husna Binti Awang who is willing to spend her time helping and contribute precious idea, commitment, encouragement and guidance in sharing knowledge towards the completion of this thesis.

I would like to share my greatest appreciation to my beloved parents, Rashid Bin Sharib and as they are the one who will always be there to support me despite all the hardship I have been through, keep praying for my success with an everlasting faith. Thanks for all the motivation, encouragement and never giving up on me.

I would like to share my thanks to all my friends and people who are involved directly or indirectly for the completion of this thesis.

ABSTRACT

This work presents the design, simulation and fabrication of a design of a single order filter by using circular SIW cavity for 2.4 GHz application. The proposed SIW filter was designed and simulated at the center frequency of 2.4 GHz and fabricated on FR4-lossy substrate with relative permittivity, ε_r of 4.7, substrate thickness, h of 1.6 mm and copper thickness, t of 0.035mm. Computer Simulation Technology (CST) software was used in designing and simulation. Measurements of the parameters of the filter were carried out by using Vector Network Analyzer (VNA). The filter was designed with a circular cavity SIW. The performance of the filter was improved through the implementation of the circular cavity SIW. Performance of the filter was discussed in term of return loss (S_{11}), insertion loss (S_{21}). The results from the simulation and measurement was compared and discussed. The measurement result for The return loss and insertion loss of the simulation design are -22.09 dB and -1.041 dB, while the measurement of the return loss and insertion loss are -10.59 dB and -4.298dB. Both the measured and simulated values concur well and satisfied the specification.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The rapid growing microwave and millimeter-wave communication communications provided that the major advancement for the improvements in microwave filter [13]. The microwave filter is a two port network which used to control the frequency response at a specific point in a communication system by providing transmission at frequencies within the passband and attenuation in the stopband of a filter. Around the years preceding World War II, microwave filter theory and practice began by pioneers such as Mason, Sykes, Darlington, Fano, Lawson and Richards [2].Ke Wu was introduced the substrate integrated circuit in 2003 which is the new concept for high-frequency electronics and optoelectronics [4].

Rectangular waveguide structure has been used to design high-performance filters, but due to its three dimensional structure, it requires changes to integrate planar circuits. Additionally at lower Millimeter wave frequencies the rectangular waveguide structures tend to be bulky. A solution for this is achieved through integrating the rectangular waveguide structure into the microstrip substrate shaping a promising candidate known as the substrate-integrated waveguide (SIW) structure [14]. It has been found that the rectangular waveguide resonators have wide range for microwave and millimeter-wave applications at high costs [13].SIW are integrated waveguide-like structures fabricated by