DESIGN A BUTTERWORTH MICROSTRIP HAIRPIN BAND PASS FILTER FOR WIRELESS LOCAL AREA NETWORK (WLAN) APPLICATION.

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NOR HAZIRAH BT ABU BAKAR
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR

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ABSTRACT

This paper focuses on designing microstrip hairpin band pass filter for Wireless Local Area Network (WLAN) application. The Wireless Local Area Network (WLAN) is operated at frequency 2.4GHz until 5GHz. The filter is designed for a centre frequency of 3GHz and it operates within 10% operating bandwidth. The design specifications of the filter include insertion loss is not exceed than -3dB and the return loss is more than -20dB. The filter was simulated with seventh order elements of the Butterworth. It includes the design, simulation, fabrication and measurements. The filter was designed using Genesys software and implemented on RT/Duroid.

The simulation result precise to the specification result that about 100% in term of Center frequency (fc) ,High cut-off frequency (fH) and Low cut-off frequency (fL). The simulation result for return loss is -25 dB and the insertion loss is -2.451 dB which meet the specification requirement. About 5% value of return losses and 18.3% value of insertion losses difference between specification and simulation results which meet of specification requirement. Result for the comparison between specification and measurement is about 5% different of Center frequency (fc), 8% different of High cut-off frequency (fH), and about 4% different of Low cut-off frequency (fL). The measurement for return loss is -20.66 dB and the insertion loss is -2.918 dB which also meet the specification requirement, it about 3% for return losses and 1.3% for insertion losses.

The objective to design, fabricate and measure the characteristics of a microstrip hairpin band-pass filter is achieved. A comparison between the measurement and simulation is presented that the measured response strongly influenced by fabricated processing.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

In wireless communication systems, microwave filters are vital components and play important roles in many microwave applications. Band pass filters are essential components utilized in the microwave and wireless communication systems, which are usually found in both transmitters and receivers to discriminate between wanted and unwanted signal frequencies [1]. They are used to select or reject Microwave signals within assigned spectral limits. Evidently, the quality of band pass filters is extremely important to acquire precise desired frequency.

Microstrip is a popular type of planar high frequency due to ease of fabrication and its ability to integrate with other devices. RT/Duroid is one of the microstrip laminates that are suitable in designing hairpin band-pass filter [2].

In this paper, a Butterworth microstrip hairpin band pass filter for Wireless Local Area Network (WLAN) application is presented. The Wireless Local Area Network (WLAN) is operated at frequency 2.4GHz until 5GHz.The design specifications of the filter include a pass band ripple of 0.01 dB, pass band insertion loss must not exceed 3dB while the pass band return loss was to be more than -20dB and a minimum attenuation of -20dB at 3GHz.