BUTTERWORTH BAND-PASS FILTER FOR GPS APPLICATION

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ABSTRACT

This thesis presents the design of a Butterworth microstrip parallel couple band-pass filter (BBPF) for GPS application. Butterworth approach was used in designing the filter and the simulation was carried out using CST simulation software. The filter is designed with the operating frequency range from 1559MHz to 1610MHz with the cut-off frequency 1575MHz with the consideration of 24MHz bandwidth It wil demonstrate the third order of the Butterworth elements. The specified pass band insertion loss must not exceed 3dB while the pass band return loss was to be more than 20dB. The filter were fabricated on RT/Duroid 4350B having a relative permittivity of 3.48, and substrate thickness 1.542mm respectively. The filters characteristic were then measured using Rhodes&Schwarz ZVR-40 vector network analyzer. The simulation result show a good agreement.

Keywords—Parallel Couple band-pass filter, Computer Simulation Technology (CST), Microstrip, Return loss, Insertion loss

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CHAPTER 1

INTRODUCTION

1.1   Background of the Project

Microwave filter are vital component in a huge variety of electronic systems, including cellular radio, satellite communications and radar. The specifications on these devices are usually severe; often approaching the limit of what is theoretically achievable in terms of frequency selectivity and phase linearity. Microwave systems have an enormous impact on modern society. Applications are diverse, from entertainment via satellite television, to civil and military radar systems. Microwave and RF filters are widely used in these systems in order to discriminate between wanted and unwanted signal frequencies

Microstrips played an important role in radio frequency (RF) or microwave applications. Emerging application such as wireless communication continue to challenge RF/microwave filter to operate in higher performance requirements, smaller size, lighter weight and lower cost [Rahani bt Abdullah,1997]. There are various filter types that used in communication systems classified as low-pass filter, high-pass filter, band-pass filter, and also band-stop filter. A band pass filter is one with a pass band between two cutoff frequencies and two stop bands. The range of the frequencies called bandwidth [Siti Azidah bt Abidin, 2009]. The parameters of the Butterworth bandpass filter (BBPF) consist of the length, l and the width, w of the coupled lines, as well as the distance between the two coupled lines known as space gaps, s [Reinhold Ludwig, 2002]. The advantage of BBPF is the frequency response is maximally flat and no ripples in the pass band [Leo G. Maloratsky, 2000].

One of the most common implementation methods for band-pass filter is a cascade of parallel coupled lines (PCL). This is a popular type of filter for realization in microstrip format because it does not require grounding of any conductors [Edward A. Wolf, 1988] Microstrip is a popular type of planar high frequency due to ease of

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