MULTILAYER BANDPASS FILTER IN DUAL-BAND APPLICATIONS

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ABSTRACT

A multilayer filter technique is proposed to enhance an existing design of a dual-mode dual-band bandpass filter topology. In this paper the design adapts vias to connect two quarter-wavelength parallel coupled-lines to two half-wavelength lines creating a dual-path structure. The influence of different impedance parameters such as line impedance, Zr and even- and odd-mode impedances, Zoe and Zoo of the filter topology were analysed, thus showing the control parameters of the dual-band response in terms of the bandwidth and separation between the passbands. The adaptation of multilayer technology in this topology, improves the rejection-band of the dual-band frequency response. The multilayer filter was designed using microstrip technology at 2 GHz using Flame Retardancies 4 (FR4) material. The result shows the filter is suitable in addressing wide band applications and the concept is validated through measurement.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Filters are two-port devices designed to allow selected frequencies to pass with little attenuation, while unwanted frequencies are rejected. Filters are used widely in military or civilian communication systems – they are used to control the frequency response of a device, provide a means of channel separation in frequency division multiplexing systems, remove harmonics in oscillators or amplifiers, and are employed for noise reduction and to reject signals at particular frequencies [1].

Filters are categorized by several types which are the bandpass filter, low-pass filter, high-pass filter and the band-stop filter. As the number of different wireless systems and services is rapidly growing, frequencies become less available. A solution to this problem is multi-band operation of modern wireless communication systems, on arbitrary frequencies.

Therefore, the band pass filters are necessitated that operate at two or more non-harmonically related frequency bands. In a bandpass filter design, only a particular band of frequencies are allowed to pass through. This will allow the designer to control which frequencies will pass through in their design.

Compact and broadband filters are key passive components and highly demanded in wideband applications systems. The criterion of a good filter is high in frequency selection [2] and compact with the ability to be implemented in a system [3]. These characteristics pose an advantage to designers as they can be widely used in a variety of radio frequency/microwave and millimetre-wave systems [4]. Some designs use