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Analysis and Design Tunable Dual-band Bandpass Filter of a second-order Maximally Flat using Miniaturized Technique

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Abstract

This study presented an analysis and design of tunable dual-band bandpass filter using miniaturized technique. The miniaturized technique makes the weight and volume of the filter smaller. This design is based on a combination of parallel coupled lines of microstrip.

A second-order low pass filter was designed by using mathematical equations. The low pass filter was transferred into a middle pass filter using these equations. Then by using tuning technique this filter was turned into a tunable dual-band bandpass filter.

The used sublayer of RT-DURROID-5880 with ε_r=2.21 and loss tangent was 0.0009. The ADS software was used to do all the diagrams and simulations which lead to designing a double band filter with 1GHz bandwidth.

Key words: Bandwidth, dual-band filter, Miniaturized, Parallel Coupled, Tuning Technique

1. Introduction

The efficiency of RF circuits of inactive microwave with high-power has significantly increased by the rapid expansion of industrial electronics and manufacturing technology. A microwave filter is a double-port linear device that reduces the unwanted signal frequency with noise and makes the transfer of the desired noiseless level possible. The electrical performance of the filter is analyzed based on Group Delay, Frequency Selectivity, Return Loss, and Insertion Loss.

A middle pass filter (MPF) microwave is an essential part of the microwave communication system, which is commonly used in transmitter and receiver. There are various ways to make these filters. These filters can be made using compact components such as inductors and capacitors. Lumped-element filters are now used at microwave frequencies up to about 18 GHz, and form a large percentage of microwave filters produced by the industry[1]. The unloaded Q_V which is realizable depends on frequency, but averages about 200, and values over 800 may be achieved at lower frequencies e.g., at 170 MHz [2]. Another method for making these filters is the use of a transmission line that expresses the capacitive and inductive values in most of the frequency transmission lines. The realization of filters at frequencies in Gigabyte range is difficult[3]. Microstrip transmission line is one of the most used and it is the most used flat-line transmission. The