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# A Low Cost Electrically Tunable Bandpass Filter with Constant Absolute Bandwidth

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**Abstract**

This paper presents an electrically tunable bandpass filter which provides nearly constant absolute bandwidth (CABW) within the center frequency tuning range. The proposed tunable band pass filter (BPF) is designed on a low cost FR4 substrate with mixed coupled 3rd order open loop ring resonators, high frequency varactor diodes, chip capacitors and some RF chokes. The center frequency of the BPF is tunable from 1.9 GHz to 2.52 GHz with 3 dB absolute bandwidth of 201.5±1.5 MHz. The measured insertion loss of the proposed BPF is found less than 3 dB within the tuning range. There is a good agreement found between the simulated and measured results of the proposed BPF.

## Keywords

Microstrip; BPF; CABW; resonator; scattering; tunable

## 1. Introduction

Tunable microwave and RF bandpass filters (BPFs) are subject of interest to improve adaptability in communication systems. Microstrip BPFs can be tuned electrically, magnetically or by using MEMS based switches. Electrical or MEMS based tuning methods are mostly preferred because of higher fabrication density obtained with these methods. This present work is based on electrical tuning of microstrip BPF using varactor diodes. Some recently published articles based on tunable microstrip BPFs are shown in [1-17]. Tunable BPFs can be divided into single passband and dual passband type with center frequency tunability, bandwidth tunability, constant absolute bandwidth (CABW) and constant fractional bandwidth (CFBW) types respectively. Center frequency tunable microstrip BPFs with single passbands are proposed in [1-3] using [1] microstrip line ring resonator with varactor diodes, [2] open loop ring resonator with piezoelectric transducer (PET), and [3] microstrip lumped elements with varactor loaded inductors respectively. Center frequency tunable BPFs with switchable bandwidth and continuously tunable bandwidth are proposed in [4-5] using [4] varactor and pin diode loaded with dual mode resonators and [5] combline topology with variable coupling reducers. Although the center frequencies of the BPFs shown in [1-5] are tunable but the passband characteristics are not similar for the tuning range. Therefore, the concepts of center frequency tunable BPFs with CABW and CFBW are