

**MULTILAYER HAIRPIN BANDPASS FILTER FOR DIGITAL  
BROADCASTING**

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## ABSTRACT

This thesis presents a 2.52 - 2.65 GHz bandpass filter using hairpin resonators in a multilayer configuration for digital broadcasting application. Multilayer configuration technique is used to reduce the size, increase the bandwidth and eventually improve the performance of the filter. A combination of four-pole hairpin resonators was designed using Tchebychev filter with passband ripple of 0.01 dB operating at center frequency of 2.58 GHz with a bandwidth of 130 MHz. The best return and insertion losses in the passband are -27.828 dB and -1.5028 dB, respectively. The circuit was simulated using Computer Simulation Technology (CST). Rogers RO3003 substrate with dielectric constant,  $\epsilon_r$  of 3 and 0.75 mm thickness was used as a material based. The simulated results from the design show that the circuit is working well. Few parameters in the circuit were analysed and have a good relationship to the microwave theory.

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# CHAPTER 1

## INTRODUCTION

### 1.1 BACKGROUND STUDY

Digital broadcasting denotes a set of standards that aim to distribute broadcast signals in digital form in a specific and standardized way. The mode of distribution can be satellite, terrestrially or through cable. Recently, many countries worldwide are moving towards a revolutionary change to digital broadcasting including Malaysia. The digital signal broadcasting begins with a transmitter located at an uplink facility and finally received radio wave from satellite transponder at downlink receiver. The digital signal at the end users' site can be fed directly into the integrated digital receivers, or in a transition period, e.g. regarding TV, through a digital multimedia receiver or set-top-box (STB) to a regular analogue TV receiver. The latest spectrum allocations in Malaysia issued on June 2009 by Malaysia Communications and Multimedia Commission (MCMC) listed all frequency spectrum used for many applications which include the commercial broadcasting purposes such as FM radio and television channel.

Microwave bandpass filters are widely used in communication system as an electronic device or circuit that allows signals between two specific frequencies to pass through, and discriminates unwanted signals at other frequencies. Some bandpass filters require an external source of power and employ active components such as transistors and integrated circuits known as active bandpass filters. Other bandpass filters use no external source of power and consist only of passive components such as capacitors and inductors called passive bandpass filters.