

# **DOUBLE-RING 3<sup>RD</sup> ORDER BANDPASS FILTER WITH HALF-WAVELENGTH COUPLED-LINE INTEGRATION**

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## ABSTRACT

This paper proposes the cascaded of two-ring resonator topology. The response of this ring resonator is a 3<sup>rd</sup> order bandpass response, resulted the extra poles that comes from the cascaded-rings. There was an improvement in size and shape of the design of a ring resonator from the previous topology of a microwave ring resonator with quarter-wavelength coupled-line integration. The proposed ring resonator is consisted of two cascaded circular rings where the half-wavelength coupled-line is integrated at the center of the two ring resonator. The response of the 3<sup>rd</sup> order bandpass filter can be controlled by varying the values of several parameters such as the gap of the coupling. The proposed concept is demonstrated at the operating frequency of 2.4GHz. The substrate used in this simulation is FR4 with the following characteristics:  $\epsilon_r = 5.4$  and  $h = 1.6\text{mm}$ . To show its feasibility, the measurement result is presented.

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# **CHAPTER 1**

## **INTRODUCTION**

This chapter consists of a brief introduction about the background of the overall project including the problem statement, objectives, scope of works and outline of this thesis.

### **1.1 BACKGROUND**

Since the early stages of telecommunication, filters have played an important role in electric circuits. With the rapidly advancement of the communication technology, filters become one of the demanding electrical device in the market. In 1915, the German scientist K.W. Wagner has introduced a filter design method that became a very famous method that is called the “Wagner Filter” [1]. A more precise filter design method was introduced in 1940. The method contains to specific design steps that are the determination of a transfer function that met the specific requirements and synthesize the electrical circuits. The filter design development was expanded from the lumped-element LC resonator to the newly discovered field of distributed-element coaxial resonators or waveguide resonators [1]. Most electric equipment used filters devices and this made the filter become essential devices in electrical and communication. The