UNIVERSITI TEKNOLOGI MARA

DUAL-PATH COUPLED-LINE MICROWAVE BANDPASS FILTER TOPOLOGY FOR WIDEBAND APPLICATIONS

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Thesis submitted in fulfillment
of the requirements for the degree of
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Faculty of Electrical Engineering

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or nom-academic institution for any degree or qualification.

I, hereby acknowledged that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

This thesis describes the development of a new topology of coupled line bandpass filter for wideband applications. The concept deals with an even number of identical quarter-wavelength coupled lines that are interconnected to form two parallel paths of series-connected coupled lines. Such way, a bandpass response of order $\frac{n}{2}+1$ is resulted, where n is the number of identical coupled lines used. The existence transmission zero at both sides of the passband constitutes the main advantage of this filter topology, where very good selectivity can be ensured, while wide bandwidth can be achieved. The global synthesis of the proposed topology is presented for the case of second order response. The design synthesis was developed to control the electrical characteristics of the resonator such as bandwidth and also to fix the position of the transmission zeros frequencies. Besides, the fractional bandwidth on the in-band matching level can be controlled by varying the value of characteristic impedances of the coupled lines. For implementation of the second-order filter, the uses of symmetrical and asymmetrical coupled lines are studied in order to obtain better performance. In practice, asymmetrical coupled lines are more flexible in obtaining higher wave coupling, for better in-band matching level. A further combination of identical quarter-wavelength coupled lines in the initial second order topology is proposed for higher order design. The topology of second-order and higher order filters are implemented on microstrip technology using two substrates which are FR-4 and TRF45. Simulations and measurement results are presented to validate the idea.

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