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Title :
Microwave Planar Filter Topologies Based on Ring Resonators with Coupled-Lines Combination

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This research is divided into two topics, where ring resonator and coupled line will be, either, integrated or cascaded. In the first topic, quarter-wavelength coupled line ring resonator integration will be developed, which will result in a single mode resonator with two transmission zeros on both sides of the passband. The new filter will be presented by its equivalent circuits in order to derive the mathematical modeling and extract the controlling parameters which determine the position of the transmission zeros. Several filters are designed using the new synthesis to show its advantages and new applications. The synthesis of the new topology could be generalized to design higher order filters, which facilitates the design of such filter. Moreover, the filter will be cascaded to offer higher orders and more selective filters. 2^{nd}, 3^{rd}, 4^{th} and 5^{th} order filters will be designed and simulated to show the feasibility of the new topology.In the second part, the concept of the ring resonator and coupled lines will be further explored, where the quarter-wavelength coupled line will be cascaded with the ring resonator. Such a topology will offer high selective and wideband filter compared to conventional coupled line filter. Furthermore, the new topology reduces the number of controlling parameters, thereby, achieving ease of designing and fabrication. Several techniques are proposed to miniaturize the filter size by using curved coupled line cascaded with curvy ring resonator or by adding a square patch to the inner corner of the ring resonator. Moreover, the same concept is used where the quarter-wavelength coupled lines are cascaded with multiple ring resonators to achieve high selective, wideband and shorter circuitry filters, when compared with conventional coupled line filter. Eleven filters will be designed and fabricated using planar circuitry technology, where measurements using vector network analyzer show the agreement of measured and simulated results.

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