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Liquid crystal dual-mode band-pass filter with improved performance

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Abstract:

Over the last twenty years, there has been a growing interest in the design of tunable devices at microwave frequencies by using liquid crystals technology. In particular, the use of liquid crystals with high dielectric anisotropy allows manufacturing voltage-controlled devices to operate in a wide frequency range. In this work the frequency response of a liquid crystal band-pass filter with dual-mode microstrip structure has been studied in depth by using a simulation software tool. A reshaping of a conventional dual-mode square patch resonator bandpass filter with a square notch, studied in the literature, has been proposed with the goal of improving the filter performance. The main features achieved are a significant increase in the return loss of the filter and a narrowing of a 3-dB bandwidth. Specifically, a reduction in the filter bandwidth from 800 MHz to 600 MHz, which leads to a return loss increase from 6 dB to 12.5 dB, has been achieved. The filter centre frequency can be tuned from 4.54 GHz to 5.19 GHz.