

Miniaturized Cross-slotted Dual-mode Filter for Mobile and Satellite Communications

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A new, compact, narrow band, low loss, dual-mode cross-slotted filter is proposed and developed. The compactness and improved filter characteristics of this square filter makes it suitable for mobile and satellite communications. The dual-mode filter consists of simple star-type geometry slot lines crossing a square patch. Two additional fringe slots are also introduced on each side of the square patch. The external coupling is capacitive and was achieved through external lines, which are placed at a right angle. The conventional square patch dual-mode filters offer simple design and good power handling capability, however they require larger size than the dual-mode loop filters for the same frequency band. The novelty of this proposed structure consists in significant size-reduction and the ability to control the central frequency and the bandwidth; our proposed dual-mode filter is 37% smaller than a conventional patch dual-mode filter for the same frequency band. The filter was simulated using Sonnet Software, both lossless and lossy cases being considered, and was fabricated on a Rogers' substrate with a dielectric constant of 10.8. The star-type geometry dual-mode filter presents two transmission zeros on each side of the pass-band, and improved filter characteristics over the conventional ones. The perturbation was introduced using a difference between the lengths of the diagonal slots. It is found that the resonant frequency of the filter with 1% fractional bandwidth could be shifted down to below 900 MHz, for the use in the mobile and satellite communications.

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