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Design of band-notched UWB BPF with very wide upper stopband using combined λ/4 TSSIR

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Abstract

In this paper, a new band-notched UWB BPF with a very wide upper stopband is designed using a λ/4-type multi-mode resonator (MMR). The proposed MMR, being formed by combining two identical λ/4 tri-section stepped-impedance resonators (TSSIRs) in a structure-shared fashion, exhibits both λ/4 and embedded λ/2 types of resonance with a relatively smaller circuit size. By properly locating the first four resonant modes of the MMR and the coupling peaks of the input/output parallel-coupled lines, a five-transmission-pole UWB BPF is realized with a favorable uniform in-band UWB response. Besides the good UWB performance, a 5-GHz notched band is created by embedding in the output feed line a T-shape lumped-element bandstop structure to reject the influence from WLAN signals. Also, a very wide upper stopband is achieved by implementing a compact bandstop filter structure in the input feed line together with the properly located transmission zeros generated by the input/output interdigital-coupled lines and the second harmonic of the T-shape bandstop structure. A prototype of the proposed UWB BPF was fabricated and measured for performance verification. The measured results show a return loss of higher than 10 dB, a minimum insertion loss of 0.41 dB, and a group delay variation of less than 0.11 ns in the UWB passband except the notch. The notched band has a 3-dB bandwidth of

18%. The measured upper-end -20-dB stopband ranges from 11.94 to 30.56 GHz, with a bandwidth of 18.62 GHz.