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MMR-based band-notched UWB bandpass filter design

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Abstract

A new band-notched ultra-wideband (UWB) bandpass filter (BPF) with an improved upper stopband is designed using a multi-mode resonator (MMR). The MMR, being a modified version of a common tri-section stepped-impedance resonator (TSSIR), is split at its two open ends with the input/output feed lines sandwiched in between to form an interdigital parallel-coupled configuration that results in stronger coupling. In addition, an extended coupling length in the second section of the TSSIR is featured to provide further coupling and impedance-matching tuning. With such a design strategy, coupling gaps of no smaller than 0.1 mm was achieved to obtain the required UWB response. In this design, the first five resonant modes of the MMR and the coupling peaks of the input/output parallel-coupled lines are properly located in the UWB passband to achieve a uniform in-band transmission response. Also, the spur lines and open-circuited stubs are implemented in the MMR to create a 5-GHz notched band and to broaden the upper stopband, respectively. The designed UWB BPF, which being verified by measurement, shows a very good UWB performance. The measured in-band minimum insertion loss and maximum group delay variation except those in the notched band are 0.45 dB and 0.05 ns, respectively, and the upper-end −20-dB stopband bandwidth is about 5.35 GHz. The created notched band is centered at 5.69 GHz with a maximum insertion loss of 37.2 dB and a 3-dB notch bandwidth of 18%.