

Compact All-frequency Reflectionless Filtering Power Divider with High-Isolation and Extended Out-of-Band Suppression

Gangxiong Wu¹, Yang Jin¹, Hao Wu¹, Wei Zhang¹, Ruirui Jiang¹, and jin shi¹

¹Nantong University

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Abstract

This paper presents a filtering power divider (FPD) that integrates all-frequency absorptive and isolative functionalities while achieving extended out-of-band suppression. The proposed design employs an absorption-isolation network (AIN), composed of microstrip lines and resistors, to ensure simultaneous reflectionless input operation and high isolation without degrading filtering performance or requiring additional absorption circuits. A cascaded coupled-line (CL) structure facilitates broadband filtering and power division, while parallel half-wavelength stubs enhance out-of-band suppression. Additionally, a π -type defected ground structure (DGS) is incorporated to mitigate high-frequency spurious signals, further extending out-of-band suppression without increasing circuit footprint. Theoretical analysis and parametric optimization are performed to establish impedance conditions for achieving reflectionless operation and optimizing circuit performance. A fabricated prototype, centered at 2 GHz, exhibits a 72% 3-dB bandwidth, input reflection below -10 dB across the entire frequency range, all-band isolation exceeding 21.1 dB, and stopband attenuation greater than 25.2 dB up to $6.8 f_0$. These results validate the proposed FPD as a compact and high-performance solution for modern RF front-end applications requiring spectral purity and robust isolation.

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