NGD Bandpass Type Characterization of Circular Curved Coupled-Line

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Abstract: The present study examines the negative group delay (NGD) behavior of a circular curved (CC) coupled-line (CL) microstrip circuit with a bandpass (BP) characteristic. The novel CC CL-based circuit is derived from the curved li-topology which demonstrates BP-NGD functionality. The basic theoretical approach enabling the BP-NGD analysis is introduced. The BP-NGD function main properties related to NGD center frequency, NGD value, and NGD bandwidth are defined. Despite the progressive NGD research work, it was wondered how the RF printed circuit board trace geometrical parameters such as curvature radius and angle change the microwave communication parameters. To

verify the BP-NGD concept feasibility, different microstrip prototypes are designed, simulated, fabricated, and tested as the proof of concept (POC). Thus, a developed empirical study of CC microstrip structures corroborating well-correlated simulations and experimental results is examined. Moreover, deep sensitivity analyses for geometrical design parameters were performed using commercial tool full-wave simulations. The obtained results provide insights into the effects of CC-structure inter-space and curvature angles on the inherent BP-NGD parameters. The proposed NGD circuit is potentially useful in the future in RF and microwave engineering for signal delay correction. Additionally, it helps in understanding the characteristics of microstrip PCB traces that are important for optimizing signal integrity (SI), power integrity (PI), and electromagnetic compatibility (EMC).

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