IEEE Antennas and Wireless Propagation Letters, vol.12, pp.1424-1427, December, 2013.

Fundamental mode leaky-wave-antenna (LWA) using slot line and split-ring-resonator(SRR)-based metamaterials

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Abstract-

A new composite right/left-handed (CRLH) slotline leaky-wave antenna (LWA) is proposed. The antenna, implemented by loading a slotline with split-ring resonators (SRRs), is designed to exhibit a balanced dispersion relation, with a continuous transition between the left-handed and the right-handed bands at 2.5 GHz. Since the periodicity of the structure is much less than a wavelength, the proposed LWA belongs to the family of quasi-uniform LWAs, and it radiates from the fundamental mode (contrary to periodic LWAs). Measured and simulated radiation patterns, gain, and scanning angle are reported for a 17-cell LWA. The experimental results demonstrate the potential of the LWA to continuously radiate from backward (- 50°) to forward (+60°) scanning angles, with maximum gains of 7.1 and 11.3 dB in the left- and right-handed bands, respectively, and specular radiation patterns.

Index Terms- Leaky-wave antennas (LWAs), metamaterials, split-ring resonator (SRR), slotline.

Citation:
Zamora, G.; Zuffanelli, S.; Paredes, F.; Herraiz-Martínez, F.J.; Martín, F.; Bonache, J. "Fundamental mode leaky-wave-antenna (LWA) using slot line and split-ring-resonator(SRR)-based metamaterials", IEEE Antennas and Wireless Propagation Letters, vol.12, pp.1424-1427, December, 2013.