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Dielectric and Magnetic Nonlinear Materials for NLTLs*

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Nonlinear transmission lines (NLTLs) have been the subject of several studies that have shown their suitability in high-speed systems for a wide variety of applications as pulse compression, phase shifter, frequency multiplier, pulsed radar, battlefield communication disruption and also as a high power microwave source, holding in this case an additional way to generate radio frequency (RF) signals without using vacuum electronic tubes, which normally requires heating filament and bias power supplies. NLTLs, which are designed for the RF generation, uses nonlinear dielectric and magnetic materials that are arranged to form a nonlinear medium that can be dispersive or continuous (non-dispersive). This paper presents a summary of the main research on the recent NLTLs development and provides an analysis of the influence of the nonlinear material characteristics on the performance of NLTLs, pointing that there is a lack of nonlinear dielectric and magnetic materials that would allow the achievement of NLTLs with better RF conversion efficiency and the operation at higher frequencies even under adverse environmental conditions. The nonlinear dielectric and magnetic materials for NLTLs applications need to have characteristics such as highly nonlinear behavior, low losses, and thermal stability.

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