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Spatially Dispersive Nonlinear Transmission Line Experimental Performance Analysis and COMSOL Simulation Development

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Spatially dispersive nonlinear transmission lines (NLTLs) have attracted interest as frequency tunable, wide-band, high power microwave (HPM) sources. The characteristics of these sources need to be further evaluated and understood to optimize their design. This paper presents the experimental performance of a spatially dispersive NLTL composed of Nickel-Zinc (NiZn) ferrites possessing a range of loss tangents, initial permeabilities, and dimensions. The NLTL's performance is presented for each ferrite across a range of operational input voltage levels and ferrite bias conditions. Results show output frequency tunable from 0.81 to 1.39 GHz and peak RF powers in excess of 100 MW. In addition, higher peak powers were observed for ferrites with higher initial permeabilites versus lower loss tangents for the same dimensions. In addition to the experimental evaluation, a COMSOL model of the NLTL has been developed as a further method of gaining insight into the transient operation of this NLTL system architecture.

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