Introduction
Eagle Harbor Technologies, Inc. (EHT) is investigating the generation of high power microwaves using the EHT Nanosecond Pulser (NSP) and nonlinear transmission lines (NLTLs). The EHT NSP provides independent control of the output voltage (20 kV), pulse width (20 – 200 ns), and pulse repetition frequency (up to 100 kHz) and is used to drive two different NLTLs. The gyromagnetic NLTL produces RF around 2 GHz. EHT has constructed a test setup including solenoid for producing an axial field. Experimental results, including RF measurements with a D-dot probe, will be presented. The second NLTL is based on the nonlinear properties of high voltage. Schottky diodes and produces RF at a lower frequency. Rise time sharpening and RF experimental data and modeling results will be presented.

RF Production with NLTL
EHT has demonstrated RF production by driving the gyromagnetic NLTL with a 10 kV inductive adder. The RF output of the NLTL was measured with a capacitive voltage probe (CVP) and a D-dot probe in the far-field.

Lumped-element NLTL
EHT is investigating lumped-element NLTLs with off-the-shelf components. SPICE modeling showed that the pulse rise time could be improved to below 10 ns. A 10 kV NLTL with 20 elements was built and tested, which produced sub-10 ns rise time at 82-86% efficiency.

EHT Inductive Adder
Most gyromagnetic NLTLs are designed with 25-50 Ω impedance that must be driven with sub-10 ns rise time. EHT is leveraging nanosecond pulser components, which can operate at high pulse repetition frequency (PRF), to build an inductive adder that is capable of driving these low impedance loads with fast rise times. EHT has built a six board stack that can operate at 10 kV, with adjustable pulse width, fast rise time, and PRF. This circuit topology can be easily scaled to drive NLTLs with 25-50 Ω impedance at higher voltage with sub-10 ns rise time.

Conclusion
EHT has constructed a 10 kV inductive adder that has adjustable pulse width and PRF and has tested it into resistive loads. This inductive adder has been used to drive a gyromagnetic NLTL to produce RF near 2 GHz over a range of parameters. EHT has built a lumped-element NLTL and demonstrated efficient rise time reduction.

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