High Power Microwave Production with a Nanosecond Pulser and Nonlinear Transmission Line

EAGLE HARBOR TECHNOLOGIES

Introduction
Eagle Harbor Technologies, Inc. (EHT) is utilizing the previously developed EHT Nanosecond Pulser (NSP) to drive a nonlinear transmission line (NLTL) for high power microwave production. 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). EHT is using this pulser to investigate RF production with a gyromagnetic NLTL and lumped-element NLTL based on nonlinear effects in Schottky diodes. The gyromagnetic NLTL has a frequency around 2 GHz, while the diode-based NLTL’s frequency is lower. EHT will present experimental, including RF measurements with D-dot probes. Additionally, modeling results will be presented for the diode-based NLTL and compared with experiment.

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- and twelve board stack that can operate at 10 kV and 20 kV, with adjustable pulse width, fast rise time, and PRF.

RF Production with NLTL
EHT measured the RF output of the gyromagnetic NLTL driven by a 10 kV inductive adder with a capacitive voltage probe (CVP) and D-dot probe.

Lumped-element NLTL
To improve pulser rise time, 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.

Acknowledgment
This work was supported by the Department of Energy (DE-SC0013747).

Further Information
For a copy of this poster please visit http://www.eagleharbortech.com.