High Power Microwave Generation with Solid-State System

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Introduction
There is interest in the development of an all solid-state, high power microwave (HPM) system that can be deployed on small mobile platforms including trucks, small boats, and small aircraft for remotely destroying enemy electronic systems from a variety of sources. An all solid-state system could allow for a more cost effective and robust solution compared to HPM tube-based systems. To date there are no solid-state solutions for producing high power microwaves that are available for deployment, which limits directed energy weapons to larger platforms. One of the key components is the HPM source driver. Eagle Harbor Technologies, Inc. (EHT) is developing a novel, solid-state, high voltage, nanosecond pulser with fast rise-time and adjustable pulse width that can operate at very high pulse repetition rates for driving nonlinear transmission lines for HPM generation. The pulser is based on technology EHT previously developed for medical devices and aerospace applications. This poster will show detailed capabilities including microwave generation. The ultimate goal is to commercialize this technology and integrate it into military platforms as part of a complete directed energy system, which would likely be accomplished by prime contractors.

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.

Military Applications
This ultra-wideband high power microwave system can be used for defeating drone electronics; pulsed radar systems; and underground detection. The solid-state nature reduces size, weight, and complexity while increasing robustness over tube-based designs. Additionally, the nanosecond pulser technology can also be used for rapid capacitor charging and non-thermal plasma generation.

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.

Other Nanosecond Pulser Applications
EHT has commercialized a low-power nanosecond pulser used for rapid capacitor charging and generating nonequilibrium plasma. These have applications in pulsed-power, materials processing, surface modification, medical devices, water treatment, surface sterilization, and efficient combustion.

Conclusion
EHT has developed an inductive adder capable of generating high voltage, fast rise time pulses. This has been used to drive NLTLs for high power microwave production. EHT is seeking partners and funding for developing a ultra-wideband solid-state RF system for other applications including pulsed radar and underground detection.

More information:
http://www.eagleharbortech.com/