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DEVELOPMENT OF A PORTABLE, HIGH POWER MICROWAVE SYSTEM

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This paper presents the design and operational characteristics of a compact, portable, high power microwave system. The system is capable of operating at various pulse repetition frequencies (PRFs) > 100 Hz for short bursts. The microwave source is tunable between 2-6 GHz with varying power. The system utilizes several main subsystems. These subsystems include a Marx generator, Marx air flow system, a rapid capacitor charger, trigger generator, a Lithium-Ion polymer battery, and control system. The complete system was designed to fit on a movable cart that incorporates a hydraulic lift system and dimensions to fit through a standard entry way. The Marx generator is a Trigatron driven 10 stage, 500 kV, 105 J, spark-gap based device. The Marx is charged via the capacitor charger and then triggered by the trigger generator. The trigger generator is of modular design and is capable of a 20 kV pulse with a pulse risetime of 20 ns. The charger is an H-bridge design built to have an output voltage of 50 kV and a power rating of 90 kW. The portability of the system comes from the on-board air and energy systems. The air system is capable of moving 100 SCFM through the Marx generator to allow fast charging and operation. The energy system is divided into two separate systems; a 24 V and lead acid battery for powering ancillary equipment and a 380 V Li-Po battery for charging the Marx generator. The system is controlled by various microcontrollers and all communications are done via fiber optics to prevent EMI problems. Circuit topology, experimental data, voltage and current waveforms, and the overall system is discussed at various PRFs.

Primary author: BARNETT, David (Texas Tech University)

Co-authors: NEUBER, Andreas (Texas Tech University); LYNN, Curtis (Texas Tech University); DICKENS, James (Texas Tech University); MANKOWSKI, John (Texas Tech University); KELLY, Patrick (Texas Tech University)

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