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100KW PEAK RACKMOUNT MARX WITH DYNAMIC PULSE-TO-PULSE WAVEFORM CONTROL

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Stangenes Industries has designed and delivered a 5U 19”rackmount modulator for driving high impedance capacitive loads such as an electron gun. An FPGA controls the delays between successive triggering of 18 Marx stages to match the modulator output to loads of various impedances. With a single HV supply providing a fixed charge voltage the modulator can generate output voltages from 5KV to 50KV with 0.1KV of output resolution commanded pulse-to-pulse. The pulse width is adjustable between 0.5µs and 5µs in steps of 0.1µs and the pulse delay from trigger signal is adjustable from 0µs to 3µs in steps of 0.1µs, also commanded pulse-to-pulse.

The system is operated remotely by a client-computer via an ethernet protocol which also displays real-time diagnostic data. The modulator is equipped to count and recover from vacuum arcs and maintains a time-stamped fault log. Fast signals such as the trigger, faults, interlocks and waveform select are hardwired through low-latency optically isolated circuits. All the components: power supply, Marx, pulse-transformer, 40W DC filament, current/voltage diagnostics and controls are contained within the box which is powered by a single phase 120/240V wall plug. The system is entirely air cooled with no insulating oil.

This paper described the modulator as tested into an electron-gun. Waveform tuning procedures as well as heat data are presented. The system is capable of operation at a repetition rate of 1000HZ and a modulator average output power of 300W. The internal components are modular with emphasis placed on rapid MTTR for enhanced serviceability.

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