



Radar Transmitters



Advanced RF Systems



Power Converters

PowerMod™

Short Pulse Modulator Systems

Systems in Action



DTI High Power Klystron Modulator built for Daresbury Laboratory, UK. Controls and power supplies are contained in the cabinet on the right, while the tank on the left contains high voltage circuitry and pulse transformer.



340 kV, 375 A Output Pulse from the klystron modulator system pictured above. This 3 μ s pulse maintains voltage flatness to within 0.1% over 2.5 μ s. Scale is 80 kV/div.

DTI's PowerMod™ short pulse modulator systems (pulsewidths of 1 - 500 microseconds) deliver MW peak power levels at frequencies ranging from UHF to W-band. Employing direct, transformer-coupled, and Marx-based solid-state switching topologies, PowerMod™ modulator systems offer improved performance and lifetime with:

- Fast rise and fall times
- Pulse voltage flatness and stability crucial to LINAC operation.
- Pulse fidelity optimized for peak power of preferred tube
- Integrated fault detection with full, internal protection and μ s response
- Compact size and weight
- High repeatability with low droop
- Rugged design for years of reliable operation
- Estimated system availability of 99.99%

All DTI systems are fully customizable and may be optimized to meet strict size, weight, and pulse fidelity specifications. Systems may be designed as turn-key solutions to transmitter needs, or integrated into existing equipment via upgrade kits. All systems are designed to fully address both EMI and safety concerns, and may be packaged in racks for laboratory use or in ruggedized environmental enclosures for more demanding applications.

Sample Short Pulse Modulator Systems			
Type	Direct-Switched	Hybrid/Transformer-Coupled	Solid-State Marx
Avg. Power	21 kW	100 kW	4.5 kW
Tube	Klystron	Klystron	Magnicon
Peak Pulse Voltage	160 kV	500 kV	500 kV
Peak Pulse Current	125 A	530 A	250 A
Pulse Width	1 - 5 μ s	3.2 μ s	1.8 μ s
Pulse Rise/Fall Time	2 μ s	600 ns	1 μ s
Pulse Flatness	< 2%	1%	< 1%
Pulse Repetition Rate	1 kHz	120 Hz	20 Hz

A wide range of specifications are available. All DTI pulse modulators are fully customizable.



Laboratory Modulators

DTI recently delivered fully solid-state klystron transmitters to Daresbury Laboratory (UK; DAR) and Lawrence Berkeley National Laboratory (US; LBNL). Similarities in design enable a complete, replicable package for the high peak power laboratory transmitter market.

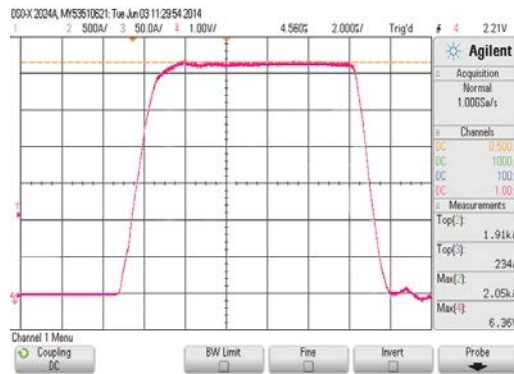
Both systems employ a relatively simple solid-state modulator, which consists of an energy storage capacitor, a high voltage series-switch, a step-up pulse transformer, and a passive pulse-flattening circuit. This arrangement gives an extremely flat pulse and allows the use of a moderate value of storage capacitor. The DTI switch can open or close as commanded, so the pulse width is adjusted by the gate pulse to the system. Each system employs a 35 kV primary voltage supplied by a DTI high voltage switching power supply. The high primary voltage allows optimization of all components to give a simple, reliable, and high stability system.



DTI Marx Modulator. This high peak power modulator is composed of 50 individual 10 kV stages which charge in parallel and discharge in series. This approach is modular and scalable, making it a reliable and cost-effective solution for a wide range of output voltages.



DTI Hybrid/Pulse-Transformer Modulator built for Lawrence Berkeley National Laboratory (LBNL). Controls and power supplies are contained in the left cabinet, while the right contains high voltage circuitry and pulse transformer.



275 kV, 250 A Output Pulse from the LBNL klystron modulator system pictured left, with 8 μ s command pulse. Cathode voltage output is shown at 40 kV/div.



500 kV, 250 A Marx Modulator Output Pulse from the unit pictured above. Scale is 106.2 kV/div, 500 ns/div.

