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5P55 - ESS Klystron Production Test Stand

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Diversified Technologies, Inc. (DTI) has delivered a new long-pulse modulator klystron test stand to Communication and Power Industries (CPI) in Palo Alto, CA for full power testing of production VKP-8292A klystrons for the European Spallation Source (ESS). The output is flat to less than 0.5% over 3.3 ms. This test stand was built using hardware and designs from an earlier SBIR effort for the Department of Energy, with modifications to support ESS requirements and klystron testing operation. Earlier versions of this design are in use at IPN Orsay and CEA Saclay in France to test RF components for ESS.

This new klystron test stand allows testing of klystrons at the full ESS specifications: 120 kV, 50 A, 3.5 ms pulse, 14 Hz with margin for operating at voltages up to 130 kV. This design is based on a patented non-dissipative regulator that compensates for the capacitor droop voltage (approximately 20%) during the pulse. This allows a much smaller capacitor than would nominally be required for the long ESS pulse, eliminating the need for a larger, more expensive capacitor bank. This test stand will speed delivery of ESS klystrons, and similar, long pulse, high power klystrons at CPI.

A control cabinet houses the main system controls and interface, including most of the power distribution and a Programmable Logic Controller (PLC) for system sequencing and other functions. The HVPS is a switching power supply operating at 6 kV DC at up to 40 A. The HVPS high voltage output is supplied to the capacitor bank in the modulator. The HVPS uses an advanced PWM inverter to provide voltage and current regulation over the full output range. Nominal output behavior is 0.1% ripple and voltage regulation, with fast response to transients.

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