Applied Energetics

High Voltage Equipment
Pulsed Power Systems

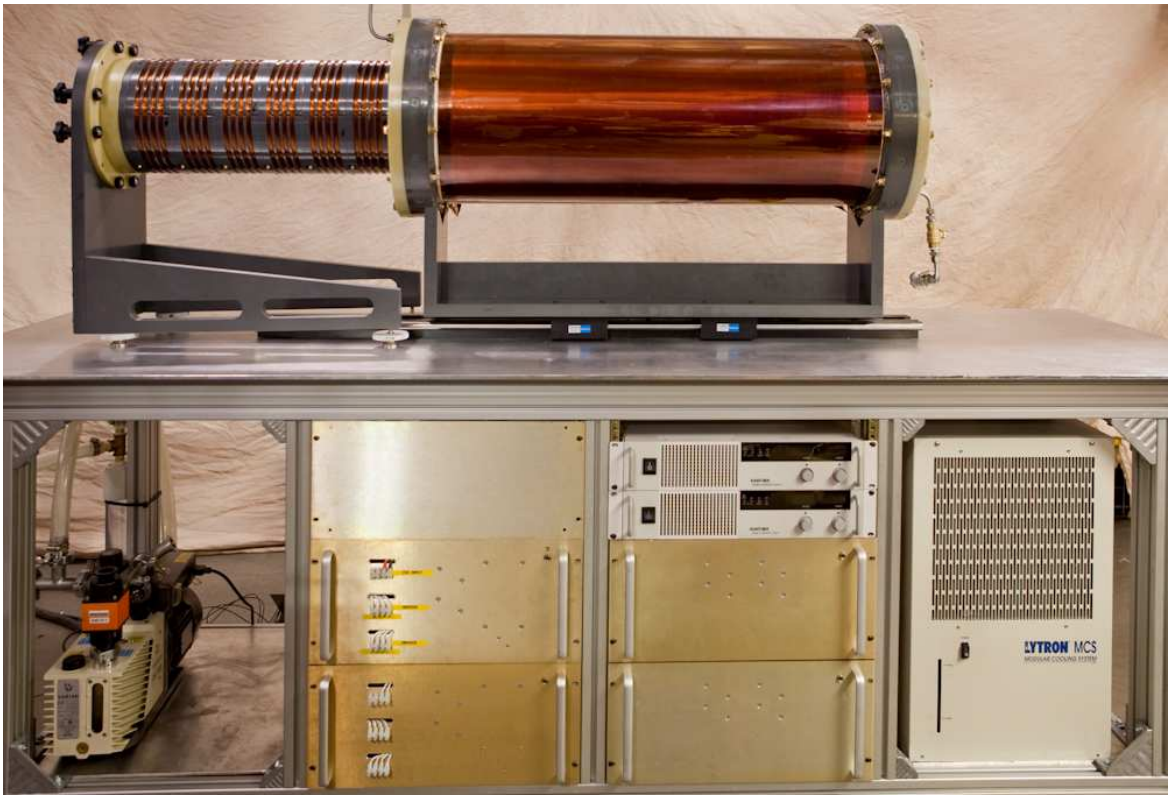
Nested High Voltage Generator (NHVG) for Electron and Ion Beam Sources

The Nested High Voltage Generator (NHVG) is an ideal electron beam/ion beam technology for applications from 200kV to over 1MeV. The NHVG reduces the cost and size of high voltage DC accelerators with the advantage of solid-state drive, environmentally safe solid and oil insulation, and elimination of high pressure gases. The modular design of the NHVG allows us to easy tailor a system for specific beam energy requirements. The NHVG can be configured for either DC or pulsed operation, with DC accelerators capable of >10kW and pulsed accelerators exceeding 1MW peak power. Comprehensive testing is performed to ensure the delivered system exceeds the customer's performance requirements. We have been delivering reliable NHVG accelerators for over a decade tracing back to our predecessor, North Star Research Corporation.

For more information about our products and services, please visit our web site at www.appliedenergetics.com/highvoltage.asp

The Nested Principle

Solid insulation is used extensively in the industry with voltages of up to 100 kV. The NHVG extends the techniques of solid insulation by building successive, topologically "nested" insulation stages to voltages over 1MeV. The radial thickness of these insulating layers is approximately 5 cm/MeV. The reduced diameter, and use of solids and liquids simplifies "self-shielding" which is essential for in-line operation. In case of a fault, energy from one cell is dissipated within that cell, eliminating total voltage faults observed in larger machines.



Applications

NHVG accelerators have accurate energy control, constant voltage and current in a compact size and are very cost effective for all applications.

- Material Processing
- Radiochemistry
- X-Ray Imaging
- Ion Implantation
- Medical Product Sterilization

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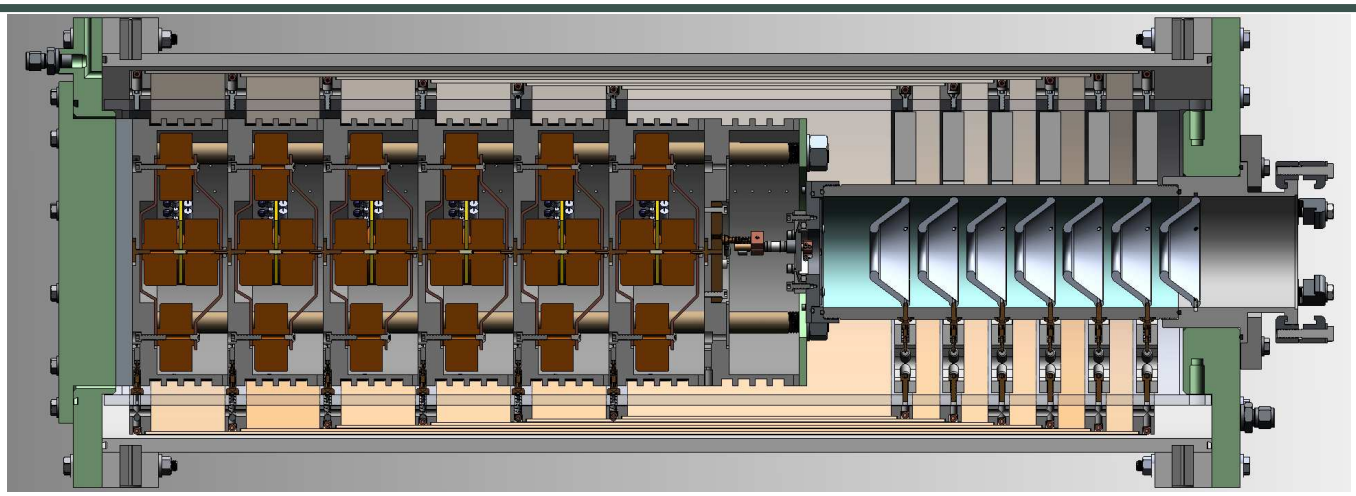
Nested High Voltage Generator Electron and Ion Beam Sources



Application Notes

The NHVG uses a unique combination of oil and plastic insulation. Units have been built to 1.5 MV and 5 kW average power. The devices embody a unique approach to the fault and insulation problems of high voltage systems. Since the high voltage source is composed of many sections, each isolated from the other by a Faraday cage, fault currents are contained to a section and do not cause successive overvoltage stresses and breakdown.

Due to their relatively small size and low cost, these accelerators are compact and inexpensive enough to allow them to be placed on production lines for in-line sterilization and for plastics processing. Applied Energetics can provide complete solutions including the accelerator, scanning system, and material handling equipment as required. These accelerators define a new price/performance for pulsed and DC machines.

High brightness electron and ion beam sources are available. Filament type electron beam sources are powered by a proprietary source driver. Penning sources and cusp sources are available for ion beam machines. Both tandem and single ended ion beam machines can be built.

Beam diameters can vary from less than 1 mm to wide areas for broad irradiation with scanning systems. The typical size of a 1 MV accelerator including vacuum system is 2.5 m X 0.4 m diameter. Such an accelerator can be supplied with a self-shielding arrangement.

Scanning Systems

Beam scanner systems are also available to meet customer processing requirements. Significant advances in beam scanning technology have been realized with linear beam scanning systems and associated magnets. For example, a system which scanned a 1 MeV beam over 3.5 meters in length with a size of 0.35 x 3.5 x 0.12 meters was built and demonstrated.

Control Systems

The accelerator is controlled by an industrial PC system with extensive use of fiber optic communications to reduce noise. Self-diagnostic features are built in. The controls can be integrated into the customer's work station as well as process variables and material handling be integrated into the accelerator control system. Monitoring features can also be provided to a customer network via Ethernet.

Size and Power of built accelerators

Voltage	Current	Power	Size, in. (L x Dia)	Input Power
250 kV	3 A	750 kW peak	42 x 16	Rep rate dependant
400 kV	1 mA	400 W	42 x 14	900 W
700 kV	1 mA	700 W	67 x 14	1300 W
1.2 MV	2 mA	2400 W	110 x 20	4000 W

Typical Accelerator Parameters

Accelerator configurations and component design are based the following information:

- Voltage
- Current (or processing rate)
- Beam type
- Beam size
- Scanning (as required)
- Size requirements
- Presentation area

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