



Adelphi Technology Inc.

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Neutron Generators

Adelphi Technology Inc. manufactures a range of neutron generators. Deuterium-Deuterium (D-D) generators are actively pumped and so have replaceable subcomponents, allowing our generators to be maintained indefinitely. Our Deuterium-Tritium (D-T) generators are sealed, and may be returned to Adelphi Technology for refurbishing at their end-of-life. All generators are 'powered' by a highly reliable, magnetron-driven ECR (Electron Cyclotron Resonance) ion source. All of the generators can be operated in a pulsed or continuous mode.

Deuterium-Deuterium (D-D) neutron generators (produce 2.45 MeV neutrons)

DD108

10^8 n/s

DD109

1×10^9 n/s
to
 4×10^9 n/s

DD109M
(Moderated)

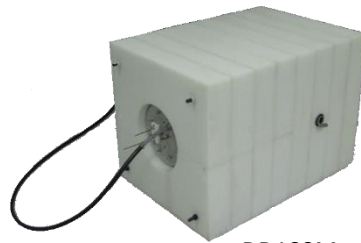
4×10^9 fast n/s
 1×10^7 thermal n/s/cm²

DD110MB
(Multi-Beam)

2×10^{10} fast n/s
 5×10^7 thermal n/s/cm²

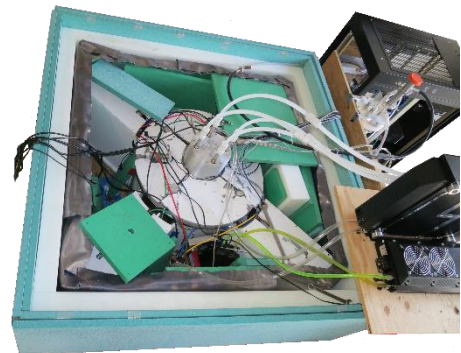


DD108 and DD109



DD109M

Moderated single beam
thermal neutron generator



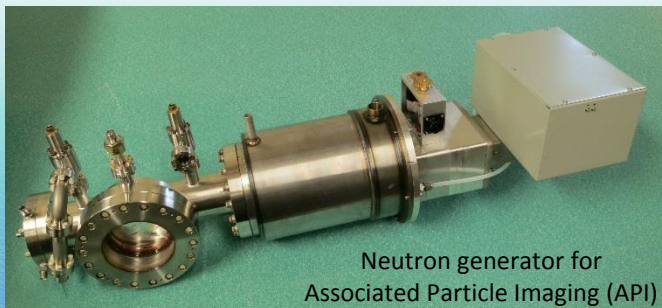
DD110MB
Multi-beam high thermal flux
neutron generator

Deuterium-Tritium (D-T) neutron generators (produce 14.1 MeV neutrons)

DT108API

Associated Particle Imaging (API)
neutron generator

10^8 fast n/s



Neutron generator for
Associated Particle Imaging (API)

DT110

10^{10} fast n/s



DT110 generator

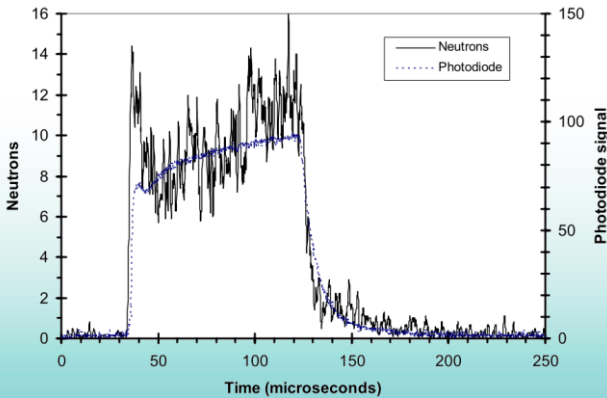


DD108 in a laboratory environment being used for neutron activation analysis.

The most popular family of Adelphi products are the D-D (deuterium-deuterium) neutron generators. The energy of the free neutron from this reaction is 2.45 MeV, which is easily moderated to thermal energies to support many experiments in materials science. Also, this energy is easier to shield, allowing more possible installation sites.

The “open vacuum” D-D systems allow disassembly for maintenance or re-configuration without being returned to the Adelphi factory. In most systems, a turbo pump is in constant operation and a small bottle of deuterium gas feeds the plasma source. The key components of a D-D generator can be replaced when they wear out, which is much preferred to exchanging the whole generator head. Moreover, the constantly replenished ion source does not suffer from the same limited lifetime as sealed generators, which produce only a fixed number of neutrons and then must be discarded. An Adelphi D-D generator has an almost unlimited tube lifetime.

The full neutron generator system consists of three main parts: the accelerator head, a cooling unit, and a power rack. The power rack consists of a microwave power supply, a high voltage power supply running at approximately 120 kV (maximum), and vacuum and gas controlling gauges and interface controls. The entire system is controlled by a computer program using serial-over-ethernet to communicate to all the subsystems of the generator. The computer display includes message logging to alert the user of the condition of the generator. Displayed indicators show interlock status of all critical functions of the generator.



Pulsed operation of the ion source

There are two methods for pulsing Adelphi generators, available as options on most systems. Pulsing the power to the ion source allows repetition rates of up to 10 kHz. This mode uses a TTL command pulse from the operator’s equipment. For pulse shapes requiring fast pulse falloff, the acceleration voltage can also be pulsed.



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