DD110M, high flux fast and thermal neutron generator

The new, award winning DD110M is a compact, high yield fast-neutron generator that has an integrated or "hybrid" moderator that quickly thermalizes these fast neutrons, resulting in high thermal neutron fluxes .

The generator and moderator are in the same compact housing that can be wheeled around to different experiments or facilities. The thermal neutrons can be directed to output ports, sample chambers or beam collimators.

These generators are revolutionary in that they produce thermal fluxes that are approaching those obtained from research reactors and national neutron facilities, thus opening up to small laboratories the possibility of applications heretofore reserved for the larger, more expensive facilities. These generators are well suited to materials analysis, radiography, and the teaching of nuclear physics. The generator housing can be modified to fit the customer's application and desired footprint.

Fast Neutron Generator Head

DD110M Specifications

Fast Neutron Yield	1 x 10^{10} neutrons/sec
Thermal Flux	1 x 10^{7} neutrons/cm^2/sec
Thermal Neutron Energy	Thermalized from 2.5 MeV
Scheduled maintenance	≥ 2000 hours
Standard operating mode	Continuous
Pulse on demand (option)	≥ 100 µS, to 100% duty factor

"We have been extremely pleased with the DD110M in terms of its capabilities, reliability, and its elegant and innovative engineering. There are no other D-D generators currently on the market that are capable of achieving the DD 110M neutron emission rate yet which are small enough to fit on a wooden pallet. In addition, its design is so well constructed and laid out that both my graduate and undergraduate students can reliably run and trouble-shoot the device." ***Assist. Prof. David C. Medich, Physics Dept. Worcester Polytechnic Institute.***

2015 R&D 100 WINNER

Uses

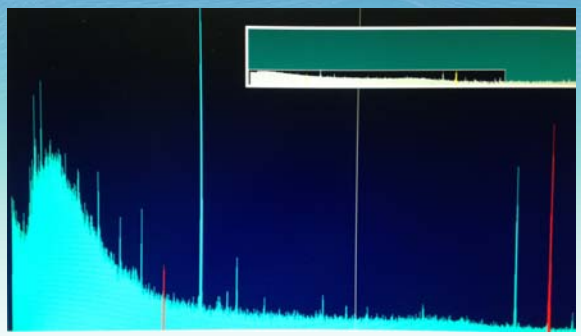

Image of the delayed gamma ray spectrum from an activated soil sample

Teaching Nuclear Physics

Imagine having a safe, compact nuclear reactor for classroom demonstrations, experiments and research. Unlike a reactor, these are not the size of a large two story building, do not cost millions of dollars, do not require special government licensing or uranium fuel and do not produce radioactive waste byproducts. In these generators, the only 'fuel' used is deuterium, readily available from most scientific gas suppliers. These deuterium based generators require no licensing for either export or operation. Shielding can be purchased that fits precisely around the generator and is removable to allow access to the experimental sample chamber.

Neutron Radiography

The DD110M can be used for both thermal and fast neutron radiography. The moderator is designed for maximum thermal neutron flux (10^7n/sec-cm^2) with a small spot size (5 cm), comparable to that achieved on many national facility neutron beamlines. Additional collimation and filtering can be installed to maximize the L/D. Neutron beam purity can be increased by optimum selection of filters. Neutron radiography has the ability to image hydrogenous materials, such as oil, water, rubber and plastics, that are embedded in components that are made of metals such as steel, aluminum, lead, and uranium.

Materials Identification

Moderating to thermal energies permits activation of many isotopes and makes the generator useful for materials analysis and identification. The generator has a high thermal neutron flux and so is a good source for Neutron Activation Analysis (NAA) and Prompt Gamma Neutron Activation Analysis (PGNAA). This moderated source closely mimics experimental research reactors, which have previously been the primary sources of thermal neutrons that can be used for NAA and PGNAA. Furthermore, the source can be pulsed or gated to minimize the noise background. This can be helpful for delayed neutron activation analysis.

Generator Head Open for Serving

WORLDWIDE