USNA Neutron Radiation Facilities

There are 3 different types of neutron radiation sources available. The cost is $3000/day, which includes everything, including setup and the use of different sources.

1. Thermo-Electron (d , t) 14.3 MeV Neutron Generator

Output: 3 x 10^{10} n/sec

Target size : circular disc approximately 1" in diameter- neutron beam spreads out isotropically from target

Fig 1. USNA 14 MeV neutron generator in exposure room

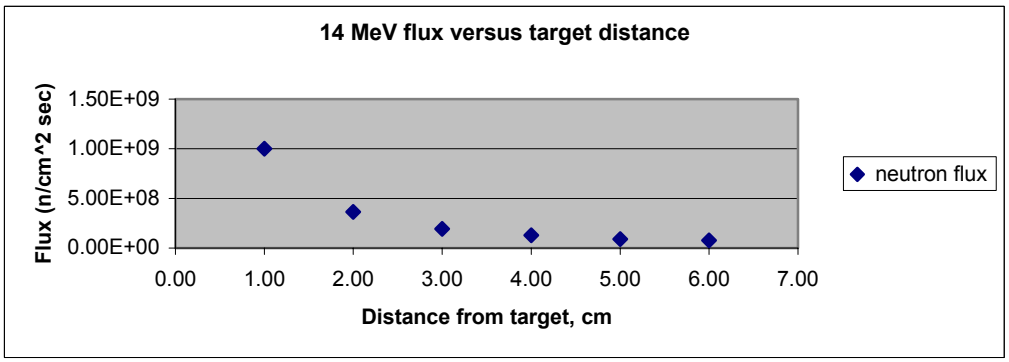

Fig. 2 14 MeV neutron flux versus distance irradiated device from generator target

Operational requirements/conditions

(1) Need 75' umbilical wire needed from control room to exposure device;
(2) No air conditioning provided in room;
(3) Beam nearly monoenergetic;
(4) Energy of bean varies from 14.6 MeV at 0º angle of incidence to 14.0 MeV at 90º angle of incidence from target
(5) Operational mode: continuous for a maximum of 2 hours; then shutdown for several hours and a second 2 hour irradiation can be performed; (maximum one day exposure is 4 hours;
(6) 14 MeV fluence delivered at 2 cm is approximately10^{12} n/cm^2 per hour of generator operation; 1 in one day maximum deliverable fluence at 2 cm distance is 4 x 10^{12} n/cm^2;
(7) System calibrated by use of copper foil activation anlysis to within +/- 20%.

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2. Thermo-electron MP320 (d , d) Neutron Generator

Output: 10^8 n/sec isotropic source

Energy: 2.2 -2.8 MeV with an average energy of 2.5 MeV

System currently undergoing calibration using indium foil activation analysis; expect flux and fluence levels to be 1/30 th compared to the 14 MeV neutron generator at a given distance from target.

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3. Sub-critical reactor (SCR) for Thermal Neutrons

Fig 3. USNA sub-critical reactor

5500 lbs of natural uranium with 5 Ci Pu-Be neutron sources. Pu-Be sources emit 10^7 n/sec with an average energy of 4 MeV

Maximum thermal neutron flux: 10^3 n/cm^2 sec based on gold foil activation analysis

Multi-day exposures can be made for the same basic one-day cost, dependent on student class schedules.

Cost of use of sources: $3000/day- 1 day minimum

Funds can be sent by Military Interdepartmental Purchase Request (MIPR) or by check payable to the "US Treasurer".

US Naval Academy
ATTN: Comptroller
Comptroller Dept Stop 20F
187 Wainwright Ave.
Annapolis, MD 21402-5008

Be sure to indicate on MIPR or check that funds are to deposited into an external reimbursable account for Prof. Martin E. Nelson