

## FAST NEUTRON IRRADIATOR DESCRIPTION

The fast neutron irradiator (FNI) is located along one side of the UMass Lowell Research Reactor (UMLRR). The UMLRR (Figs. 1 & 2) is an open-pool type reactor, utilizing flat-plate type fuel, and having a maximum thermal energy output of up to 1MW. Because the FNI faces one side of the reactor core, its design produces a geometrical planar “beam” of fast neutrons that is approximately uniform over an area of 12” x 12”.

Figs. 1 & 2: Figure 1 depicts a top view of the reactor with the core grid in the center, the FNI located to left and beam-ports located to the right. Figure 2 shows the actual reactor operating at 1MW with the characteristic Cherenkov “blue glow” radiation.

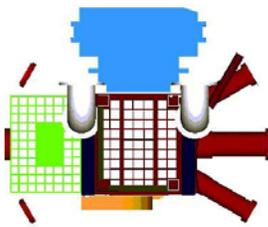


Fig. 1



Fig. 2

The FNI fast neutron current is adjustable from approximately  $1E8$  to  $1E11$  n/cm<sup>2</sup>-sec (1MeV equivalent) by varying the reactor power level. A more detailed description of the FNI radiation characteristics may be found in the FNI Brochure. FNI samples are placed inside a water-tight aluminum canister having internal dimensions of 15” x 9” x 60” (Fig 3). The samples are attached to a holder that is positioned inside the canister to maintain an optimal geometry within the uniform area of the beam. The canister is then sealed with a water tight lid and lowered 25ft underwater into the fast neutron irradiator (Fig. 4). Based on the neutron fluence rate, the irradiation is timed to achieve the desired neutron fluence level.

Figs. 3 & 4: Figure 3 shows the open FNI canister to the left. To the right is the FNI and reactor located 25’ below the water. Figure 4 depicts the FNI canister situated in the FNI grid. FNI shielding elements have been removed for clarity.

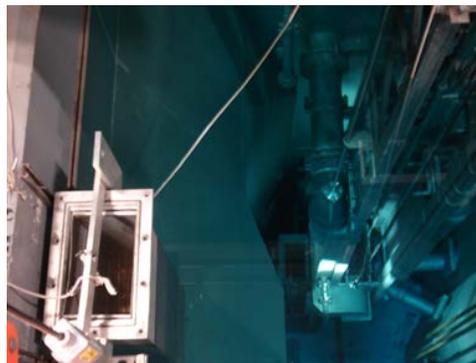


Fig. 3

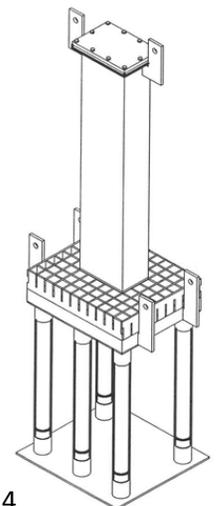


Fig. 4