

A FACILITY FOR HIGH-INTENSITY NEUTRON
IRRADIATIONS USING THICK-TARGET SOURCES
AT THE ARGONNE FAST-NEUTRON GENERATOR*

by

Donald L. Smith and James W. Meadows

Applied Physics Division
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
U.S.A.

ABSTRACT

A shielded neutron-irradiation cavity has been designed and constructed for use in high-intensity-neutron-irradiation experiments at the Argonne National Laboratory Fast-Neutron Generator facility. A target assembly which can withstand the maximum practical beam-power levels of the Fast-Neutron Generator has been developed for use in thick-target-source applications. Measurements of neutron-intensity levels inside the cavity and outside the shielded enclosure have been performed for radiological protection purposes. Two relative neutron monitors have been installed and tested. One is based on a boron-trifluoride counter while the second employs neutron fission of natural uranium. A versatile apparatus for performing precision sample irradiations and quantitative fast-neutron fluence measurements with a fission-ionization-chamber detector close to the thick-target assembly has been installed and tested. Three different ionization-chamber filler gases have been investigated to see how well they perform in the high-intensity neutron environment encountered in this facility. Time-of-flight measurements were performed with a fission chamber, employing both U-235 and U-238 enriched uranium deposits. It was found that in the region of the cavity near the target, where samples are normally irradiated, the portion of the spectrum above 1 MeV is dominated by direct neutrons from the source. The contribution from neutrons which have been scattered by the shielding surrounding the cavity is relatively small.

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