

Pulsed Neutron Measurements with a DT Neutron Generator for a Single Annular HEU Uranium Metal Casting

J. T. Mihalczo, D. E. Archer, M.C. Wright, and J. A. Mullens

Oak Ridge National Laboratory
P.O. Box 2008, Oak Ridge, Tennessee 37831-6010
e-mail: mihalczojt@ornl.gov, archerde@ornl.gov, wrightmc@ornl.gov,
mullensja@ornl.gov

Measurements were performed on a single annular, stainless-steel-canned casting of uranium (93.17 wt % ^{235}U) metal (~18 kg) to provide data to verify calculational methods used for criticality safety. The measurements used a small, portable DT neutron generator with an embedded alpha detector to time and direction tag the neutrons from the generator. The center of the time- and direction-tagged neutron beam was perpendicular to the axis of the casting. Three neutron detectors used were $1 \times 1 \times 6$ -in. plastic scintillators and were encased in 0.635-cm-thick lead shields. The detector's lead shields were adjacent to the casting, and the target spot of the generator was about 3.8 cm from the casting at the vertical center. The time distribution of the fission-induced radiation was measured with respect to the source event by a fast (1GHz) processor. The measurements described in this paper also include time-correlation measurements with a time-tagged spontaneously fissioning ^{252}Cf neutron source, both on the axis and on the surface of the casting.