DEVELOPMENT AND TESTING OF A DEUTERIUM GAS TARGET ASSEMBLY
FOR NEUTRON PRODUCTION VIA THE H-2(d,n)He-3 REACTION
AT A LOW-ENERGY ACCELERATOR FACILITY

by

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ABSTRACT

This report describes the development and testing of a deuterium
gas target intended for use at a low-energy accelerator facility to
produce neutrons for basic research and various nuclear applications.
The principle source reaction is H-2(d,n)He-3. It produces a nearly
mono-energetic group of neutrons. However, a lower-energy continuum
neutron spectrum is produced by the H-2(d;n,p)H-2 reaction and also by
deuterons which strike various components in the target assembly. The
present target is designed to achieve the following objectives: i) minimize
unwanted background neutron production from the target assembly, ii) provide a relatively low level of residual long-term activity within the target components, iii) have the capacity to
dissipate up to 150 watts of beam power with good target longevity,
and iv) possess a relatively modest target mass in order to minimize
neutron scattering from the target components. The basic physical
principles that have to be considered in designing an accelerator
target are discussed and the major engineering features of this
particular target design are outlined. The results of initial
performance tests on this target are documented and some conclusions
concerning the viability of the target design are presented.