D-^{3}He Proton Energy Distribution from an IEC Device*

[1]S. Krupakar Murali, [1]J. F. Santarius and [1]G. L. Kulcinski

[1]Fusion Technology Institute, University of Wisconsin,
1500 Engineering Drive, Madison, WI 53706
ksubramanian@wisc.edu

High energy protons are released from the D(^{3}He, p)^{4}He reactions in an IEC device. However, parasitic D(d,p)T and D(d,n)^{3}He reactions also occur simultaneously with the D(^{3}He, p)^{4}He reactions. The proton energy spectrum from the DD and D-^{3}He reactions have peaks at 3.02 MeV and 14.7 MeV respectively. These peaks show sizeable broadening caused by both Doppler broadening and energy staggering in the 700 μm thick Si detector. There is also a high-energy tail structure associated with the D-^{3}He proton peak that extends up to 10 MeV, which is the maximum proton energy that can be deposited in this detector. The Bragg response (stopping power variation with energy) of the Si detector has been identified as the cause of both the 14.7 MeV protons showing up at ~5 MeV and the associated high energy tail. The present paper calculates the proton energy spectrum using the Monte Carlo Stopping and Range of Ions in Matter (SRIM) code. Good agreement (within ~10%) between the experimental observations and theoretical predictions has been obtained.

* Research supported by the Grainger Foundation, the Greatbatch Foundation, and the University of Wisconsin.