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## An Optimization Study for Shielding Design of D-D and D-T Neutron Generators

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The neutron generator (NG) is being used more increasingly in various industrial and research area such as neutron activation analysis, neutron radiography, neutron capture therapy, and so on. In such an application of neutron generator, compactness is one of the most important issue. Since neutron source is generated by deuterium-deuterium (D-D) or deuterium-tritium (D-T) fusion reaction, relatively thick shield for both of fast neutron and related photon is usually required.

In this study, optimization of shielding design for portable D-D or D-T neutron generators was investigated by adopting appropriate moderator and shielding materials. The effects of moderator or shield materials to neutron spectra and dose rate were also studied to achieve minimization of shield.

The polyethylene showed good performance in shielding D-D neutrons source while the tungsten showed considerable performance in shielding D-T neutrons due to relatively high threshold energy of (n,2n) reactions. After neutron shield, appropriate photon shield, such as the lead, was also required because the photon shielding performance of the polyethylene or the tungsten is not sufficient.

Final required shield thickness was also evaluated for various strength of D-D or D-T neutron generators and maximum neutron source strength for portable neutron generator was also discussed.

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