NUCL 510 HMWK 7

1. HMWK #2 of Ch. 3
2. HMWK #3 of Ch. 3

Finite Cylinder

Cube

|  |  |
| --- | --- |
| Geometry | Peak-to-average flux Ratio |
| Finite cylinder | 3.636 |
| Cube | 3.876 |

1. HMWK #4 of Ch. 3

Fraction of neutrons that leaks from surface of rectangular parallelepiped reactor to those lost due to leakage and absorption

1. HMWK #5 of Ch. 3
   1. Boundary Conditions for Asymmetrical Problem

The current at x is equal to zero must be half of the plane source in each direction

The flux is zero at the extrapolated boundary, which again is shifted for simplicity

* 1. Show that flux given by book expression

Applying boundary condition 2:

Applying boundary condition 1:

* 1. Plot relative flux vs. distance from source measured in diffusion lengths. Discuss difference between part A and infinite medium as well as several thicknesses.

Plane Source in an Infinite Medium (Ott, et al., 1989 p. 128)

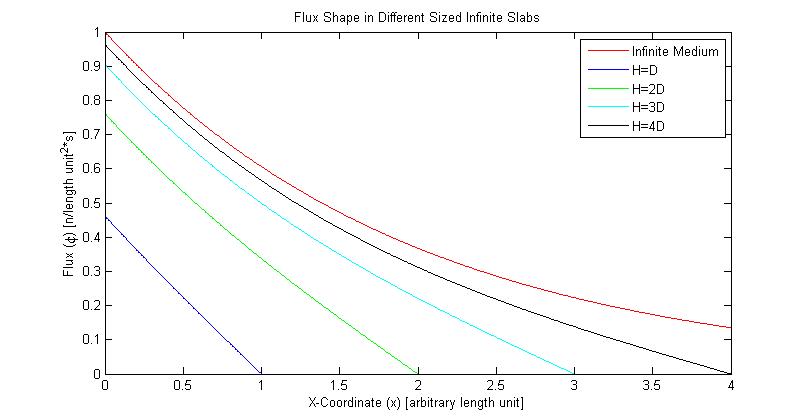


Figure Flux Shape in Different Sized Infinite Slabs

* 1. Conclusion about differences between infinite and finite slab distribution

As is shown in the figure above, the larger the slab becomes, the closer the flux distribution comes to the solution for an infinite medium. This shows convergence of solutions. This is because one of the main differences is the boundary of crossing zero at H. With H approaching infinity, the finite slab approximation starts to be exactly like the infinite medium approximation.

1. HMWK #7 of Ch. 3
   1. Minimum Critical Volume Comes in a cube configuration

Setting arbitrarily, because we have a constant value for buckling

So , thus a cubical reactor has the minimal volume for a given buckling.

* 1. Total power Cubical Rector

For the cubical case:

1. HMWK #8 of Ch. 3

Reduction in critical dimensions of slab reactor if graphite is placed on both faces.

Bare Core Slab Reactor

For criticality, material and geometric buckling are equal

Geometric Buckling (Ott, et al., 1989 p. 120)

Reflected Slab Reactor

For criticality,

From (Ott, et al., 1989 p. 144), the criticality condition becomes:

From (Ott, et al., 1989 p. 141), is the buckling of material plus reactor, given by, using kaeri (Nuclear Data Evalutation Lab, 2000) for cross sections:

Solving for , we get:

Much smaller core is needed with the large reflector; total size though will be larger because of the 100 cm of reflector total.