Thickness of the water wall

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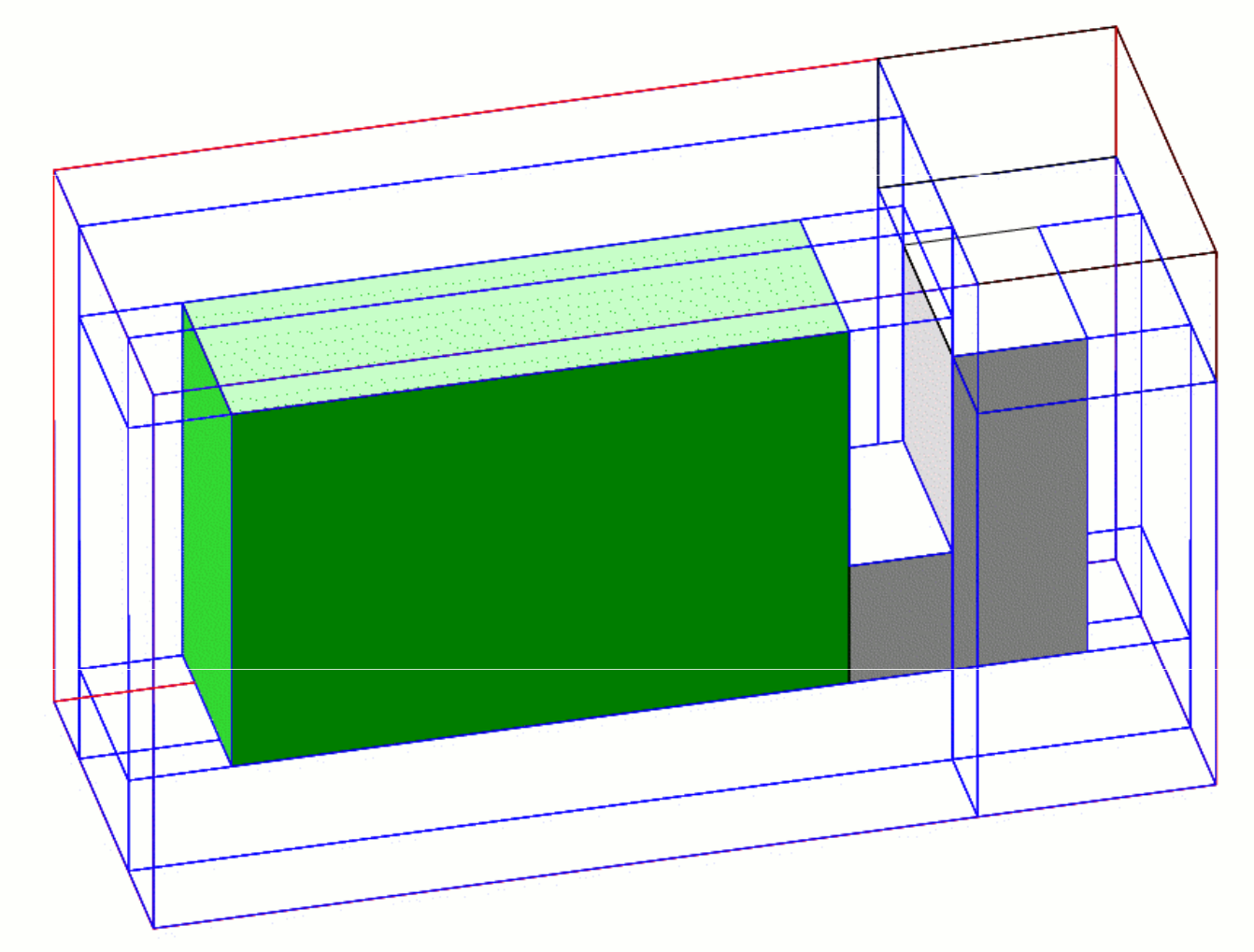
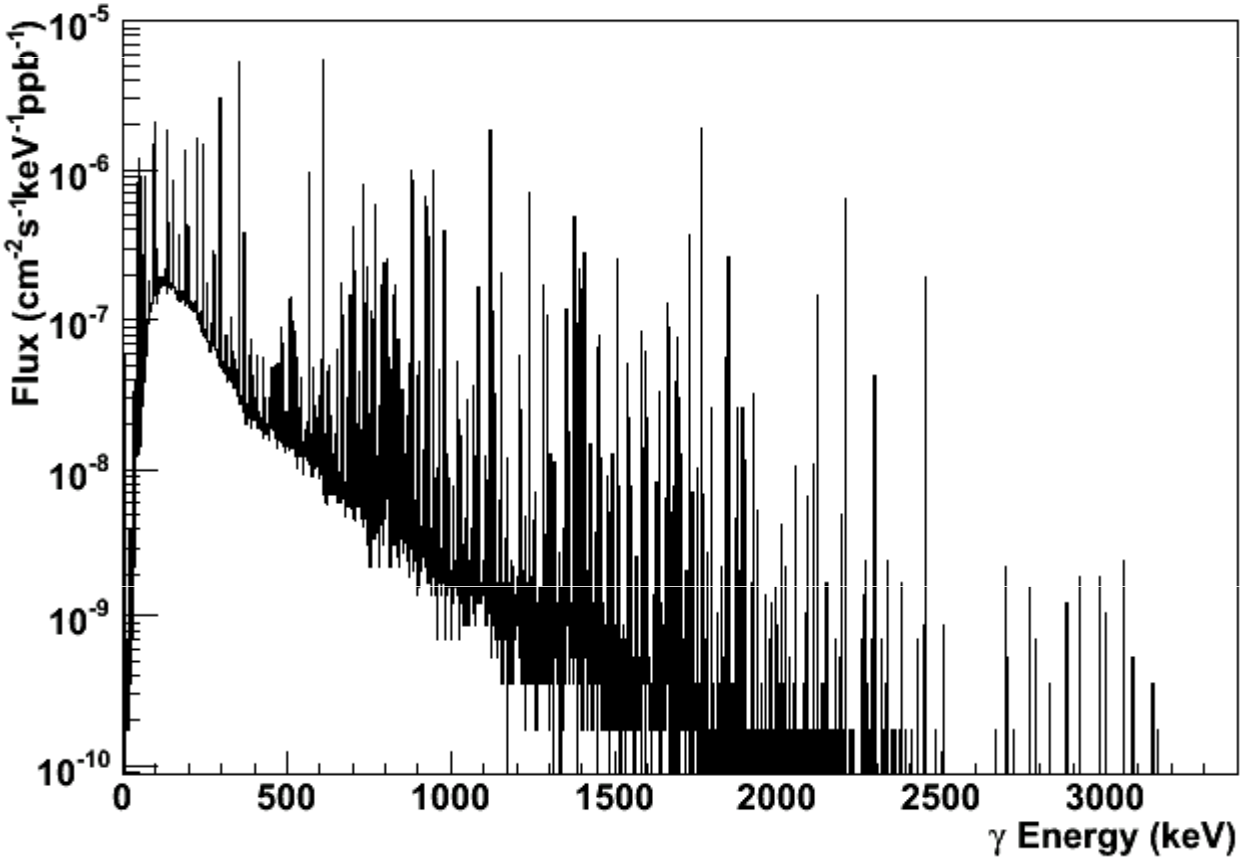
Geometry

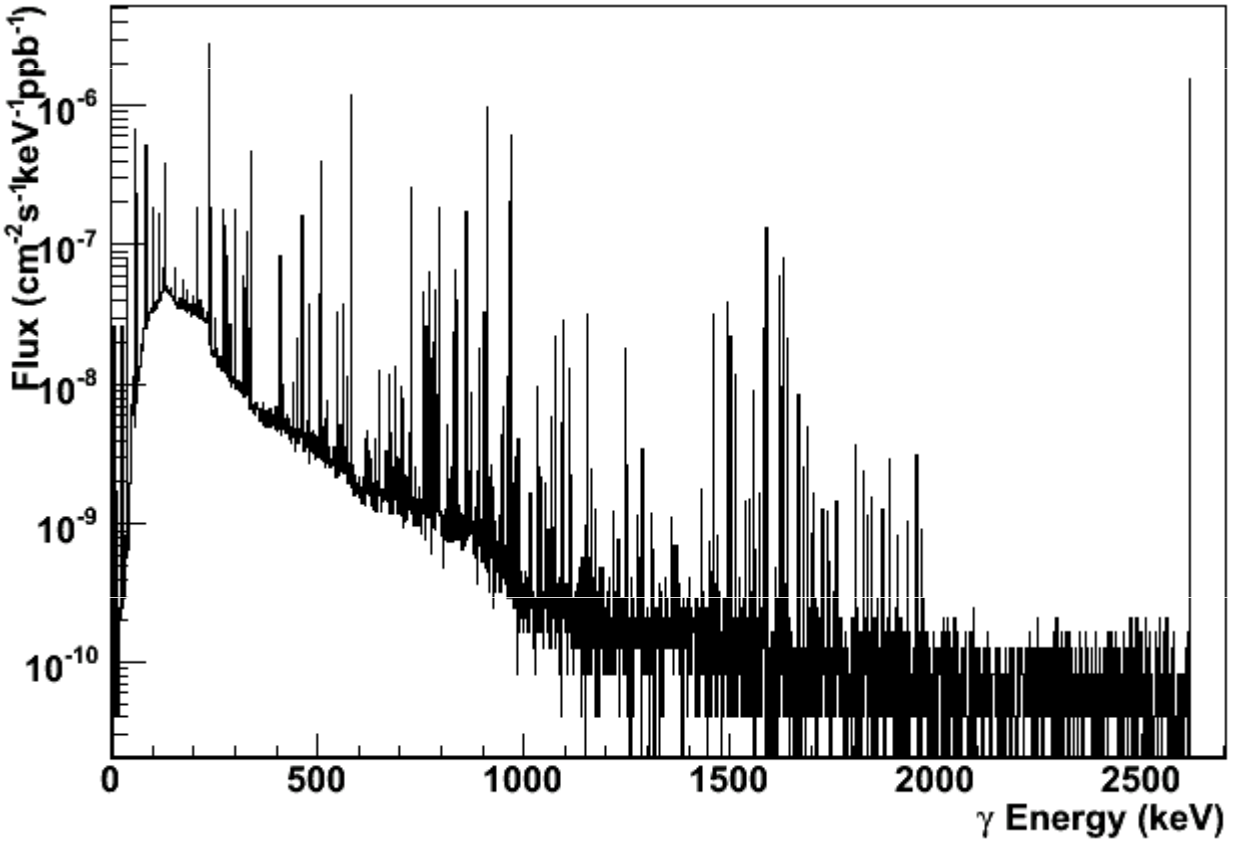
- SSteel thickness: 1/8 "
- Water thickness: 2.3m
- Internal Volume: 13.75 x 9 x 4.5m
- Entry Aisle width: 3m
- Total SSteel mass: 4.568×10^7 g



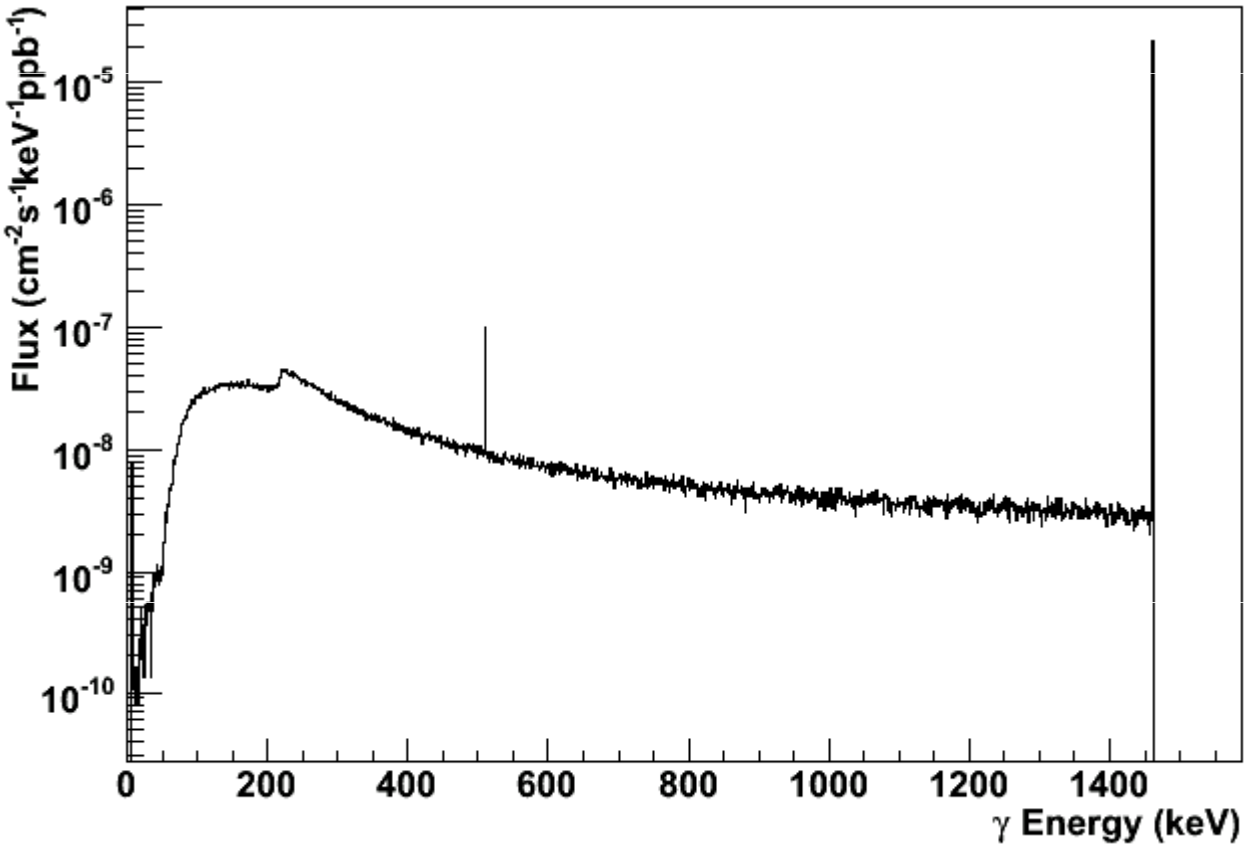
^{238}U induced gamma from SSteel



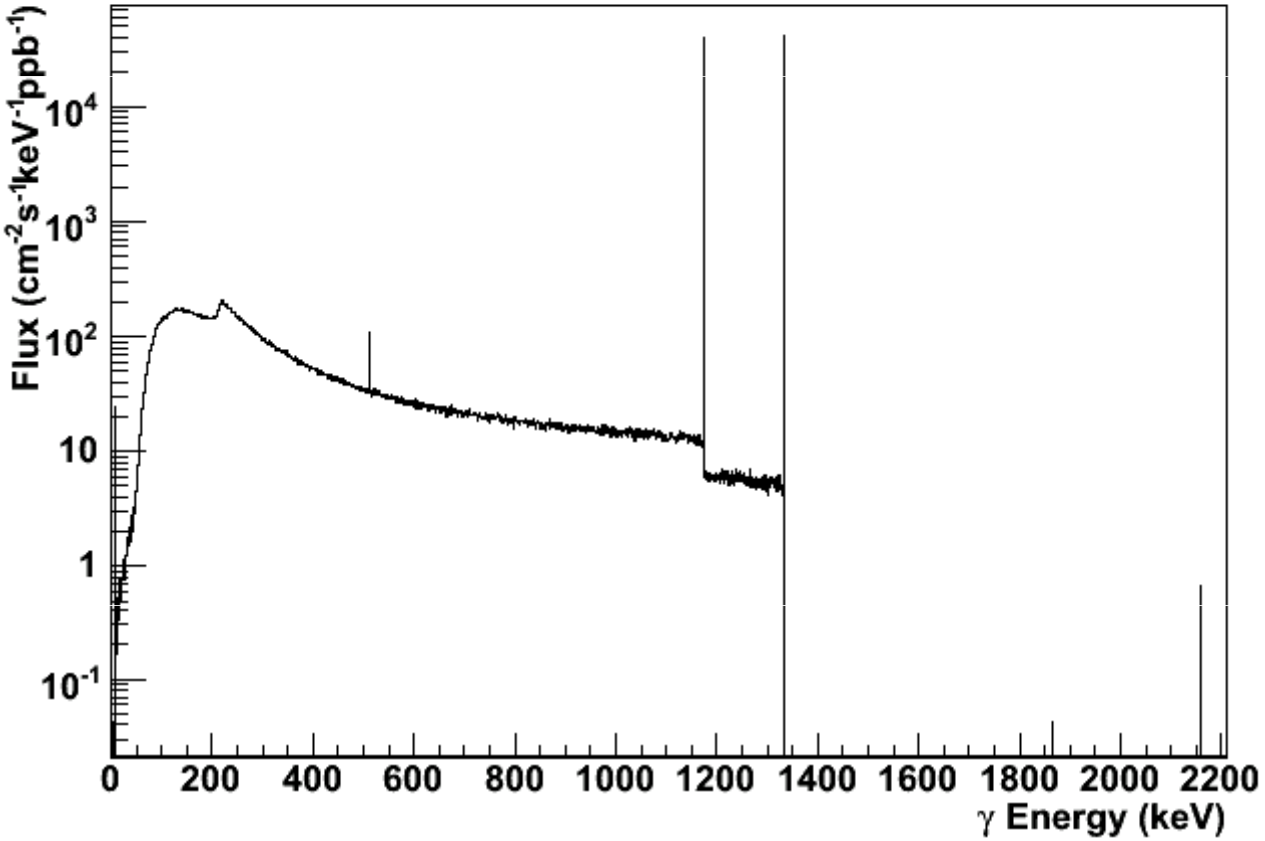
^{232}Th induced gamma from SSteel



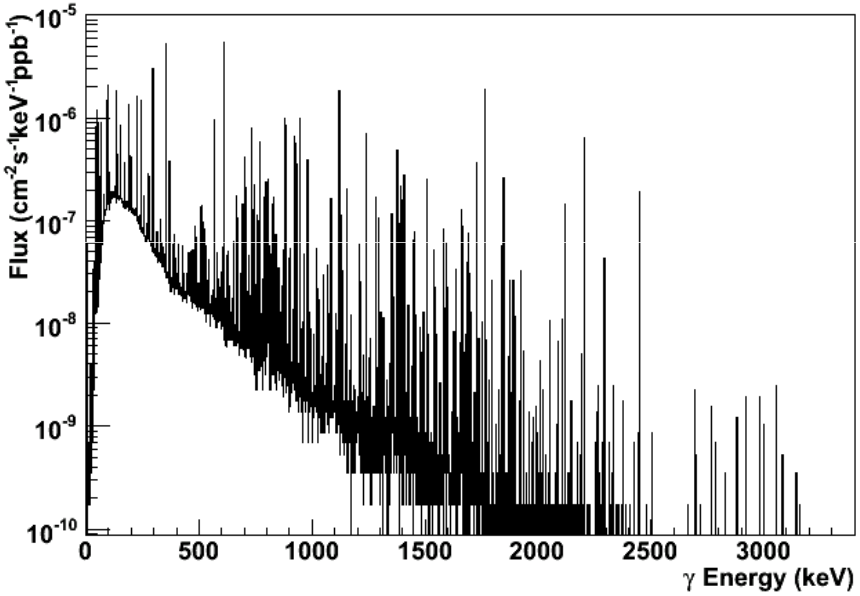
^{40}K induced gamma from SSteel

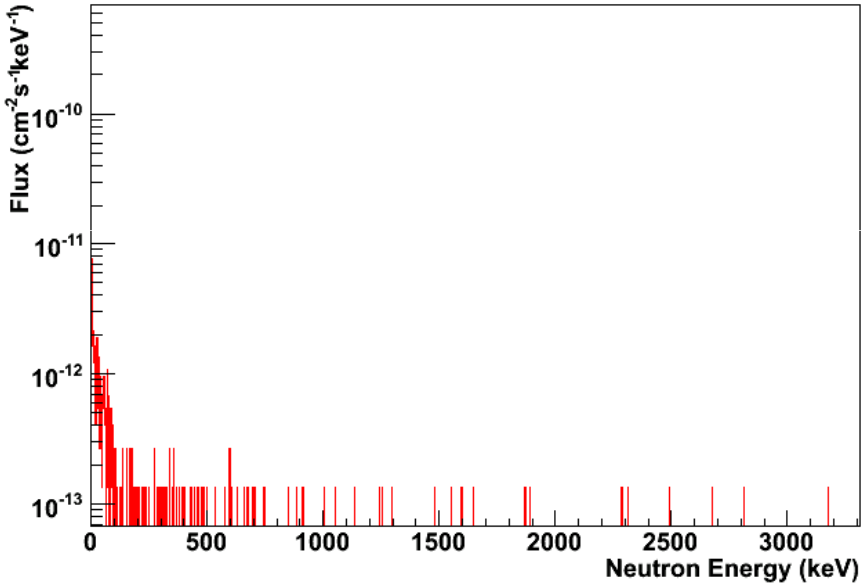


^{60}Co induced gamma from SSteel



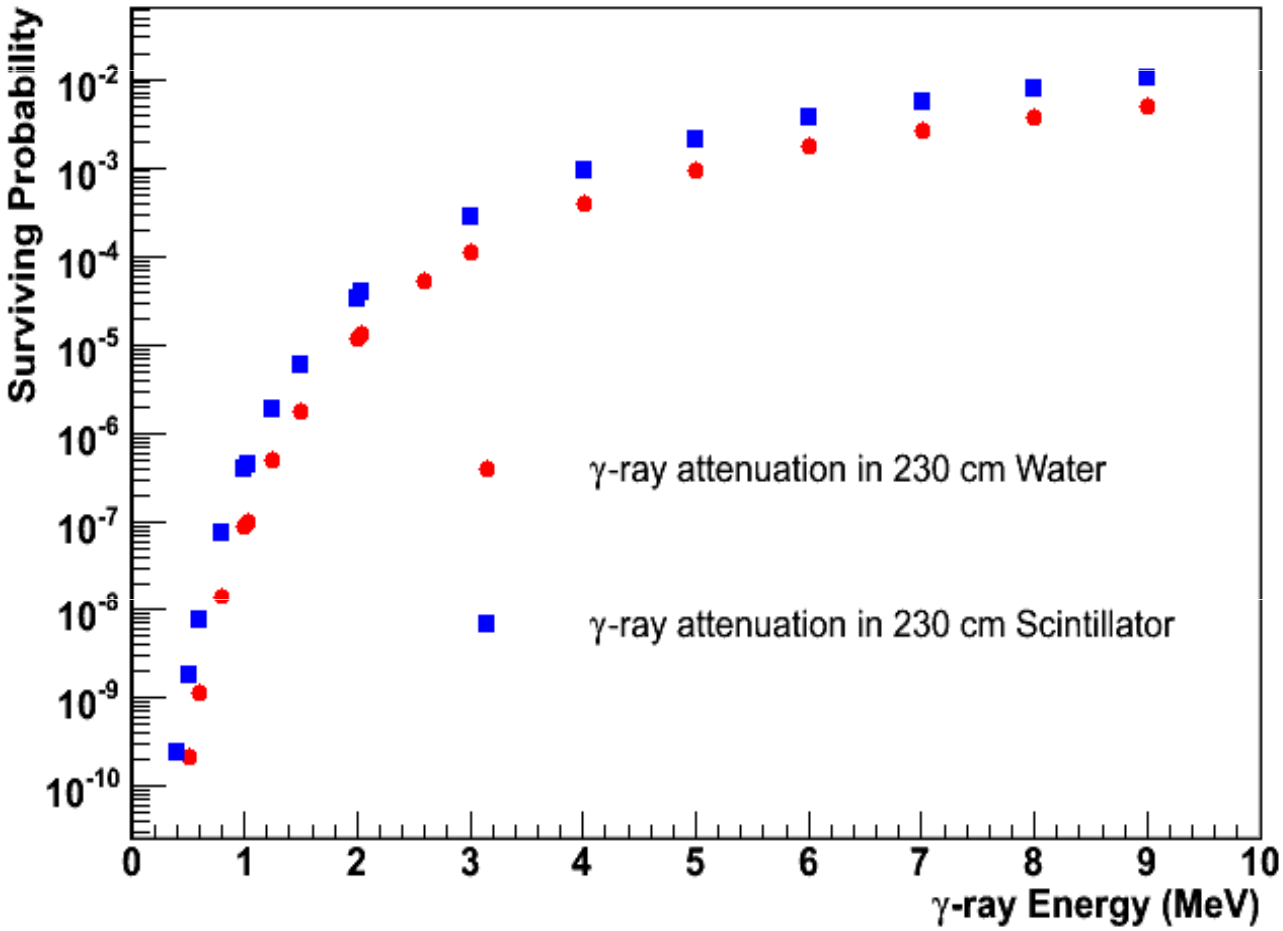
Gamma & neutrons from the rocks





- Input: for the 4850-ft level, we take the radioactivity of ^{238}U 0.55ppm, ^{232}Th 0.3ppm and ^{40}K 2.21%. That gives gamma-ray flux 1.778 /cm^2/s and neutrons 2.3×10^{-6} /cm^2/s from the rocks.
- Output: total gamma-ray: 7.974×10^{-5} /cm^2/s, total neutrons: 4.817×10^{-10} /cm^2/s.

Attenuation



Summary

^{238}U	**$9.5x10^{-5}$ $cm^{-2}s^{-1}ppb^{-1}$**	**SS (0.1 ppb) $9.5x10^{-6}$**	**Acrylic (24ppt)**
^{232}Th	$2.3x10^{-5}$ $cm^{-2}s^{-1}ppb^{-1}$	SS (0.1 ppb) $2.3x10^{-6}$	Acrylic (14 ppt)
^{40}K	$4.2x10^{-5}$ $cm^{-2}s^{-1}ppb^{-1}$	SS (0.028 ppb) $1.2x10^{-6}$	Acrylic ($(2.4x10^{-4}$ ppb)
^{60}Co	$1.4x10^{5}$ $cm^{-2}s^{-1}ppb^{-1}$	SS ($4.6x10^{-10}$ ppb) $6.4x10^{-5}$	
γ rays from rock	$8.0x10^{-5}$ $cm^{-2}s^{-1}$	Total:$7.7x10^{-5}$	Total: ~10^{-5}
Neutrons from rock	$4.8x10^{-10}$ $cm^{-2}s^{-1}$	References: EXO, GERDA, SNO	Reference: SNO

Conclusion

1. Stainless Steel: There should have more supporting materials.
2. Acrylic: The required thickness of acrylic is more. There must be stainless steel as the supporting materials.
3. Therefore, increasing the thickness of water will not helpful to further reduce the gamma-ray flux in the clean room.