Radiation Materials for Hall-A Polarized ^{3}He Target

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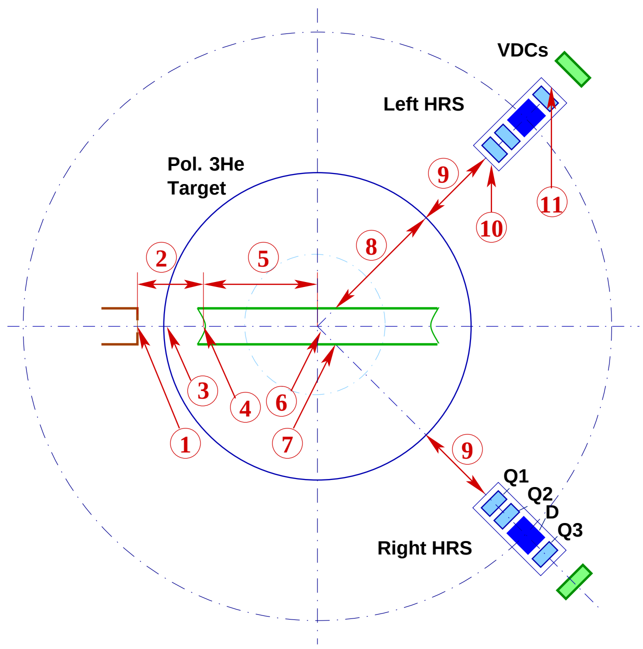
http://hallaweb.jlab.org/physics/experiments/he3/A1n/analysis/radlen.ps

This document summarizes thickness and radiation length for materials crossed by incident and scattered electrons for Hall-A Polarized ^{3}He experiments. Information listed here can be used for radiation effect caused by internal and external bremsstrahlung, and energy losses due to ionization for incident and scattered particles.

Figure 1: Radiation materials for hall A polarized ^{3}He target



1. exit window of beam pipe, 16 mils [a] Be;
2. 5cm air;
3. entrance window of scattering chamber, 15 mils Al;
4. target cell window, $\sim$ 130 μm [b] glass;
5. $\sim$ 10 atm ^{3}He, 1/2 of target cell length [c];
6. $\sim$ 10 atm ^{3}He, $(r - x_{tg})/sin\theta$, where r$\sim$1cm is target cell radius, x_{tg} is x position of scattering point in hall coordinates, θ is scattering angle;
7. target cell wall, $\sim$ 1.3mm glass [d];

8. ^{4}He inside target enclosure, 45.7 cm;

9. target enclosure exit window, 16 mil Al [e];

10. air gap between target enclosure and HRS, 65.1 cm for left arm and 64.2 cm for right arm;

11. spectrometer entrance window, 14 mils Kapton;

12. spectrometer exit window, 4 mils Ti.

material	X_0 (g/cm^2)	(cm)	density
air	36.66	30420	1.205 g/l [f]
^{4}He	94.32	755164	0.1249 g/l
^{3}He	67.42	-	
Be	65.19	35.28	1.848 g/cm^3
Al	24.01	8.9	2.70 g/cm^3
Kapton	40.56	28.6	1.42 g/cm^3
Ti	16.17	3.56	4.54 g/cm^3
glass	19.5	7.04	use GE180, 2.77 g/cm^3

a. 1 mil=2.54×10^{-3}cm
b. depends on cell geometry
c. depends on target chamber density in beam, 1 amg=1.25×10^{-4}g/cm^3
d. depends on cell geometry
e. for E94010 it was 10 mil
f. density for gases are evaluated at 20° C, 1 atm