

Phys 586 Laboratory

Lab 5

Goal: In this lab you will measure the mass attenuation coefficient for aluminum and lead using the Cs source.

Reading: Knoll pp 53-55

Lab:

1. Set up an experiment to measure the mass attenuation coefficient using the NaI(Tl) scintillator and ^{137}Cs source (Mon, Tue groups) or ^{60}Co source (Wed groups).
2. Consider carefully your experimental setup. Remember that your experiment should use narrow beam geometry as much as possible. There are several lead bricks you can use to define your beam. There are various thicknesses of aluminum and lead with which to make your measurements.
3. You should collect at least 6 data points with each material. You may want to quickly graph your results using the available graph paper.

In your lab writeup, please include:

1. Raw data from your measurements.
2. Attenuation curves for the two materials.
3. A short calculation showing how you determined the mass attenuation coefficients. Estimate the error on your results.
4. Compare your results with the known values of the mass attenuation coefficients for these materials and energies. One easy lookup source is <http://physics.nist.gov/PhysRefData/contents.html>. Comment on your results.

Also, please answer the following questions:

1. What is the dominant photon process associated with the photon energies associated with ^{137}Cs and ^{60}Co sources incident on aluminum and lead?
2. Using your results, what is the HVL for your photon energy for aluminum and lead?
3. Make pictures of the photon interactions for your relevant photon energy incident on aluminum and lead. Go to <http://www2.slac.stanford.edu/vvc/egs/basicstool.html>.

Choose photon, the energy of the photon, number of particles in the beam (10-20), and a length (10-20 cm) of aluminum or lead. For an enhanced view you can choose the advanced simulation tool and set the display size to 1000 and the zoom factor to 20. Include the pictures with your report. Comment on these.