

**PHYSICS 510 -N-1  
GAMMA RAY ABSORPTION**

**Objectives**

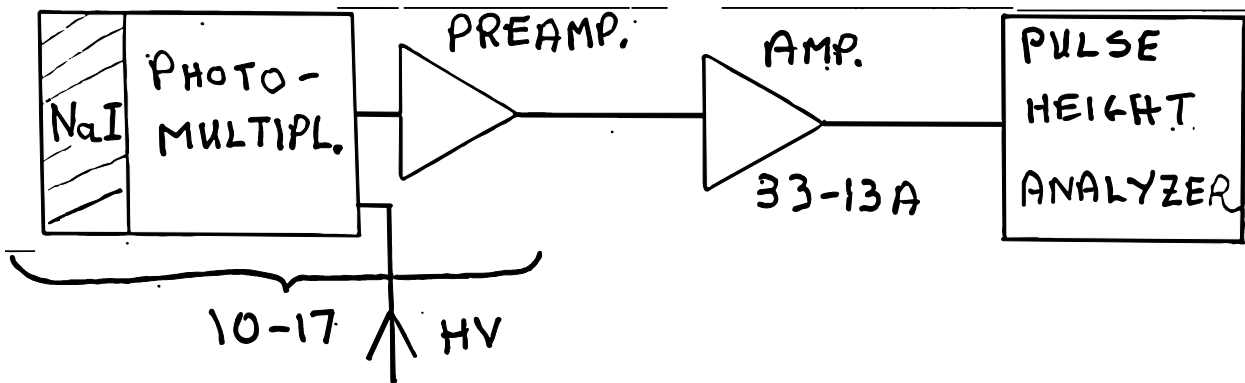
- 1) Measure the absorption coefficients of Co60 gamma rays in lead and copper.
- 2) Study the effect of the geometry on your results

**Apparatus**

The equipment is:

- i) a RIDL scintillator, photomultiplier and preamplifier assembly (Model 10- 17).
- ii) the amplifier portion of a RIDL amplifier and single channel analyzer module (Mode133-13A).
- iii) a RIDL HV(high voltage) supply
- iv) a Nuclear Data pulse height analyzer that is a card plugged into an IBM PC.

Schematically the apparatus can be represented as follows:



### **Procedure**

- 1) Observe the amplifier output on an oscilloscope. Adjust the HV and the amplifier gain to get a complete range of pulse heights with a Co60 source. The amplifier output should not be saturated (the tops of pulses squared-off) for big pulses.
- 2) Become familiar with the operation of the pulse height analyzer. A summary of instructions and a chapter from the user's guide are included in the book for the experiment.
- 3) Measure the Co60 pulse height distribution and explain its features in your report.
- 4) Measure the pulse height distribution for different thicknesses of Cu and Pb absorber between the source and detector.
- 5) Use these data to determine the absorption coefficients for the two Co60  $\gamma$ -rays by considering the dependence of the counting rate on absorber thickness. Do this for different regions of the pulse height spectrum to study the effects of Compton scattering in the absorber .
- 6) Investigate the effect of geometry , i.e. solid angle, on results. Do this for different regions of the spectrum. Explain the results.

### **References**

Bleuler: Experimental Nucleonics, P. 305-316.

Hofstader & McIntyre: Nucleonics 1,32 (1950)

Segre: Experimental Nuclear Physics, Vol. 1, p. 304-344. Colgate: Phys. Rev. .8.1, 592 (1952)