

Radiation Annihilation, Revised Notes on Procedure

Physics 510 Experiment N-12

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1 Procedure

- I Using the block diagram of the electronic setup, check that all BNC's are in the correct place.
- II Place the ^{22}Na source between the two PMT's with the source closer to PMT A and further from PMT B.
- III For PMT-A adjust the voltage and amplifier gain in order to see the complete range of pulse heights on the oscilloscope.
 - A Send the AMP OUT through the delay line (which should originally have all settings on zero), the DELAY OUT should hook-up to one channel on the oscilloscope.
 - B First look for the characteristic .511 MeV annihilation gamma-ray which will show a distinct photoelectric absorption line. At this voltage and gain, the pulse should not look saturated (it should not be squared off).
 - C The 1.28 MeV gamma-ray may be saturated at this gain, to check this simply lower the gain by a factor of two. By doing this all lines should now be observed clearly.
 - D To check that annihilation radiation is in fact being observed attach ANAL OUT (analyzer out) from PMT-A to the trigger on the oscilloscope.
 - E Now trigger the spectrum via the pulse from ANAL OUT.
 - F Note how only the tail end of the spectrum can be observed. In order to see the full spectrum, increase the delay in the delay line from zero until there is a 0.25-0.5 μsec plateau before the full spectrum. (The fine delay knob might give some problems, if it does, just hit it softly.)
 - G Changing PMT-A's discriminator unit to integral mode, now raise the threshold from zero and note the effect on the spectrum.
 - H Finally, lower the threshold to zero again and raise it until the noise in the spectrum is cut-out.