The tagging range of our pair spectrometer.

This is a simulation of possible detecting system placement around our pair spectrometer which will allow us to convert positron deflection angle into positron energy.

It was simulated the deflection of electron and positrons in the magnetic field of the pair spectrometer. B-field was measured in the central plane only and distributed all over the gap of the spectrometer.

Detectors were placed 1 cm (as an example) away from the magnet.

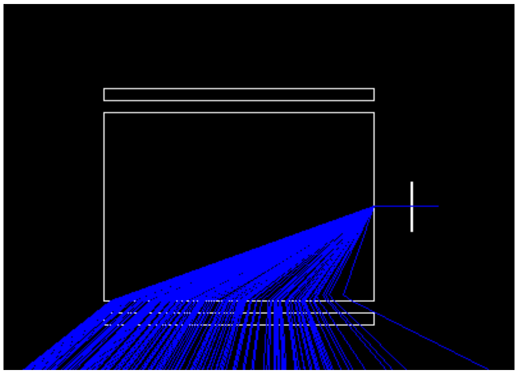

Fig. A. *Top view of the pair spectrometer. The converter is on the right. Positron trajectories are shown in blue.*

The energy spectrum of the incident particles was chosen to be linear in the range 1 – 12 MeV and particles were emitted in the plane of Fig. A. The converter and the surrounding were filled with vacuum.

The resulting picture of the electron and positron deflection by the magnetic field is shown below.

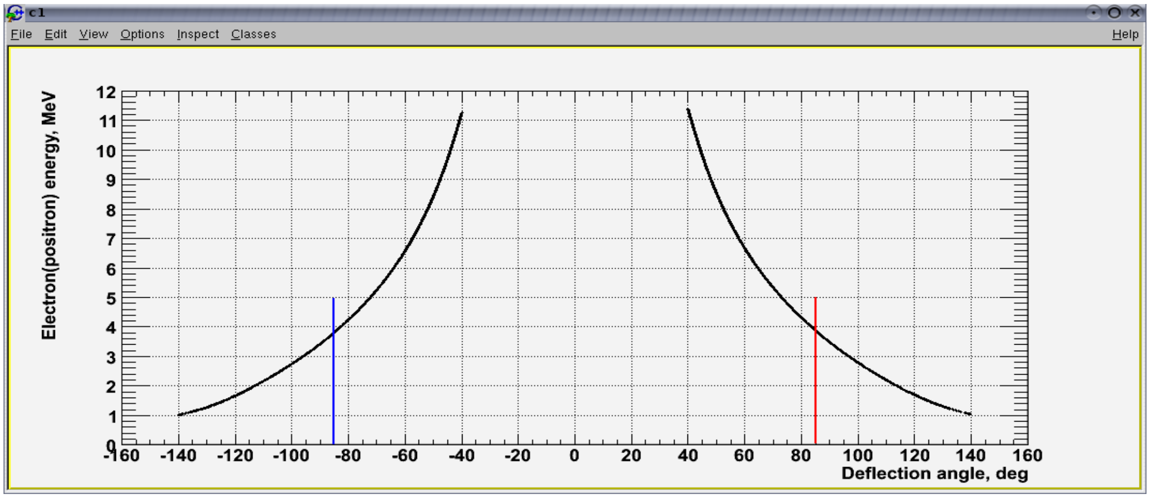

Fig. B. *Positron (left) and electron (right) energy VS. deflection angle.*

90^0 markers correspond to the trajectories going perpendicular to the detector surface.

Placing detectors in a different way will give us different calibration curves.

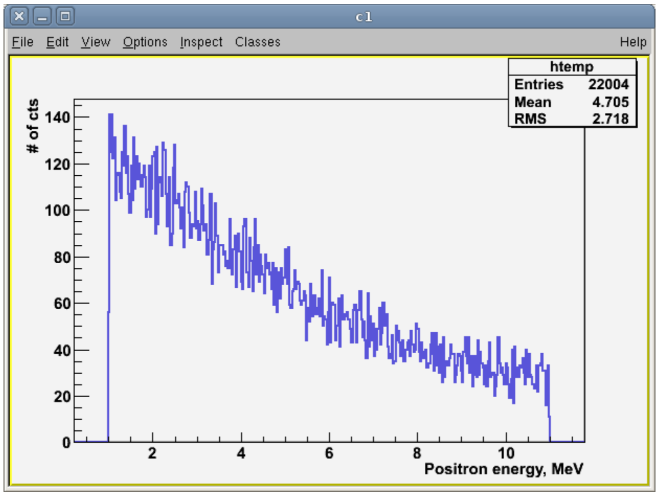

Fig. C. Positron energy spectrum. Energy cut is applied 1 – 11 MeV. Al converter 500 um thick was used. No more than 22004 positrons will be seen per second.

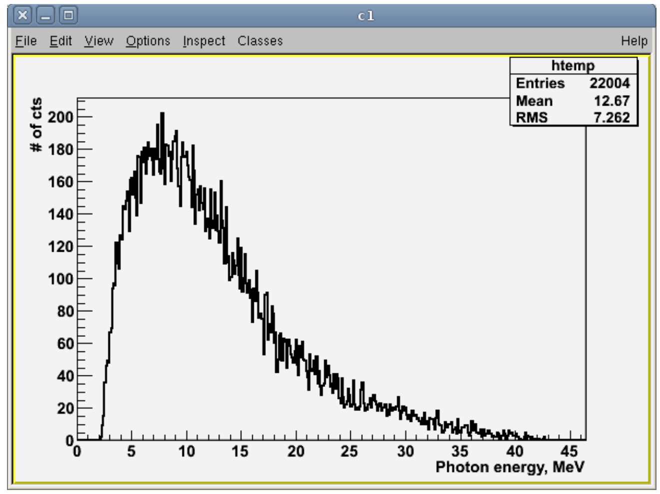

Fig. D. Photon energy spectrum corresponding to the energy cut placed on the positron energy spectrum. Al converter 500 um thick was used.

What about the rest of the photons which will make a contribution into photofission reaction and which will not leave any information about their flux?

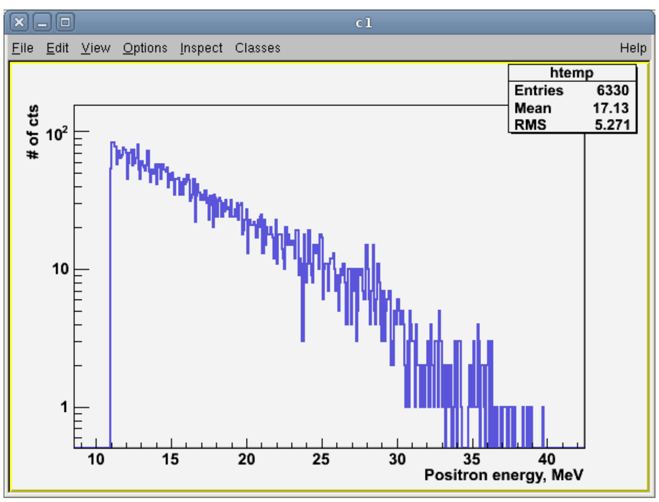

Fig. E. Positron energy spectrum. Energy cut is applied 11 – 45 MeV. Al converter 500 um thick was used. 6330 positrons will be lost due to geometry.

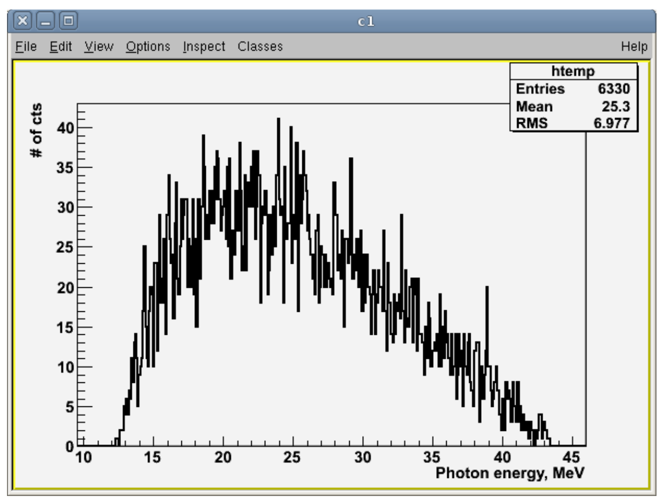

Fig. F. Photon energy spectrum corresponding to the energy cut placed on the positron energy spectrum. Al converter 500 um thick was used.

The total number of positrons emitted from 500 um Al converter ($11.2*10^7$ incident photons) was found to be 31475. The fraction of photon flux lost: 6330/31475 = 20.1 %

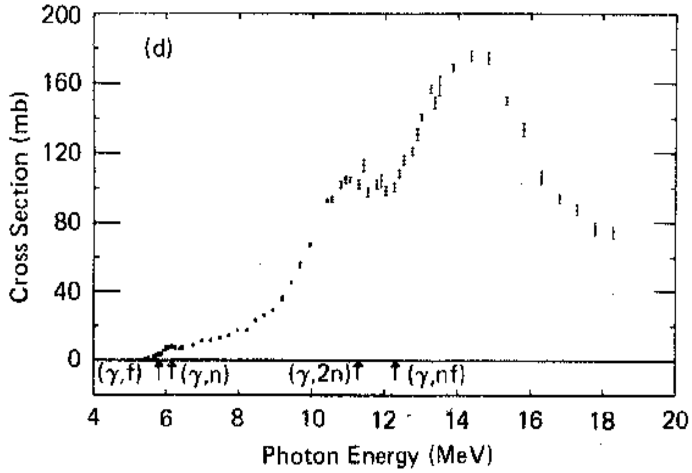

Fig. G. *Photofission crossection of U238*[1] .

Analysis of Fig. F tells one that there are 3354 photons in the range from minimum energy (~11.8 MeV) value to 25 MeV. Now we loose less information on the photon flux: 3354/22004 ~ 15.2%. According to Fig. G the photons lost would produce the highest rate of U238 photofission.

1. "Giant resonance for the actinide nuclei: Photoneutron and photofission cross sections for 235U, 236U, 238U, and 232Th", J. T. Caldwell and E. J. Dowdy, B. L. Berman, R. A. Alvarez, and P. Meyer. Physical Review C, (21), 1215, April 1980.