Neutron detector efficiency defined by the relative neutron yield in the deuteron photodisintergation prosess.

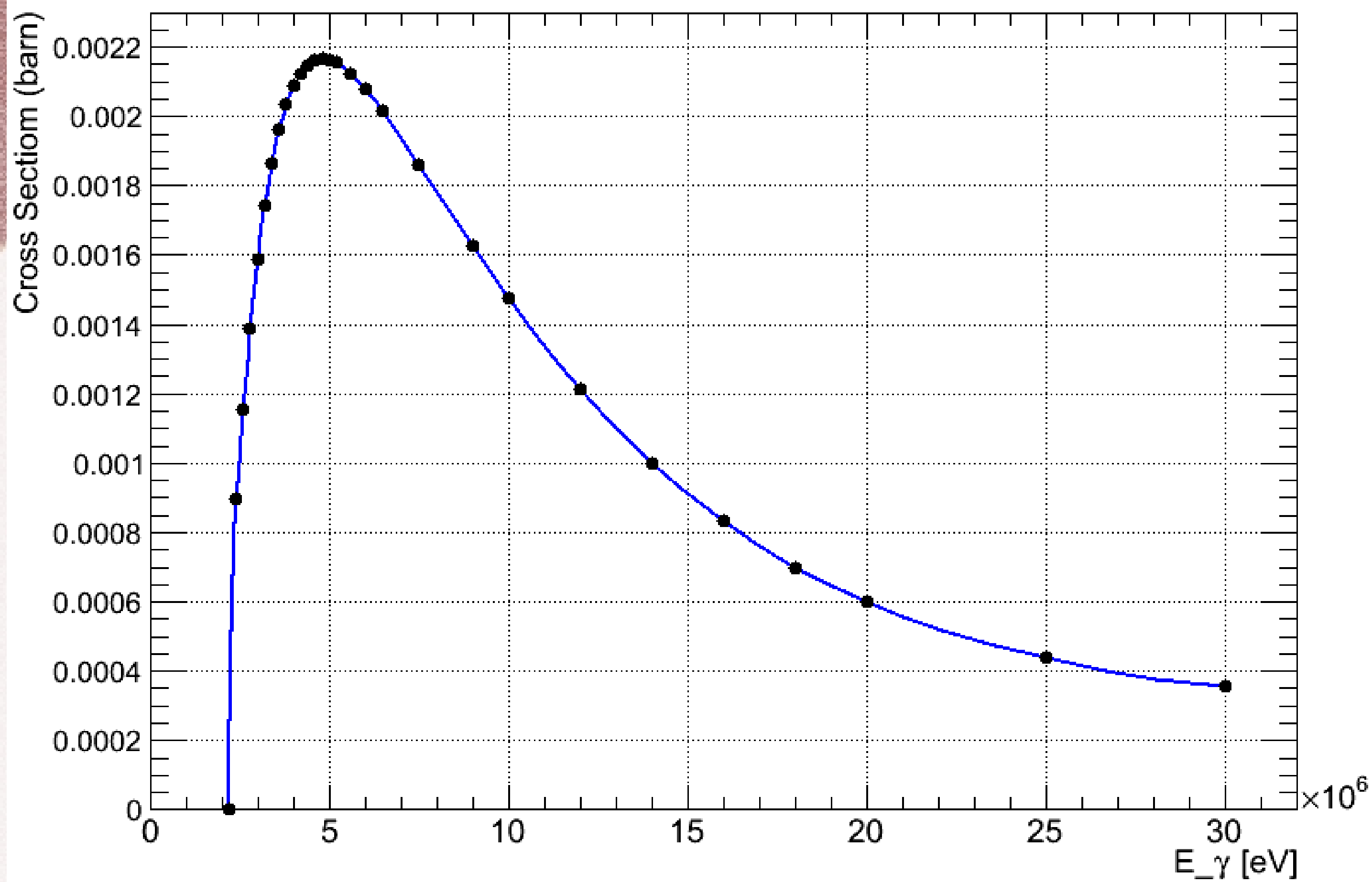

Fig. 1. Total cross section of H-2(γ,absorption). ENDF /B-VII.1.

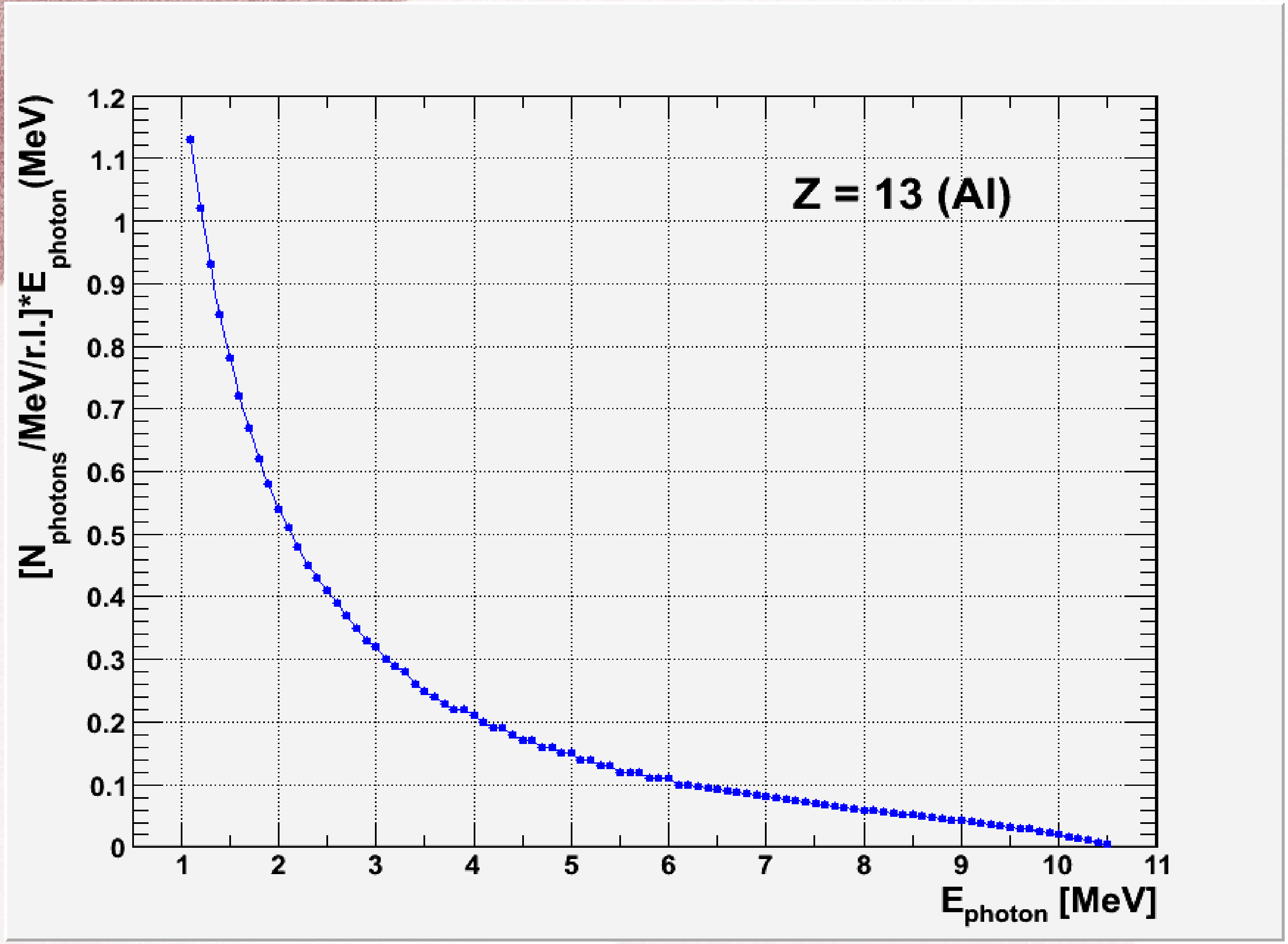

Fig. 2. Bremsstrahlung spectrum form Aluminium with end point energy 10.5 MeV [by Dr. Dale]

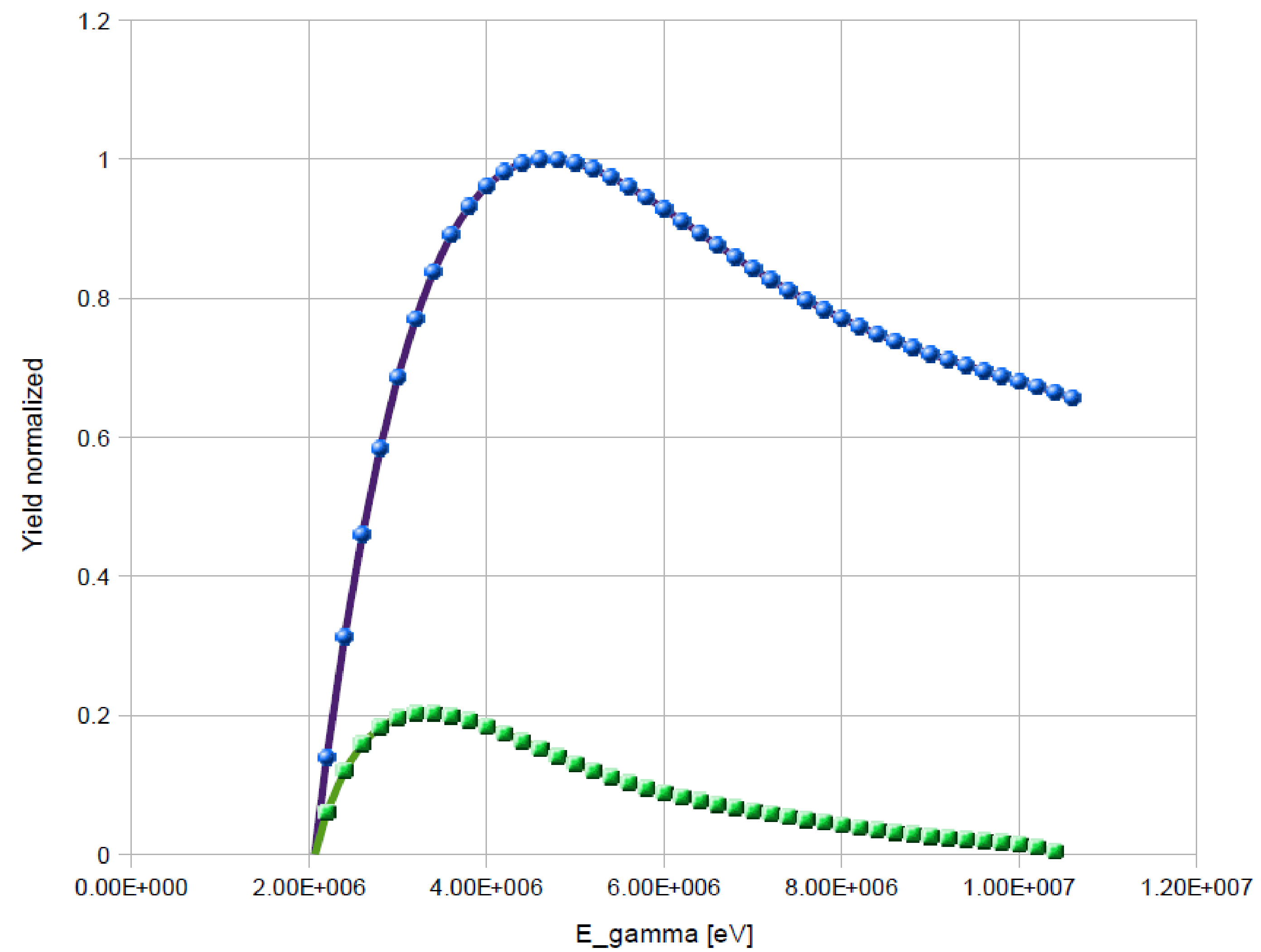

Fig. 3. Total crossection of H-2(γ,absorption) reaction weighted by the bremsstrahlung spectrum (green curve) .

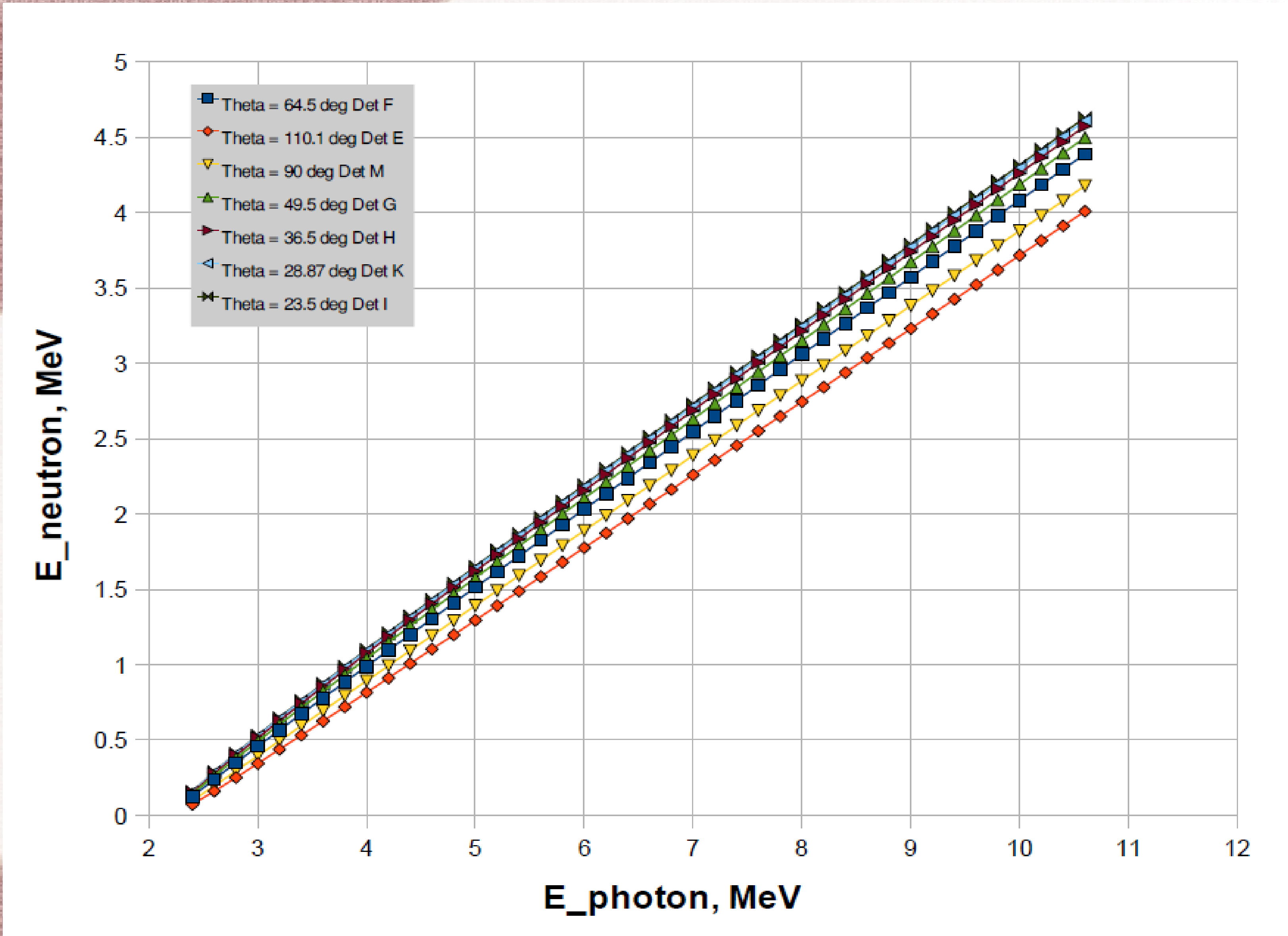

Fig. 4. Neutron energy vs. photon energy in the lab frame calculated using kinematics of the photodisintegration reaction.

$$\frac{d\sigma}{d\Omega}=A_\gamma+B_\gamma\sin^2(\theta)+C_\gamma\sin^2(\theta)\cos(\theta)+D_\gamma\sin^2(\theta)\cos^2(\theta)$$

E1, E2, M1 multipolarities are included [*]

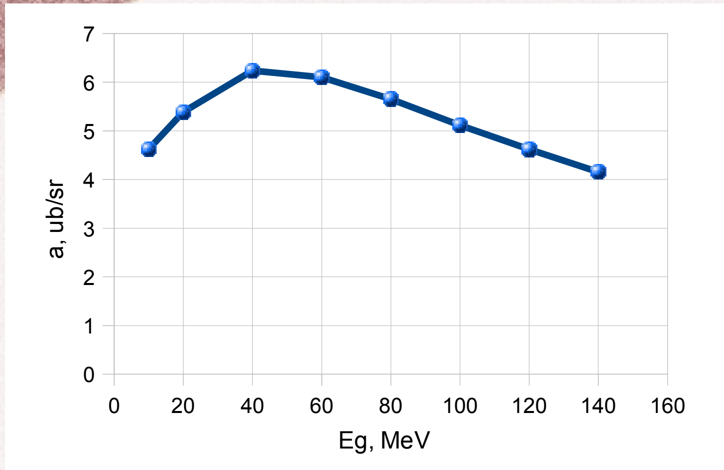

Fig. 5a. Coefficient A_{γ}. [**] F. Partovi, Ann. Phys. 27, 79 (1964)

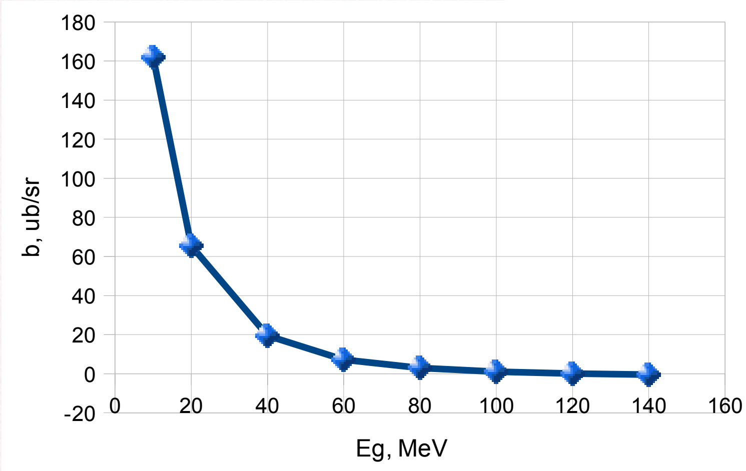

Fig. 5b. Coefficient B_{γ}. [**]

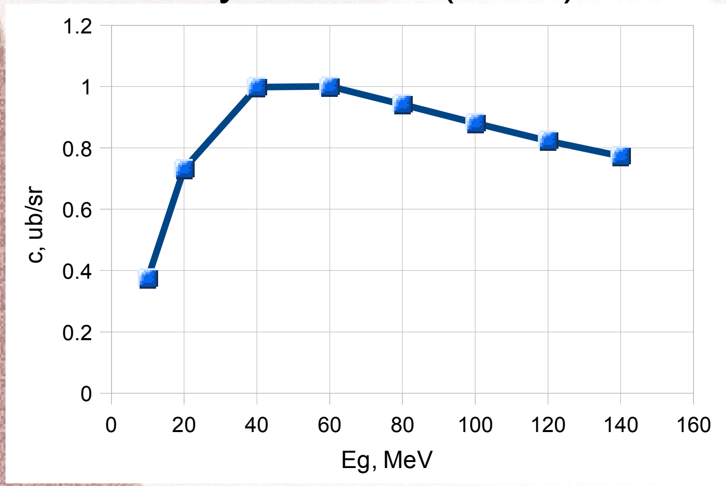

Fig. 5c. Coefficient C_{γ}. [**]

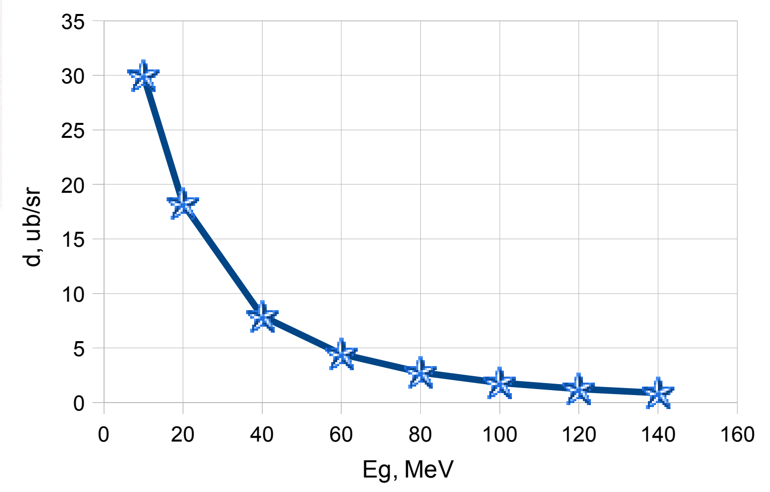

Fig. 5d. Coefficient D_{γ}. [**]

Partovi's coefficients after fitting

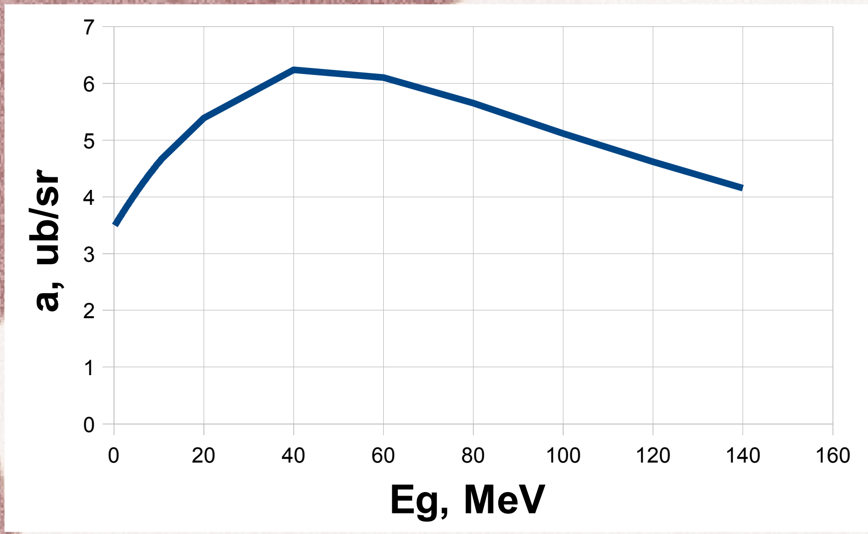

Fig. 6a. Coefficient A_{γ}.

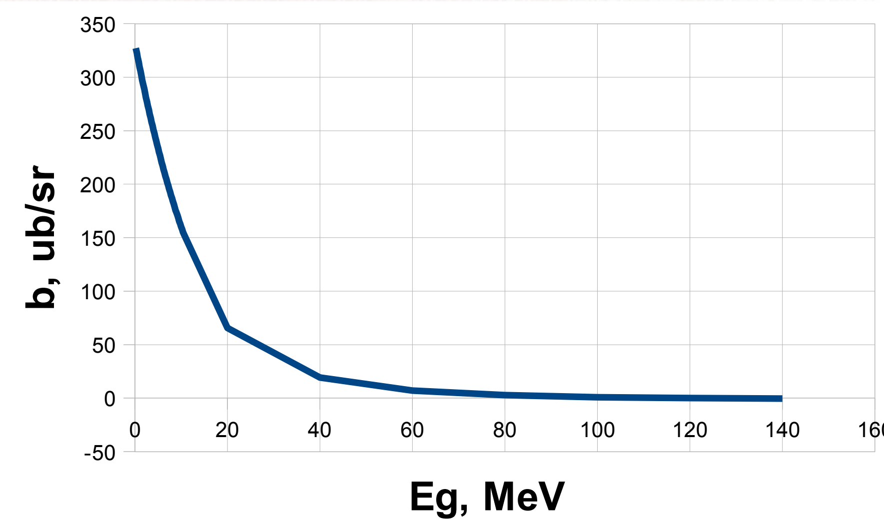

Fig. 6b. Coefficient B_{γ}.

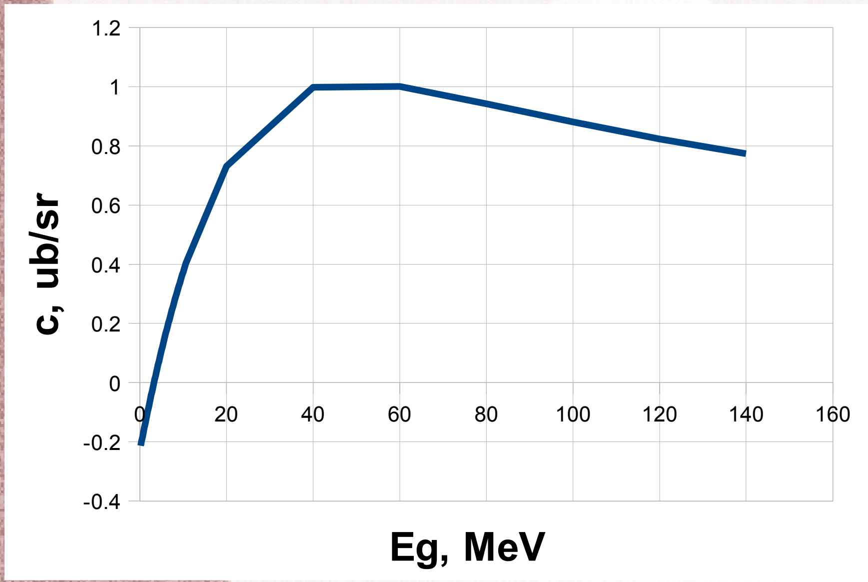

Fig. 6c. Coefficient C_{γ}.

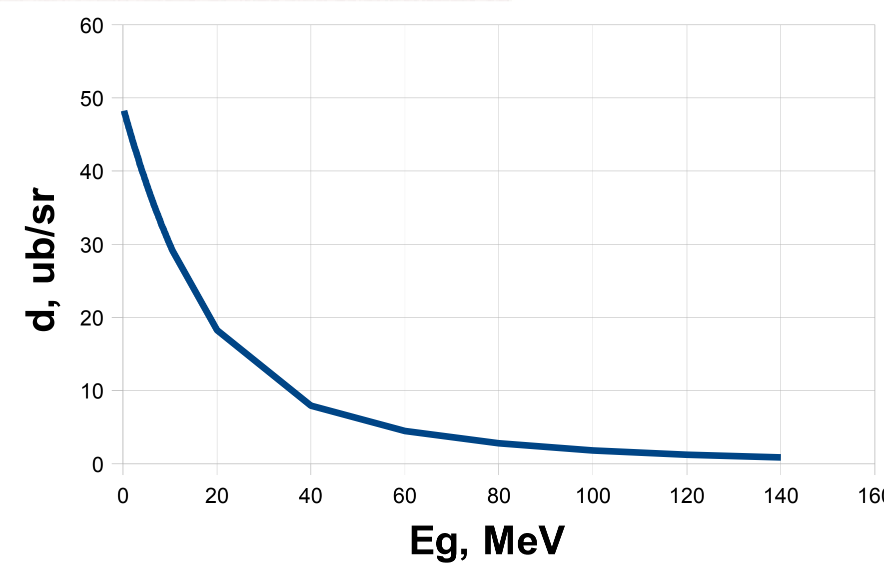

Fig. 6d. Coefficient D_{γ}.

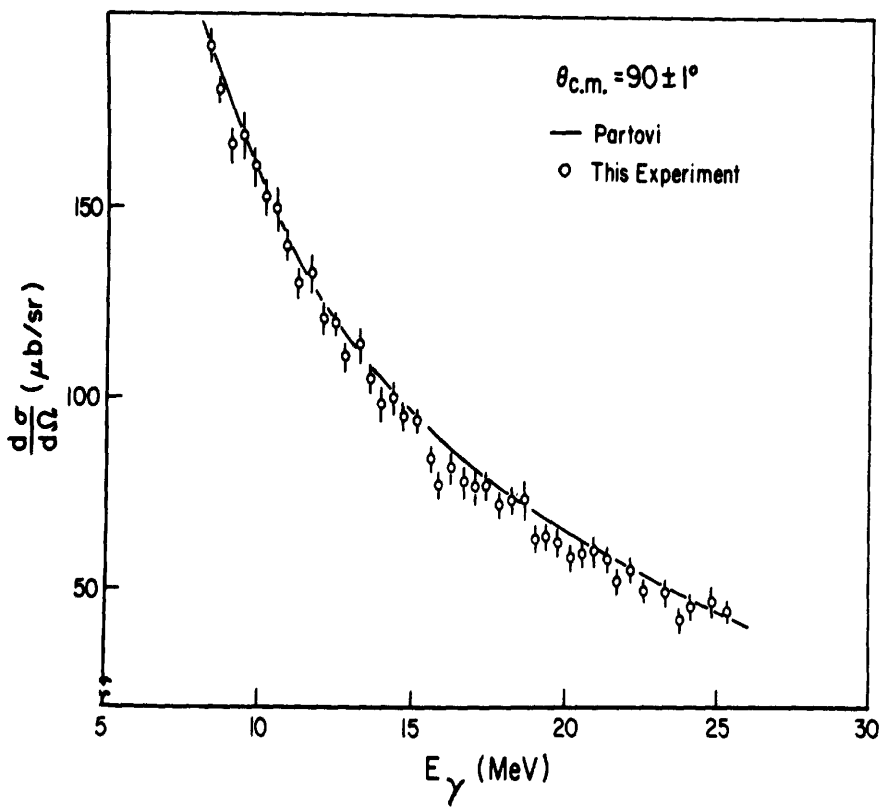

FIG. 7. Differential cross section at a c.m. angle of $90 \pm 1°$. The errors shown are statistical only.

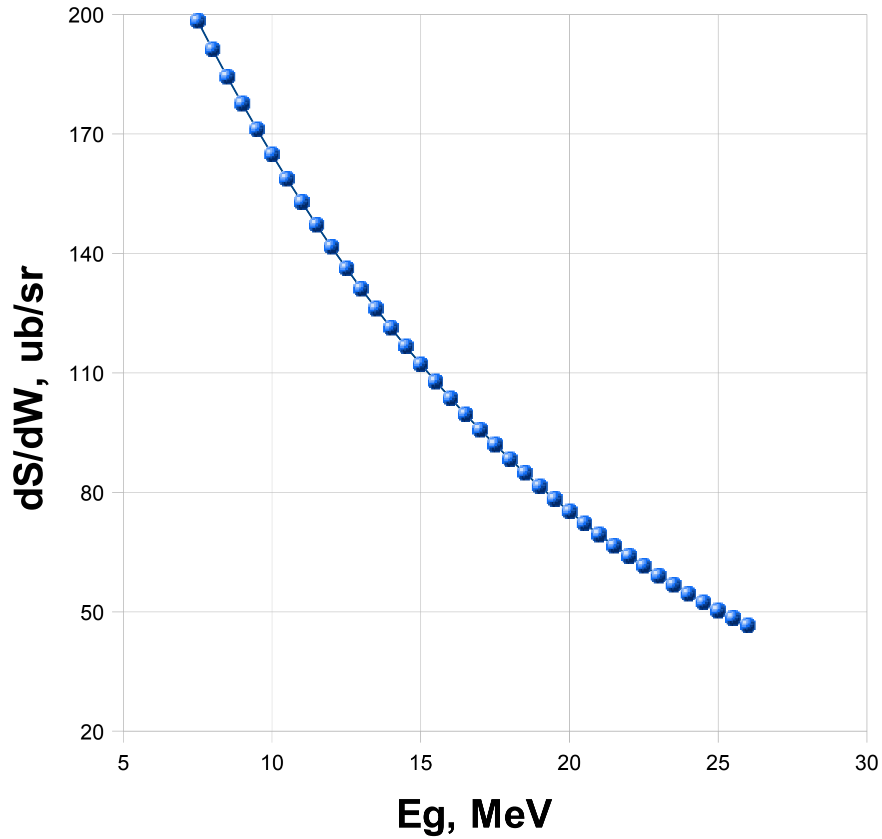

Fig. 8. Reproduction of the data plotted in Fig. 7 using fitted Partovi's coefficients.

[*] D. M. Skopik, Y. M. Shin, M. C. Phenneger, J. J. Murphy, *Photodisintegration of deuteron determined from the electrodisintegration process*, Phys. Rev. C, Vol. 9, 2, February 1974.

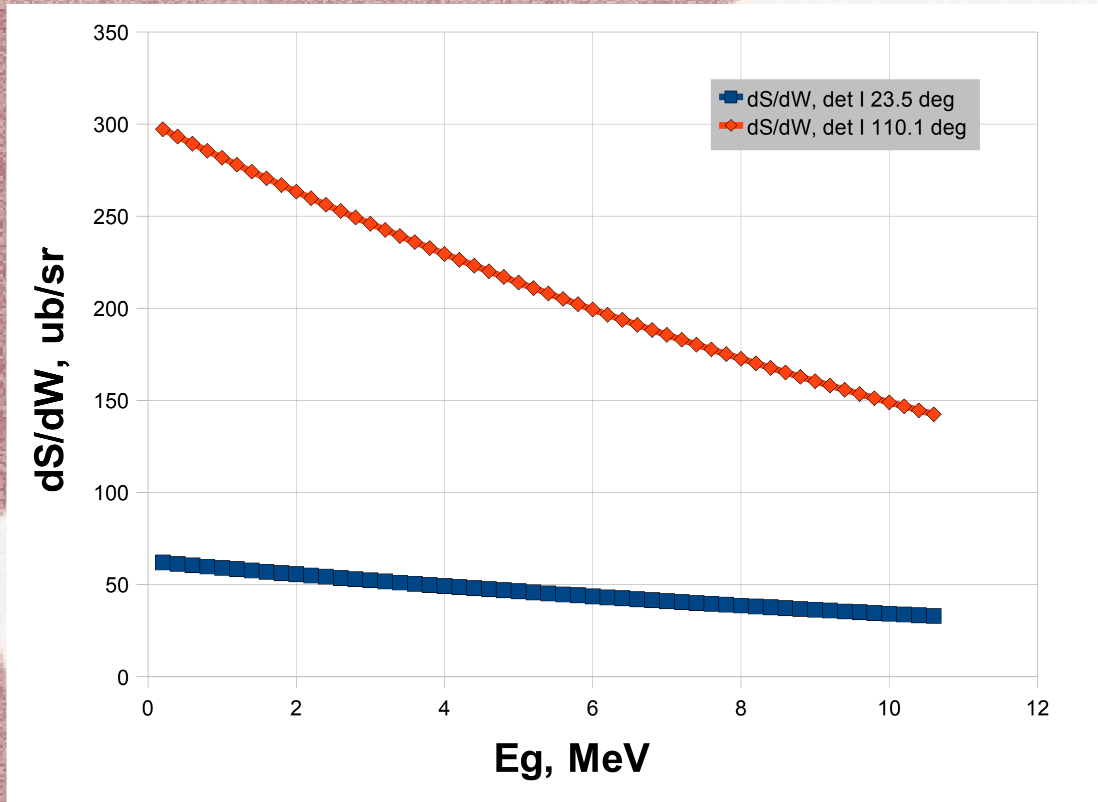

Fig. 9. Differential crossection of photodisintgration obtained with fitted coefficients form Patrovi's paper.

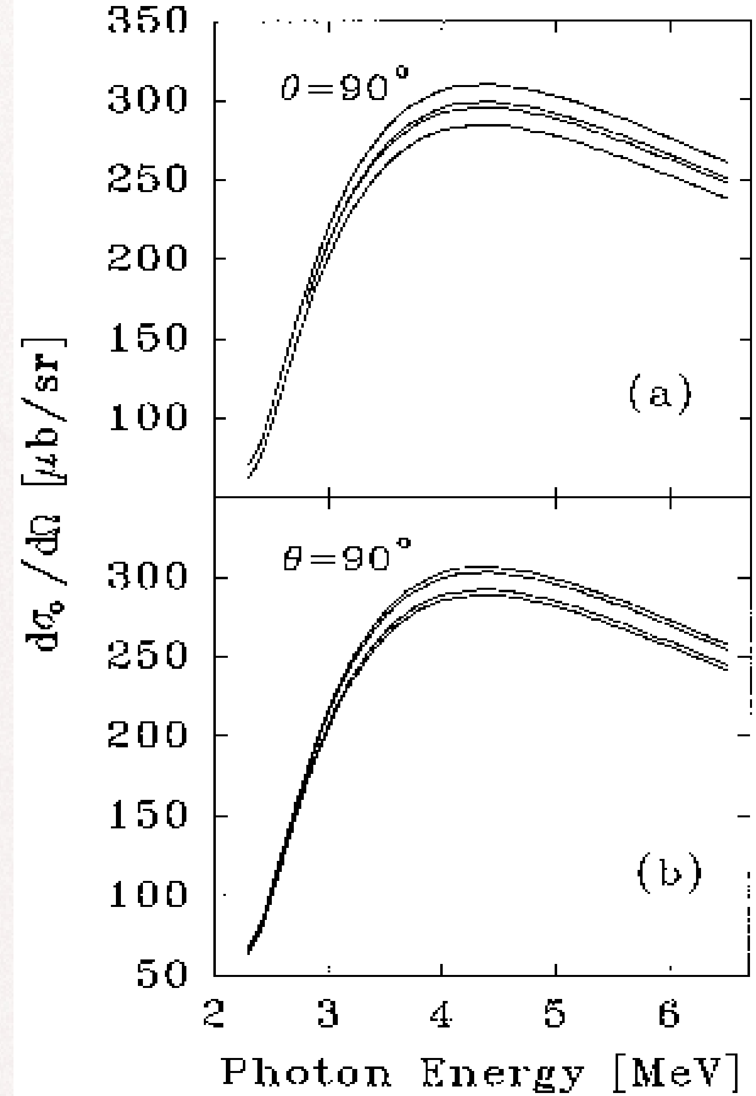

Fig. 10. Differential crossection of photodisintgration around the reaction threshold [***].

[***] V. P. Likhachev, M. N. Martins, Yu. A. Kasatkin, M. T. F. da Cruz, J. D. T. Arruda-Neto, R. Guarino, V. B. Shostak, *Disintegration of the Deuteron by Tagged, Linearly-Polarized Photons: Sensitivity of the Differential Cross Sections*, Braz. J. Phys. vol. 27 no. 3 São Paulo Sept. 1997

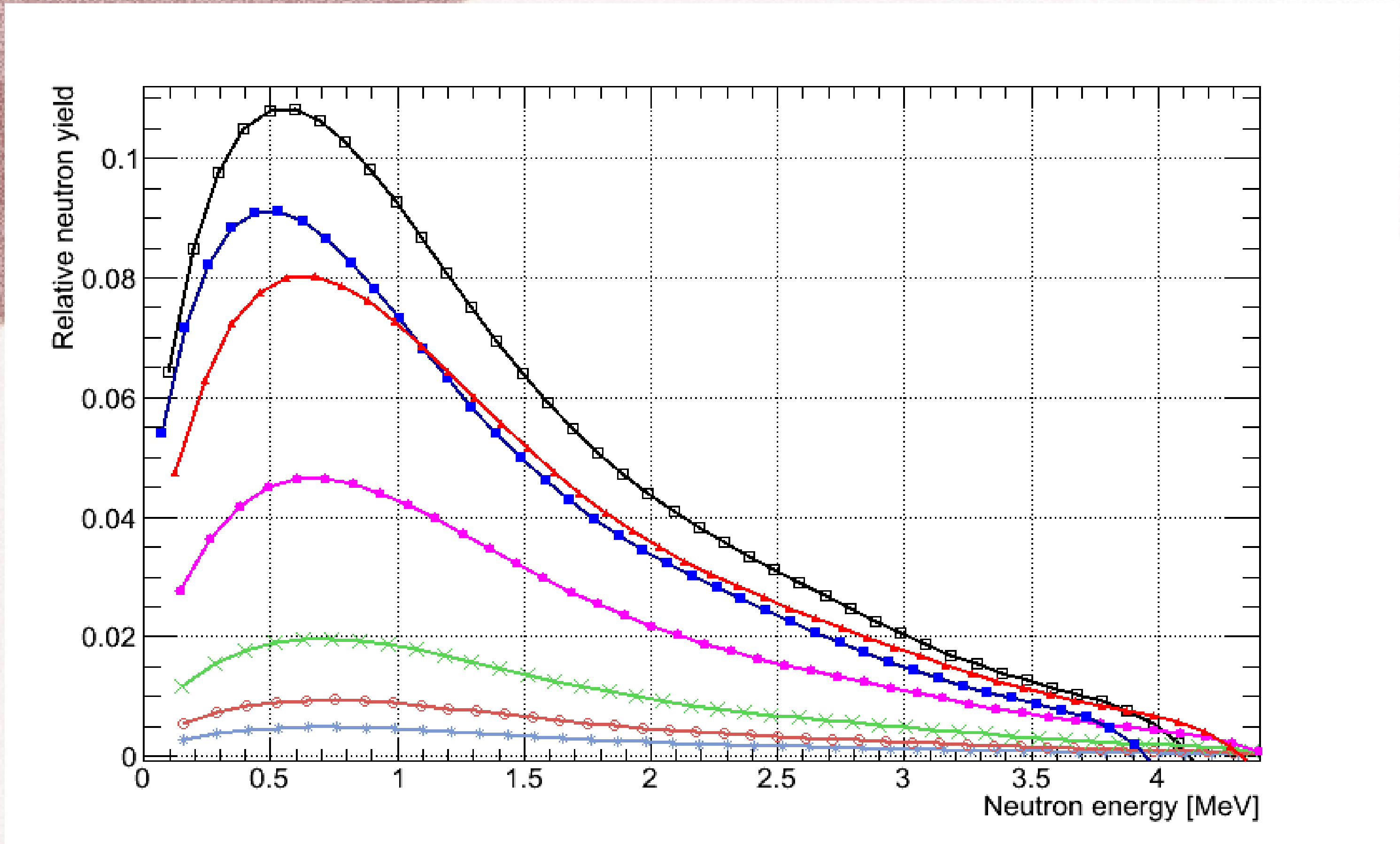

Fig. 11. Relative neutron yield for each of the neutron detectors obtained by weighting the neutron spectra with flux weighted total disintegration crossection and solid angles.

$$N_{detected}^{Det\,i}=N_{incident}^{Det\,i}\cdot\epsilon_i$$

$$N_{detected}^{Det\,j}=N_{incident}^{Det\,j}\cdot\epsilon_j$$

$$\frac{N_{incident}^{Det\,i}}{N_{incident}^{Det\,j}}=\frac{Area_i}{Area_j}$$

$$\frac{N_{detected}^{Det\,i}}{N_{detected}^{Det\,j}}=\frac{Area_i}{Area_j}\cdot\frac{\epsilon_i}{\epsilon_j}$$

$$\frac{\epsilon_i}{\epsilon_j}=\frac{N_{detected}^{Det\,i}}{N_{detected}^{Det\,j}}\cdot\frac{Area_j}{Area_i}=k_{ij}$$

$$\epsilon_i=k_{ij}\cdot\epsilon_j$$

The absolute efficiency of Det E was measured to be $\epsilon_E=14\%$,hence the rest of the efficiencies can be found.

- Partovi's calculation works well in the photon energy region above threshold value of photon energy in the photodisintegration reaction of D2.
- Different model describing differential cross section of D2 photodisintegration reaction near threshold value is needed.
- The efficiency can be defined once the differential cross section is known.