Reproduction of Laszewski's bremsstrahlung photons polarization calculation.

Here we used theoretical considerations of [1] to reproduce Laszewski's calculations published in [2].

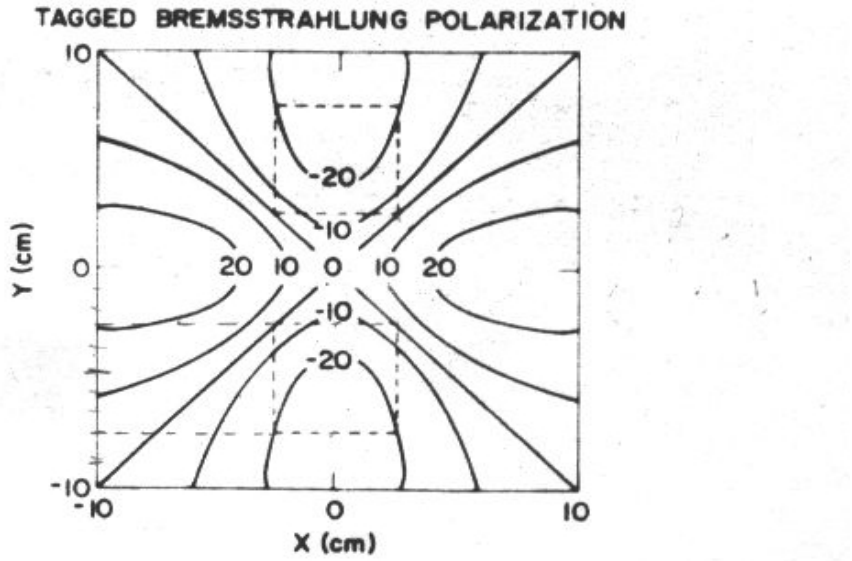

Fig. 7. Distribution of photon polarizations at the scattering target position for $E_1 = 18.4$ MeV, $E_\gamma = 11.4$ MeV with no restrictions on residual electron acceptance. Target dimensions that are θ_c on a side are indicated by the dashed lines.

Fig. a. Laszewski's paper results.

The distance from the target and bremsstrahlung converter was 183 cm [1]. According to the plot above, the polarization 20 % is achieved at ~ Y=0, X=5 cm which corresponds to polar angle 1.56^0. For the case under consideration we have characteristic angle = 1.557^0. So the maximum polarization on the target is 20 %.

Assuming that the material of the converter was Aluminum, we get the following dependence of the photon polarization vs. polar angle for incident electrons with energy 18.4 MeV and bremsstrahlung photons with energy 11.4 MeV (see *Fig. b*).

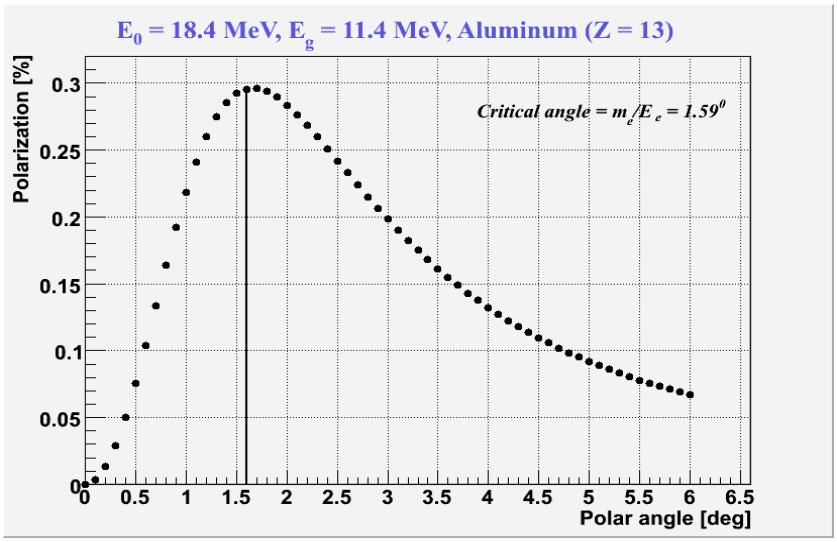

Fig. b. *Reproduction of Laszewski calculation [1] of photon polarization.* ***Complete screening.***

One can see that the value of th characteristic angle is reproduced well, however, the polarization value is about 9 % higher than the one in *Fig. a* .

Some different results can be achieved if one uses arbitrary screening (Thomas-Fermi model). The following dependence of the photon polarization vs. polar angle for incident electrons with energy 18.4 MeV and bremsstrahlung photons with energy 11.4 MeV can be found in *Fig. c* below.

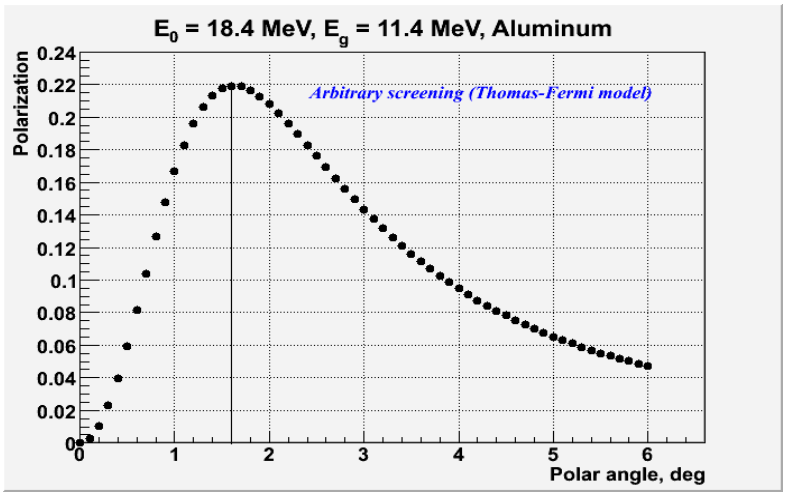

Fig. c. *Reproduction of Laszewski calculation of photon polarization.* ***Arbitrary screening (TF model).***

In the case of apllication of Thomas-Fermi model one can get better agreement. The difference in the polarization pictured in *Fig. a* and *Fig. c* is about 2 %.

References.

[1]. Haakon Olsen, L.C. Maximon, *Photon and Electron Polarization in High-Energy Bremsstrahlung and Pair Production with Screening*, Phys. Rev. **114**, 887 (1959)

[2]. Ronald M. Laszewski, Peter Rullhusen, Samuel D. Hoblt, Steven F. Lebrun, *Enhanced Linear Polarization for Tagged Photon Beam*, NIM 228 (1985) 334-342