GEp Event Generator

status update

09/11/13

Moshe Friedman

cross sections

elastic cross sections:

hydrogen - Arrington Phys. Rev. C 69, 022201 (2004) (considered reliable).

^{4}He and ^{14}N – charge and magnetization densities from De Jager, At. Data Nucl. Data Tab. 14 (1974).

non-elastic cross sections:

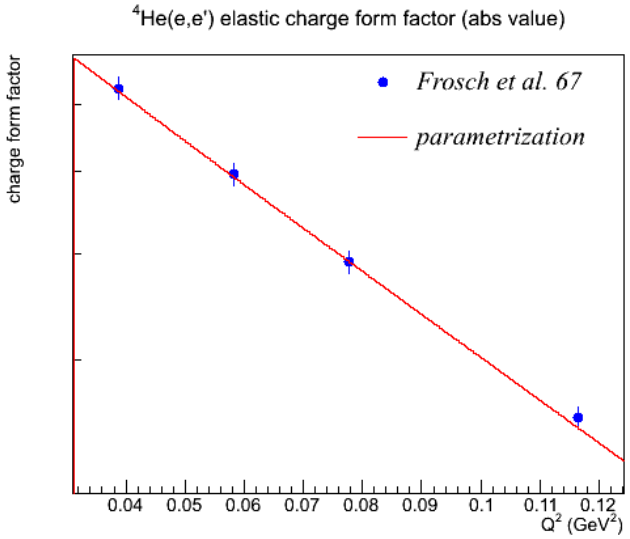
PBosted model – code by Chao

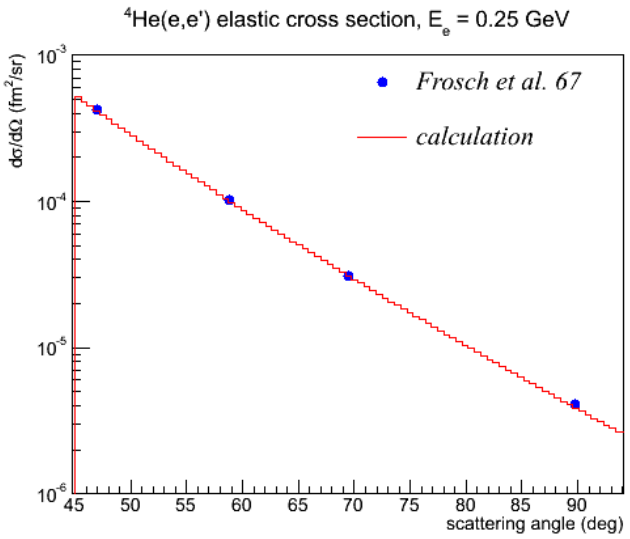
Must compare with experimental data.

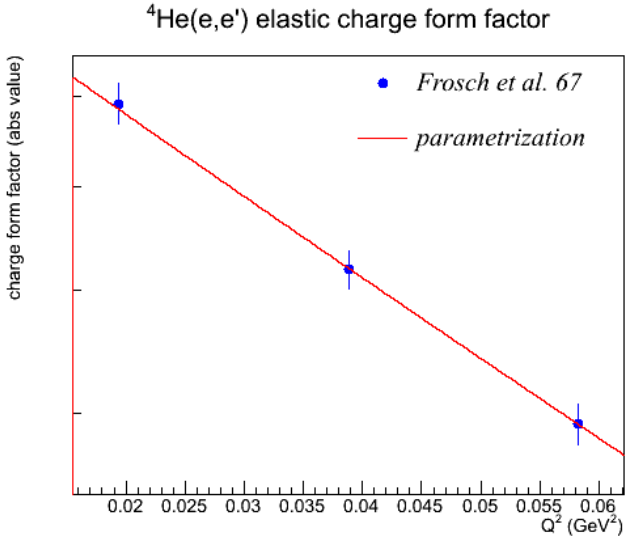
^{4}He elastic cross sections

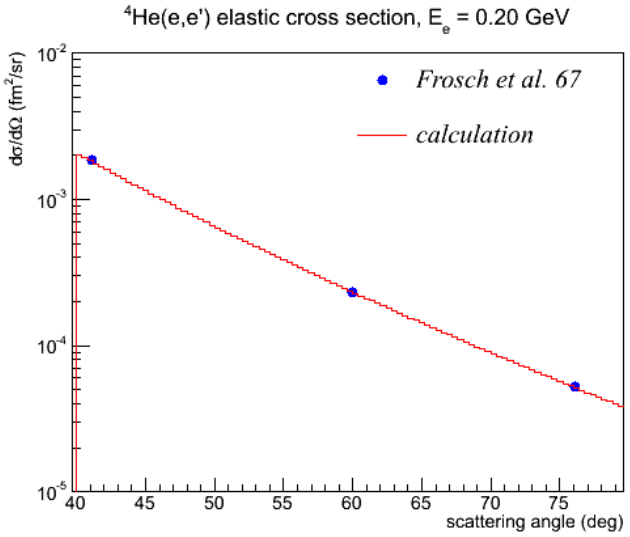
Frosch *et al.*, Phys. Rev. 160 1967

This is the reference for De Jager – used to check the process (density⇒cs)









^{4}He elastic cross sections

Frosch *et al.*, Phys. Rev. 160 1967

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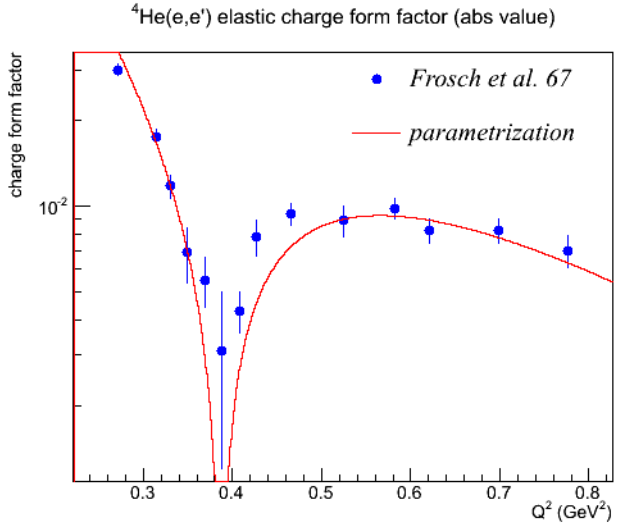
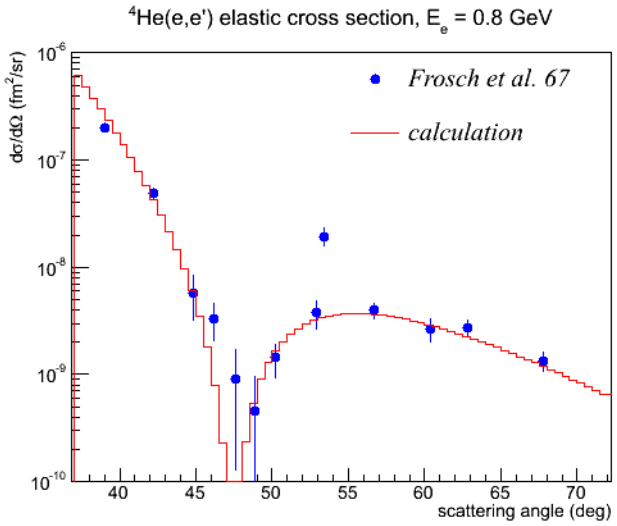
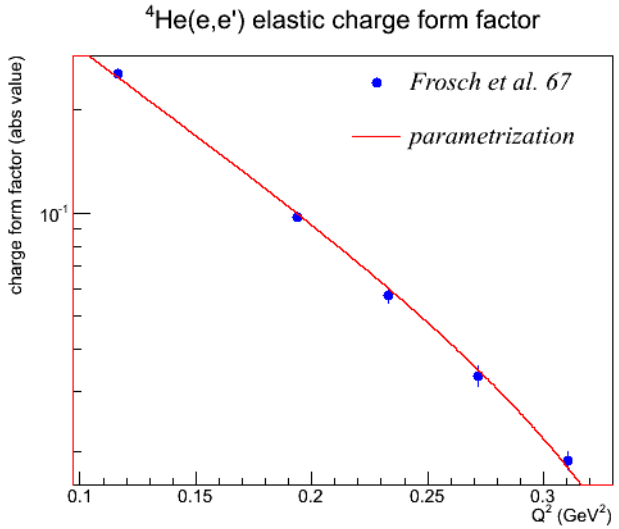
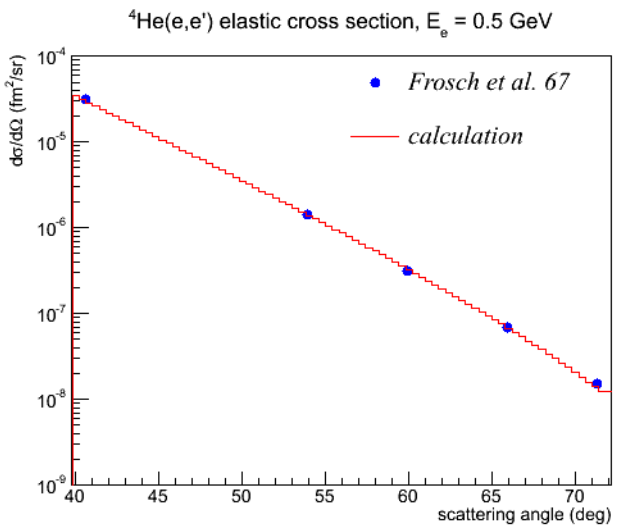


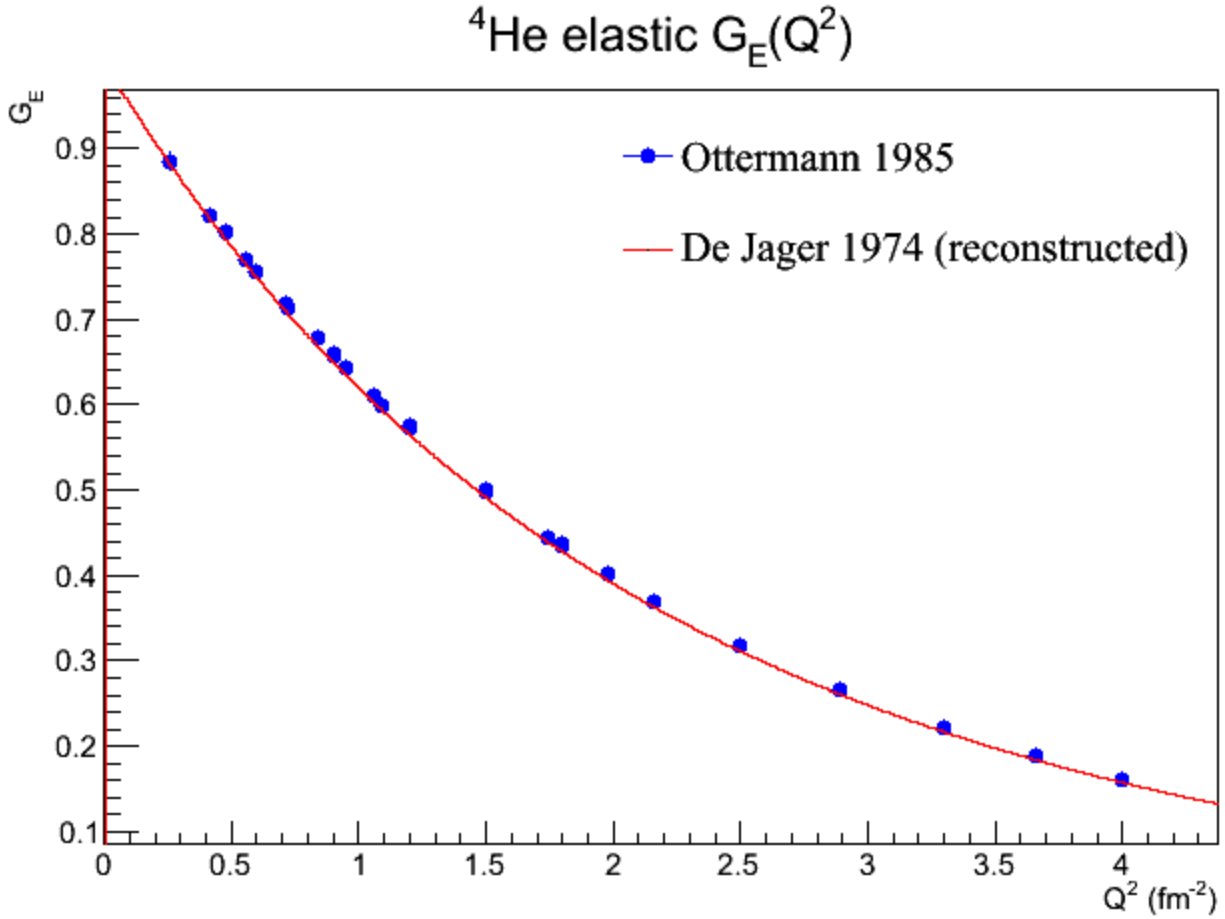






^{4}He elastic cross sections

Ottemann *et al.*, Nucl. Phys. A 436, 1985

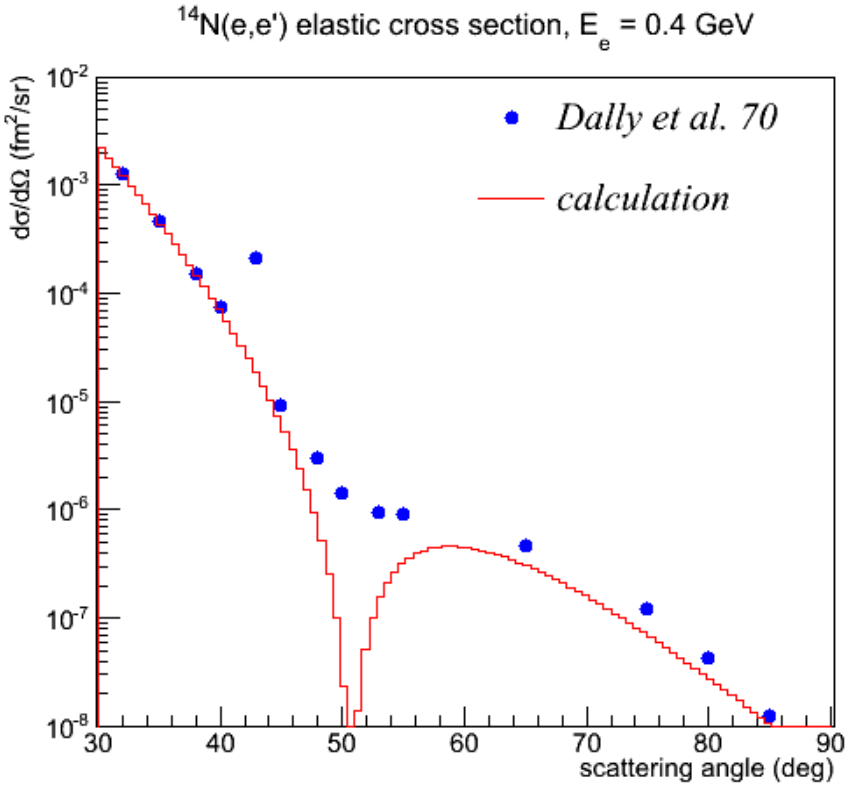


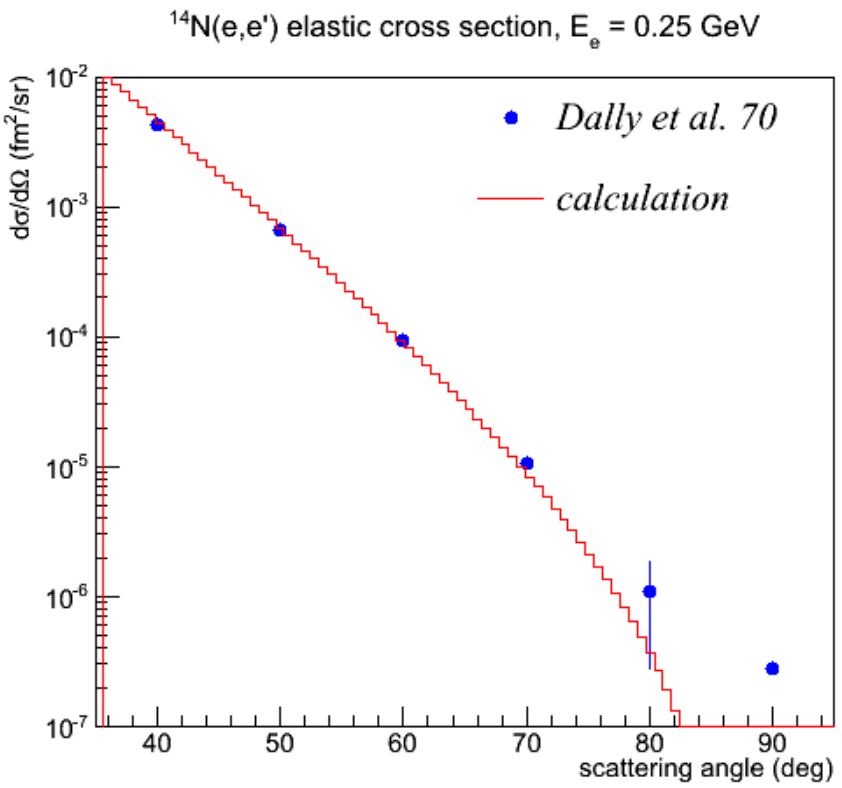
$0.01 < Q^2 < 0.16$ GeV^2

^{14}N elastic cross sections

Dally *et al.*, Phys. Rev. C 1970

This is the reference for De Jager – couldn't find more data (maybe someone knows?)

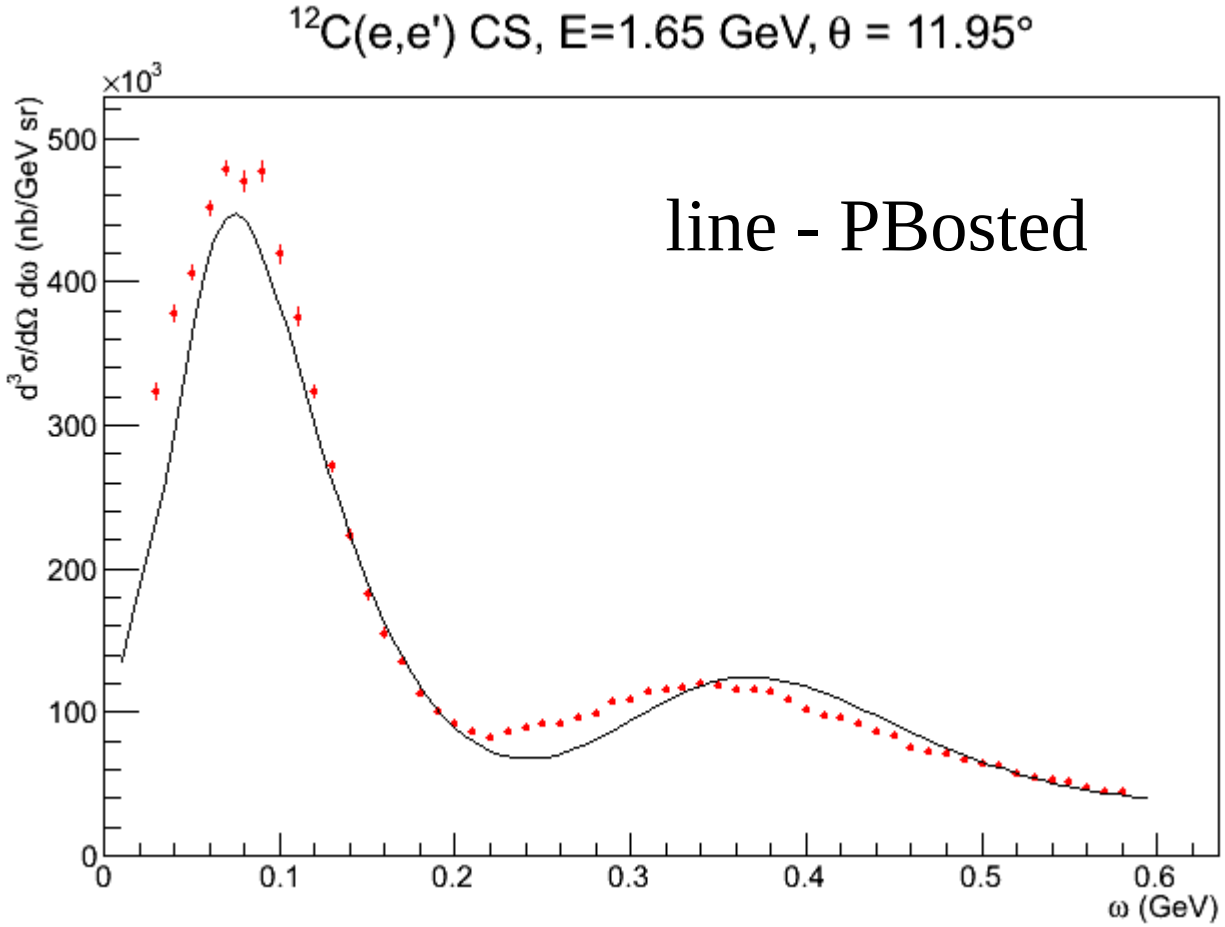




$0.03 < Q^2 < 0.28$ GeV^2

^{12}C non-elastic cross sections

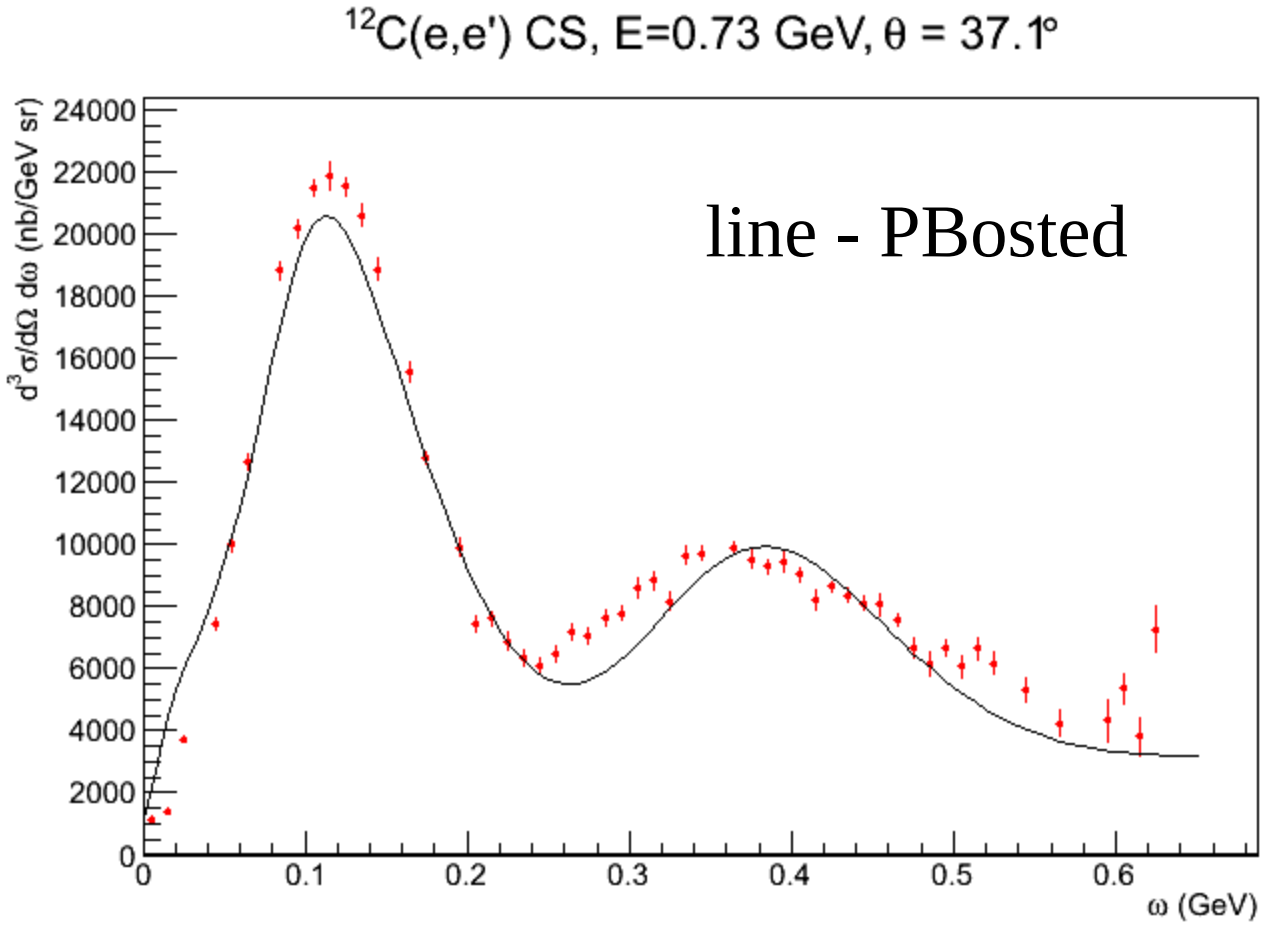
T. Baran *et al.* Phys. Rev. Lett., 61, 1988.



$0.08 < Q^2 < 0.12$ GeV^2

^{12}C non-elastic cross sections

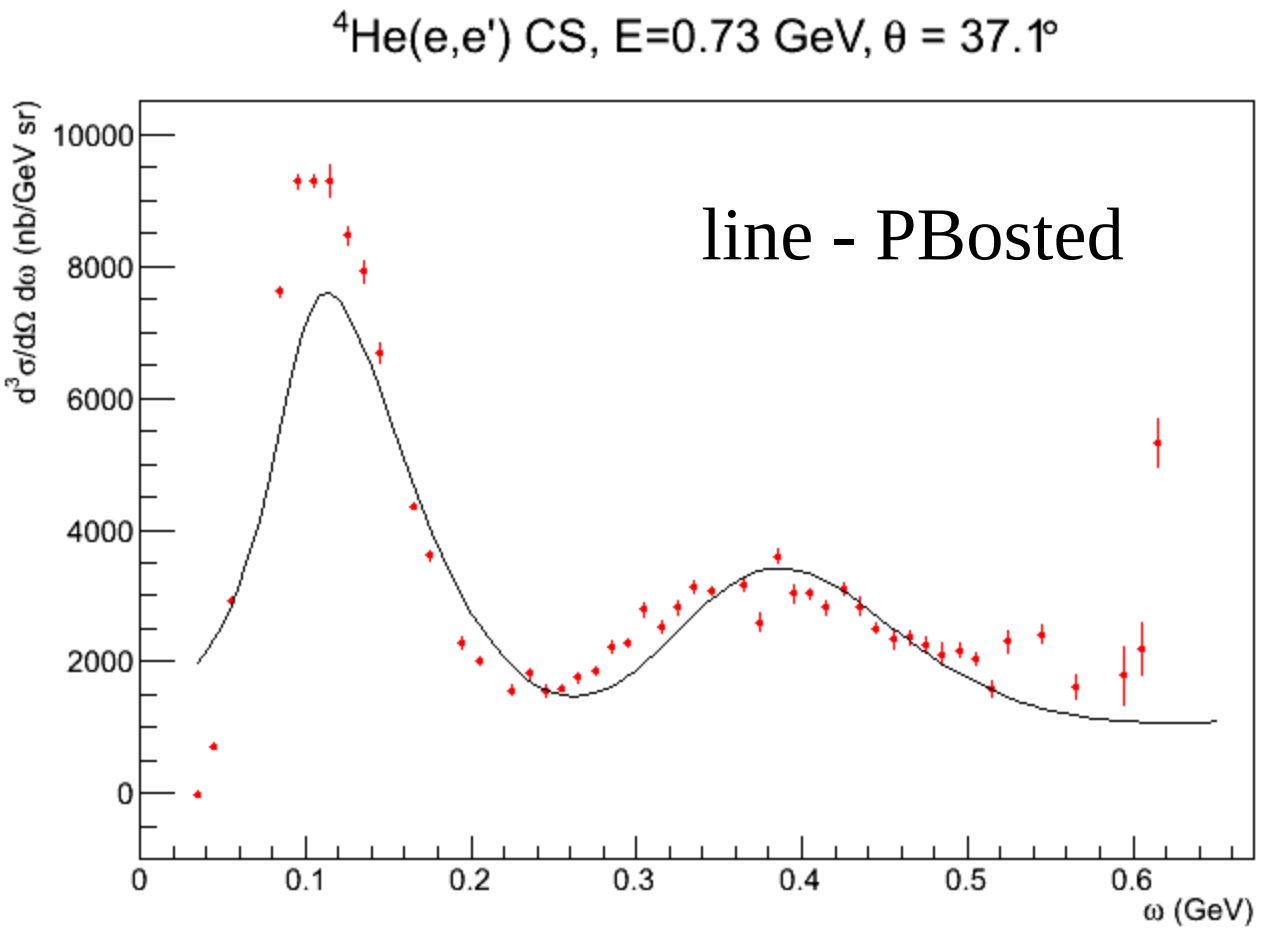
J. S. O'Connell *et al.* Phys. Rev. C 35, 1987.



$0.03 < Q^2 < 0.21$ GeV^2

^{4}He non-elastic cross sections

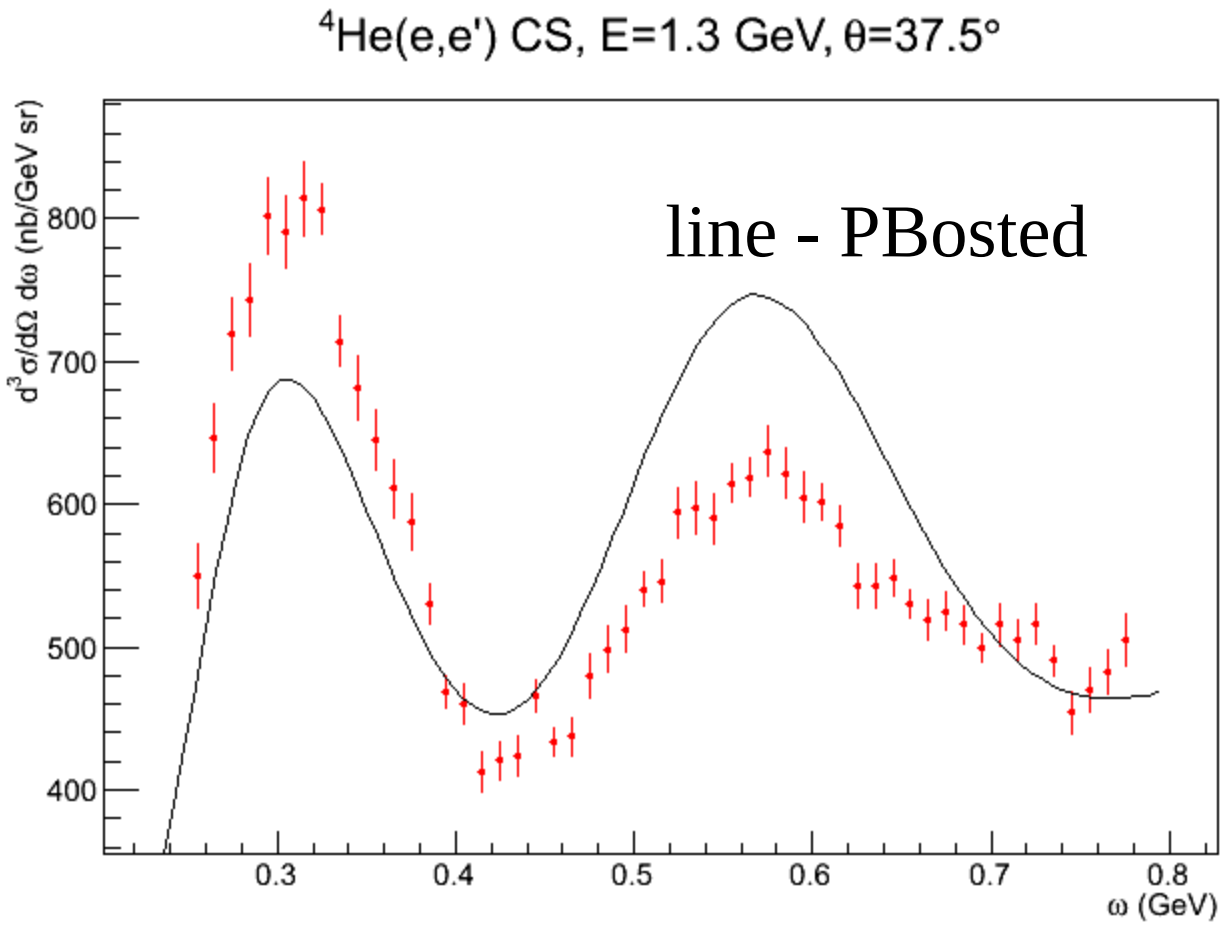
J. S. O'Connell *et al.* Phys. Rev. C 35, 1987.



$0.03 < Q^2 < 0.20$ GeV^2

^{4}He non-elastic cross sections

R. M. Sealock *et al*. Phys. Rev. Lett., 62, 1989.

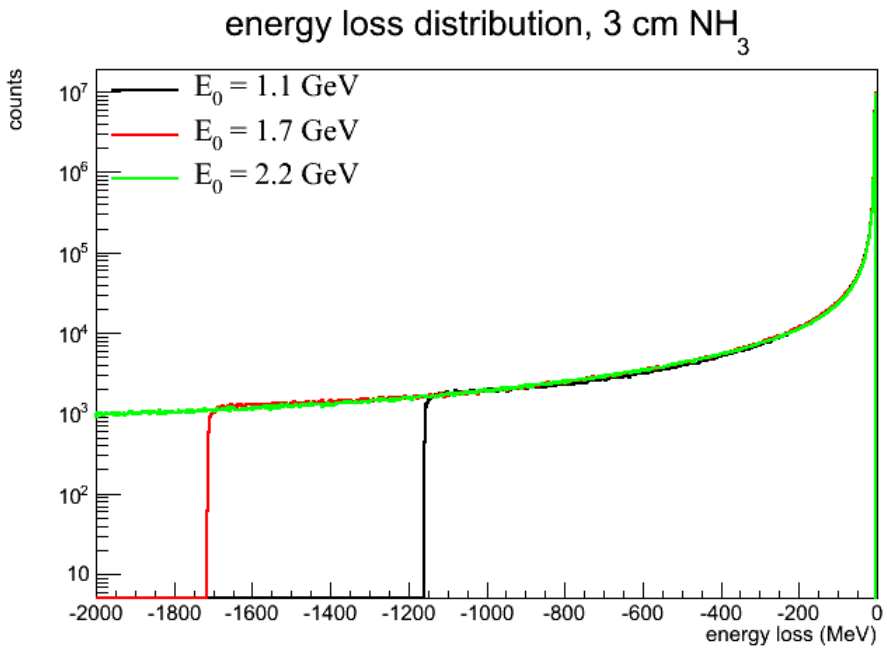


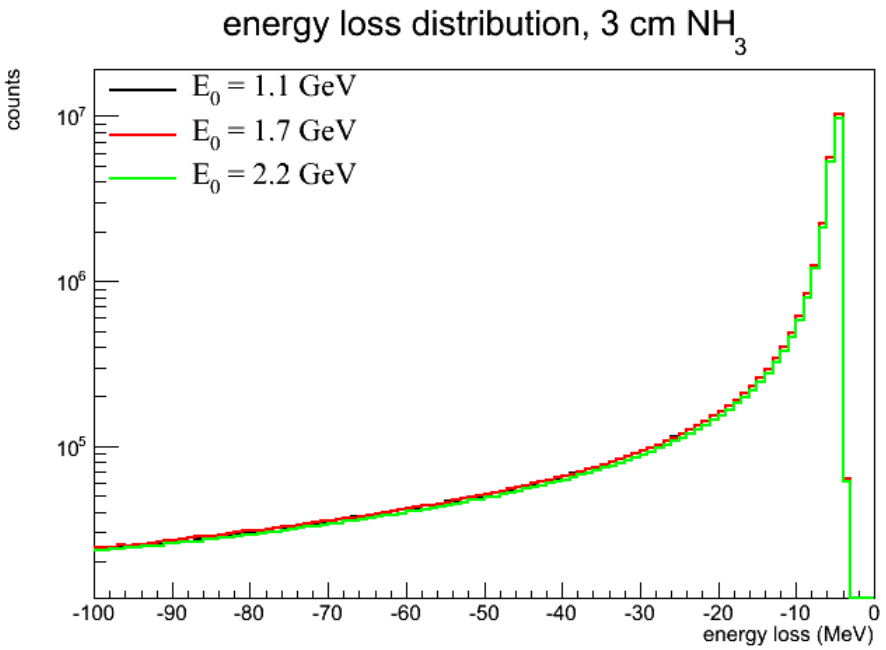
$0.08 < Q^2 < 0.12$ GeV^2

energy loss

- Energy loss is calculated by Geant4 in separate simulation.
- The differences between liquid helium and ammonia are significant, hence packing fraction is important parameter.
- There are 2 options:
    a. Calculate in Geant4 a mixed material with hypothetical packing fraction, then tune according to data, or use independent PF value. (more precise but not flexible).
    b. Calculate in Geant4 separately for helium and ammonia, and combine the effects numerically. (may be more flexible, but assumes energy-independent energy loss).
- Anyway, consistent PF value should be used in HRSMC and checked against data.

energy loss


energy loss distribution, 3 cm NH3
counts
E0 = 1.1 GeV
E0 = 1.7 GeV
E0 = 2.2 GeV
10^7
10^6
10^5
10^4
10^3
10^2
10
-2000 -1800 -1600 -1400 -1200 -1000 -800 -600 -400 -200 0
energy loss (MeV)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-100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0
energy loss (MeV)