Mott Theory Support at a Glance

Xavier

- DWBA (Distorted Wave Born Approximation)
- Point-like, No Coulomb screening of shell electrons
- Provided (θ, $d\sigma/d\Omega$ [cm^2/sr], T, U, S) for (Au, Ag) at KE (3, 5, 6.2, 8) MeV

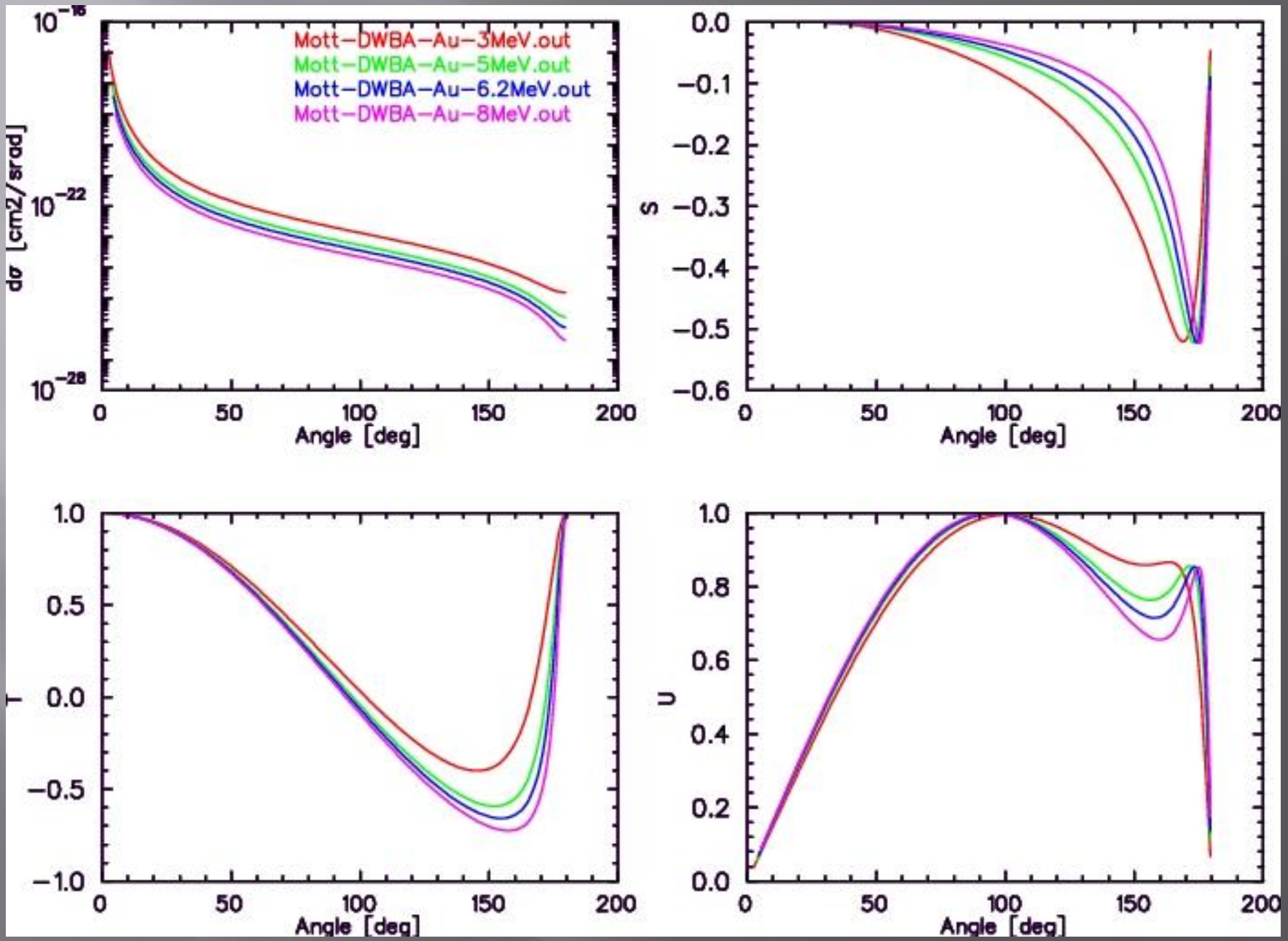
Horowitz

- According to SPIN2000 proceedings
  - Provided (θ, $d\sigma/d\Omega$, T, U, S)
  - Does not include Coulomb screening or nuclear effect (size, recoil)
  - Indicates biggest effect is radiative correction <1%
- Is he checking doing the code cross-check?

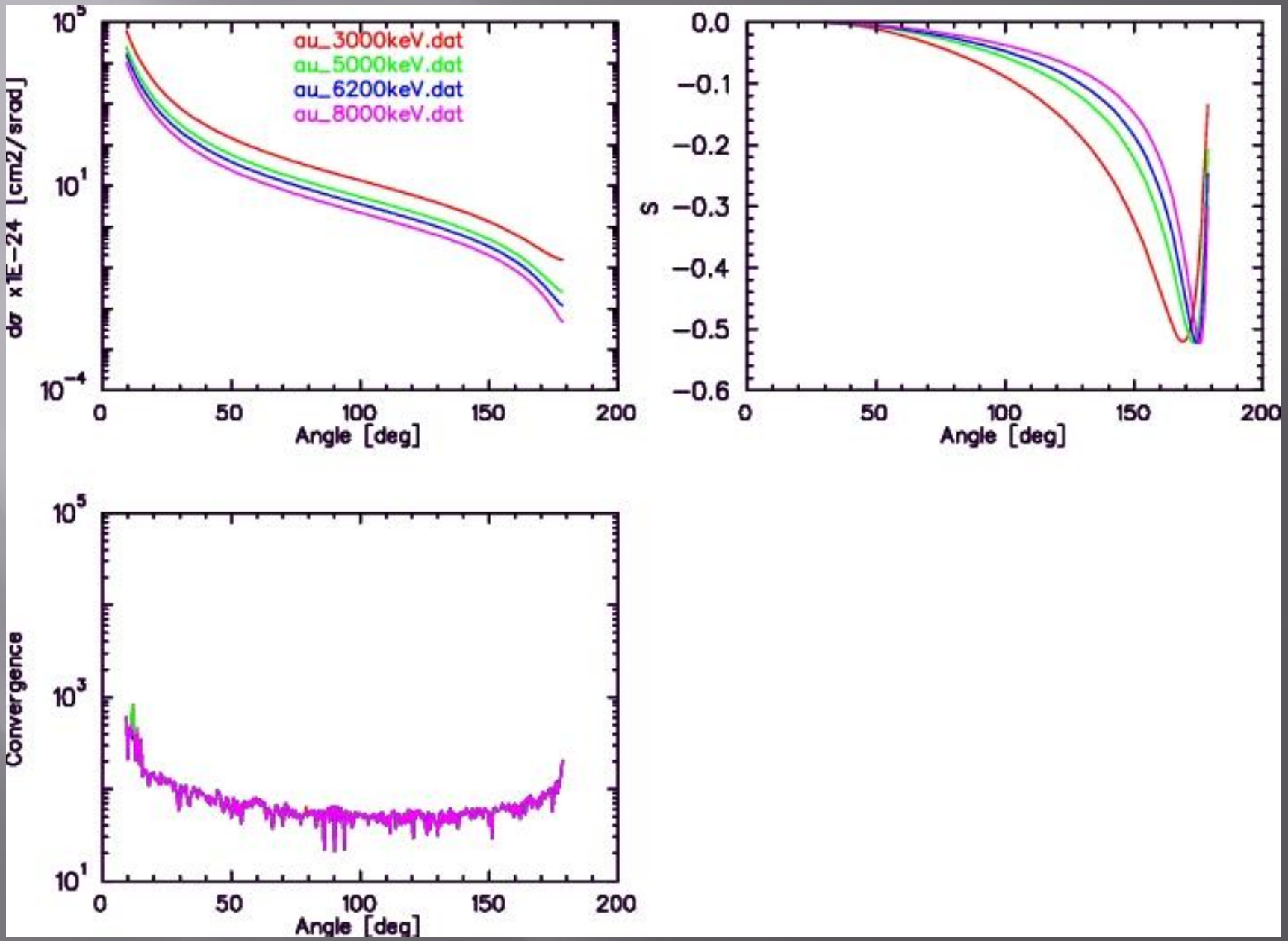
Assamagan

- Fortran code used during Mott design in mid-90's
- Implementation believed to originate from NIM article (TBD)
- Provided (θ, $d\sigma/d\Omega$ [b/sr], T, U, S)

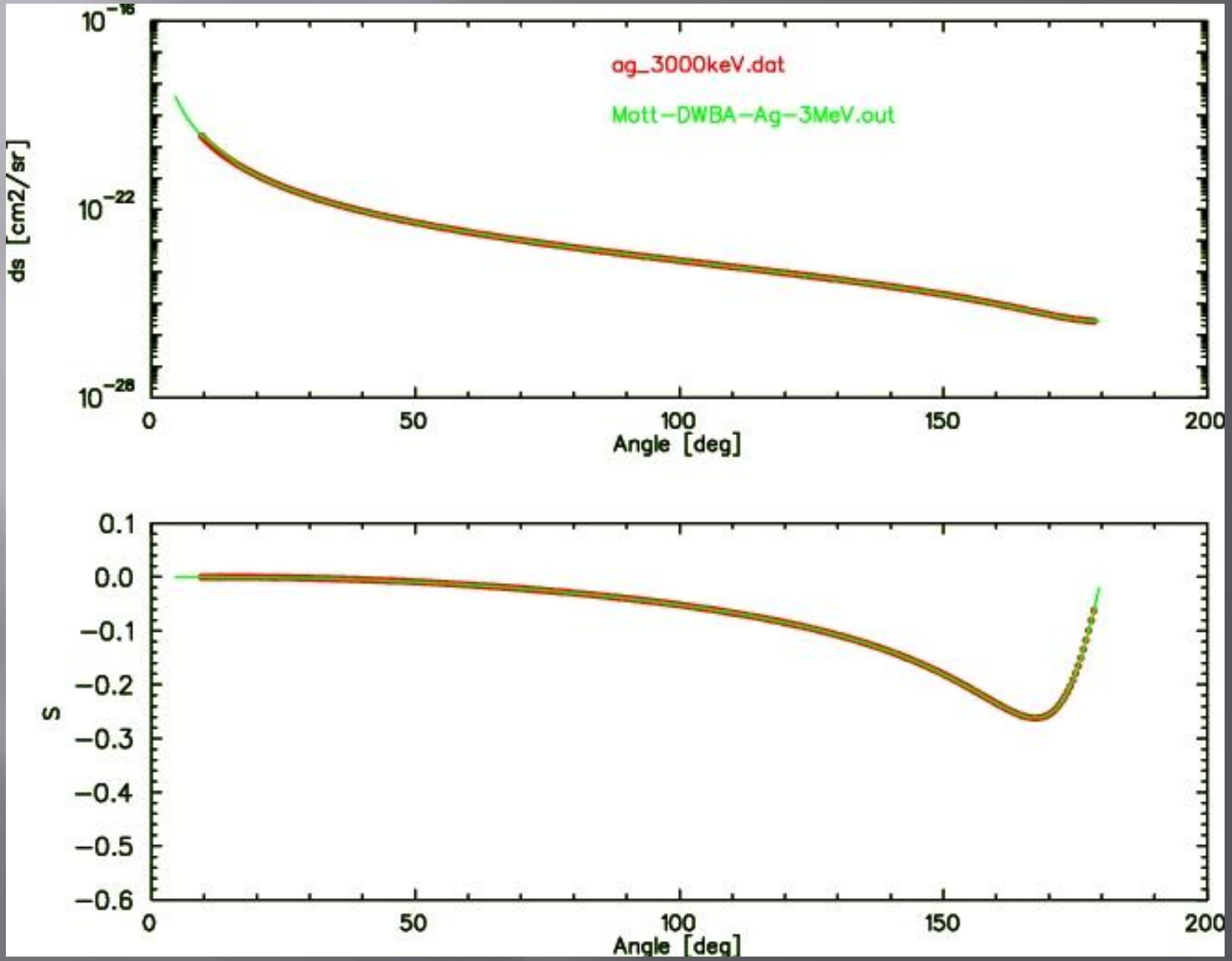
Xavier's Result for Gold



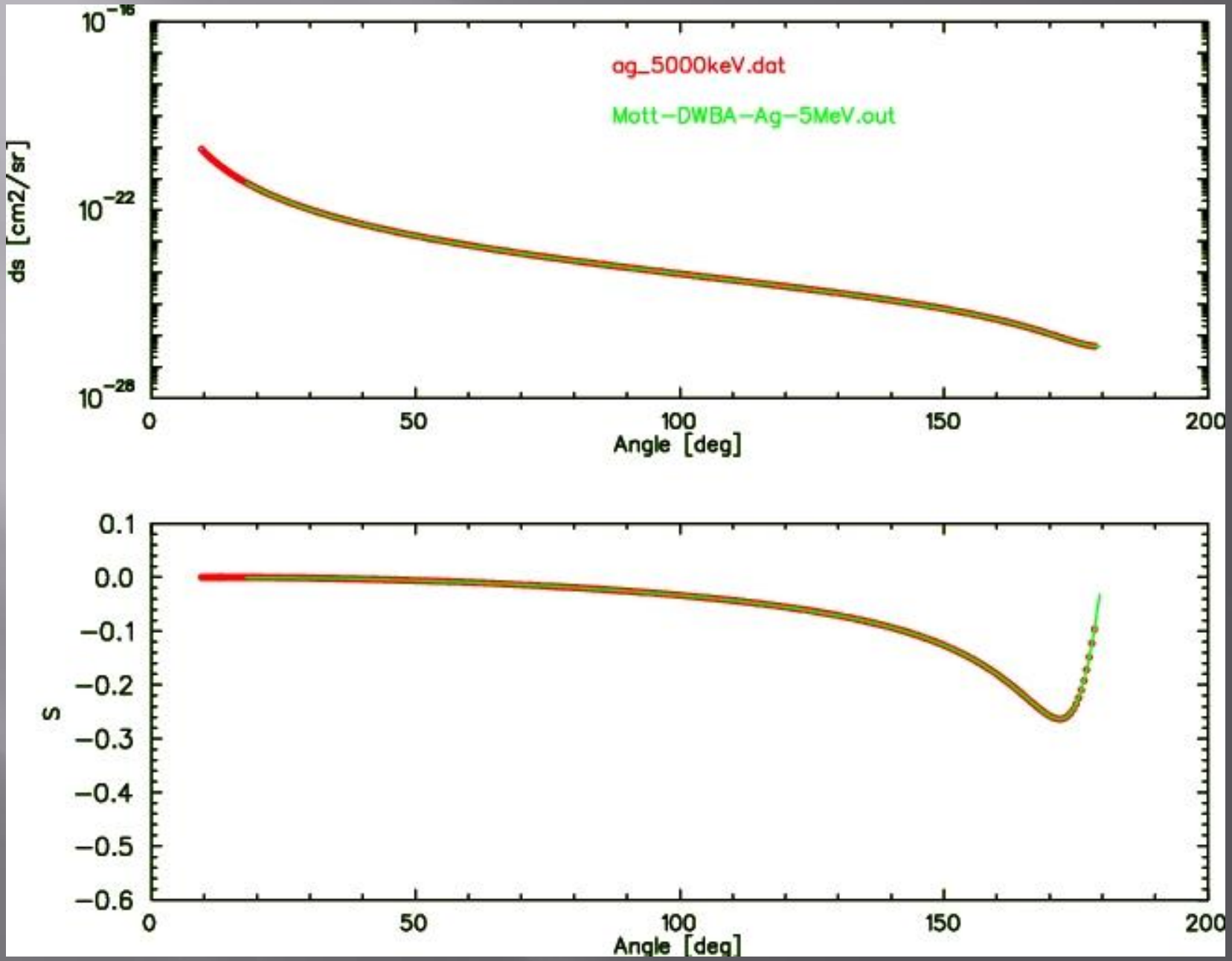
Assamagan's Result for Gold



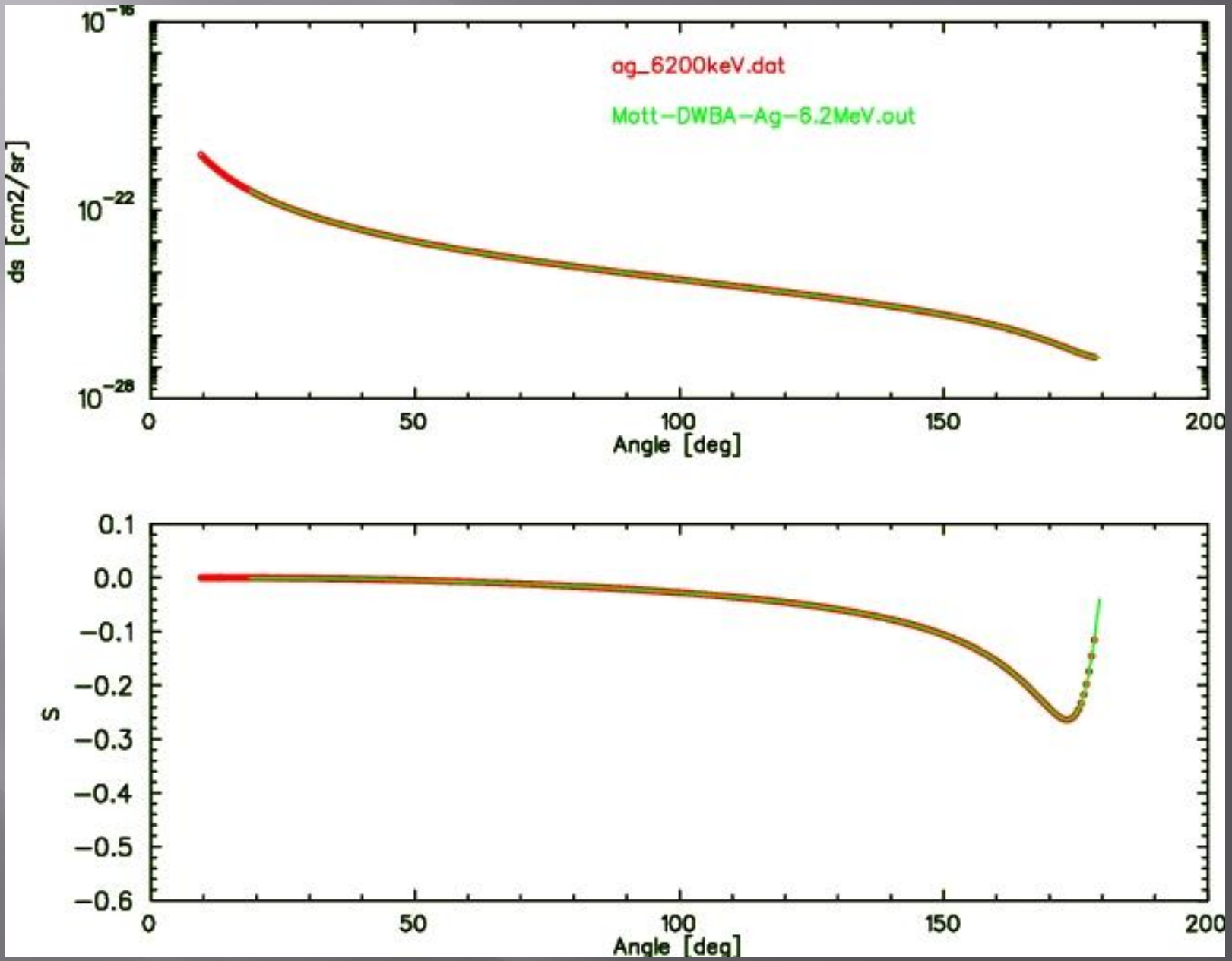
Ag @ 3 MeV


ag_3000keV.dat
Mott-DWBA-Ag-3MeV.out
ds [cm2/sr]
Angle [deg]
S
Angle [deg]

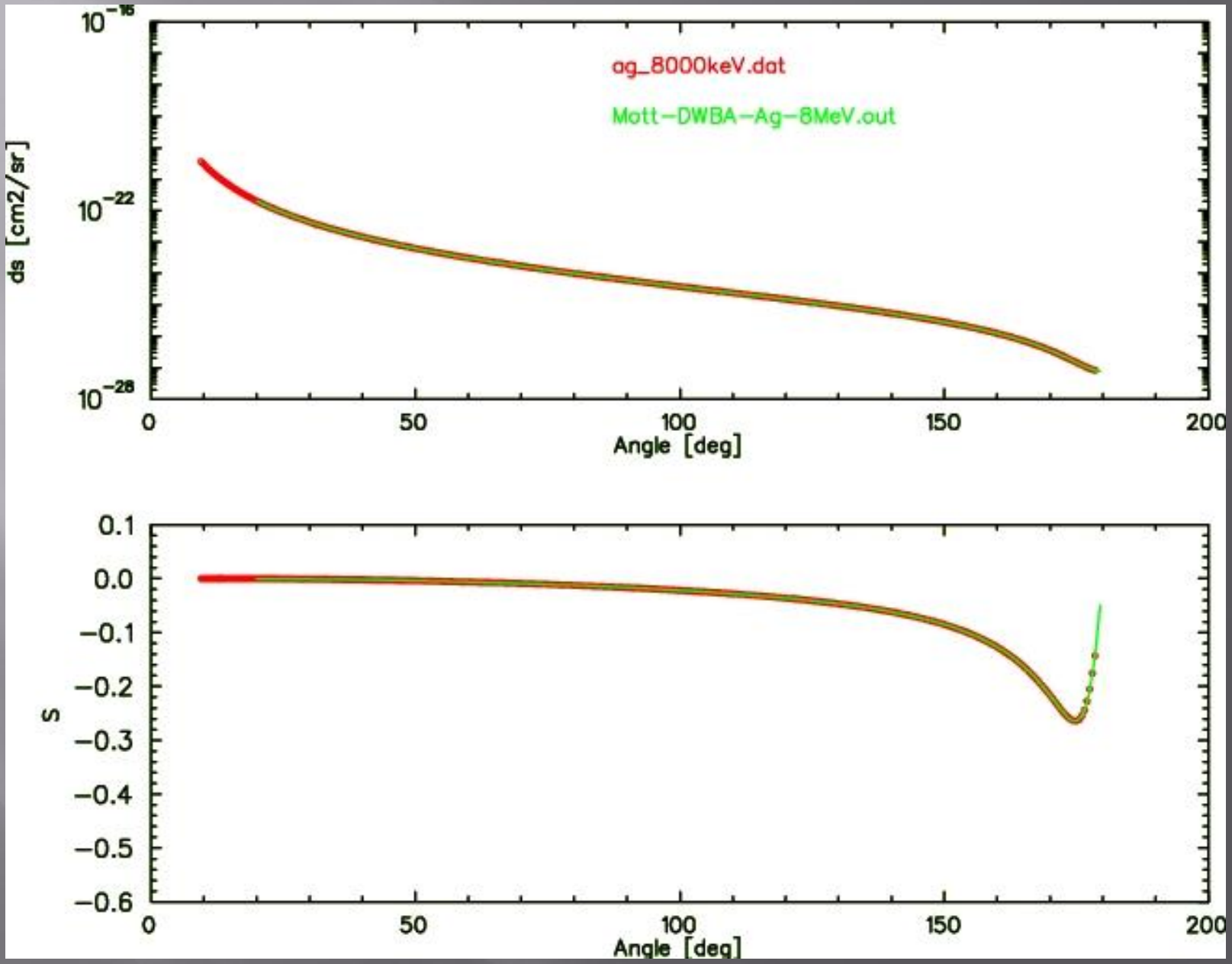
Ag @ 5 MeV


ag_5000keV.dat
Mott-DWBA-Ag-5MeV.out
ds [cm2/sr]
Angle [deg]
S
Angle [deg]

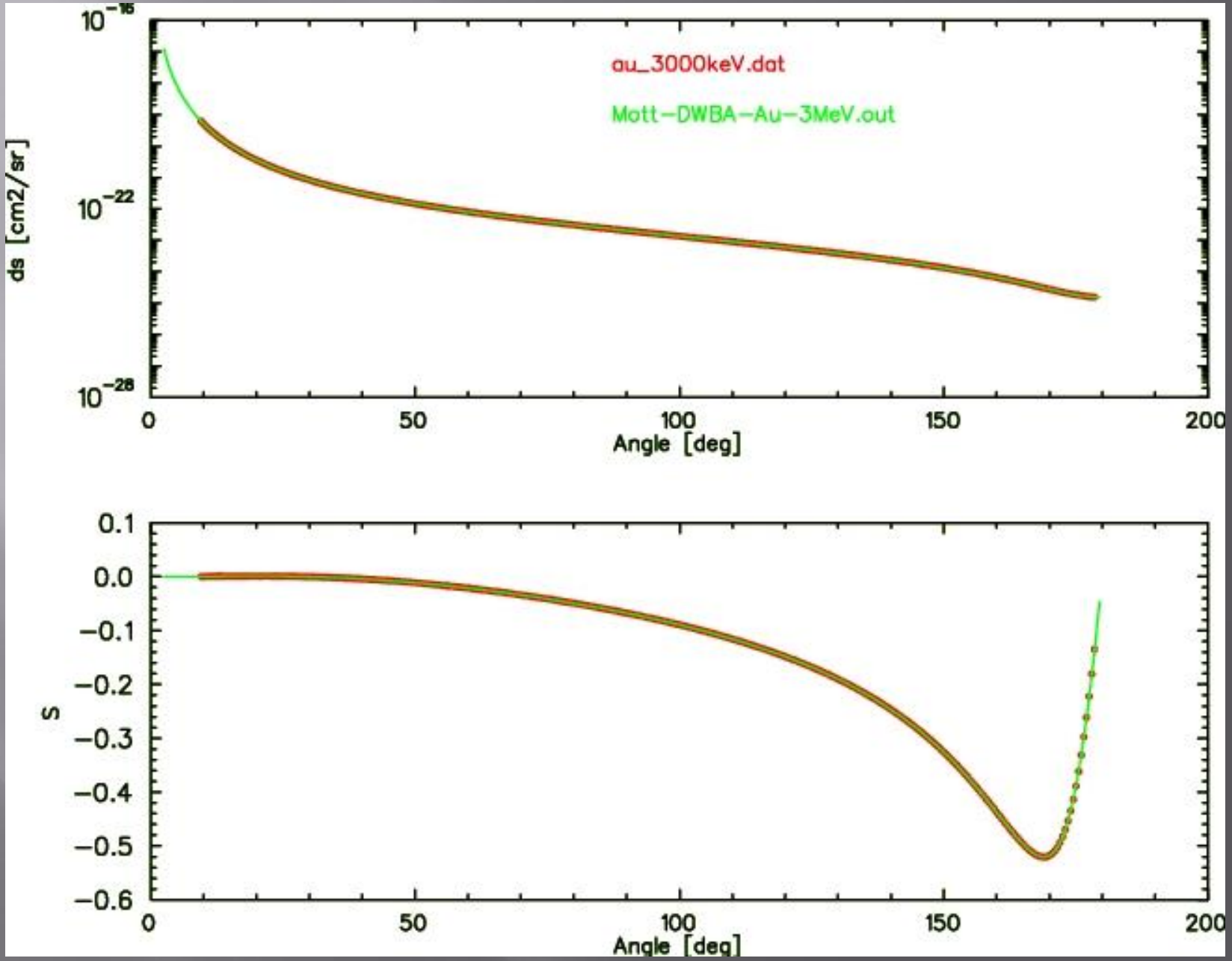
Ag @ 6.2 MeV


ag_6200keV.dat
Mott-DWBA-Ag-6.2MeV.out
ds [cm2/sr]
Angle [deg]
S
Angle [deg]

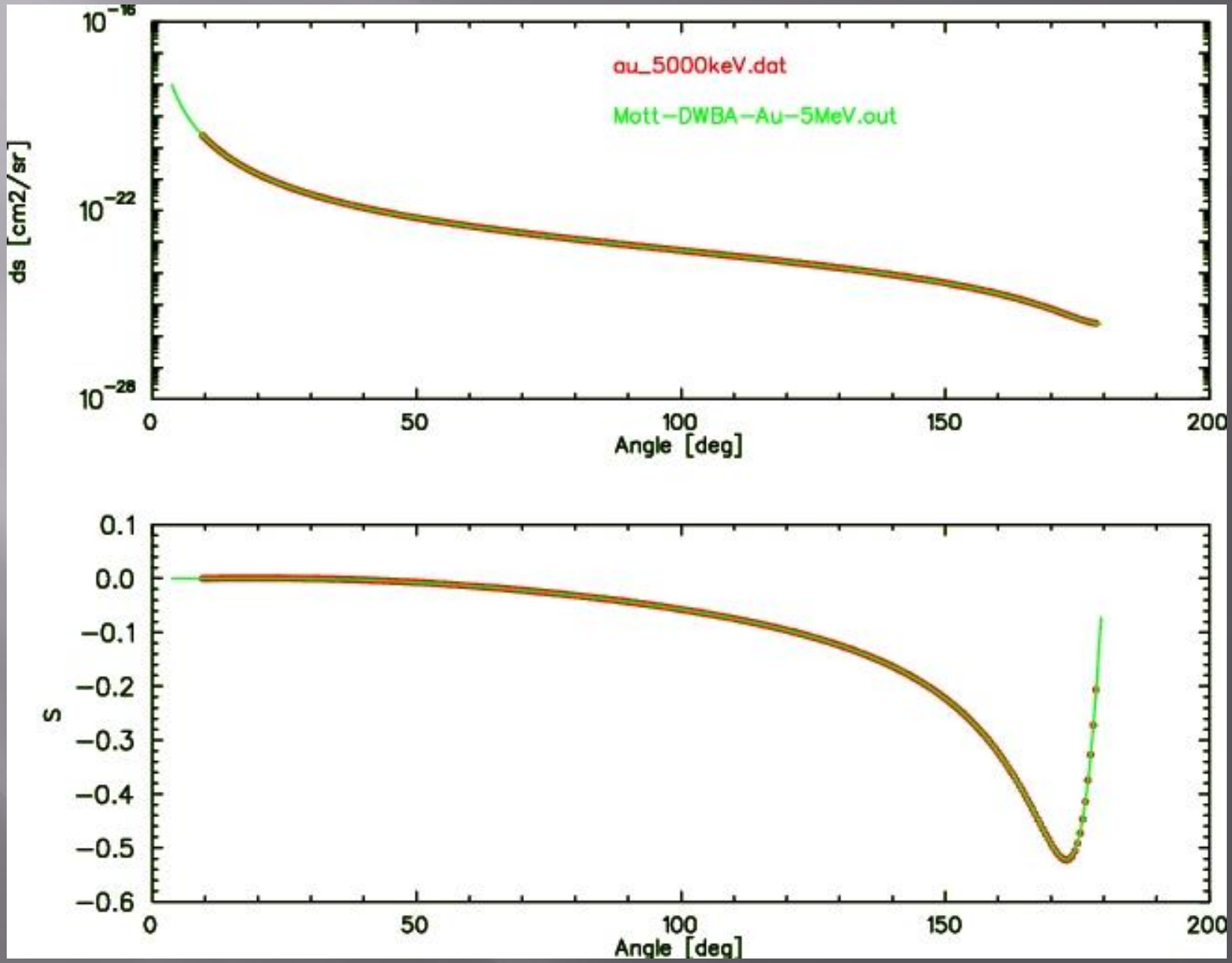
Ag @ 8 MeV


ag_8000keV.dat
Mott-DWBA-Ag-8MeV.out
ds [cm2/sr]
10^{-16}
10^{-22}
10^{-28}
0
50
100
150
200
Angle [deg]
S
0.1
0.0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
0
50
100
150
200
Angle [deg]

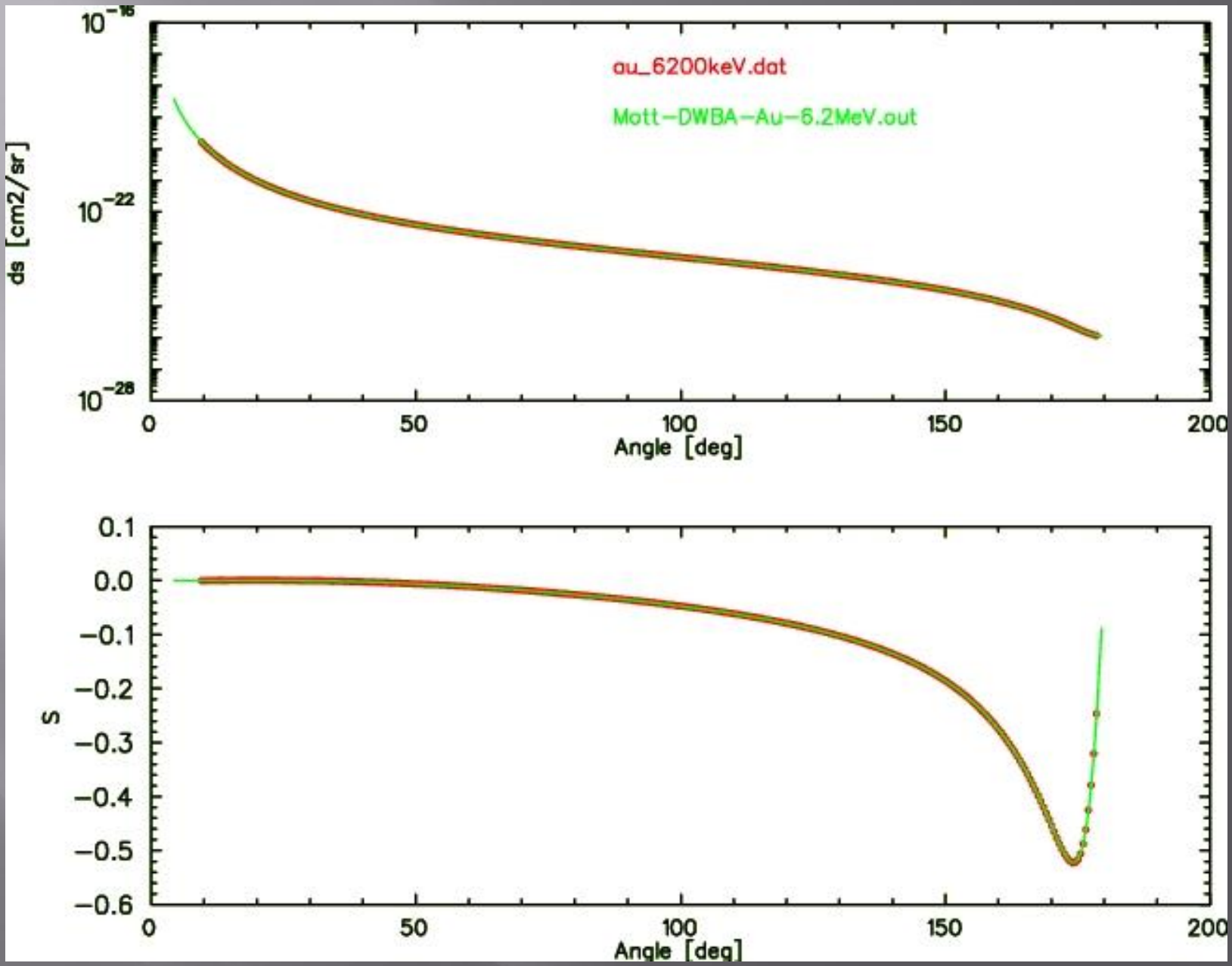
Au @ 3 MeV


au_3000keV.dat
Mott-DWBA-Au-3MeV.out
ds [cm2/sr]
Angle [deg]
S
Angle [deg]

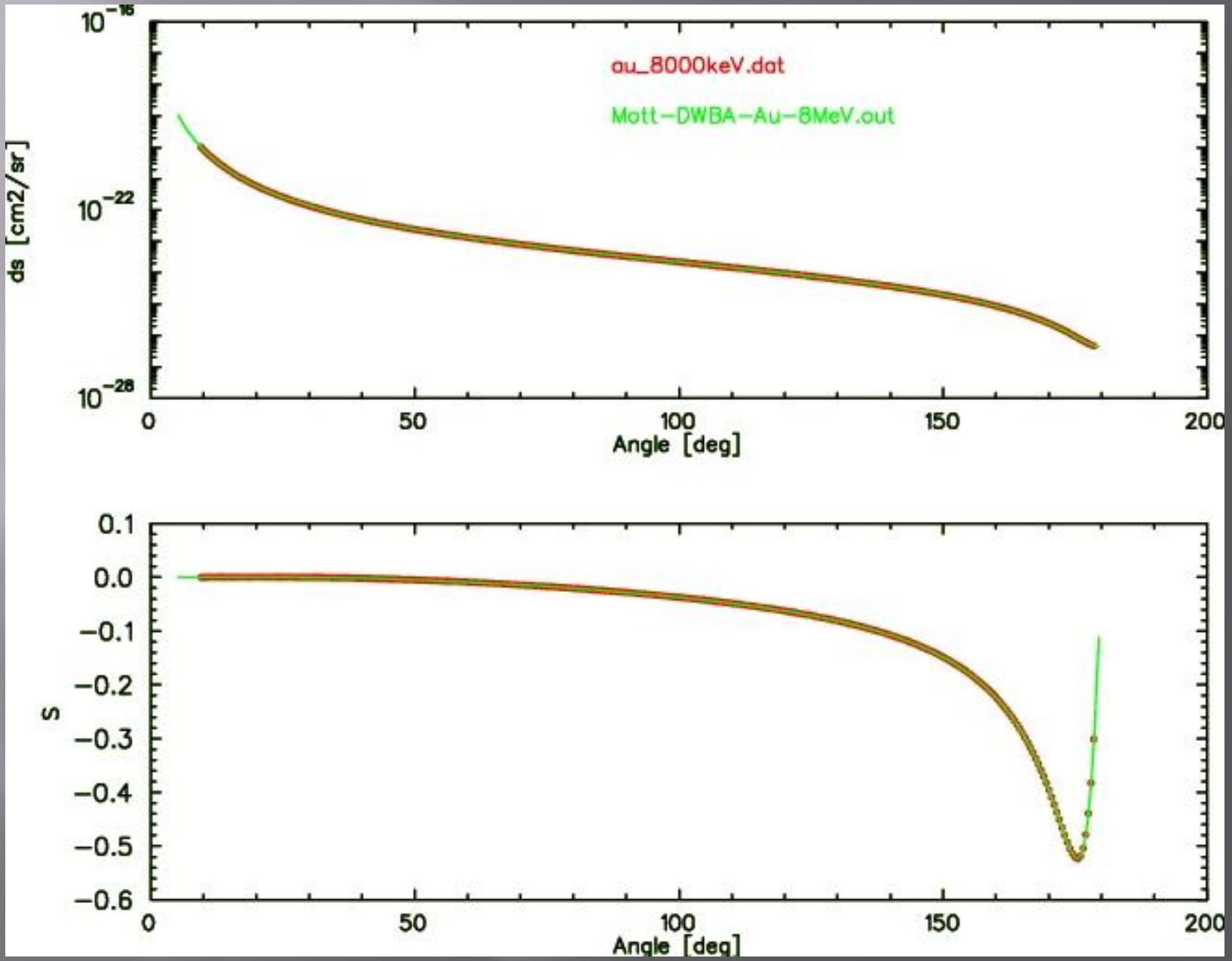
Au @ 5 MeV


au_5000keV.dat
Mott-DWBA-Au-5MeV.out
ds [cm2/sr]
Angle [deg]
S
Angle [deg]

Au @ 6.2 MeV


au_6200keV.dat
Mott-DWBA-Au-6.2MeV.out
ds [cm2/sr]
Angle [deg]
S
Angle [deg]

Au @ 8 MeV


au_8000keV.dat
Mott-DWBA-Au-8MeV.out
ds [cm2/sr]
Angle [deg]
S
Angle [deg]

Conclusions

- Both codes provide similar values, surprising if Horowitz's disagrees
- Computational limits in angle are important, i.e. (0°, 90°, 180°).
- From Assamagan code: reference and (T,U) should be available
- We now have something to proceed with comparing against Geant4
- Discussion during CREX (March 17-19)
  - Agreement on leading corrections and their size
  - Level of theory effort required
  - Interest in participating
  - Is meeting arranged – should include Charles, Xavier and Wally.
  - Goal is to walk away with defined plan