Functionalization of Thin Absorbers

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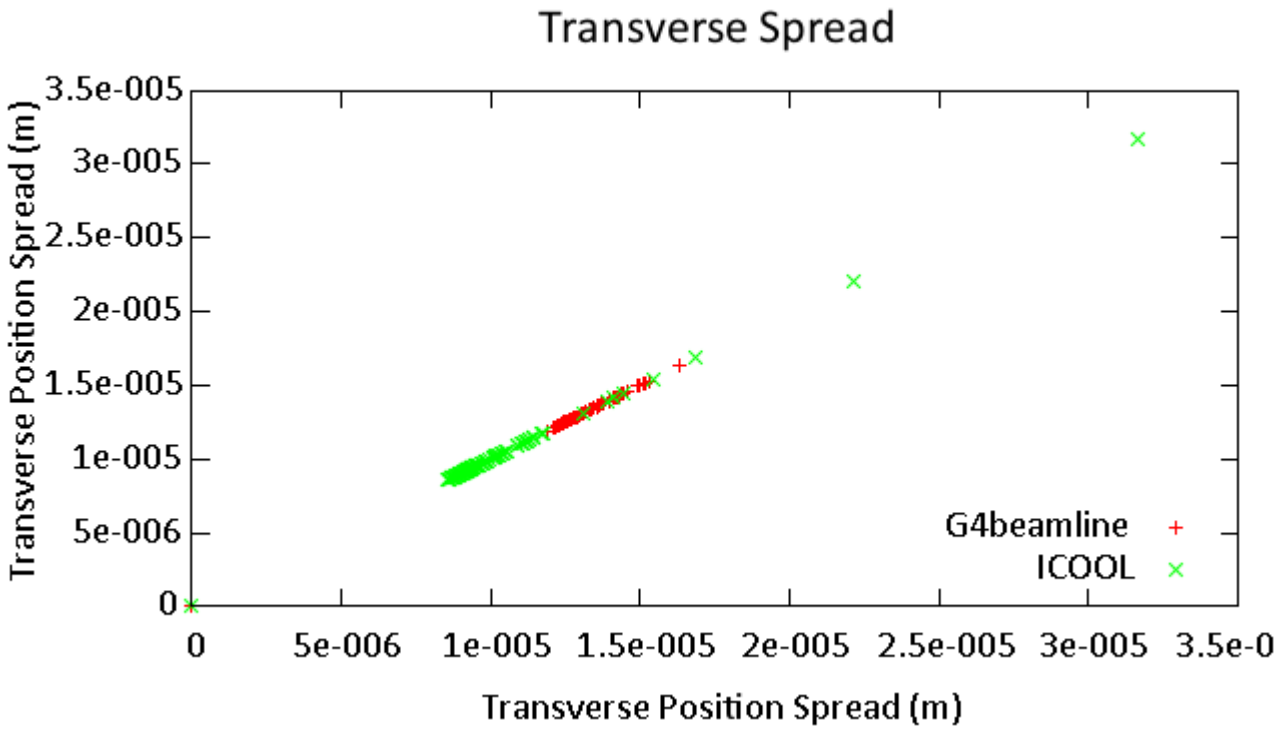
G4beamline vs. ICOOL Using Maxstep=0.1 mm



G4 vs. ICOOL: Coding

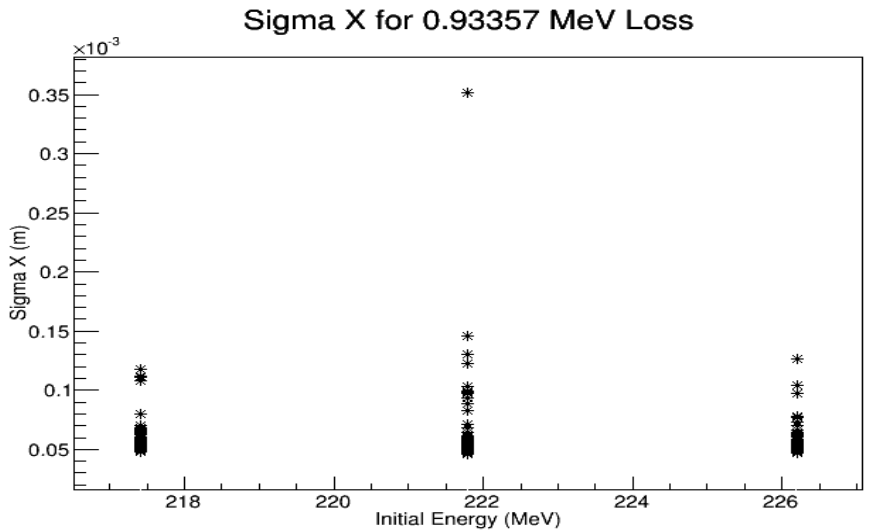
```
  // Data[9]:  Eplasma rho -C X_0 X_1 a m delta_0 DELTA_{max}
  // Eplasma - Plasma energy (in eV)
  // rho     - Sternheimer adjustment factor for the atomic excitation
energies
  // -C
  // X_0, X_1, m, a - parameters in fitting formulas
  // delta_0 - Density-effect value delta(X_0)
  // DELTA_{max} - Upper bound for the error inherent in the fitting

  //G4_lH2  index=0
    G4double M1[NDENSARRAY]=
  {7.031,1.546,3.2632,0.4759,1.9215,0.13483,5.6249,0,0.021};
    AddMaterial(M1,"G4_lH2");
```

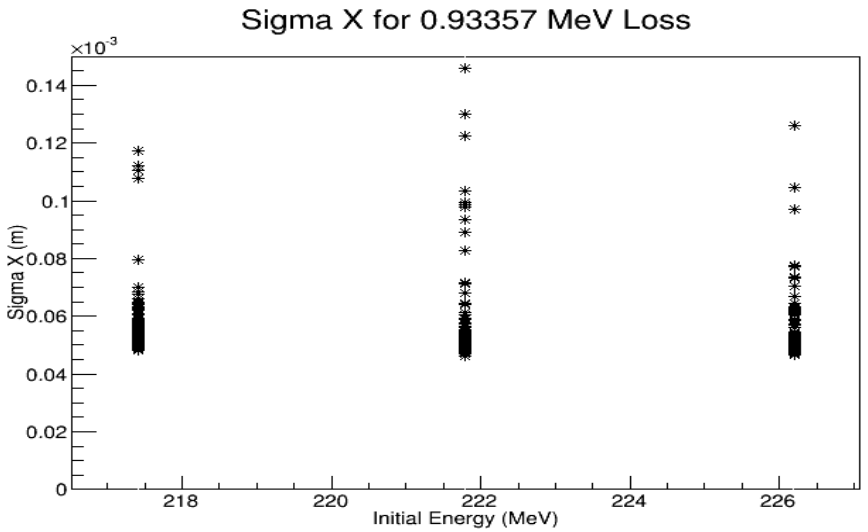
```
!   data order: Z rho __ Lr     Xo X1 Sa Sc Sm
!             : nel { Zel(i), Ael(i), IPel(i), fel(i) ,i=1,nel}
      data matdat/
     &  1.,0.071,0.,866.,  0.4759,1.9215,0.1348,-3.2632,5.6249,
     &     1, 1.,1.008,21.8,1., 8*0.,       ! Liq H
```

Number	7.031	3.2632	0.4759	1.9215	0.13483	5.6249	0.021	866	1.546
G4 label	Eplasma	-C	X_0	X_1	a	m	DELTA_{max}	[none]	rho (at. ex. factor)
ICOOL label	rho (7.1)	-Sc	Xo	X1	Sa	Sm	IPel(i)	Ir	[none]

Functionalization: Sigma vs. Initial Energy

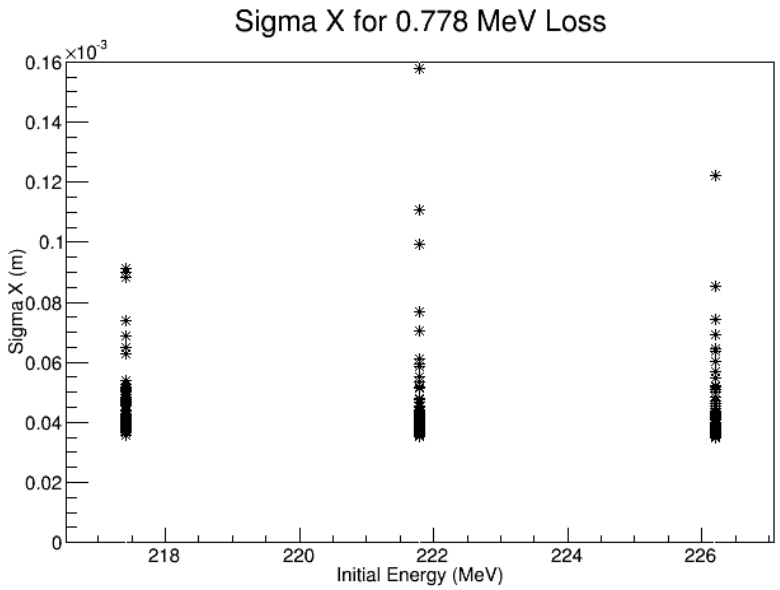
- 3 initial energies, 6 absorber lengths, 100 random seeds
- Sigma is not obviously correlated to initial energy
- Right plot is zoomed

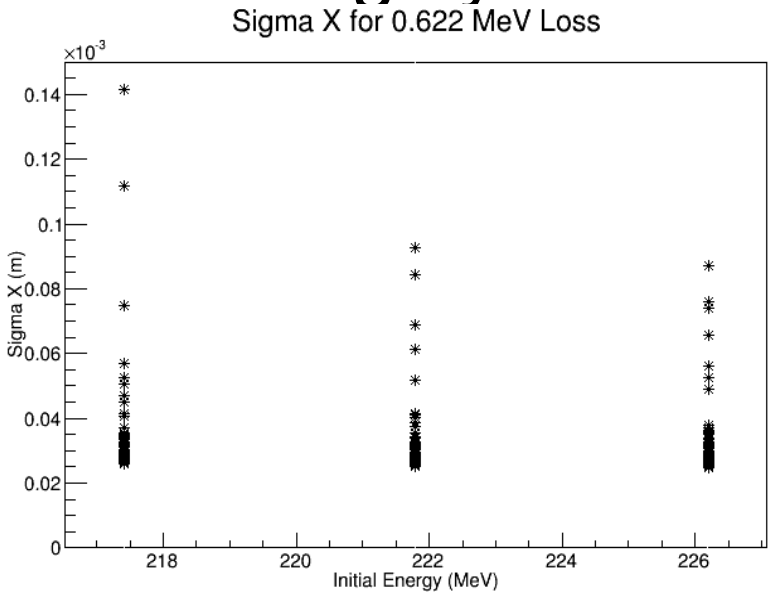




Functionalization: Sigma vs. Initial Energy

- Sigma profiles done for (approximately) 3 cm, 2.5 cm, …, 0.5 cm absorbers with similar results
- Muon rest frame lengths are roughly the same





Functionalization:
Landau Parameters vs. Initial Energy

- Modify ICOOL FORTRAN files to spit out energy loss in for004.dat
- ROOT fits each of the **1800** simulations to a Landau distribution
- Store parameters into two 3x6x100 arrays ([initial energy]x[energy loss]x[random seed]), do scatter plot