Parameters for Doug Moehs' Foil Test at 750 keV

1. dE/dx at 750 keV:

From the attached file, you can find the stopping power (-dE/dx) of protons incident on a carbon foil:

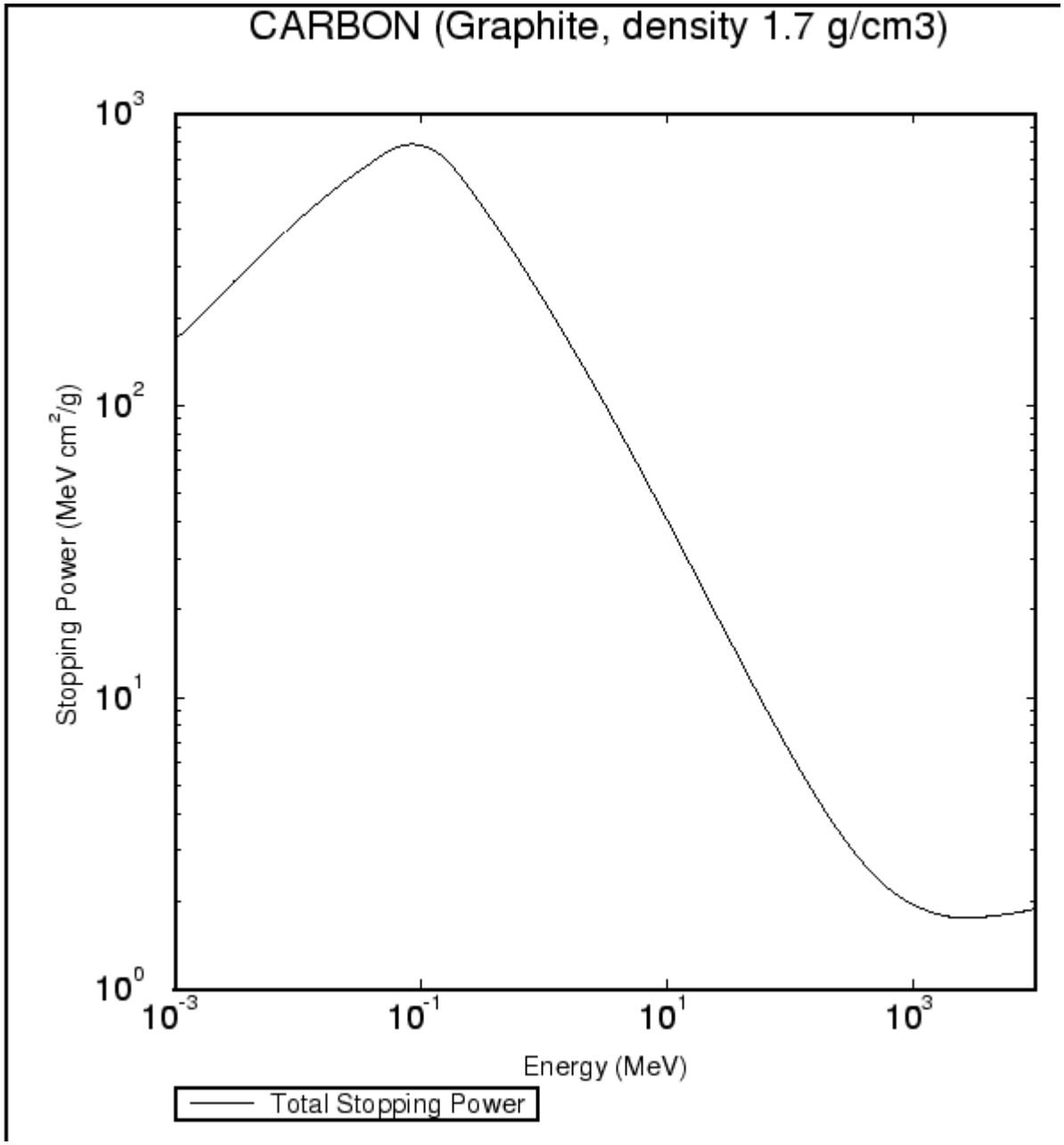
750 keV: 279.3 MeV-cm2/g
400 MeV: 2.7 MeV-cm2/g
8 GeV: 1.847 MeV-cm2/g

So the difference is about a factor of 100. This is why carbon foil can survive forever at the present linac beam intensity at 400 MeV but could be damaged quickly at 750 keV.

2. Cross section at 750 keV:

The energy scaling of the interaction cross section is roughly 1/beta^2 with corrections at low energies (Born approximation). Hence the stripping cross section at 750 keV is more than 300 times larger than at 400 MeV. In your experiment, all H- would be stripped by the first foil. If you put a second foil nearby, it would see one proton and two electrons from every incident H- ion.

PSTAR : Stopping Power and Range Tables for Protons



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Show compositional data for CARBON (Graphite, density 1.7 g/cm3)

CARBON (Graphite, density 1.7 g/cm3)

To download data in spreadsheet (array) form, choose a delimiter and use the checkboxes in the table heading. After downloading, save the output by using your browser's `Save As` feature.

Delimiter:

- (●) space
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- ( ) tab (some browsers may use spaces instead)
- ( ) newline

Download data Reset

(required) Kinetic Energy (MeV)	Stopping Power (MeV cm^2/g)			Range		
	Electronic	Nuclear	Total	CSDA (g/cm^2)	Projected (g/cm^2)	Detour Factor Projected / CSDA
1.000E-03	1.426E+02	2.514E+01	1.677E+02	8.186E-06	3.051E-06	0.3727
1.500E-03	1.753E+02	2.106E+01	1.963E+02	1.092E-05	4.596E-06	0.4211
2.000E-03	2.031E+02	1.829E+01	2.214E+02	1.331E-05	6.107E-06	0.4588
2.500E-03	2.280E+02	1.625E+01	2.443E+02	1.546E-05	7.564E-06	0.4893
3.000E-03	2.505E+02	1.469E+01	2.652E+02	1.742E-05	8.966E-06	0.5147
4.000E-03	2.834E+02	1.241E+01	2.958E+02	2.098E-05	1.166E-05	0.5557
5.000E-03	3.133E+02	1.081E+01	3.241E+02	2.421E-05	1.423E-05	0.5877
6.000E-03	3.404E+02	9.618E+00	3.500E+02	2.718E-05	1.667E-05	0.6136
7.000E-03	3.651E+02	8.690E+00	3.738E+02	2.994E-05	1.901E-05	0.6351
8.000E-03	3.867E+02	7.943E+00	3.946E+02	3.254E-05	2.126E-05	0.6534
9.000E-03	4.059E+02	7.328E+00	4.132E+02	3.502E-05	2.343E-05	0.6693
1.000E-02	4.235E+02	6.810E+00	4.303E+02	3.739E-05	2.554E-05	0.6832
1.250E-02	4.620E+02	5.814E+00	4.678E+02	4.295E-05	3.057E-05	0.7118
1.500E-02	4.940E+02	5.094E+00	4.991E+02	4.812E-05	3.533E-05	0.7343
1.750E-02	5.219E+02	4.547E+00	5.264E+02	5.299E-05	3.987E-05	0.7525
2.000E-02	5.469E+02	4.115E+00	5.510E+02	5.763E-05	4.424E-05	0.7677
2.250E-02	5.693E+02	3.765E+00	5.731E+02	6.208E-05	4.846E-05	0.7806
2.500E-02	5.892E+02	3.475E+00	5.927E+02	6.637E-05	5.254E-05	0.7917
2.750E-02	6.069E+02	3.229E+00	6.101E+02	7.052E-05	5.652E-05	0.8015
3.000E-02	6.229E+02	3.019E+00	6.259E+02	7.457E-05	6.041E-05	0.8102
3.500E-02	6.524E+02	2.678E+00	6.551E+02	8.237E-05	6.795E-05	0.8250
4.000E-02	6.799E+02	2.411E+00	6.823E+02	8.985E-05	7.521E-05	0.8371
4.500E-02	7.045E+02	2.196E+00	7.067E+02	9.705E-05	8.222E-05	0.8472
5.000E-02	7.253E+02	2.019E+00	7.274E+02	1.040E-04	8.903E-05	0.8559
5.500E-02	7.422E+02	1.870E+00	7.441E+02	1.108E-04	9.568E-05	0.8635
6.000E-02	7.556E+02	1.744E+00	7.574E+02	1.175E-04	1.022E-04	0.8702
6.500E-02	7.661E+02	1.634E+00	7.677E+02	1.240E-04	1.087E-04	0.8761
7.000E-02	7.740E+02	1.539E+00	7.755E+02	1.305E-04	1.150E-04	0.8815
7.500E-02	7.796E+02	1.455E+00	7.810E+02	1.369E-04	1.214E-04	0.8864
8.000E-02	7.831E+02	1.380E+00	7.845E+02	1.433E-04	1.277E-04	0.8908
8.500E-02	7.847E+02	1.313E+00	7.861E+02	1.497E-04	1.339E-04	0.8949
9.000E-02	7.848E+02	1.253E+00	7.860E+02	1.560E-04	1.402E-04	0.8987

(required) Kinetic Energy (MeV)	Stopping Power (MeV cm^2/g)			Range		
	Electronic	Nuclear	Total	CSDA (g/cm^2)	Projected (g/cm^2)	Detour Factor Projected / CSDA
9.500E-02	7.834E+02	1.199E+00	7.846E+02	1.624E-04	1.465E-04	0.9022
1.000E-01	7.807E+02	1.149E+00	7.819E+02	1.688E-04	1.528E-04	0.9055
1.250E-01	7.538E+02	9.548E-01	7.548E+02	2.013E-04	1.850E-04	0.9192
1.500E-01	7.145E+02	8.200E-01	7.153E+02	2.353E-04	2.187E-04	0.9298
1.750E-01	6.714E+02	7.204E-01	6.721E+02	2.713E-04	2.545E-04	0.9382
2.000E-01	6.291E+02	6.436E-01	6.297E+02	3.097E-04	2.927E-04	0.9451
2.250E-01	5.902E+02	5.825E-01	5.908E+02	3.507E-04	3.335E-04	0.9509
2.500E-01	5.556E+02	5.326E-01	5.561E+02	3.944E-04	3.769E-04	0.9558
2.750E-01	5.249E+02	4.911E-01	5.254E+02	4.406E-04	4.230E-04	0.9599
3.000E-01	4.977E+02	4.559E-01	4.982E+02	4.895E-04	4.717E-04	0.9635
3.500E-01	4.539E+02	3.995E-01	4.543E+02	5.948E-04	5.765E-04	0.9692
4.000E-01	4.193E+02	3.561E-01	4.196E+02	7.095E-04	6.907E-04	0.9736
4.500E-01	3.903E+02	3.217E-01	3.906E+02	8.330E-04	8.139E-04	0.9770
5.000E-01	3.651E+02	2.937E-01	3.654E+02	9.655E-04	9.458E-04	0.9797
5.500E-01	3.430E+02	2.704E-01	3.433E+02	1.107E-03	1.087E-03	0.9818
6.000E-01	3.237E+02	2.505E-01	3.240E+02	1.257E-03	1.236E-03	0.9836
6.500E-01	3.071E+02	2.335E-01	3.073E+02	1.415E-03	1.394E-03	0.9851
7.000E-01	2.923E+02	2.187E-01	2.925E+02	1.582E-03	1.561E-03	0.9864
7.500E-01	2.791E+02	2.058E-01	2.793E+02	1.757E-03	1.735E-03	0.9874
8.000E-01	2.673E+02	1.943E-01	2.675E+02	1.940E-03	1.917E-03	0.9884
8.500E-01	2.566E+02	1.842E-01	2.568E+02	2.131E-03	2.108E-03	0.9891
9.000E-01	2.468E+02	1.750E-01	2.470E+02	2.329E-03	2.306E-03	0.9898
9.500E-01	2.378E+02	1.668E-01	2.380E+02	2.536E-03	2.512E-03	0.9905
1.000E+00	2.295E+02	1.594E-01	2.297E+02	2.750E-03	2.725E-03	0.9910
1.250E+00	1.967E+02	1.305E-01	1.968E+02	3.930E-03	3.902E-03	0.9929
1.500E+00	1.730E+02	1.108E-01	1.731E+02	5.288E-03	5.257E-03	0.9941
1.750E+00	1.550E+02	9.640E-02	1.551E+02	6.816E-03	6.781E-03	0.9949
2.000E+00	1.408E+02	8.541E-02	1.409E+02	8.509E-03	8.471E-03	0.9955
2.250E+00	1.292E+02	7.674E-02	1.293E+02	1.036E-02	1.032E-02	0.9959
2.500E+00	1.196E+02	6.971E-02	1.196E+02	1.238E-02	1.233E-02	0.9962
2.750E+00	1.114E+02	6.390E-02	1.115E+02	1.454E-02	1.449E-02	0.9965
3.000E+00	1.044E+02	5.901E-02	1.045E+02	1.686E-02	1.680E-02	0.9967
3.500E+00	9.296E+01	5.122E-02	9.301E+01	2.194E-02	2.188E-02	0.9970

(required) Kinetic Energy (MeV)	Stopping Power (MeV cm^2/g)			Range		
	Electronic	Nuclear	Total	CSDA (g/cm^2)	Projected (g/cm^2)	Detour Factor Projected / CSDA
4.000E+00	8.394E+01	4.529E-02	8.399E+01	2.761E-02	2.753E-02	0.9972
4.500E+00	7.667E+01	4.063E-02	7.671E+01	3.384E-02	3.376E-02	0.9974
5.000E+00	7.065E+01	3.685E-02	7.069E+01	4.064E-02	4.054E-02	0.9975
5.500E+00	6.559E+01	3.373E-02	6.562E+01	4.799E-02	4.787E-02	0.9976
6.000E+00	6.126E+01	3.112E-02	6.130E+01	5.588E-02	5.575E-02	0.9977
6.500E+00	5.752E+01	2.888E-02	5.755E+01	6.430E-02	6.416E-02	0.9978
7.000E+00	5.425E+01	2.696E-02	5.428E+01	7.325E-02	7.309E-02	0.9979
7.500E+00	5.136E+01	2.528E-02	5.139E+01	8.272E-02	8.255E-02	0.9979
8.000E+00	4.879E+01	2.380E-02	4.881E+01	9.271E-02	9.252E-02	0.9980
8.500E+00	4.650E+01	2.249E-02	4.652E+01	1.032E-01	1.030E-01	0.9980
9.000E+00	4.442E+01	2.132E-02	4.444E+01	1.142E-01	1.140E-01	0.9980
9.500E+00	4.254E+01	2.027E-02	4.256E+01	1.257E-01	1.255E-01	0.9981
1.000E+01	4.082E+01	1.932E-02	4.084E+01	1.377E-01	1.374E-01	0.9981
1.250E+01	3.411E+01	1.567E-02	3.413E+01	2.050E-01	2.046E-01	0.9982
1.500E+01	2.944E+01	1.320E-02	2.945E+01	2.841E-01	2.836E-01	0.9983
1.750E+01	2.598E+01	1.141E-02	2.599E+01	3.746E-01	3.740E-01	0.9983
2.000E+01	2.331E+01	1.006E-02	2.332E+01	4.764E-01	4.756E-01	0.9984
2.500E+01	1.945E+01	8.149E-03	1.946E+01	7.122E-01	7.111E-01	0.9985
2.750E+01	1.800E+01	7.446E-03	1.801E+01	8.459E-01	8.446E-01	0.9985
3.000E+01	1.678E+01	6.858E-03	1.678E+01	9.898E-01	9.883E-01	0.9985
3.500E+01	1.481E+01	5.926E-03	1.482E+01	1.308E+00	1.306E+00	0.9985
4.000E+01	1.331E+01	5.221E-03	1.331E+01	1.664E+00	1.662E+00	0.9986
4.500E+01	1.211E+01	4.669E-03	1.211E+01	2.058E+00	2.056E+00	0.9986
5.000E+01	1.113E+01	4.225E-03	1.114E+01	2.489E+00	2.486E+00	0.9986
5.500E+01	1.032E+01	3.859E-03	1.033E+01	2.956E+00	2.952E+00	0.9986
6.000E+01	9.642E+00	3.553E-03	9.645E+00	3.457E+00	3.453E+00	0.9987
6.500E+01	9.056E+00	3.293E-03	9.060E+00	3.992E+00	3.987E+00	0.9987
7.000E+01	8.549E+00	3.069E-03	8.553E+00	4.561E+00	4.555E+00	0.9987
7.500E+01	8.106E+00	2.874E-03	8.109E+00	5.161E+00	5.155E+00	0.9987
8.000E+01	7.714E+00	2.703E-03	7.717E+00	5.794E+00	5.786E+00	0.9987
8.500E+01	7.366E+00	2.551E-03	7.368E+00	6.457E+00	6.449E+00	0.9987
9.000E+01	7.054E+00	2.416E-03	7.056E+00	7.151E+00	7.142E+00	0.9987
9.500E+01	6.773E+00	2.295E-03	6.775E+00	7.874E+00	7.864E+00	0.9987

(required) Kinetic Energy (MeV)	Stopping Power (MeV cm^2/g)			Range		
	Electronic	Nuclear	Total	CSDA (g/cm^2)	Projected (g/cm^2)	Detour Factor Projected / CSDA
1.000E+02	6.518E+00	2.186E-03	6.520E+00	8.627E+00	8.616E+00	0.9988
1.250E+02	5.536E+00	1.768E-03	5.538E+00	1.281E+01	1.279E+01	0.9988
1.500E+02	4.867E+00	1.486E-03	4.868E+00	1.764E+01	1.762E+01	0.9988
1.750E+02	4.381E+00	1.283E-03	4.382E+00	2.306E+01	2.303E+01	0.9989
2.000E+02	4.013E+00	1.130E-03	4.014E+00	2.903E+01	2.900E+01	0.9989
2.250E+02	3.723E+00	1.010E-03	3.724E+00	3.550E+01	3.547E+01	0.9989
2.500E+02	3.491E+00	9.141E-04	3.492E+00	4.244E+01	4.240E+01	0.9989
2.750E+02	3.299E+00	8.349E-04	3.300E+00	4.981E+01	4.976E+01	0.9990
3.000E+02	3.140E+00	7.686E-04	3.140E+00	5.758E+01	5.753E+01	0.9990
3.500E+02	2.888E+00	6.638E-04	2.889E+00	7.422E+01	7.414E+01	0.9990
4.000E+02	2.699E+00	5.847E-04	2.700E+00	9.214E+01	9.206E+01	0.9990
4.500E+02	2.553E+00	5.228E-04	2.554E+00	1.112E+02	1.111E+02	0.9991
5.000E+02	2.437E+00	4.730E-04	2.438E+00	1.313E+02	1.311E+02	0.9991
5.500E+02	2.343E+00	4.321E-04	2.344E+00	1.522E+02	1.521E+02	0.9991
6.000E+02	2.266E+00	3.979E-04	2.266E+00	1.739E+02	1.737E+02	0.9991
6.500E+02	2.201E+00	3.688E-04	2.202E+00	1.963E+02	1.961E+02	0.9992
7.000E+02	2.147E+00	3.438E-04	2.147E+00	2.193E+02	2.191E+02	0.9992
7.500E+02	2.100E+00	3.220E-04	2.101E+00	2.428E+02	2.426E+02	0.9992
8.000E+02	2.060E+00	3.029E-04	2.061E+00	2.669E+02	2.667E+02	0.9992
8.500E+02	2.026E+00	2.860E-04	2.026E+00	2.913E+02	2.911E+02	0.9992
9.000E+02	1.996E+00	2.710E-04	1.996E+00	3.162E+02	3.160E+02	0.9992
9.500E+02	1.969E+00	2.575E-04	1.969E+00	3.414E+02	3.412E+02	0.9993
1.000E+03	1.946E+00	2.453E-04	1.946E+00	3.670E+02	3.667E+02	0.9993
1.500E+03	1.816E+00	1.672E-04	1.816E+00	6.345E+02	6.341E+02	0.9994
2.000E+03	1.771E+00	1.275E-04	1.772E+00	9.138E+02	9.133E+02	0.9995
2.500E+03	1.757E+00	1.034E-04	1.757E+00	1.197E+03	1.197E+03	0.9995
3.000E+03	1.755E+00	8.710E-05	1.755E+00	1.482E+03	1.482E+03	0.9995
4.000E+03	1.768E+00	6.650E-05	1.768E+00	2.050E+03	2.050E+03	0.9996
5.000E+03	1.787E+00	5.395E-05	1.787E+00	2.613E+03	2.612E+03	0.9997
6.000E+03	1.808E+00	4.548E-05	1.808E+00	3.169E+03	3.168E+03	0.9997
7.000E+03	1.828E+00	3.937E-05	1.828E+00	3.719E+03	3.718E+03	0.9997
8.000E+03	1.847E+00	3.474E-05	1.847E+00	4.264E+03	4.263E+03	0.9997
9.000E+03	1.864E+00	3.112E-05	1.864E+00	4.803E+03	4.801E+03	0.9998

(required) Kinetic Energy (MeV)	Stopping Power (MeV cm^2/g)			Range		
	Electronic	Nuclear	Total	CSDA (g/cm^2)	Projected (g/cm^2)	Detour Factor Projected / CSDA
1.000E+04	1.881E+00	2.820E-05	1.881E+00	5.337E+03	5.335E+03	0.9998