Report on the Comparison of the August 2002 $^{21}Ne(p,\gamma)^{22}Na$ Ionization Chamber Data with Results from a SRIM-based Energy-Loss Simulation

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The following graphs depict comparisons between the energy loss data and the predicted energy losses. I used a C++ program that I wrote to generate energy loss predictions based on SRIM tables. In each of the graphs, the curves labeled Ne21 represent the predicted behavior of the leaky beam, and the curves labeled Na22 represent the predicted behavior of the recoils. The curves labeled leakies refer to the leaky beam data, and the curves labeled recoils refer to the recoil data.

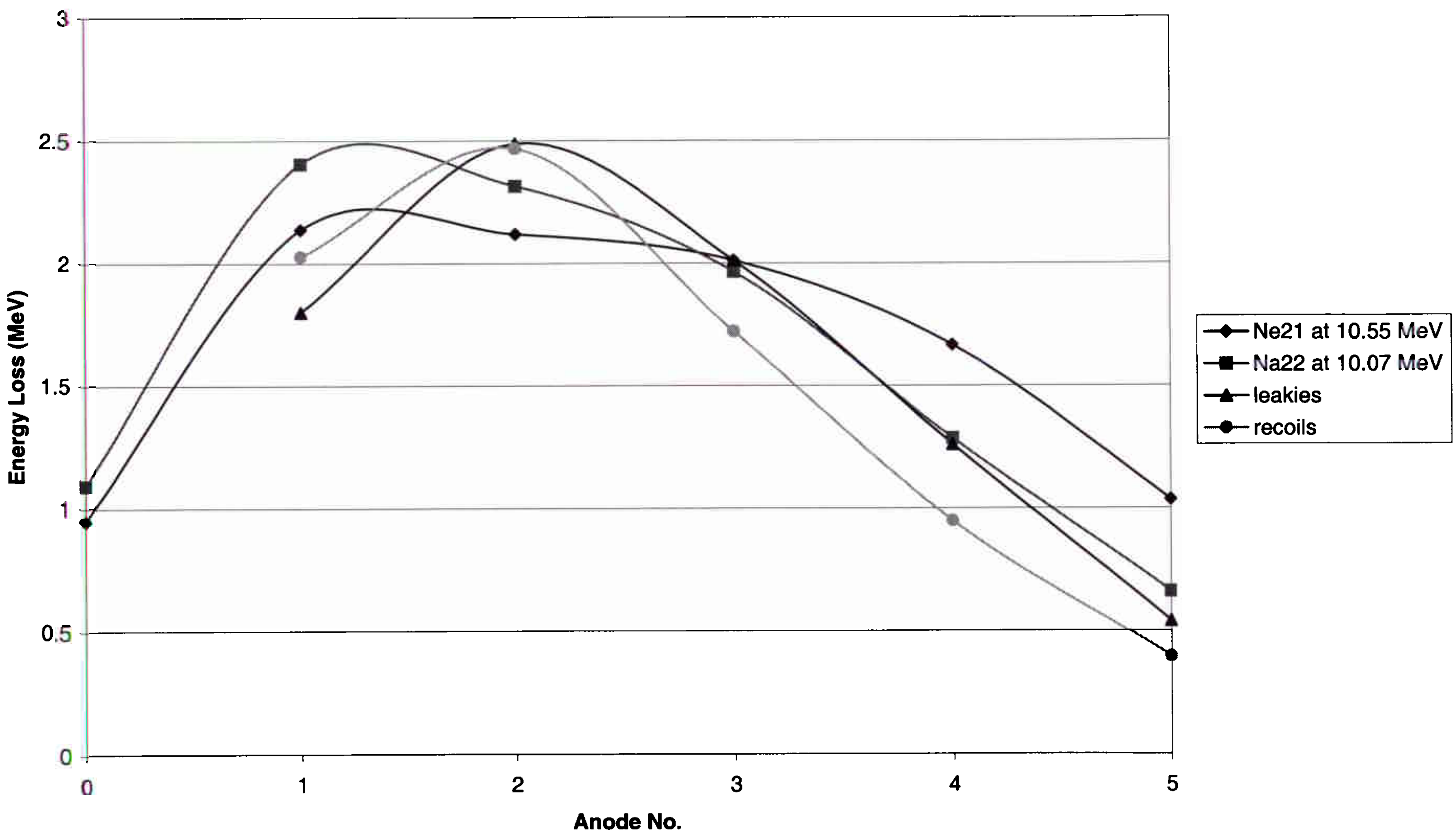
Fig. 1 and Fig. 2 are plots of the data from runs 6672 and 6640 and energy loss predictions that include the predicted energy loss in a 55 $\mu g/cm^2$ polypropylene window. For run 6672, the isobutane pressure was 7.5 torr, and the energy of the beam after loss in the gas target was 10.55 MeV. Hence, I used those values in the SRIM-based calculations for Fig. 1. For run 6640, the energy was 10.43 MeV, and the isobutane pressure was 8.5 torr, so I entered those values into the program for the simulation results I plotted in Fig. 2. I normalized the energy data in both runs by multiplying the energy losses by a factor that forced the energy loss in Anode 3 of run 6672 to equal that predicted for Anode 3 at an isobutane pressure of 7.5 torr.

In Fig. 3 and Fig. 4, I graphed the data from runs 6672 and 6640 along with energy loss calculations that assume that the leaky beam loses enough energy in the window that it enters Anode 1 with an energy of 7.6 MeV. In the simulation I assumed that the recoils entered Anode 1 with an energy of 7.6*21/22 = 7.25 MeV. I normalized the energy losses in both runs by applying a scaling factor that forced the energy loss in Anode 3 for run 6672 to equal the predicted loss for Anode 3 at a pressure of 7.5 torr.

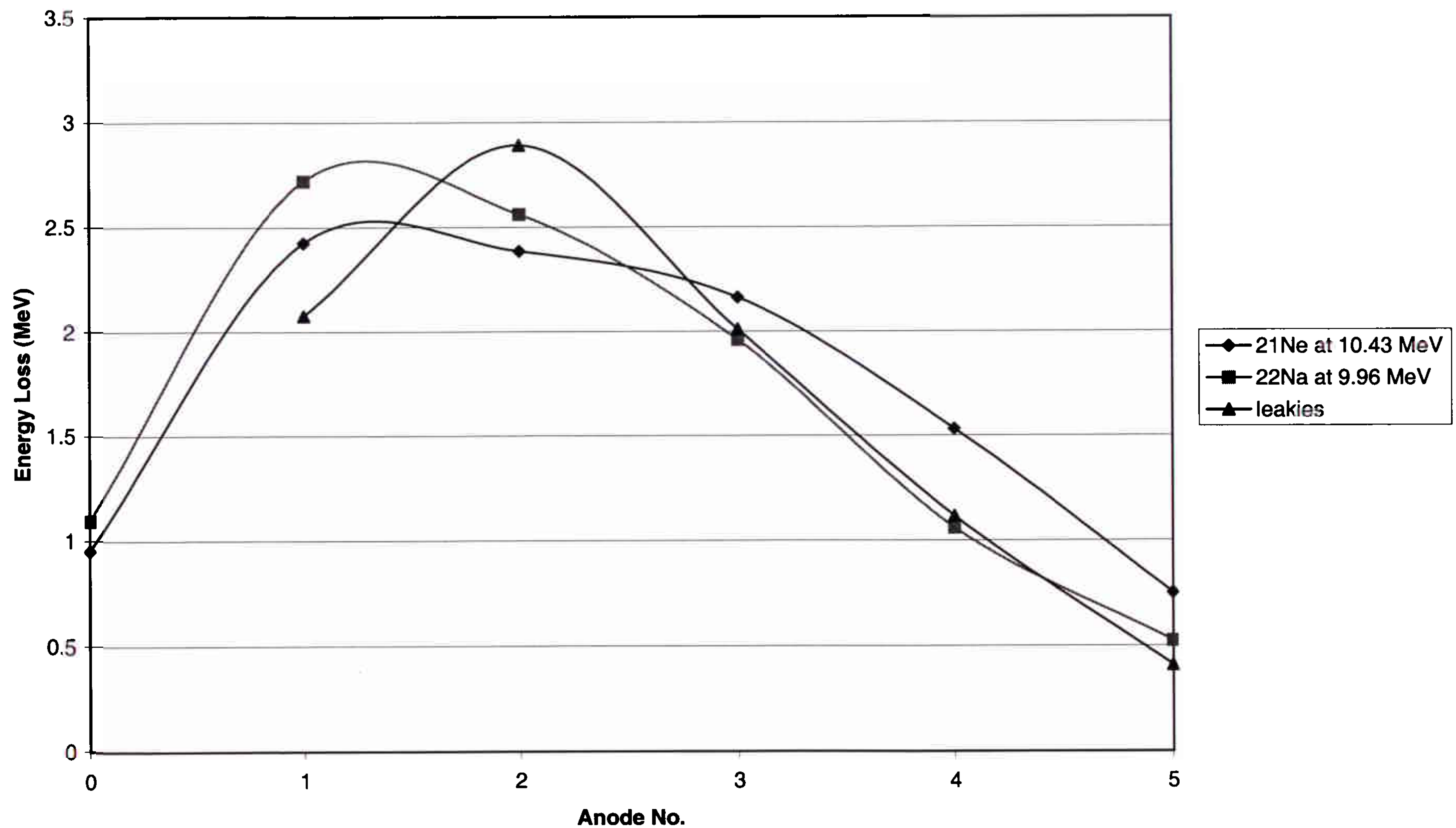
The following table displays the energies that the simulation predicted the ions would have after passing through Anode 5:

Ion Species	P_{IC}(torr)	E at Anode1(MeV)	E after Anode5 (MeV)
^{21}Ne	7.5	7.6	0.13
^{21}Ne	8.5	7.6	0
^{22}Na	7.5	7.25	0.036
^{22}Na	8.5	7.25	0
^{21}Ne	7.5	10.55-0.95 = 9.60	0.63
^{21}Ne	8.5	10.43-0.95 = 9.48	0.22
^{22}Na	7.5	10.07-1.1 = 8.98	0.36
^{22}Na	8.5	9.96-1.1 = 8.87	0.036

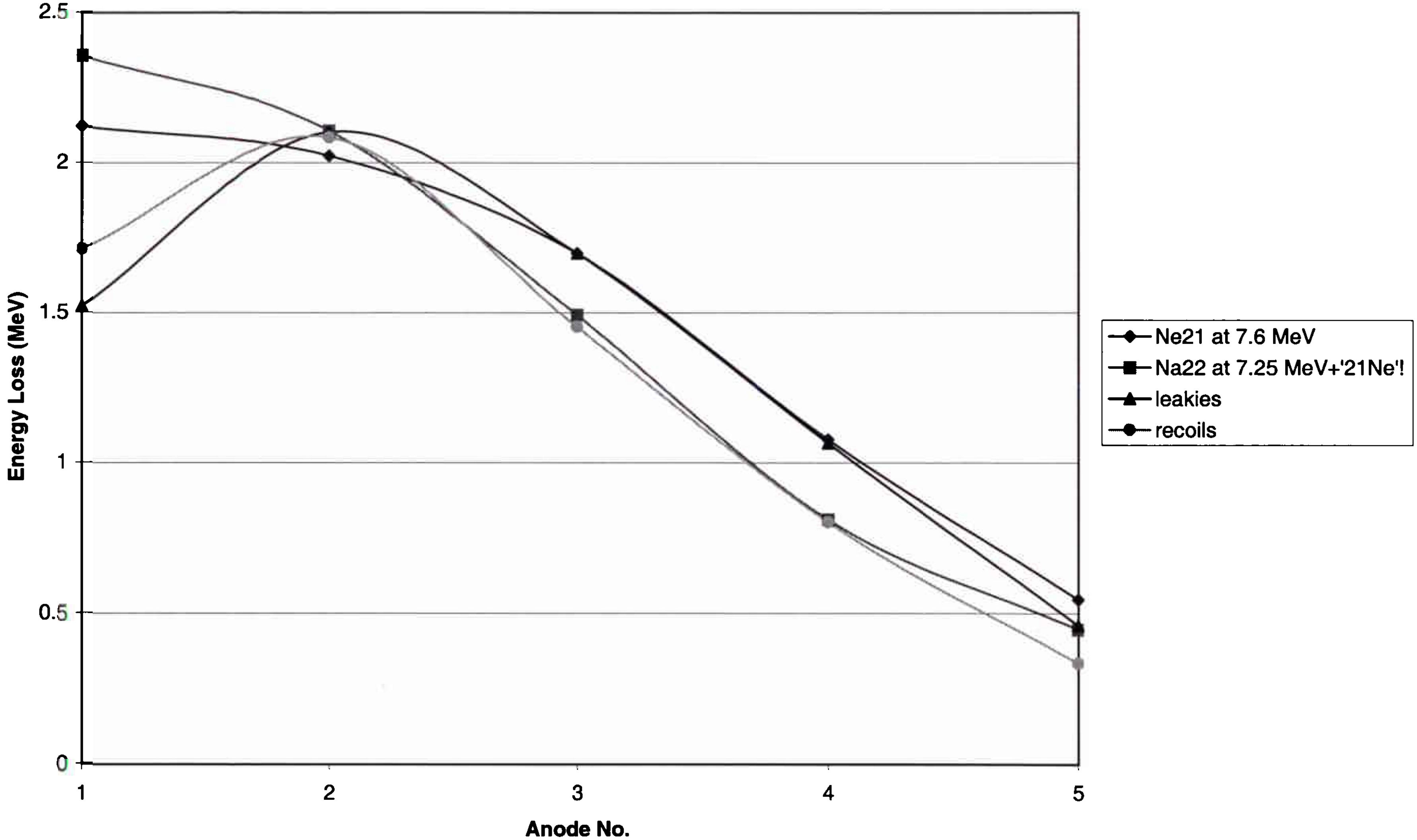
Energy loss vs. Anode No.
Comparison of run6672 with SRIM for P(IC) = 7.5 torr
Fig. 1



Anode No. vs. Energy Loss
Comparison of run6640 with SRIM for P(IC) = 8.5 torr
Fig. 2



Energy loss vs. Anode No.
Comparison of run6672 with SRIM for P(IC) = 7.5 torr
Fig. 3



Anode No. vs. Energy Loss
Comparison of run6640 with SRIM for P(IC) = 8.5 torr
Fig. 4