

SIMION 7.0 Operating Instructions

May 8, 2009

SIMION 7.0 will be the main simulation tool used for this lab. While this version was originally created for Windows NT (and therefore has a very dated GUI), it is a very powerful tool for simulating features of this accelerator and generally gaining an intuition for what is happening. SIMION allows one to draw in the components of the accelerator, vary the electric potential (and magnetic field) present on each of these components and track ions through the accelerator. Fortunately, the drawing portion has already been completed. That is, the majority of the accelerator has already been drawn to scale (by Mike Martin and updated by Joel Thompson) and is ready for use. These instructions describe how to access this file and vary important quantities. For more detailed information on SIMION 7 in general visit <http://simion.com/info>.

1 Accessing the Accelerator Drawing

- 1) Open SIMION 7.0. A shortcut for this program is located on the desktop of the computer located on the first floor of the lab next to Nick Szabo's office.
- 2) Select the "View" button. Select "Yes" or "Return" on any dialog boxes that pop up. The program will then prompt you to select a file. Move into

```
0000_Mike\Gem
```

and select

```
joel_edit_4_21_2009.iob
```

This should open up the accelerator file.

2 Initializing the Particles

- 1) To initialize the particles make sure you are in the "Normal" tab and select "Def". This will allow you to define the initial particle positions, charge, mass, etc. You may need to change these parameters multiple times depending on what you wish to explore.
- 2) Near the top of the screen there is a box labeled "Trajectory Group". The first number tell you what group parameters you are currently viewing and the number in parentheses tells you the total

number of groups. To change the group number put your cursor over the first number and either right or left click. To add or remove groups you must either “copy” and “paste” a group (and then change its parameters) or “cut” a group.

3) The initial position and angle of a particle in a group (the other particles will be filled in around the first particle according to the Delta values specified on the right portion of the screen) is defined on the left portion of the screen. All positions are defined in grid units.

3 Tracking the Particles

1) Once the particles are properly initialized one can track the particles by pressing the “Fly’m” button. Wait until the button turns back to original color. This indicates the program has finished tracking the trajectory of each ion.

2) In the “Normal” tab, if one clicks on “Dots” before tracking particles, the simulation tracks each particle as a dot in real time.

3) The energy and position of each particle at different points along the trajectory can be displayed or outputted to a file. Read the SIMION 7.0 Manual for more details.

4 Changing the Potential on each Einzel Lens

1) Click on the “PA” tab and place your cursor over the “Instance” number.

2) Right or left click until a green box appears around the section that contains the Einzel Lens of interest.

3) Press the “Fadj” button. This will open a panel that shows the voltage on each electrode (and beam pipe).

4) Place your cursor over the electrode of interest and change the value of the potential.

5) When you are finished adjusting the potential press “Fast Adjust PA.”

6) Remember to press “Fly’m” again in order to track the ions with the new Einzel Lens voltages.

5 Changing the View

1) You can zoom into any section by left clicking, dragging a box around the area of interest and then right clicking.

2) To change the viewing plane (or view in 3D) click on the “WB View” tab and select which view you want.

3) It is also very useful to view the potential energy diagram of the lenses. This can be shown by selecting the “PE View” tab.

Notice the difference in the potential energy diagram of each lens.

4) One can also display the contour lines for each lens. Press the “WB View” tab and then “XY” to get back to “XY” view. Next press the “Contour” tab and choose the number of contour lines you want to draw in the green box.

- 5) Press "Auto" to draw in the contour lines.
- 6) To remove the contour lines press "Del".

6 Determining the Focal Length of the Lenses

The best way to determine the focal length of a lens is to initialize a parallel beam of particles somewhere before the lens. To do this you should initialize a group of ions with zero angle right before the lens. Make sure to specify the energy to be that of your extractor voltage. After tracking through the lens there should be a point where all of the trajectories converge. This is your focal length.