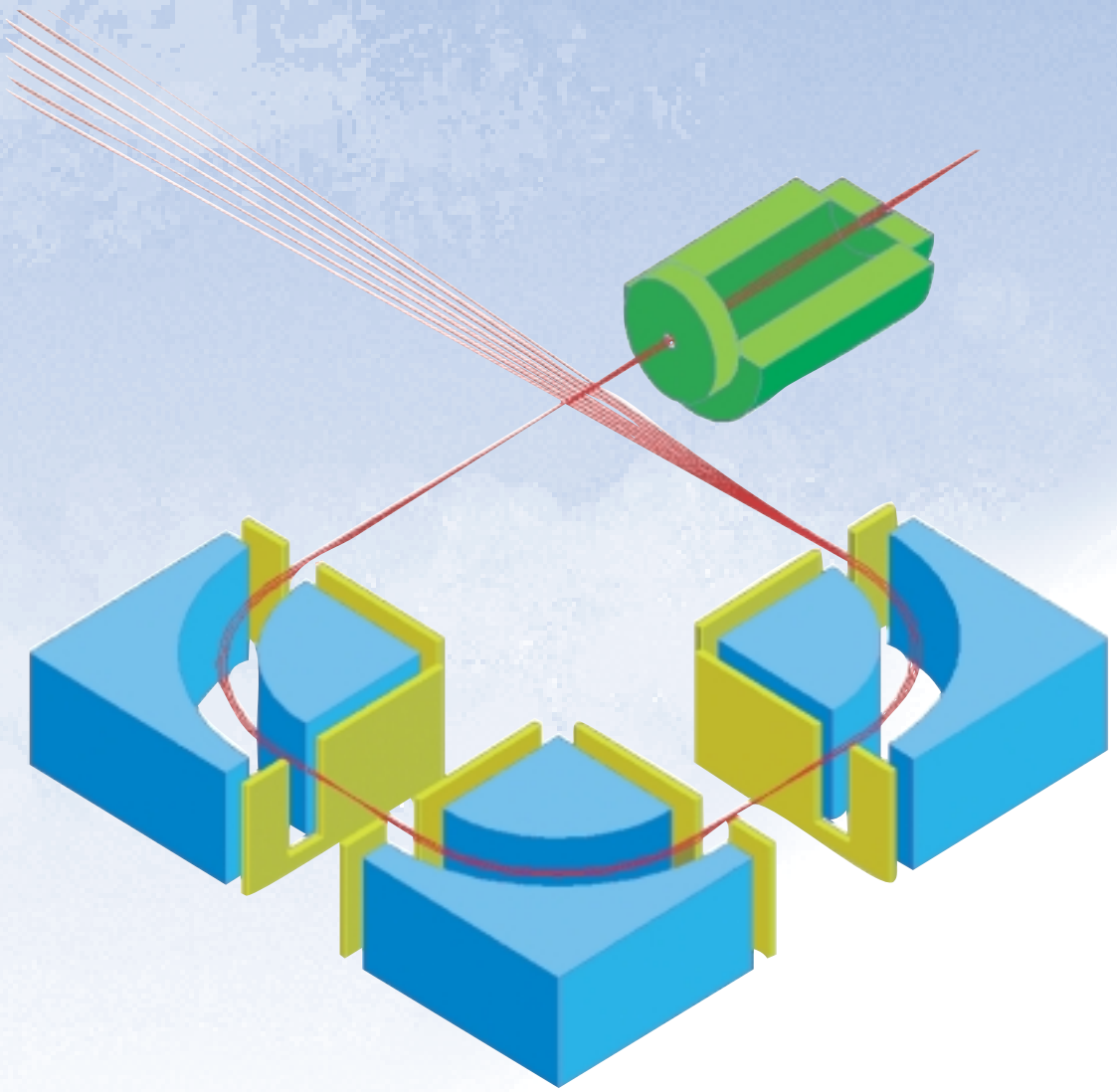
SIMION 3D 7.0

The Industry Standard for Ion Optics Simulations



New

SIMION SL™ Toolkit*

Expands the Capabilities of SIMION 3D Ion Optics Modeling Software

*SIMION SL Toolkit is developed by David Manura at Scientific Instrument Services, Inc.

Scientific Instrument Services, Inc.

1027 Old York Rd, Ringoes, NJ 08551

Phone: (908) 788-5550 **Fax: (908) 806-6631**

SIMION is developed at the Idaho National Engineering & Environmental Laboratory.

SIMION 3D 7.0

Since 1978, the SIMION 3D simulation software has been the industry standard for modeling electron and ion optics. SIMION's versatility and power allow the simulation of a wide variety of systems: from ion flight through simple electrostatic and magnetic lenses to highly complex instruments, including time-of-flight, ion traps, quadrupoles, ICR cells, and other MS, ion source and detector optics.

In its seventh major revision, SIMION 3D 7.0 is a full Windows program featuring 3D electrostatic/magnetic arrays, cutaways of 3D views, movie effects, data recording, charge repulsion, solid geometry definition files, and a user program interface. SIMION models ion optics problems with 2D symmetrical and/or 3D asymmetrical electrostatic and/or magnetic potential arrays. It incorporates an ion optics workbench strategy that allows you to size, orient, and position up to 200 instances (3D images) of these potential arrays within a workbench volume of up to 8 cubic km. All potential arrays are visualized as 3D objects that the user can cut away to inspect ion trajectories and potential energy surfaces. Ions can be flown singly or in groups, recorded to a data file, displayed as lines or flying dots, and automatically re-flown to provide movie effects when needed. SIMION 3D Package includes SIMION 3D software and a 330 page manual.

No program can be all things to all people. SIMION 3D is intended to provide direct and highly interactive methods for simulating a wide variety of general ion optics problems, with interactive parameter manipulation, immediate feedback, and multi-ion trajectory visualization. The program balances of ease-of-use, speed, and accuracy to enable it to support many real-world applications.

Additional features are now available in the SIMION SL Toolkit, developed by SIS. This add-on package provides CAD import/export capabilities, a new high-level language for user programs, simplified import/export of potential and field data as ASCII text to/from SIMION potential arrays files, C++/Perl/Python libraries for manipulating potential arrays, and other miscellaneous utilities.

Part No.	Description
SIMION7C	SIMION 3D Version 7.0 (Commercial Pricing)
SIMION7A	SIMION 3D Version 7.0 (Academic Pricing)
SIMION7G	SIMION 3D Version 7.0 (US Govt. Pricing)

*Quantity discounts are available

Features

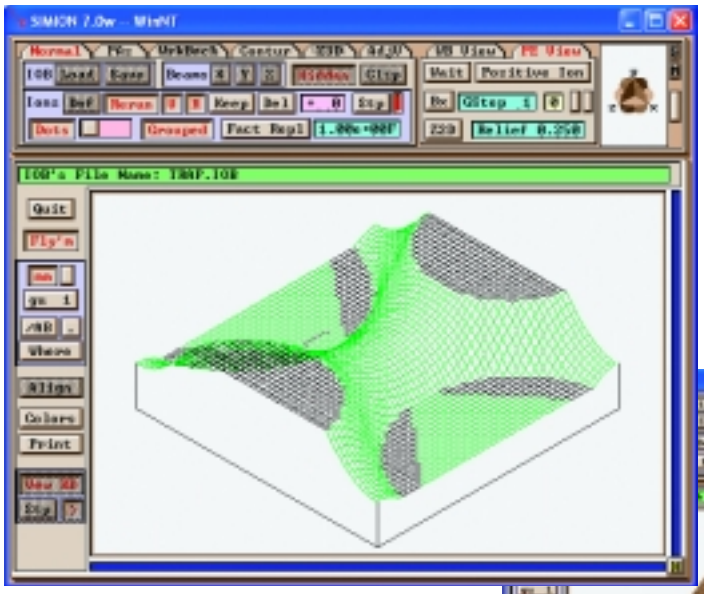
- **Capabilities**
  - **Models ion flight** through electrostatic and/or magnetic fields computed from electrode geometries you input.
  - **3D viewing** of the simulation in real-time, with the ability to cut away surfaces to see inside.
  - **Potential energy surface display**. Quickly generate potential surfaces from your model and watch ions fly over it.
  - **Data recording**. Ion parameters and results during flight may be viewed or exported to a delimited text file.
  - **Define ion parameters:** charge, mass, kinetic energy, initial velocity direction. Define a series of ions, or for complete control, import ions definitions from a text file or define ions via a user program.
  - **Draw electrode geometries** from multiple methods: (1) a GUI paint editor or (2) "GEM" geometry file format in which to code constructive solid geometry (CSG) operations, with arbitrary vector scaling. (The SL Toolkit also provides import from CAD software and libraries for generating geometries from general purpose programming languages.)
  - **A user programming language** for tailoring the simulation at runtime: adjust or electrode potentials, change ion properties, perform calculations, output results.

- **Calculation methods and constraints:**
  - **Ion flight via Runge-Kutta calculation** with adaptive timesteps, edge detection, and binary boundary approach. Time step quality adjustable via GUI or user programming.
  - **Relativistic corrections.**
  - **Charge repulsion estimation methods supported:** beam repulsion, Coulombic repulsion, and factor repulsion.
  - **Voxel (3D pixel) volume graphics system**.
  - **Very fast ion flying between instances.**
  - **Fields solved from the Laplace equation and finite difference methods**, optimizing with symmetry when available. "Fast adjust" feature allows individual electrode potentials to be quickly changed without recalculating (e.g. when oscillating quadrupole rods). Fields over multiple components may be solved globally or solved locally and then combined into a workbench.
  - **50 million points per potential array instance**, 200 potential array instances, +/- 10 million V potential range, full support of Win32's virtual memory (2 gigabytes).

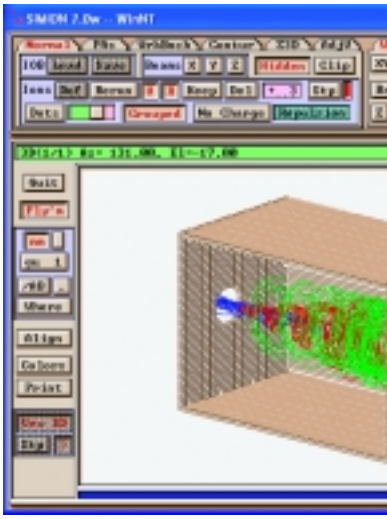
- **Usability and Windows Compatibility:**
  - **Highly interactive.** Adjust parameters and receive immediate feedback.
  - **Full Windows Compatibility** (including 9X/NT/2K/XP/Wine).
  - **Multitasking** - one can run several copies of SIMION 7.0 at the same time or have SIMION 7.0 run in the background while running other Windows programs.
  - **Windows metafile support for image export**.
  - **Context sensitive help on every control**.
  - **Viewing, recording, saving, and rerunning trajectories.**
- **Printed manual (330 pages) + electronic courses/tutorials.**
- **Support and resources available at www.SIMION.com**.
- **More features are available in the SIMION SL Toolkit.**

Capabilities and Fu

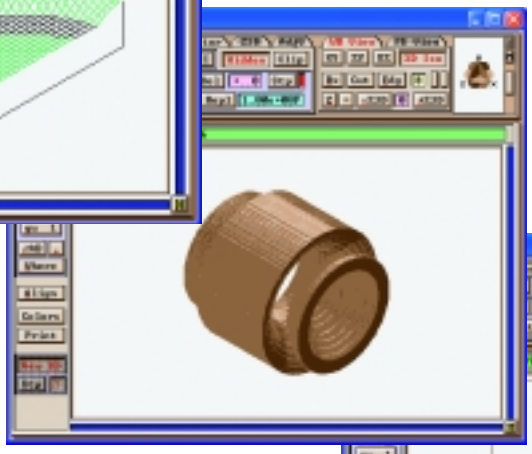
Simulate ion flights and collect data on your model or in the handful of electrostatic and magnetic exam

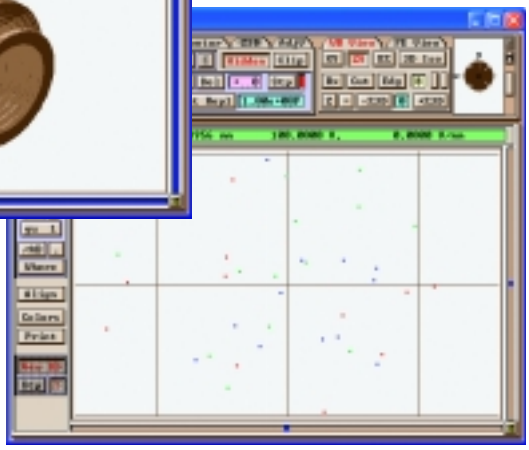


Watch the potential energy surface of an ion trap oscillate.

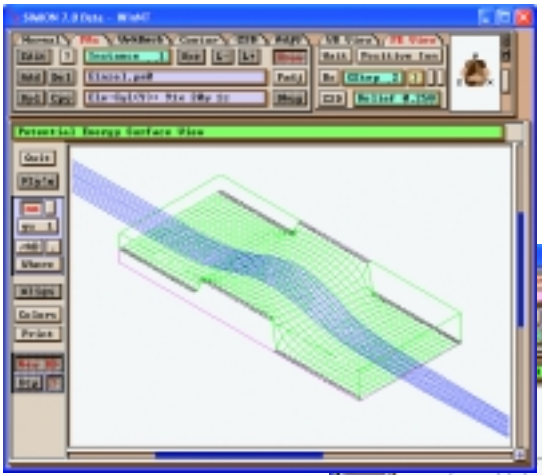


Cut away surfaces to see insi
ICR cell.

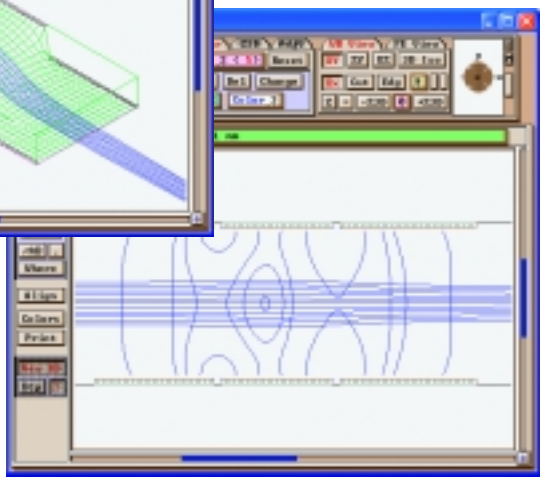




View ions fly as dots.



Visualize how the potential energy surface affects ion paths in a buncher lens.



Display potential and field contours.

Define initial ion charges, masses, energies and trajectories.

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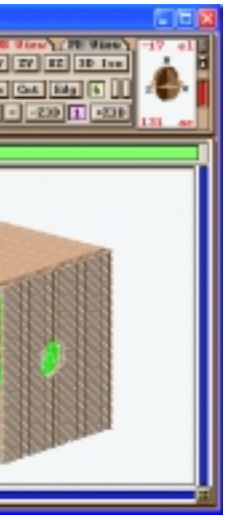
ple systems: quadrupole, ion trap, ICR cell, buncher lens, magnetic lens systems, lens tuning and others.



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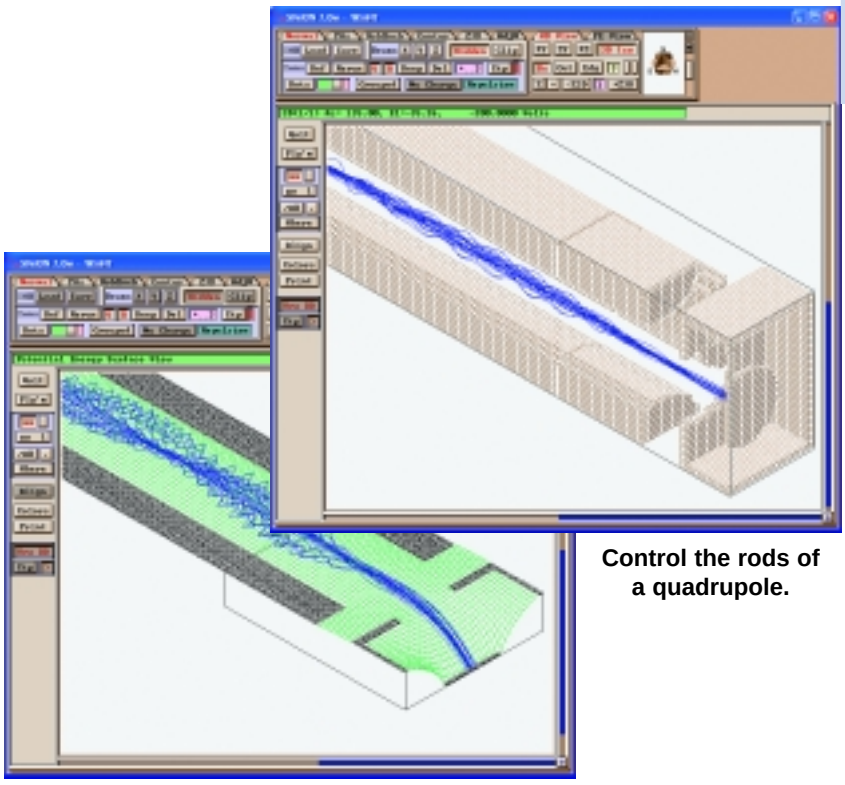
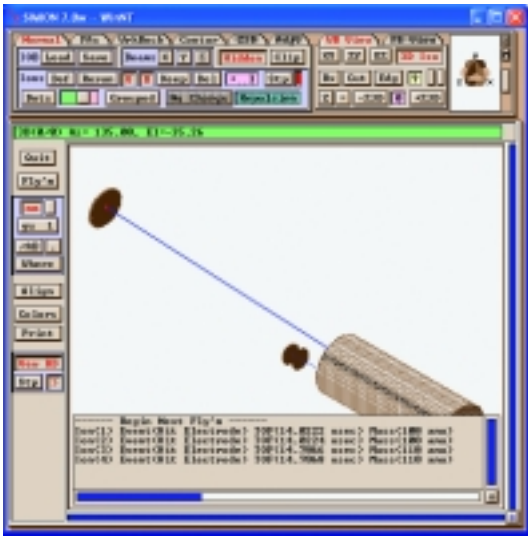
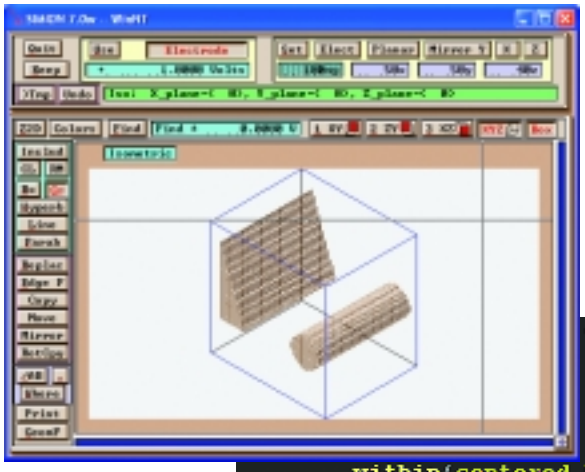


Control the rods of a quadrupole.



Record ion flight times in a TOF.

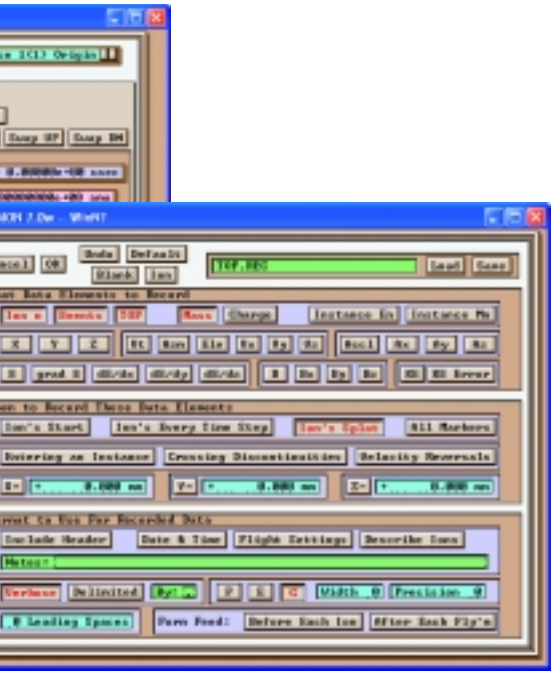


Define electrode geometries using a 3D GUI paint editor or write a geometry (GEM) text file describing your geometry in terms of constructive solid geometry (CSG) operations.

```
electrode (0V)

        within{centered_box(0,0,2,70)}

        ; cut hole in entrance plane
        notin{locate(,,,,-90){circle(0,0,5)}}
    }
}
```



Define data recording options.

SIMION SL™ Toolkit

A *NEW* Accessory Package to Expand the Capabilities of SIMION 3D

The SIMION SL Toolkit is a collection of customer requested utilities that SIS has developed to expand the capabilities of SIMION. It consists of the SL Tools, the SL Compiler, the SL Libraries and other miscellaneous utilities.

Features

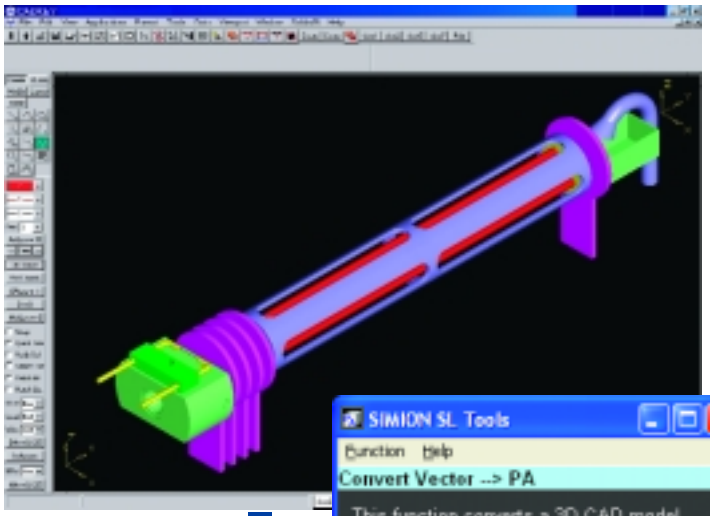
- The **SL Tools** is a GUI or command-line driven Windows executable program for performing a variety of functions on PA files, such as easily importing CAD models into SIMION. The SL Tools allows you to
  - Convert 3D CAD (STL) files from your favorite CAD package to/from 3D SIMION PA files. **(shown at right)**
  - Convert 2D bitmap images to/from 2D SIMION PA files
  - Extract/Import potential and potential gradient (i.e. field) maps as ASCII text files to/from refined PA files.

- The **SL Compiler** Provides a high-level programming language to replace the built-in low-level "PRG" language available in SIMION 7.0. Coding user programs becomes much simpler. Additional details are available on the SIMION.com web site.
  - Write SIMION user programs in a high-level SL language (rather than in PRG code) **(shown below)**

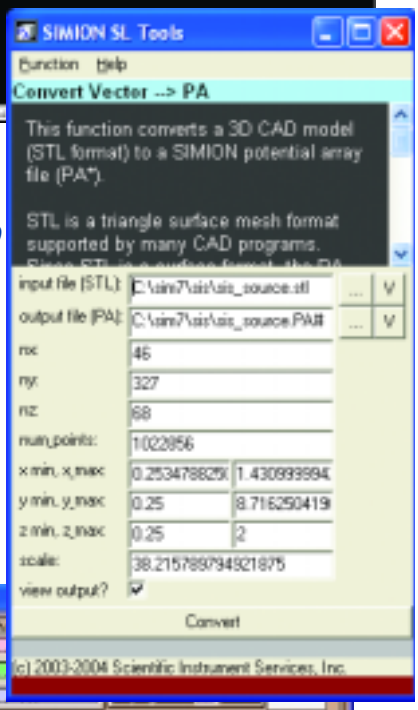
- The **SL Libraries** provide C++/Perl/Python libraries, in source code form, for programmatically manipulating SIMION potential array files or calling remote C++ code from SL program code.

- **Miscellaneous Utilities**. Various other utilities are included or bundled with SL, such as text editor plug-ins for syntax highlighting.

This list will continue to expand based on user requests. Updates are available from the SIMION web site



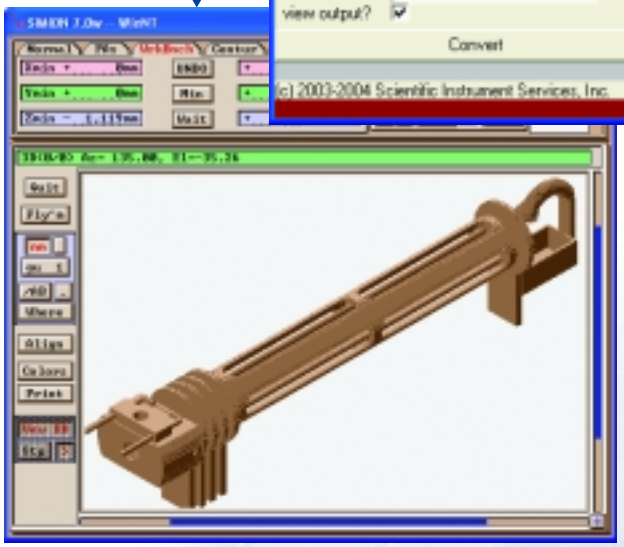
(1)

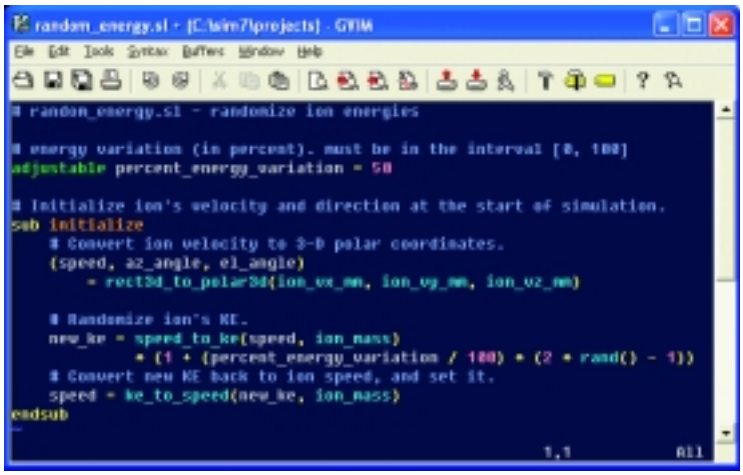


(2)

(1) Complex system of a MS source, quadrupole and detector generated in a CAD system.
(2) SL Tools used to convert the CAD file to SIMION PA file.
(3) Resultant SIMION PA file loaded into SIMION.

(3)





The SL Compiler can translate a high-level "SL" user program (above) into "PRG" code that can be executed by SIMION.

Part No.	Description
SIMIONSL2	SIMION SL Toolkit*

* Quantity discounts are available

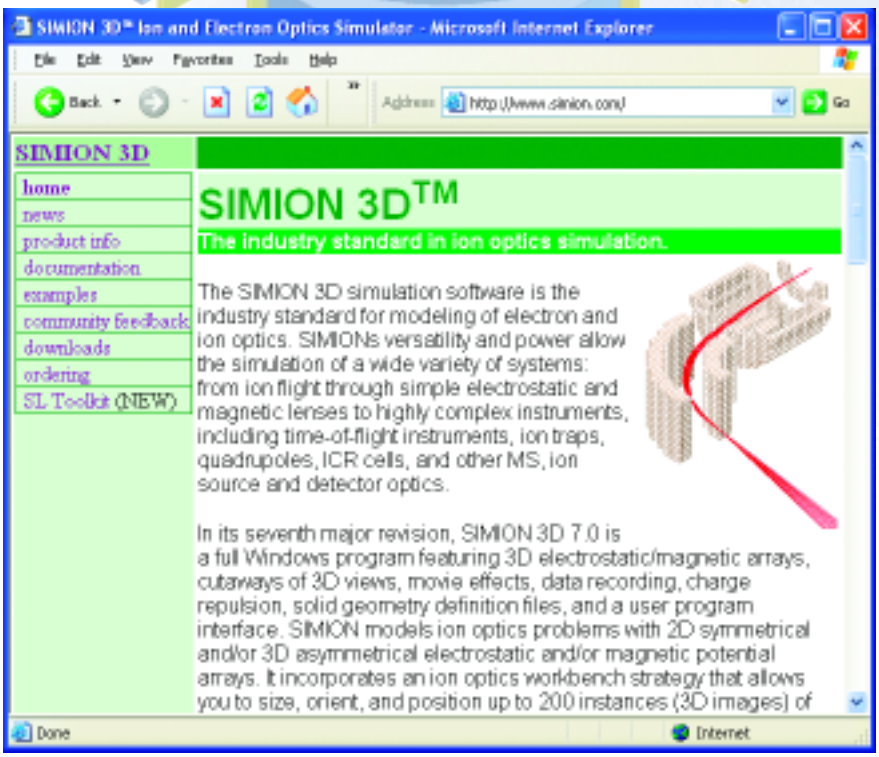
SIMION.COM

We Invite you to the NEW Web Site Dedicated to Serve the SIMION Community.

http://www.simion.com

Features:

- Discussions among SIMION users via the web and e-mail
- Product Information
- Downloads
- Articles



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Scientific Instrument Services, Inc.
1027 Old York Rd, Ringoes, NJ 08551
Phone: (908) 788-5550 Fax: (908) 806-6631