



S3-Exercise

Nuclear emergency exercise simulation software for laptop computers

S3-Exercise simulates space and time-dependent field measurements following a release of radioactivity to the environment using GPS technology.

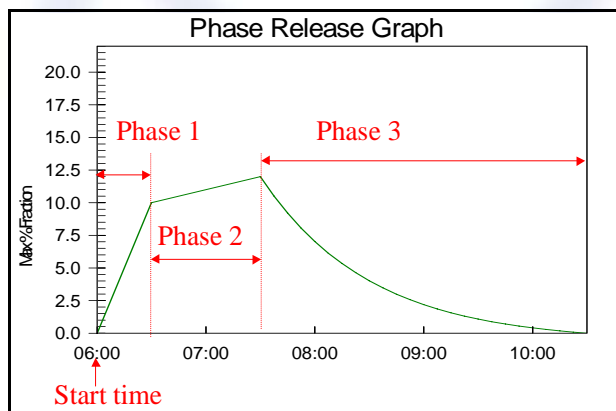
Introduction

One of the greatest challenges associated with nuclear emergency exercises has to do with creating scenarios and generating radiological data that reflect realistic accident conditions. S3-Exercise allows emergency response survey personnel to obtain instrument readings during an exercise as they would during a real event.

What is S3-Exercise?

S3-Exercise is a Windows program that was developed to automate the generation of radiological data from exercise scenarios. The program simulates gamma dose rate survey instruments, electronic personal dosimeters, and air sample filter measurements in a flexible manner. The program can generate printed data, can be run in real-time during table-top exercises or can be deployed in survey vehicles equipped with a GPS receiver.

The scenario data includes the source term magnitude as a function of time and variable meteorological wind data. The software comes bundled with pre-defined exercise scenarios for the main reactor types, however the user has the option of changing them, or creating entirely new exercise scenarios.



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How does S3-Exercise work?

S3-Exercise can generate radiological data in four different modes of operation: real-time with GPS, real-time at pre-defined locations, real-time with a mouse on a map and static (hardcopy). The GPS mode requires a GPS unit that can communicate with a computer through an NMEA connector. The real-time at pre-defined locations mode simulates a detector array around a nuclear site. The mouse mode converts the movement of the cursor on a map into simulated movement in the field and generates real-time instrument readings. The static mode data is stored in an Excel spreadsheet that can be printed for inclusion in an exercise manual.

Real-Time Scenario Generation with GPS

This mode allows the user to generate data automatically, and present it the way it would appear in a real accident situation. Simulated readings are displayed on an instrument panel and change as a function of time and location. A GPS unit is used to continuously track the user's position.

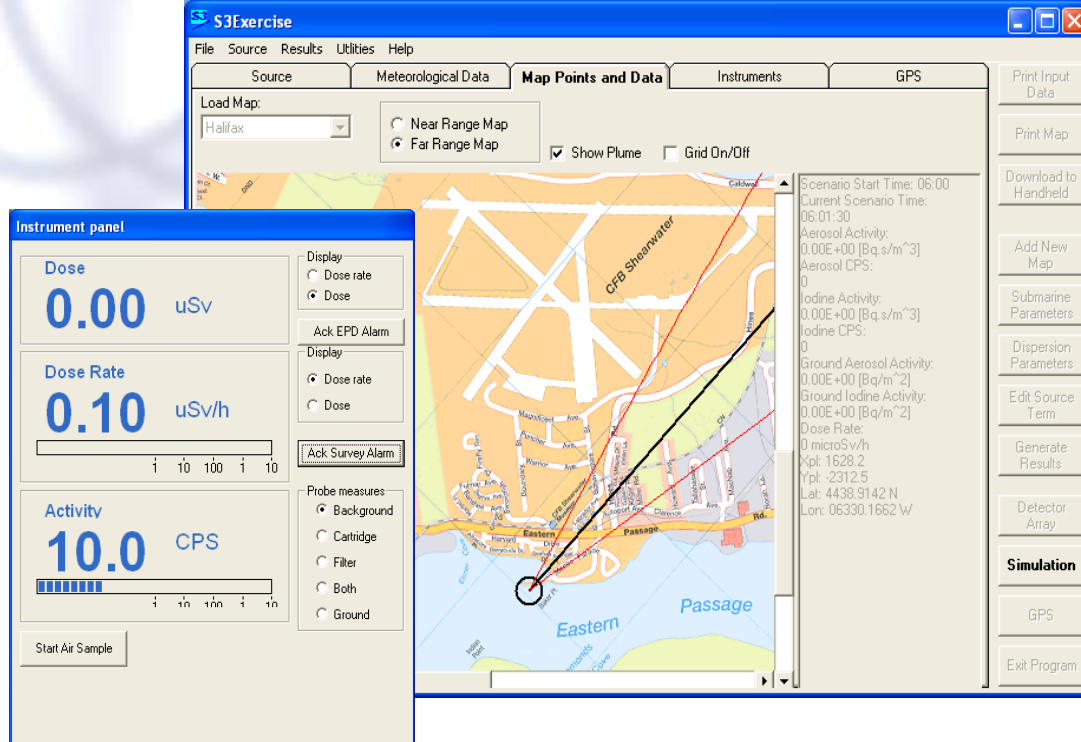
Real-Time Scenario at Pre-Defined Locations

This mode allows the user to specify the location of a fixed detector and simulate the ambient gamma dose rate at those locations.

Real-Time Scenario Generation with a Mouse

This mode allows the user to obtain data at different locations by running the mouse cursor over a map. Simulated readings are displayed on an instrument panel and change as a function of time and location.

An example of a map and instrument panel are shown below. During an exercise, the plume would be hidden.



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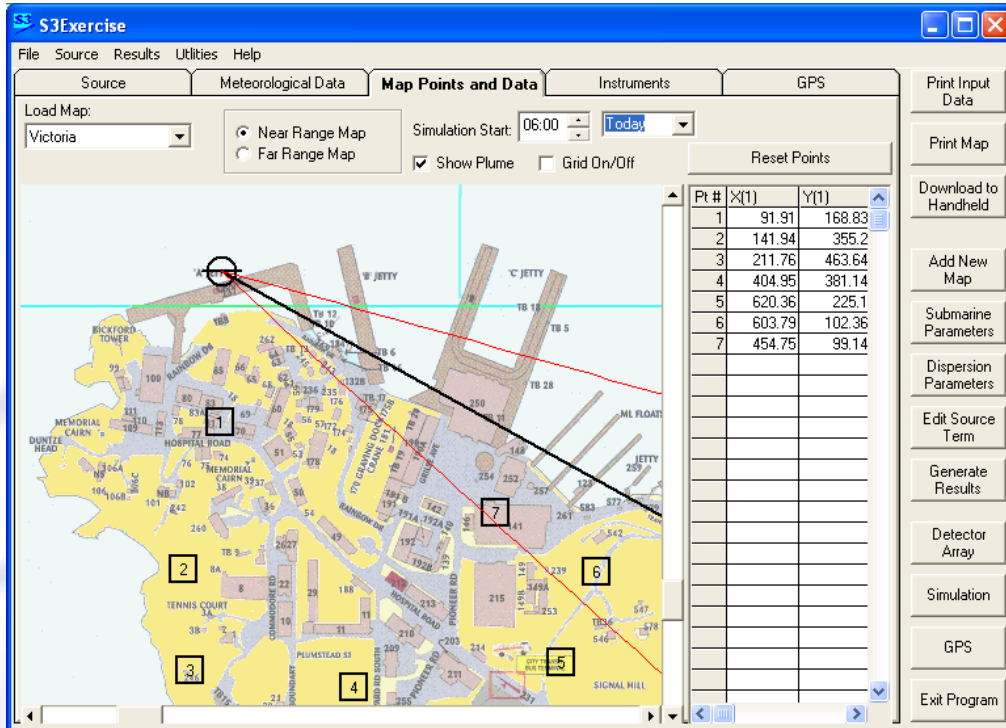


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Paper Copy Scenario Generation

The paper copy scenario generation produces an Excel file located in the S3-Exercise program directory. The generated worksheets give *Ambient Gamma Dose Rate*, *Air Sampling Iodine* and *Air sampling aerosol* results.

An example of a map displaying data points is shown below.



An example of the Excel worksheet displaying ambient gamma dose rates is shown below.

The screenshot shows an Excel spreadsheet titled 'Ambient Gamma Dose Rates [microSv/hr]'. The data is organized as follows:

Map Points	6:00	6:15	6:30	6:45	7:00
1	79.07	278656.09	417298.19	548345.50	689359.9
2	16.37	199901.58	322593.91	436232.81	559258.1
3	19.53	223536.69	235862.11	247478.19	257463.7
4	11.11	11.23	11.07	11.20	11.13
5	7.90	16032.40	16835.61	17447.41	18381.08
6	6.78	145257.61	223152.52	301060.59	381940.4
7	6.02	44808.08	46364.43	48441.73	50139.54
8	2.56	3481.21	3665.64	3770.66	3956.25
9	2.12	102502.02	152568.17	203648.34	253371.9
10	1.93	85106.98	122099.41	160131.05	198707.9



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S3-Exercise Features

- Accepts up to 5 wind phases and 5 release phases
- Can customize the nuclide release by isotope
- The instrument panel mimics the appearance of an actual meter
- Digital maps of the area are provided (near and far fields)
- Alarms for turn-back levels can be set therefore allowing a controller to see if the team respects the turn-back limits
- With a GPS connected to the laptop it tracks the actual position of the vehicle in real-time
- Accumulates total dose for field teams, depending on where they travel in the plume, which gives them accurate electronic dosimeter readings
- Can simulate a detector array around a nuclear plant
- Can be used in simulation mode for table-tops using a mouse/cursor
- Readings are given in Sv or rem and CPM or CPS

The screenshot displays the S3Exercise software interface. The main window has a menu bar (File, Source, Results, Utilities, Help) and several tabs: Source, Meteorological Data, Map Points and Data, Instruments, and GPS. The Meteorological Data tab is active, showing a table for wind phases and several checkboxes for simulation options.

The Source Term dialog box is open, showing a table of isotopes and their activity in Bq. The units are set to Bq. The table lists isotopes and their activity values:

Isotope	Activity (Bq)
I-131	9.71E+15
I-132	1.63E+16
I-133	3.04E+16
I-134	2.48E+16
I-135	2.80E+16
Rb-88	1.43E+16
Rb-89	9.15E+15
Sr-89	1.48E+15
Sr-90	4.78E+14
Ru-103	1.51E+15
Ru-106	2.07E+14
Te-131m	2.30E+15
Te-131	0.00E+00
Te-132	2.33E+16
Te-133m	1.12E+16
Te-133	0.00E+00
Te-134	2.34E+16
Cs-134	6.80E+15
Cs-137	4.99E+15
Cs-138	1.54E+16
Tritium	0.00E+00
Kr-83m	0.00E+00
Kr-85m	2.10E+16
Kr-85	0.00E+00
Kr-87	2.97E+16
Kr-88	5.40E+16
Kr-89	0.00E+00
Xe-131m	0.00E+00
Xe-133m	0.00E+00
Xe-133	8.72E+16
Xe-135m	0.00E+00
Xe-135	3.81E+16
Xe-137	0.00E+00
Xe-138	4.95E+16

The dialog box also includes an 'OK' button and a 'Cancel' button.



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