

SCALE Newsletter



Computational Physics and Engineering Division
Nuclear Engineering Applications Section
Oak Ridge National Laboratory

SCALE Web Site: <http://www.cped.ornl.gov/scale>

SCALE Electronic Notebook: <http://www-rsicc.ornl.gov/enote/enotscale.html>

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SCALE 4.4a Is Released

SCALE 4.4a, including the new CSPAN GUI for CSAS/KENO V.a and the new Visual Heating GUI for HEATING 7.2, was released by RSICC on March 23. Check the January 2000 issue of the newsletter for more information on what's new in SCALE 4.4a, CSPAN, and Visual Heating. Note that CSPAN and Visual Heating are also available on the SCALE Web site Download page.

SCALE Training Course Schedule

The SCALE staff will offer both criticality safety and shielding training courses at ORNL in October 2000. The courses emphasize hands-on experience solving practical problems on PCs. No prior experience in the use of SCALE is required to attend. The registration fee is \$1800 for one course or \$2700 for both courses (\$300 discount if you register at least one month before the course). A copy of the SCALE software and manual on CD may be obtained for an additional fee of \$310. Registrations will be accepted on a first-come basis. Registration forms submitted directly from the Web are preferred. Registration via FAX or e-mail is also acceptable. The registration fee must be paid by check, travelers checks, or credit card (Visa or MasterCard only). The agenda and registration form are included in this issue.

New KENO3D Web Site

A KENO3D web site has been developed to provide users with a resource for timely information, software updates, and a mechanism for communicating with KENO3D developers and users. Included on the web site is a KENO3D Users Notebook for questions and answers regarding the use of KENO3D and the KENO3D Gallery of 3-D images. The web site can be viewed at <http://www.cped.ornl.gov/scale/keno3d>. A link is also available on the SCALE web site.

In This Issue ...

SCALE 4.4a Is Released	1
SCALE Training Course Schedule	1
New KENO3D Web Site	1
SCALE Newsletter Is Distributed Electronically	1
Words to the Wise	2
The Use of HOLES in KENO-VI in SCALE 4.4a .	2
SCALE Web Site Updates	2
SCALE Software Updates	2
New KENO3D Version for KENO-VI Geometry ...	3
SCALE Minor Modifications	3
SCALE Shielding & Source Terms Course Agenda .	4
SCALE KENO V.a Course Agenda	4
SCALE Training Course Registration Form	5

SCALE Newsletter Is Distributed Electronically

The *SCALE Newsletter* is now published and distributed in electronic format only. The newsletter is published on the Web in a PDF file that is identical to the hard copy that previously had been mailed to our subscribers. Current and past issues of the *SCALE Newsletter* can be found on the *SCALE Newsletter* Web page at http://www.cped.ornl.gov/scale/scale_news.html. We encourage you to register for the SCALE hotline e-mail notification service. You will be notified by e-mail when important news, updates, or new issues of the *SCALE Newsletter* are posted on the SCALE Web site. Sign up by clicking on the "Join List" button on the *SCALE Newsletter* Web page.



The Use of HOLES in KENO-VI in SCALE 4.4a

In SCALE 4.4a, the HOLE does not need to be explicitly placed in a region in a unit. Therefore, the HOLE record no longer requires a vector definition array. If a vector definition is included in the HOLE record, it is ignored. Instead, the HOLE creates its own region, and any particle that enters that region is inside the unit that is contained within the HOLE. By default, the origin of the HOLE is placed at the origin of the unit that contains the HOLE. The position of the HOLE within the unit may be modified by using the geometry modification keywords ORIGIN and ROTATE.

The user should be aware of an important limitation when using HOLES in this version of KENO-VI. **A HOLE cannot be the only region in a unit** and, if possible, **should not be on the outer edge of a unit**. It is possible to produce incorrect results if arrays contain units that contain only HOLES. An example of an improperly specified geometry is shown below. In this case, assume unit 10 is contained in an array.

```
unit 9
hexprism 100 12.0 2p100.0 rotate a1=90
array 1 100 place 5 5 1 3p0.0
boundary 100
unit 10
hexprism 100 12.0 2p100.0
hole 9 rotate a1=-90
boundary 100
```

The proper way to define this in SCALE4.4a would be

```
unit 9
hexprism 100 11.999 2p99.999 rotate a1=90
array 1 100 place 5 5 1 3p0.0
boundary 100
unit 10
hexprism 100 12.0 2p100.0
hole 9 rotate a1=-90
media 0 1 100
boundary 100
```

The differences in the second example are highlighted: (1) a slight reduction in the unit boundary that is placed in the HOLE and (2) a media record in the unit containing the HOLE. These changes ensure that a particle crossing into the unit containing the HOLE crosses first through a region containing a material, in this case void.

SCALE Web Site Updates

The SCALE Web site has been redesigned with an easier-to-use and more attractive interface. A link was added to the new KENO3D web site. The SCALE and KENO3D web sites were featured in a poster presentation in a session titled "The Tangled World Wide Web of Criticality Safety" at the American Nuclear Society meeting in June. Listed below are some recent updates to the content of the SCALE Web site.

- Agenda/registration form for training courses
- Download page updates
- Shielding V&V input files
 - CSPAN, Visual Heating installation files
 - USLSTATS and LWR benchmark corrections
- Two new reports on Validation page
 - *Benchmark of SCALE (SAS2H) Isotopic Predictions of Depletion Analyses for San Onofre PWR MOX Fuel*, ORNL/TM-1999/326
 - *Technical Support for a Proposed Decay Heat Guide Using SAS2H/ORIGEN-S Data*, NUREG/CR-5625, ORNL-6698
- SCALE Manual, Rev. 6 (May 2000)
- SCALE Users Notebook updates
- Nuclear Resources on the Internet updated links

SCALE Software Updates

Updates for KENO3D and CSPAN are available on the Web.

KENO3D Update 2 (Version 1.02) was posted on the KENO3D Update Web page on May 14. The update includes the following items.

- An error in LOOP processing of ARRAY data was corrected.
- An error in REPLICATE processing was corrected.
- An option to set the default wireframe color was added.
- An option to specify the absolute location of the origin for axes was added.

An update to CSPAN was placed on the SCALE Download Web page on July 28. This update corrected several minor bugs in Standard Compositions, Arbitrary Materials, and Unit Cell data. A new feature

was added to the KENO V.a Arrays input screen that provides the user with a mechanism to save the 2-D color representation of the array. The image may be written to a bitmap file or copied to the clipboard to paste in another application, such as a word processor.

New KENO3D Version for KENO-VI Geometry

A new version of KENO3D that can display KENO-VI geometry models is scheduled for release this fall. This new version will be capable of reading and displaying both KENO V.a and KENO-VI geometry models. Watch the SCALE and KENO3D Web sites in late September for more information.

SCALE Minor Modifications

The following minor modifications have been made to SCALE this year. These changes were not included in the SCALE 4.4a release.

UNIXLIB: Replace dummy subroutine PULL with a working version for Unix that interrupts program loops when the specified time has expired. This subroutine has not been functional since SCALE was migrated from the IBM mainframe to Unix workstations. (MRR 00-003)

CSAS: Problems requiring more than 10,000,000 words of storage are now allowed. (MRR 00-006)

KENO V.a: (1) Changes made to PERFUME for generating angles and probabilities were incorporated. (2) An update was made to terminate a problem if the specified time limit in KENO parameter TBA is exceeded in a given generation. This option has not been functional since SCALE was migrated from the IBM mainframe to Unix workstations. (3) The code was corrected to generate the initial source guess for start type 0 when the outer region of the global unit was an XCYLINDER or XHEMICYLINDER with a non-zero origin. Previously, this type of case would fail. (MRRs 00-001, 00-010)

KENO-VI: (1) The code was modified to allow a unit in an array to contain a hole as its only region. (2) An update was made to terminate a problem if the specified time limit in KENO parameter TBA is exceeded in a given generation. This option has not been functional since SCALE was migrated from the IBM mainframe to Unix workstations. (3) The code was corrected for a fatal error that occurred when the option to collect matrix information by array number at the highest array nesting level (HAL=YES) is activated. (MRRs 00-002, 00-007)

XSDRNPM: (1) The code was enhanced by adding a new output quantity, the sensitivity of k-eff to search parameter p, $((p/k)dk/dp)$. (2) The geometric factors calculated by XSDRNPM were changed to double precision to allow tighter convergence of searches. (3) The I/O for mesh-centered angular fluxes was changed to direct access record blocks to break up large records to smaller segments, which was necessary for PCs. (4) A real variable named ONE was defined in subroutine OUTERS and set to 1.0 to improve portability. (5) The code was updated to correct a problem where the option to write fluxes to a file failed. (MRRs 00-004, 00-005, 00-009)

SAS2: The code was updated to correct a problem where the decay time for the last cycle could be negative if a downtime of zero was specified. A misleading error message was removed. (MRR 00-008)

GENWGTS/GWAS: The code was updated for compatibility with the current version of XSDRNPM. Changes made to XSDRNPM in MRR98-065 required changes to read the XSDRNPM data needed to generate biasing weights for KENO. (MRRs 99-032, 99-033)

SCALE Shielding & Source Terms Course Agenda

(October 16–20, 2000)

Monday

Overview of SCALE System
Introduction to SCALE Shielding Sequences
Depletion/Decay/Source-Term Sequences SAS2 and ORIGEN-ARP
ORIGEN-ARP Demonstration
SAS2/ORIGEN-ARP Problem Definitions
Problem Session 1 (SAS2/ORIGEN-ARP)

Tuesday

Review of Problem Session 1
SAS2 Input Details
SAS2 Tips and Tricks
How to Create ORIGEN-ARP Libraries
Problem Session 2 (SAS2)

Wednesday

Review of Problem Session 2
SAS4 3-D Monte Carlo Shielding Analysis Sequences - Basics
SAS4 Variance Reduction Techniques
SAS4 MARS Geometry Option
SAS4 Validation/Limitations
SAS4 Problem Definitions
Problem Session 3 (SAS4)

Thursday

Review of Problem Session 3
SAS1 1-D Shielding Sequence - Basics
SAS1 1-D Shielding Sequence - Advanced
SAS1X 1-D Combined Criticality/Shielding Sequence
Problem Session 4 (SAS1)

Friday

Review of Problem Session 4
QADS 3-D Point Kernel Shielding Analysis Sequence
QADS Problem Definitions
Problem Session 5 (QADS)
Shielding Course Wrap-up
Questions & Answers

The course will conclude with lunch on Friday. Attendees may stay for an optional afternoon problem session to work on problems that they bring.

SCALE KENO V.a Course Agenda

(October 23–27, 2000)

Monday

Overview of SCALE System
Introduction to CSAS
Standard Composition Library
Material Information Processor Library (MIPLIB)
Input
Resonance Self-Shielding
Unit Cell Geometry - Lattice Cell/Multiregion
CSPAN Demo
Problem Session 1

Tuesday

Review of Problem Session 1
KENO V.a Parameters
KENO V.a Geometry
KENO V.a Plot Data
Problem Session 2

Wednesday

Review of Problem Session 2
Introduction to KENO V.a Output
KENO3D Tutorial
HOLES
Arrays
Problem Session 3

Thursday

Review of Problem Session 3
KENO V.a Output - How to Read It
Start Data
Bias Data
Boundary Data
Mixing Table
Search Data
Problem Session 4

Friday

Review of Problem Session 4
Monte Carlo Uncertainties
Code and Data Validation Issues
Conclusion/Questions and Answers

The course will conclude with lunch on Friday.



SCALE Training Course Registration Form

Oak Ridge National Laboratory, Oak Ridge, Tennessee

SCALE Shielding & Source Terms Course

Oct. 16–20, 2000

SCALE KENO V.a Criticality Course

Oct. 23–27, 2000

Please use the Web registration form if possible (http://www.cped.ornl.gov/scale/scale_course_reg.html)

I am registering (check one):

- Shielding and Source Terms Course**
- KENO V.a Course**
- Both Courses**

Before Sept. 15

Fee: \$1,500
 Fee: 1,500
 Fee: 2,400
 Fee: 310

After Sept. 15

Fee: \$1,800
 Fee: 1,800
 Fee: 2,700
 Fee: 310

Do you want a copy of SCALE on CD (\$310 extra)? Yes No

Total Fee \$ _____

Name _____

Citizenship _____

Organization _____

Mailing address _____

E-mail _____

Telephone _____ Fax _____

Your level of experience (circle one for each)

	Very High	High	Medium	Low	None
Criticality					
CSAS/KENO V.a	4	3	2	1	0
Other _____	4	3	2	1	0
Shielding					
SAS1	4	3	2	1	0
SAS3	4	3	2	1	0
SAS4	4	3	2	1	0
QADS/QAD-CGGP	4	3	2	1	0
Other _____	4	3	2	1	0
Source Terms/Depletion					
SAS2	4	3	2	1	0
ORIGEN-S/ORIGEN-ARP	4	3	2	1	0
Other _____	4	3	2	1	0

What types of problems/applications do you want to be able to analyze with SCALE after attending the course?

Please mail this form and registration fee payment to

SCALE Training Course
 c/o Kay Lichtenwalter
 Oak Ridge National Laboratory
 P.O. Box 2008, Bldg. 6011, MS 6370
 Oak Ridge, Tennessee 37831-6370
 FAX: 815-327-6460
 E-mail: x4s@ornl.gov

**Classes may be canceled if minimum enrollment is not obtained.
 Course fees are refundable up to one month before each class.**



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