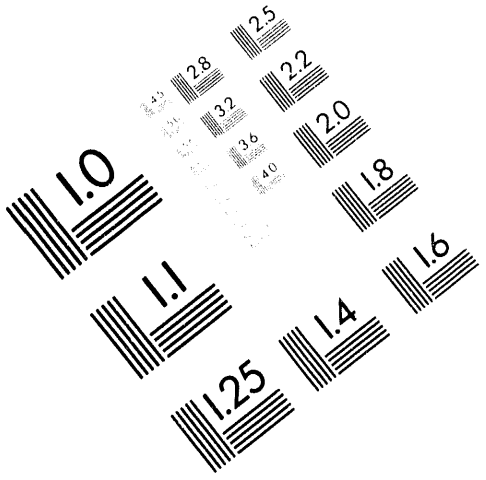

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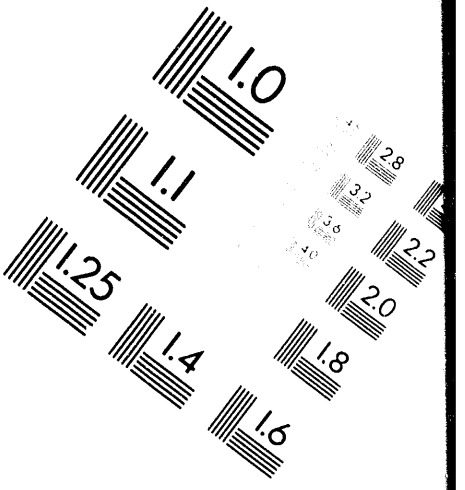
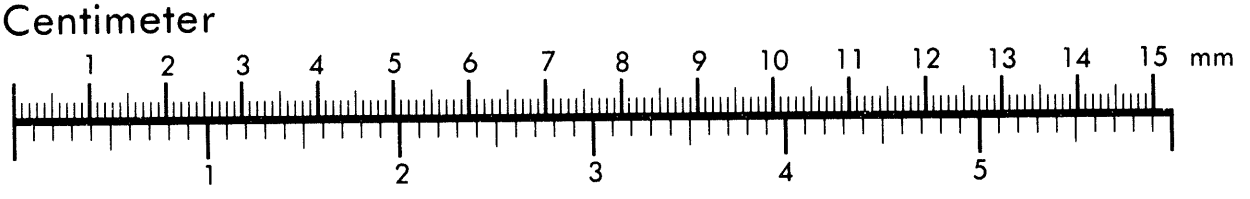
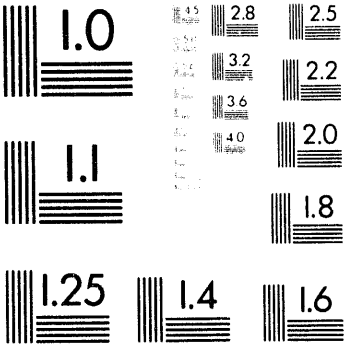
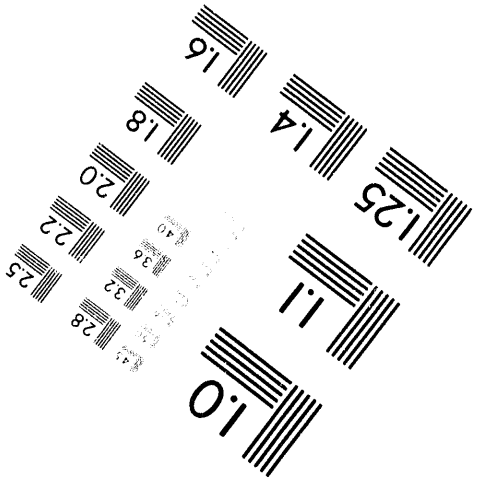
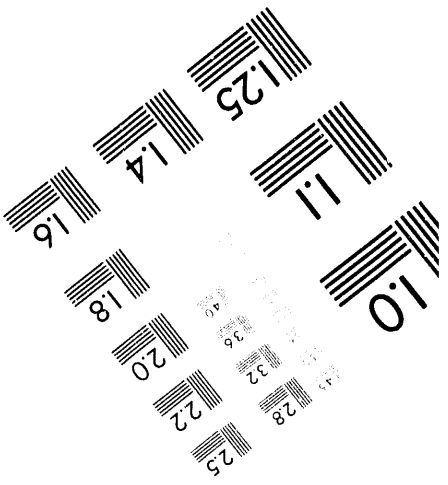
1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910
301/587-8202











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1 of 1

AMPX-77 PHASE I CERTIFICATION PACKAGE (U)

by
K. A. Niemer

Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

DOE Contract No. DE-AC09-89SR18035

DISCLAIMER

WSRC-TR-94-0125

KEY WORDS: AMPX-77
Computer Codes
Cross Sections
Criticality

SAFETY TECHNOLOGY DEPARTMENT

RETENTION PERIOD: Permanent

AMPX-77 PHASE I CERTIFICATION PACKAGE (U)

By

KEYES A. NIEMER

ISSUED: March 1994

SAVANNAH RIVER TECHNOLOGY CENTER, AIKEN, SC 29808
Westinghouse Savannah River Company
Prepared for the U. S. Department of Energy under Contract DE-AC0988SR18035

DOCUMENT: WSRC-TR-94-0125

TITLE: AMPX-77 PHASE I CERTIFICATION PACKAGE (U)

TASK: 93-006-M-A-1

TASK TITLE: AMPX-77 CRITICALITY CODE CERTIFICATION

APPROVALS

M. R. BUCKNER, MANAGER
APPLIED TECHNOLOGY SECTION
DATE: 3-15-94

C. E. APPERSON, MANAGER
APPLIED PHYSICS GROUP
DATE: 3-10-94

R. E. PEVEY, TECHNICAL REVIEWER
DATE: 3-10-94

K. A. NIEMER, AUTHOR
DATE: 3/7/94

ABSTRACT

The AMPX-77 Phase I modules have been certified. AMPX-77 is a modular code system for generating coupled multigroup neutron-gamma cross section libraries from Evaluated Nuclear Data Files (ENDF/B). All basic cross-section data are input from the formats used by the ENDF/B, and output can be obtained from a variety of formats, included in its own internal and very general formats, along with a variety of other useful formats used by major transport, diffusion theory, and Monte Carlo codes. Processing is provided for both neutron and gamma-ray data. The AMPX-77 code system will be used at SRS to perform critical calculations related to nuclear criticality safety. The AMPX-77 modular codes system contains forty-seven separate modules. For the certification process, the 47 modules have been divided into three groups or phases. This Certification Package is for the Phase I modules: BONAMI, LAPHNGAS, MALOCS, NITAWL, ROLAIDS, SMUG, and XSDRNPM.

Table of Contents

I. INTRODUCTION AND SUMMARY

In response to a Department of Energy (DOE) request, Westinghouse Savannah River Company committed to certify all computer codes used in critical calculations at the site. The AMPX-77 code system will be used at SRS to perform critical calculations related to nuclear criticality safety, and therefore must be certified.

The AMPX-77 modular codes system[1] contains forty-seven separate modules. For the certification process, the 47 modules have been divided into three groups. The first group (**Phase I**) is comprised of the following modules: BONAMI, LAPHNGAS, MALOCS, NITAWL, ROLAIDS, SMUG, and XSDRNPM. The second group (**Phase II**) is comprised of the following modules: AIM, AJAX, ALE, ALPO, CASTROL, COMET, JERGENS, POLIDENT, PRELL, PRUDE, RADE, TABU, UNITAB, VEL, and XLACS. The third group (**Phase III**) is comprised of the following modules: CLAROL, COLLINS, COMAND, CONTAC, CORECTOL, CREST, FRESH, GERITOL, ICE, LAVA, MAD, NPTX, PAL, PERFUME, RUFFLES, SALVAGE, SMILER, TIDE, VASELINE, WAX, WINE, WISK, WORKER, WORM, ZEST. This Certification Package is for the Phase I modules.

Certification as applied to existing computer codes includes the verification process, placing the code in configuration control, and establishing user qualification standards and training requirements. All software intended for use in critical calculations must be certified. This report is intended to fulfill the requirements for the certification of the AMPX-77 Phase I modules, RSIC version PSR-315, packaged 8/31/92, built at SRS January 27, 1994, by H.L. Harris (executable version 1-0) on the IBM mainframe.

Note that certification as defined here does not include the validation process. In the past, work performed by the Applied Physics Group was directly related to reactor safety or performance. This relatively narrow scope meant that defining validation requirements that would encompass all uses of the code was possible. In our new environment, APG performs criticality and shielding analyses. The variety of geometries, materials, and systems encountered is innumerable. For this reason, AMPX-77 codes will be certified without validation. Validation will subsequently be performed for specific tasks that the codes are to be used for, using certified software. Thus certified software will be validated for specific tasks. Certification does imply that the code has been verified, placed in configuration management, and that all applicable documents as required in 1Q34 have been approved. Verification is accomplished by running the test problems included with the code, and comparing the results to those provided with the source code. Verification is documented in the test problem report.

This work was performed under STD task number 93-006-M-A-1 Rev. 1, *AMPX-77 Criticality Code Certification,* and follows the requirements of QAP IV-9 of 1Q34.

DISCUSSION

Application

AMPX-77 is a modular code system for generating coupled multigroup neutron-gamma cross section libraries from Evaluated Nuclear Data Files (ENDF/B). The AMPX-77 code system was written at Oak Ridge National Laboratory (ORNL), and is currently maintained by the Radiation Shielding Information Center (RSIC). A complete discussion of the function of each individual module is given in Reference 1.

Input

All basic cross-section data are to be input in the formats used by the ENDF/B. A complete discussion of the input requirements for each module is given in Reference 1.

Output

The output from AMPX-77 can be obtained in a variety of formats, included in its own internal and very general formats, along with a variety of other useful formats used by major transport, diffusion theory, and Monte Carlo codes. Processing is provided for both neutron and gamma-ray data. A complete discussion of the output requirements for each module is given in Reference 1.

Solution Method

Details for the solution method of each individual module can be found in Reference 1.

Accuracy and Limitations

The accuracy of the AMPX-77 code system in generating cross sections for particular types of problems will be addressed in the validation studies to be performed for those cases.

Code Source Listing Location

The source code for the AMPX-77 system is stored under the Scientific Code Management System (SCMS),[4] which protects it from unauthorized changes, and ensures strict quality assurance standards are adhered to. The source code for AMPX-77 is stored on the VAX in the following directory: disc$scms:[scms.source .AMPX77]. Users who need a copy of the source files should contact the SCMS administrator.

Program Execution

Instructions for executing the AMPX-77 system can be found in Reference 1. A set of test problems has been developed which tests the major functions of the AMPX-77 Phase I modules. The input and output from these problems are detailed in References 1-3. The test problem input can be found on the IBM in the UNCS.AMPX.INPUT dataset. The executable modules for the AMPX-77 system are in SCMS.

Access Control and Security

A list of users of the code system is maintained by the proprietor. Only those users labeled as cognizant on the proprietor's list may use the codes for critical calculations. Changes to the AMPX-77 coding are made only by the proprietor, and are implemented by the SCMS custodian after successful execution of the test problem set.

Technically knowledgeable personnel have been assigned to serve as code proprietor for the AMPX-77 code system. These proprietors are members of the user community who are experienced users of the code.

A proprietor's code notebook (Reference 2) is being maintained in which an ongoing history of code development, alterations, validation, and error corrections is recorded. This notebook will be continually maintained by the code proprietor.

User Qualifications

User qualification status is divided into the two categories of Apprentice and Cognizant User, as defined in References 5 and 6. Due to the variety of problems for which AMPX-77 may be used, a test will not be required to become a Cognizant User. Instead, the Apprentice will be trained by a Cognizant User. The code proprietor will determine when the Apprentice User has sufficient knowledge and understanding of the code to become a Cognizant User. Cognizant Users may be certified only for specific types of calculations or for all calculation types. A list of Apprentice and Cognizant Users will be maintained by the code proprietor.

Discrepancy Reporting

Cognizant users who find a discrepancy or apparent error in the AMPX-77 coding, or who wish to request an upgrade/enhancement of the code, shall file an SCDR with the technical proprietor. The proprietor will report any errors to the code developers at ORNL via a numbered document mailed to RSIC and the developers. The proprietor will monitor the RSIC newsletter to see when bugs are found or a new version of the code has been released by ORNL.

Manual And Other Documentation

A user's manual for the AMPX-77 system is in place that details code theory, input and output (Reference 1).

A controlled tracking system is in place to inform all cognizant users of coding and system changes in the AMPX-77 code system. All memoranda issued through this system are numbered and approved by management. The cognizant user list is maintained by the code proprietor.

Software Requirements Specifications (Appendices A-G) for each module and a Software Test Plan were developed and approved by the appropriate personnel. A Software Baseline Status Listing for each module is maintained by the code proprietor. This document will be kept current as revisions and additions to the software documentation are made. All of these documents are maintained by the code proprietor in the task files, along with the task plan and the test problem report (Reference 3).

Technical Review

A technical review of this document has been performed in accordance with QAP II-14 of the 1Q34 Manual. The review sheets will be maintained as part of the official task records.

Approvals

The Certification Package Approval form for each module has been signed by the required personnel and comprises the final pages of this report.

REFERENCES

1. N. M. Greene, W. E. Ford, L. M. Petrie, J. W. Arwood, *AMPX-77: A Modular Code System for Generating Coupled Multigroup Neutron-Gamma Cross-Section Libraries from ENDF/B-IV and/or ENDF/B-V*, ORNL/CSD/TM-283, October 1992.

2. K. A. Niemer, *AMPX-77 Certification Laboratory Notebook*, WSRC-NB-93-345 (1993).

3. K. A. Niemer, *AMPX-77 Phase I and II Test Report (U)*, SRT-APG-940009, February 28, 1994.

4. J.C. Jensen, *SCMS Entry Procedure*, TP-90-019, Nov. 15, 1990.

5. J.E. Aull, *Qualification of Apprentice Users*, TP-90-304, April 15, 1991.

6. J.E. Aull, *Qualification of Cognizant Users*, TP-90-035, April 15, 1991.

APPENDIX A: BONAMI SRS

OSR 34-A3634 (9-36-91)

Software Requirements Specification
Title and Approval Page

Page 1 of 4

Identification			
Software Title: BONAMI	Software Version: 1-0		Rev: 0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Requirements Specification			
Customer: C. E. Apperson	Customer Specification: none		Dated: 10/29/93
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Kayen A Niemer	Date: 10/29/93	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer; concurrence with contents of the plan.)			
Print Name	Signature	Date	Organization
Technical Reviewer (If required by responsible manager; concurrence with technical content.)			
Print Name: J. F. Mincey	Signature: J F Mincey	Date: 10/29/93	Organization: SRTC/APG
Responsible Manager (Level 4 or higher; accepts as completely verifiable, consistent, and technically feasible.)			
Print Name: C. E. Apperson	Signature: C E Apperson	Date: 11-2-93	Organization: SRTC/APG
Customer (Accepts as meeting requirements and will result in usable code)			
Print Name: C. E. Apperson	Signature: C E Apperson	Date: 11-2-93	Organization: SRTC/APG
COF (Acceptance of specification.)			
Print Name: W. F. Ayres	Signature: W Wayne F. Ayres	Date: 11-3-93	Organization: SRTC/QS

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D. Biswas, 773-22A
R. L. Reed, 773-42A/182
T. G. Williamson 773-42A/123
R.L. Webb, 786-1A
R. E. Pevey, 773-42A/119

Continued on Attachment ☐ Yes ☒ No

Refer to NRTSC procedure QAP IV-3, "Software Requirements Specifications," for additional information.

BONAMI Software Requirements Specification

AMPX-77 is a modular code system for generating coupled multigroup neutron-gamma cross section libraries from ENDF-B data. AMPX-77 was written at Oak Ridge National Laboratory (ORNL), and is currently maintained by the Radiation Shielding Information Center (RSIC). The BONAMI module performs a Bondarenko resonance self-shielding calculation. Since BONAMI is an existing code maintained by RSIC, this Software Requirement Specification was written with the existing capabilities, formats, and standards in mind.

Function

The BONAMI (BONdarenko AMPX Interpolator) module uses Bondarenko factor data in a resonance self-shielding calculation. The output is a master library that contains the self-shielded cross sections produced in the calculation.[1] The Bondarenko[2] method is basically an "infinite medium" method that parameterizes cross sections for a nuclide as a function of temperature and the "background" cross section of all the other nuclides mixed with the nuclides.

Performance and Attributes

1. Time-related issues. Time-related issues are not applicable since running times are extremely problem and computing platform dependent.

2. Software environment. Since BONAMI was written in FORTRAN-77, the code is portable. At SRS, BONAMI is expected to be executed on the IBM 3091 and the CRAY computing platforms.

   Offsite, BONAMI is maintained by RSIC. In order to install the code at SRS, the code proprietor acquires the software from RSIC and submits the source to the Scientific Code Management System (SCMS)[3] for protection and control. The code proprietor is also responsible for revising, testing, certifying and documenting the code.

   The original source code from RSIC contains certain sections commented out which meet the requirements of a particular machine (IBM or CRAY). In some instances, additional machine-dependent changes may be necessary for the code to execute on the SRS computing platforms. These changes will be documented with a Software Discrepancy/Change Report (SDCR). It is possible that there would be a version 1-0 for the IBM and a version 1-1 for the CRAY. An appropriate set of the test problems will be run to ensure that the code performs correctly on each computing platform.

A certification package will be prepared for BONAMI that encompasses both the IBM and CRAY source. The certification package will reference any SDCR written to document machine-dependent changes necessary for the code to execute on the different SRS computers. A single certification package will be written for both the IBM and CRAY version since differences between the two versions will be minimal and machine specific. Once again, all changes will be documented with a SDCR and referenced in the certification package.

Since BONAMI is maintained offsite, the certified SRS source may be subject to periodic upgrades as they are received from RSIC. Upon receiving the source, the proprietor would install the upgrade on the SRS platforms as described above.

Errors in the code found by users outside the SRS community are beyond our control. The following procedure is encouraged for error reporting/ reconciliation:

a) The error is reported to RSIC or the code developers.

b) The code developers fix the error and submit a new version of the code to RSIC.

c) RSIC makes the new version of the code available and notifies users via the RSIC Newsletter. (The AMPX-77 proprietor receives the RSIC Newsletter monthly).

d) When the proprietor discovers that a new version of the code is available, the proprietor acquires the new source code and installs the upgrade on the SRS platforms as described above.

3. Tolerances. Tolerances on the results will not be addressed in this Software Requirement Specification since BONAMI is an existing code.

Design constraints imposed on design and implementation phase activities

1. None.

External interfaces

1. BONAMI uses an AMPX master library[1] as input to create a new AMPX master library that contains the self-shielded cross sections produced in the calculation.

Coding Standards

1. BONAMI was written at Oak Ridge National Laboratory (ORNL) to conform with FORTRAN-77 source coding standards.

Documents

1. The existing code documentation[1] will satisfy the 1Q34 requirements for a Software Design Report and User's Manual.

References

1. N. M. Greene, W. E. Ford, L. M. Petrie, J. W. Arwood, *AMPX-77: A Modular Code System for Generating Coupled Multigroup Neutron-Gamma Cross-Section Libraries from ENDF/B-IV and/or ENDF/B-V*, ORNL/CSD/TM-283, October 1992.

2. I. Bondarenko, Ed., *Group Constants for Nuclear Reactor Calculations*, Consultants Bureau, New York, 1964.

3. W. S. Parks, *Responsibility of Technical Proprietors for Code Control Using SCMS*, TP-90-018, Rev. 2, August 16, 1991.

APPENDIX B: LAPHNGAS SRS

OSR 24-A2634 (8-28-91)

Software Requirements Specification
Title and Approval Page

Page 1 of 4

Identification			
Software Title: LAPHNGAS	Software Version: 1-0		Rev: 0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Requirements Specification			
Customer: C. E. Apperson	Customer Specification: none		Dated: 12/2/93
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Kaye A Niemer	Date: 12/2/93	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer; concurrence with contents of the plan.)			
Print Name	Signature	Date	Organization
Technical Reviewer (If required by responsible manager; concurrence with technical content.)			
Print Name: J. F. Mincey	Signature: J F Mincey	Date: 12/4/93	Organization: SRTC/APG
Responsible Manager (Level 4 or higher; accepts as completely verifiable, consistent, and technically feasible.)			
Print Name: C. E. Apperson	Signature: C E Apperson Jr	Date: 12-6-93	Organization: SRTC/APG
Customer (Accepts as meeting requirements and will result in usable code.)			
Print Name: C. E. Apperson	Signature: C E Apperson Jr.	Date: 12-6-93	Organization: SRTC/APG
CQF (Acceptance of specification.)			
Print Name: W. F. Ayres	Signature: Wayne F. Ayres	Date: 12-17-93	Organization: SRTC/QSAD

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Continued on Attachment ☐ Yes ☒ No

Refer to NRTSC procedure QAP IV-3, "Software Requirements Specifications," for additional information.

LAPHNGAS Software Requirements Specification

AMPX-77 is a modular code system for generating coupled multigroup neutron-gamma cross section libraries from ENDF-B data. AMPX-77 was written at Oak Ridge National Laboratory (ORNL), and is currently maintained by the Radiation Shielding Information Center (RSIC). The LAPHNGAS module retrieves photon production data from ENDF data files and calculates either multigroup secondary gamma-ray production cross sections and/or multigroup secondary gamma-ray yields that will be written to an AMPX master interface. Since LAPHNGAS is an existing code maintained by RSIC, this Software Requirement Specification was written with the existing capabilities, formats, and standards in mind.

Function

The LAPHNGAS (Los Alamos PHotoN GenerAtion Scheme) module retrieves photon production data from ENDF data files and calculates either multigroup secondary gamma-ray production cross sections (SGRPXS) and/or multigroup secondary gamma-ray yields that will be written to an AMPX master interface.[1] To form coupled neutron-gamma cross sections, the SGRPXS or yields are passed to other AMPX modules, CHOX and NITAWL, to be combined with multigroup neutron and photon interaction cross sections. When used as a stand-alone code, LAPHNGAS can calculate either fine-neutron-group or broad-neutron-group SGRPXS for use with other codes.

Performance and Attributes

1. Time-related issues. Time-related issues are not applicable since running times are extremely problem and computing platform dependent.

2. Software environment. Since LAPHNGAS was written in FORTRAN-77, the code is portable. At SRS, LAPHNGAS is expected to be executed on the IBM 3091 and the CRAY computing platforms.

   Offsite, LAPHNGAS is maintained by RSIC. In order to install the code at SRS, the code proprietor acquires the software from RSIC and submits the source to the Scientific Code Management System (SCMS)[2] for protection and control. The code proprietor is also responsible for revising, testing, certifying and documenting the code.

   The original source code from RSIC contains certain sections commented out which meet the requirements of a particular machine (IBM or CRAY). In some instances, additional machine-dependent changes may be necessary for the code to execute on the SRS computing platforms. These changes will be documented with a Software Discrepancy/Change Report (SDCR). It is possible that there

would be a version 1-0 for the IBM and a version 1-1 for the CRAY. An appropriate set of the test problems will be run to ensure that the code performs correctly on each computing platform.

A certification package will be prepared for LAPHNGAS that encompasses both the IBM and CRAY source. The certification package will reference any SDCR written to document machine-dependent changes necessary for the code to execute on the different SRS computers. A single certification package will be written for both the IBM and CRAY version since differences between the two versions will be minimal and machine specific. Once again, all changes will be documented with a SDCR and referenced in the certification package.

Since LAPHNGAS is maintained offsite, the certified SRS source may be subject to periodic upgrades as they are received from RSIC. Upon receiving the source, the proprietor would install the upgrade on the SRS platforms as described above.

Errors in the code found by users outside the SRS community are beyond our control. The following procedure is encouraged for error reporting/ reconciliation:

a) The error is reported to RSIC or the code developers.

b) The code developers fix the error and submit a new version of the code to RSIC.

c) RSIC makes the new version of the code available and notifies users via the RSIC Newsletter. (The AMPX-77 proprietor receives the RSIC Newsletter monthly).

d) When the proprietor discovers that a new version of the code is available, the proprietor acquires the new source code and installs the upgrade on the SRS platforms as described above.

3. Tolerances. Tolerances on the results will not be addressed in this Software Requirement Specification since LAPHNGAS is an existing code.

Design constraints imposed on design and implementation phase activities

1. None.

External interfaces

1. The LAPHNGAS uses ENDF data to produce an AMPX master library interface file that can pass data to other AMPX modules such as CHOX and NITAWL.

Coding Standards

1. LAPHNGAS was written at Oak Ridge National Laboratory (ORNL) to conform with FORTRAN-77 source coding standards.

Documents

1. The existing code documentation[1] will satisfy the 1Q34 requirements for a Software Design Report and User's Manual.

References

1. N. M. Greene, W. E. Ford, L. M. Petrie, J. W. Arwood, *AMPX-77: A Modular Code System for Generating Coupled Multigroup Neutron-Gamma Cross-Section Libraries from ENDF/B-IV and/or ENDF/B-V*, ORNL/CSD/TM-283, October 1992.

2. *Scientific Code Management Operations Manual (U)*, WSRC-IM-91-106, October, 1992.

APPENDIX C: MALOCS SRS

OSR 34-A3634 (8-38-91)

Software Requirements Specification
Title and Approval Page

Page 1 of 4

Identification			
Software Title: MALOCS	Software Version: 1-0		Rev: 0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Requirements Specification			
Customer: C. E. Apperson	Customer Specification: none		Dated: 12/6/93
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Kaye A. Niemer	Date: 12/6/93	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer; concurrence with contents of the plan.)			
Print Name	Signature	Date	Organization
Technical Reviewer (If required by responsible manager; concurrence with technical content.)			
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Print Name: C. E. Apperson	Signature: C E Apperson Jr	Date: 1-9-94	Organization: SRTC/APG
COF (Acceptance of specification.)			
Print Name: W. F. Ayres	Signature: Wayne F. Ayres	Date: 1-11-94	Organization: SRTC/QS

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K. A. Niemer, 786-1A

Continued on Attachment ☐ Yes ☒ No

Refer to NRTSC procedure QAP IV-3, "Software Requirements Specifications," for additional information.

MALOCS Software Requirements Specification

AMPX-77 is a modular code system for generating coupled multigroup neutron-gamma cross section libraries from ENDF/B data. AMPX-77 was written at Oak Ridge National Laboratory (ORNL), and is currently maintained by the Radiation Shielding Information Center (RSIC). The MALOCS module collapses AMPX master libraries. Since MALOCS is an existing code maintained by RSIC, this Software Requirement Specification was written with the existing capabilities, formats, and standards in mind.

Function

The MALOCS (Miniature AMPX Library Of Cross Sections) module can be used to collapse neutron, gamma-ray, or coupled neutron-gamma master libraries.

Performance and Attributes

1. Time-related issues. Time-related issues are not applicable since running times are extremely problem and computing platform dependent.

2. Software environment. Since MALOCS was written in FORTRAN-77, the code is portable. At SRS, MALOCS is expected to be executed on the IBM 3091 and the CRAY computing platforms.

   Offsite, MALOCS is maintained by RSIC. In order to install the code at SRS, the code proprietor acquires the software from RSIC and submits the source to the Scientific Code Management System (SCMS)[2] for protection and control. The code proprietor is also responsible for revising, testing, certifying and documenting the code.

   The original source code from RSIC contains certain sections commented out which meet the requirements of a particular machine (IBM or CRAY). In some instances, additional machine-dependent changes may be necessary for the code to execute on the SRS computing platforms. These changes will be documented with a Software Discrepancy/Change Report (SDCR). It is possible that there would be a version 1-0 for the IBM and a version 1-1 for the CRAY. An appropriate set of the test problems will be run to ensure that the code performs correctly on each computing platform.

   A certification package will be prepared for MALOCS that encompasses both the IBM and CRAY source. The certification package will reference any SDCR written to document machine-dependent changes necessary for the code to execute on the different SRS computers. A single certification package will be written for both the IBM and CRAY version since differences between the two

versions will be minimal and machine specific. Once again, all changes will be documented with a SDCR and referenced in the certification package.

Since MALOCS is maintained offsite, the certified SRS source may be subject to periodic upgrades as they are received from RSIC. Upon receiving the source, the proprietor would install the upgrade on the SRS platforms as described above.

Errors in the code found by users outside the SRS community are beyond our control. The following procedure is encouraged for error reporting/ reconciliation:

a) The error is reported to RSIC or the code developers.

b) The code developers fix the error and submit a new version of the code to RSIC.

c) RSIC makes the new version of the code available and notifies users via the RSIC Newsletter. (The AMPX-77 proprietor receives the RSIC Newsletter monthly).

d) When the proprietor discovers that a new version of the code is available, the proprietor acquires the new source code and installs the upgrade on the SRS platforms as described above.

3. Tolerances. Tolerances on the results will not be addressed in this Software Requirement Specification since MALOCS is an existing code.

Design constraints imposed on design and implementation phase activities

1. None.

External interfaces

1. The MALOCS module uses a fine-group AMPX master library to produce a broad-group AMPX master library.

Coding Standards

1. MALOCS was written at Oak Ridge National Laboratory (ORNL) to conform with FORTRAN-77 source coding standards.

Documents

1. The existing code documentation[1] will satisfy the 1Q34 requirements for a Software Design Report and User's Manual.

References

1. N. M. Greene, W. E. Ford, L. M. Petrie, J. W. Arwood, *AMPX-77: A Modular Code System for Generating Coupled Multigroup Neutron-Gamma Cross-Section Libraries from ENDF/B-IV and/or ENDF/B-V*, ORNL/CSD/TM-283, October 1992.

2. *Scientific Code Management Operations Manual (U)*, WSRC-IM-91-106, October, 1992.

APPENDIX D: NITAWL SRS

OSR 34-A2634 (8-26-91)

Software Requirements Specification
Title and Approval Page

Page 1 of 4

Identification			
Software Title: NITAWL	Software Version: 1-0		Rev: 0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Requirements Specification			
Customer: C. E. Apperson	Customer Specification: none		Dated: 12/6/93
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Keyin A. Niemer	Date: 12/6/93	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer; concurrence with contents of the plan.)			
Print Name	Signature	Date	Organization
Technical Reviewer (If required by responsible manager; concurrence with technical content.)			
Print Name: J. F. Mincey	Signature: J F Mincey	Date: 12/30/93	Organization: SRTC/APG
Responsible Manager (Level 4 or higher; accepts as completely verifiable, consistent, and technically feasible.)			
Print Name: C. E. Apperson	Signature: C E Apperson Jr	Date: 1-4-94	Organization: SRTC/APG
Customer (Accepts as meeting requirements and will result in usable code.)			
Print Name: C. E. Apperson	Signature: C E Apperson Jr	Date: 1-4-94	Organization: SRTC/APG
CQF (Acceptance of specification.)			
Print Name: W. F. Ayres	Signature: Wayne F. Ayres	Date: 1-11-94	Organization: SRTC/QS

Distribution (Controlled identification; include signers of Title and Approval Page.)

To:

C. E. Apperson, 773-42A/124
J. F. Mincey, 773-22A
W. F. Ayres, 773-42A/275
K. A. Niemer, 786-1A

Continued on Attachment ☐ Yes ☒ No

Refer to NRTSC procedure QAP IV-3, "Software Requirements Specifications," for additional information.

NITAWL Software Requirements Specification

AMPX-77 is a modular code system for generating coupled multigroup neutron-gamma cross section libraries from ENDF/B data. AMPX-77 was written at Oak Ridge National Laboratory (ORNL), and is currently maintained by the Radiation Shielding Information Center (RSIC). The NITAWL module converts an AMPX master library to an AMPX working library. Optionally, it will perform a Nordheim integral treatment calculation for nuclides with resonance parameters. Since NITAWL is an existing code maintained by RSIC, this Software Requirement Specification was written with the existing capabilities, formats, and standards in mind.

Function

The NITAWL (Nordheim Integral Treatment And Working Library Production) module converts master libraries to working libraries and performs self-shielding calculations.[1] The optional resonance self-shielding calculation is for the resolved energy range and employs the Nordheim Integral Treatment. The Nordheim Integral Treatment is a two-region integral transport theory method, a fuel lump, surrounded by a moderator region, in which the moderator region is assumed to have an asymptotic (1/E) flux everywhere and at all energies.

Performance and Attributes

1. Time-related issues. Time-related issues are not applicable since running times are extremely problem and computing platform dependent.

2. Software environment. Since NITAWL was written in FORTRAN-77, the code is portable. At SRS, NITAWL is expected to be executed on the IBM 3091 and the CRAY computing platforms.

   Offsite, NITAWL is maintained by RSIC. In order to install the code at SRS, the code proprietor acquires the software from RSIC and submits the source to the Scientific Code Management System (SCMS)[2] for protection and control. The code proprietor is also responsible for revising, testing, certifying and documenting the code.

   The original source code from RSIC contains certain sections commented out which meet the requirements of a particular machine (IBM or CRAY). In some instances, additional machine-dependent changes may be necessary for the code to execute on the SRS computing platforms. These changes will be documented with a Software Discrepancy/Change Report (SDCR). It is possible that there would be a version 1-0 for the IBM and a version 1-1 for the CRAY. An

appropriate set of the test problems will be run to ensure that the code performs correctly on each computing platform.

A certification package will be prepared for NITAWL that encompasses both the IBM and CRAY source. The certification package will reference any SDCR written to document machine-dependent changes necessary for the code to execute on the different SRS computers. A single certification package will be written for both the IBM and CRAY version since differences between the two versions will be minimal and machine specific. Once again, all changes will be documented with a SDCR and referenced in the certification package.

Since NITAWL is maintained offsite, the certified SRS source may be subject to periodic upgrades as they are received from RSIC. Upon receiving the source, the proprietor would install the upgrade on the SRS platforms as described above.

Errors in the code found by users outside the SRS community are beyond our control. The following procedure is encouraged for error reporting/ reconciliation:

a) The error is reported to RSIC or the code developers.

b) The code developers fix the error and submit a new version of the code to RSIC.

c) RSIC makes the new version of the code available and notifies users via the RSIC Newsletter. (The AMPX-77 proprietor receives the RSIC Newsletter monthly).

d) When the proprietor discovers that a new version of the code is available, the proprietor acquires the new source code and installs the upgrade on the SRS platforms as described above.

3. Tolerances. Tolerances on the results will not be addressed in this Software Requirement Specification since NITAWL is an existing code.

Design constraints imposed on design and implementation phase activities

1. None.

External interfaces

1. NITAWL uses an AMPX master library[1] as input to create a new AMPX working library.

Coding Standards

1. NITAWL was written at Oak Ridge National Laboratory (ORNL) to conform with FORTRAN-77 source coding standards.

Documents

1. The existing code documentation[1] will satisfy the 1Q34 requirements for a Software Design Report and User's Manual.

References

1. N. M. Greene, W. E. Ford, L. M. Petrie, J. W. Arwood, *AMPX-77: A Modular Code System for Generating Coupled Multigroup Neutron-Gamma Cross-Section Libraries from ENDF/B-IV and/or ENDF/B-V*, ORNL/CSD/TM-283, October 1992.

2. *Scientific Code Management Operations Manual (U)*, WSRC-IM-91-106, October, 1992.

APPENDIX E: ROLAIDS SRS

OSR 24-A3634 (8-28-91)

Software Requirements Specification
Title and Approval Page

Page 1 of 4

Identification			
Software Title: ROLAIDS		Software Version: 1-0	Rev: 0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Requirements Specification			
Customer: C. E. Apperson	Customer Specification: none		Dated: 12/6/93
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Kenneth A. Niemer	Date: 12/6/93	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer; concurrence with contents of the plan.)			
Print Name	Signature	Date	Organization
Technical Reviewer (If required by responsible manager; concurrence with technical content.)			
Print Name: J. F. Mincey	Signature: J. F. Mincey	Date: 12/30/93	Organization: SRTC/APG
Responsible Manager (Level 4 or higher; accepts as completely verifiable, consistent, and technically feasible.)			
Print Name: C. E. Apperson	Signature: C. E. Apperson Jr.	Date: 1-4-94	Organization: SRTC/APG
Customer (Accepts as meeting requirements and will result in usable code.)			
Print Name: C. E. Apperson	Signature: C. E. Apperson Jr.	Date: 1-4-94	Organization: SRTC/APG
CQF (Acceptance of specification.)			
Print Name: W. F. Ayres	Signature: Wayne F. Ayres	Date: 1-11-94	Organization: SRTC/QS

Distribution (Controlled identification; include signers of Title and Approval Page.)

To:

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W. F. Ayres, 773-42A/275
K. A. Niemer, 786-1A

Continued on Attachment ☐ Yes ☒ No

Refer to NRTSC procedure QAP IV-3, "Software Requirements Specifications," for additional information.

ROLAIDS Software Requirements Specification

AMPX-77 is a modular code system for generating coupled multigroup neutron-gamma cross section libraries from ENDF/B data. AMPX-77 was written at Oak Ridge National Laboratory (ORNL), and is currently maintained by the Radiation Shielding Information Center (RSIC). The ROLAIDS module performs an integral transport calculation for the energy-pointwise, slowing-down flux distribution in each zone of a 1-D, multiregion geometry to produce multigroup resonance-shielded constants. Since ROLAIDS is an existing code maintained by RSIC, this Software Requirement Specification was written with the existing capabilities, formats, and standards in mind.

Function

The ROLAIDS (Resonance OverLap Analysis In Discretely Represented Systems) module is provided in AMPX for treating problems in which either resonance overlap causes mutual shielding or severe spatial attenuation of the neutron flux indicates the need for spatially dependent resonance cross sections.[1] Given a point cross-section library and an AMPX master cross-section library, ROLAIDS performs an integral transport calculation for the energy-pointwise, slowing-down flux distribution in each zone of a 1-D multiregions geometry. ROLAIDS provides resonance-shielded fine-group constants to be folded into existing AMPX master data sets. The folding is subsequently done with the CLAROL module. The modified AMPX master library can be used in NITAWL to generate a working library for use in XSDRNPM discrete-ordinates analyses or to generate other multigroup libraries for use with other transport codes.

Performance and Attributes

1. Time-related issues. Time-related issues are not applicable since running times are extremely problem and computing platform dependent.

2. Software environment. Since ROLAIDS was written in FORTRAN-77, the code is portable. At SRS, ROLAIDS is expected to be executed on the IBM 3091 and the CRAY computing platforms.

   Offsite, ROLAIDS is maintained by RSIC. In order to install the code at SRS, the code proprietor acquires the software from RSIC and submits the source to the Scientific Code Management System (SCMS)[2] for protection and control. The code proprietor is also responsible for revising, testing, certifying and documenting the code.

   The original source code from RSIC contains certain sections commented out which meet the requirements of a particular machine (IBM or CRAY). In some

instances, additional machine-dependent changes may be necessary for the code to execute on the SRS computing platforms. These changes will be documented with a Software Discrepancy/Change Report (SDCR). It is possible that there would be a version 1-0 for the IBM and a version 1-1 for the CRAY. An appropriate set of the test problems will be run to ensure that the code performs correctly on each computing platform.

A certification package will be prepared for ROLAIDS that encompasses both the IBM and CRAY source. The certification package will reference any SDCR written to document machine-dependent changes necessary for the code to execute on the different SRS computers. A single certification package will be written for both the IBM and CRAY version since differences between the two versions will be minimal and machine specific. Once again, all changes will be documented with a SDCR and referenced in the certification package.

Since ROLAIDS is maintained offsite, the certified SRS source may be subject to periodic upgrades as they are received from RSIC. Upon receiving the source, the proprietor would install the upgrade on the SRS platforms as described above.

Errors in the code found by users outside the SRS community are beyond our control. The following procedure is encouraged for error reporting/ reconciliation:

a) The error is reported to RSIC or the code developers.

b) The code developers fix the error and submit a new version of the code to RSIC.

c) RSIC makes the new version of the code available and notifies users via the RSIC Newsletter. (The AMPX-77 proprietor receives the RSIC Newsletter monthly).

d) When the proprietor discovers that a new version of the code is available, the proprietor acquires the new source code and installs the upgrade on the SRS platforms as described above.

3. Tolerances. Tolerances on the results will not be addressed in this Software Requirement Specification since ROLAIDS is an existing code.

Design constraints imposed on design and implementation phase activities

1. None.

External interfaces

1. ROLAIDS provides resonance-shielded fine-group constants to be folded into existing AMPX master data sets. The folding is subsequently done with the CLAROL module. The modified AMPX master library can be used in NITAWL to generate a working library for use in XSDRNPM discrete-ordinates analyses or to generate other multigroup libraries for use with other transport codes.

Coding Standards

1. ROLAIDS was written at Oak Ridge National Laboratory (ORNL) to conform with FORTRAN-77 source coding standards.

Documents

1. The existing code documentation[1] will satisfy the 1Q34 requirements for a Software Design Report and User's Manual.

References

1. N. M. Greene, W. E. Ford, L. M. Petrie, J. W. Arwood, *AMPX-77: A Modular Code System for Generating Coupled Multigroup Neutron-Gamma Cross-Section Libraries from ENDF/B-IV and/or ENDF/B-V*, ORNL/CSD/TM-283, October 1992.

2. *Scientific Code Management Operations Manual (U)*, WSRC-IM-91-106, October, 1992.

APPENDIX F: SMUG SRS

OSR 34-A3634 (8-38-91)

Software Requirements Specification
Title and Approval Page

Page 1 of 4

Identification			
Software Title: SMUG	Software Version: 1-0		Rev: 0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Requirements Specification			
Customer: C. E. Apperson	Customer Specification: none		Dated: 12/6/93
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Keyn A. Niem	Date: 12/6/93	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer; concurrence with contents of the plan.)			
Print Name	Signature	Date	Organization
Technical Reviewer (If required by responsible manager; concurrence with technical content.)			
Print Name: J. F. Mincey	Signature: J F Mincey	Date: 12/30/93	Organization: SRTC/APG
Responsible Manager (Level 4 or higher; accepts as complete, verifiable, consistent, and technically feasible.)			
Print Name: C. E. Apperson	Signature: C. E. Apperson Jr	Date: 1-4-94	Organization: SRTC/APG
Customer (Accepts as meeting requirements and will result in usable code.)			
Print Name: C. E. Apperson	Signature: C E Apperson Jr	Date: 1-4-94	Organization: SRTC/APG
CQF (Acceptance of specification.)			
Print Name: W. F. Ayres	Signature: Wayne F. Ayres	Date: 1-11-94	Organization: SRTC/QS

Distribution (Controlled identification; include signers of Title and Approval Page.)

To:

C. E. Apperson, 773-42A/124
J. F. Mincey, 773-22A
W. F. Ayres, 773-42A/275
K. A. Niemer, 786-1A

Continued on Attachment ☐ Yes ☒ No

Refer to NRTSC procedure QAP IV-3, "Software Requirements Specifications," for additional information.

SMUG Software Requirements Specification

AMPX-77 is a modular code system for generating coupled multigroup neutron-gamma cross section libraries from ENDF/B data. AMPX-77 was written at Oak Ridge National Laboratory (ORNL), and is currently maintained by the Radiation Shielding Information Center (RSIC). The SMUG module generates a photon-interaction master library from ENDF/B data. Since SMUG is an existing code maintained by RSIC, this Software Requirement Specification was written with the existing capabilities, formats, and standards in mind.

Function

The SMUG (Simple MUltigroup Gamma) module calculates multigroup photon cross section, with transfer coefficients represented by a Legendre approximation of an arbitrary order.[1] The scattering moments are computed from the Klein-Nishina equation.[2] The photoelectric and pair-production cross sections are obtained from ENDF/B data. Three sets of dose factors[3] are built in and can be averaged over the problem group structure.

Performance and Attributes

1. Time-related issues. Time-related issues are not applicable since running times are extremely problem and computing platform dependent.

2. Software environment. Since SMUG was written in FORTRAN-77, the code is portable. At SRS, SMUG is expected to be executed on the IBM 3091 and the CRAY computing platforms.

   Offsite, SMUG is maintained by RSIC. In order to install the code at SRS, the code proprietor acquires the software from RSIC and submits the source to the Scientific Code Management System (SCMS)[4] for protection and control. The code proprietor is also responsible for revising, testing, certifying and documenting the code.

   The original source code from RSIC contains certain sections commented out which meet the requirements of a particular machine (IBM or CRAY). In some instances, additional machine-dependent changes may be necessary for the code to execute on the SRS computing platforms. These changes will be documented with a Software Discrepancy/Change Report (SDCR). It is possible that there would be a version 1-0 for the IBM and a version 1-1 for the CRAY. An appropriate set of the test problems will be run to ensure that the code performs correctly on each computing platform.

A certification package will be prepared for SMUG that encompasses both the IBM and CRAY source. The certification package will reference any SDCR written to document machine-dependent changes necessary for the code to execute on the different SRS computers. A single certification package will be written for both the IBM and CRAY version since differences between the two versions will be minimal and machine specific. Once again, all changes will be documented with a SDCR and referenced in the certification package.

Since SMUG is maintained offsite, the certified SRS source may be subject to periodic upgrades as they are received from RSIC. Upon receiving the source, the proprietor would install the upgrade on the SRS platforms as described above.

Errors in the code found by users outside the SRS community are beyond our control. The following procedure is encouraged for error reporting/ reconciliation:

a) The error is reported to RSIC or the code developers.

b) The code developers fix the error and submit a new version of the code to RSIC.

c) RSIC makes the new version of the code available and notifies users via the RSIC Newsletter. (The AMPX-77 proprietor receives the RSIC Newsletter monthly).

d) When the proprietor discovers that a new version of the code is available, the proprietor acquires the new source code and installs the upgrade on the SRS platforms as described above.

3. Tolerances. Tolerances on the results will not be addressed in this Software Requirement Specification since SMUG is an existing code.

Design constraints imposed on design and implementation phase activities

1. None.

External interfaces

1. SMUG generates a photon-interaction master library from ENDF/B data.

Coding Standards

1. SMUG was written at Oak Ridge National Laboratory (ORNL) to conform with FORTRAN-77 source coding standards.

Documents

1. The existing code documentation[1] will satisfy the 1Q34 requirements for a Software Design Report and User's Manual.

References

1. N. M. Greene, W. E. Ford, L. M. Petrie, J. W. Arwood, *AMPX-77: A Modular Code System for Generating Coupled Multigroup Neutron-Gamma Cross-Section Libraries from ENDF/B-IV and/or ENDF/B-V*, ORNL/CSD/TM-283, October 1992.

2. R. D. Evans, *The Atomic Nucleus*, Chapter 23, McGraw-Hill, 1955.

3. B. J. Henderson, *Conversion of Neutron or Gamma Ray Flux To Absorbed Dose Rate*, XDC-59-8-179, General Electric Co., Cincinnati, Ohio, August 1959.

4. *Scientific Code Management Operations Manual (U)*, WSRC-IM-91-106, October, 1992.

APPENDIX G: XSDRNPM SRS

OSR 94-A3634 (9-30-91)

Software Requirements Specification
Title and Approval Page

Page 1 of 4

Identification			
Software Title: XSDRNPM	Software Version: 1-0		Rev: 0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Requirements Specification			
Customer: C. E. Apperson	Customer Specification: none		Dated: 12/6/93
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Kyle A Niemer	Date: 12/6/93	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer; concurrence with contents of the plan.)			
Print Name	Signature	Date	Organization
Technical Reviewer (If required by responsible manager; concurrence with technical content.)			
Print Name: J. F. Mincey	Signature: J F Mincey	Date: 12/30/93	Organization: SRTC/APG
Responsible Manager (Level 4 or higher; accepts as complete, verifiable, consistent, and technically feasible.)			
Print Name: C. E. Apperson	Signature: C E Apperson Jr	Date: 1-4-94	Organization: SRTC/APG
Customer (Accepts as meeting requirements and will result in usable code.)			
Print Name: C. E. Apperson	Signature: C E Apperson Jr	Date: 1-4-94	Organization: SRTC/APG
CQF (Acceptance of specification.)			
Print Name: W. F. Ayres	Signature: Wayne F. Ayres	Date: 1-11-94	Organization: SRTC/QS

Distribution (Controlled identification; include signers of Title and Approval Page.)

To:

C. E. Apperson, 773-42A/124
J. F. Mincey, 773-22A
W. F. Ayres, 773-42A/275
K. A. Niemer, 786-1A

Continued on Attachment ☐ Yes ☒ No

Refer to NRTSC procedure QAP IV-3, "Software Requirements Specifications," for additional information.

XSDRNPM Software Requirements Specification

AMPX-77 is a modular code system for generating coupled multigroup neutron-gamma cross section libraries from ENDF/B data. AMPX-77 was written at Oak Ridge National Laboratory (ORNL), and is currently maintained by the Radiation Shielding Information Center (RSIC). The XSDRNPM module performs a 1-D discrete-ordinates or diffusion theory calculation using cross sections from an AMPX working library. Since XSDRNPM is an existing code maintained by RSIC, this Software Requirement Specification was written with the existing capabilities, formats, and standards in mind.

Function

The XSDRNPM (X-Section Dynamics for Reactor Nucleonics with Petrie Modifications) module is provided to provide a 1-D transport calculation capability for calculating reaction rates, eigenvalues, and critical dimensions; and to allow spatial cross section weighting to be performed. The collapsed cross sections from XSDRNPM are written as an AMPX-weighted library which can be used by the module to do transport calculations. The collapsed cross sections can also be output in a format suitable for the ANISN, DOT, or MORSE codes.

Performance and Attributes

1. Time-related issues. Time-related issues are not applicable since running times are extremely problem and computing platform dependent.

2. Software environment. Since XSDRNPM was written in FORTRAN-77, the code is portable. At SRS, XSDRNPM is expected to be executed on the IBM 3091 and the CRAY computing platforms.

   Offsite, XSDRNPM is maintained by RSIC. In order to install the code at SRS, the code proprietor acquires the software from RSIC and submits the source to the Scientific Code Management System (SCMS)[2] for protection and control. The code proprietor is also responsible for revising, testing, certifying and documenting the code.

   The original source code from RSIC contains certain sections commented out which meet the requirements of a particular machine (IBM or CRAY). In some instances, additional machine-dependent changes may be necessary for the code to execute on the SRS computing platforms. These changes will be documented with a Software Discrepancy/Change Report (SDCR). It is possible that there would be a version 1-0 for the IBM and a version 1-1 for the CRAY. An appropriate set of the test problems will be run to ensure that the code performs correctly on each computing platform.

A certification package will be prepared for XSDRNPM that encompasses both the IBM and CRAY source. The certification package will reference any SDCR written to document machine-dependent changes necessary for the code to execute on the different SRS computers. A single certification package will be written for both the IBM and CRAY version since differences between the two versions will be minimal and machine specific. Once again, all changes will be documented with a SDCR and referenced in the certification package.

Since XSDRNPM is maintained offsite, the certified SRS source may be subject to periodic upgrades as they are received from RSIC. Upon receiving the source, the proprietor would install the upgrade on the SRS platforms as described above.

Errors in the code found by users outside the SRS community are beyond our control. The following procedure is encouraged for error reporting/ reconciliation:

a) The error is reported to RSIC or the code developers.

b) The code developers fix the error and submit a new version of the code to RSIC.

c) RSIC makes the new version of the code available and notifies users via the RSIC Newsletter. (The AMPX-77 proprietor receives the RSIC Newsletter monthly).

d) When the proprietor discovers that a new version of the code is available, the proprietor acquires the new source code and installs the upgrade on the SRS platforms as described above.

3. Tolerances. Tolerances on the results will not be addressed in this Software Requirement Specification since XSDRNPM is an existing code.

Design constraints imposed on design and implementation phase activities

1. None.

External interfaces

1. XSDRNPM uses an AMPX working library as input. The collapsed cross sections from XSDRNPM are written as an AMPX-weighted library which can be used by the module to do transport calculations. The collapsed cross sections can also be output in a format suitable for the ANISN, DOT, or MORSE codes.

Coding Standards

1. XSDRNPM was written at Oak Ridge National Laboratory (ORNL) to conform with FORTRAN-77 source coding standards.

Documents

1. The existing code documentation[1] will satisfy the 1Q34 requirements for a Software Design Report and User's Manual.

References

1. N. M. Greene, W. E. Ford, L. M. Petrie, J. W. Arwood, *AMPX-77: A Modular Code System for Generating Coupled Multigroup Neutron-Gamma Cross-Section Libraries from ENDF/B-IV and/or ENDF/B-V*, ORNL/CSD/TM-283, October 1992.

2. *Scientific Code Management Operations Manual (U)*, WSRC-IM-91-106, October, 1992.

OSR 34-A2709 (9-5-91)

Software Certification Approval Form

Page 1 of 1

Identification			
Software Title: BONAMI			Software Version: 1-0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Certification			
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Kayes A. Niem	Date: 3/7/94	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer, concurrence with content of certification.)			
Print Name	Signature	Date	Organization
Technical Reviewer (All technical review comments have been resolved.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3/10/94	Organization: SRTC/APG
Software Quality Coordinator (Package meets QAP IV-9 and task plan requirements.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3/10/94	Organization: SRTC/APG
Responsible Manager (Accepts software as being certified.)			
Print Name: C. E. Apperson	Signature: C E Apperson Jr	Date: 3-10-94	Organization: SRTC/APG
Customer (Accepts the software as being certified and meeting deliverable requirements.)			
Print Name: C. E. Apperson	Signature: C E Apperson Jr	Date: 3-10-94	Organization: SRTC/APG

Distribution (Controlled identification; all signers and technical proprietor.)

Identify those who need a copy of this document if it is revised. All functions that received a prior version must receive each subsequent version.

C. E. Apperson, 773-24A
R. E. Pevey, 773-42A/Rm. 127
K. A. Niemer, 786-1A

Continued on attachment? ☐ Yes ☒ No

Refer to NRTSC procedure QAP IV-9, "Software Certification," for additional information.

GER 24-A2704 (9-5-91)

Software Certification Approval Form

Page 1 of 1

Identification			
Software Title: LAPHNGAS			Software Version: 1-0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Certification			
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Kenyon A. Niemer	Date: 3/7/94	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer, concurrence with content of certification.)			
Print Name	Signature	Date	Organization
Technical Reviewer (All technical review comments have been resolved.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3/10/94	Organization: SRTC/APG
Software Quality Coordinator (Package meets QAP IV-9 and task plan requirements.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3/10/94	Organization: SRTC/APG
Responsible Manager (Accepts software as being certified.)			
Print Name: C. E. Apperson	Signature: C E Apperson Jr	Date: 3-10-94	Organization: SRTC/APG
Customer (Accepts the software as being certified and meeting deliverable requirements.)			
Print Name: C. E. Apperson	Signature: C E Apperson Jr	Date: 3-10-94	Organization: SRTC/APG

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C. E. Apperson, 773-24A
R. E. Pevey, 773-42A/Rm. 127
K. A. Niemer, 786-1A

Continued on attachment? ☐ Yes ☒ No

Refer to NRTSC procedure QAP IV-9, "Software Certification," for additional information.

OSR 24-A2706 (9-5-91)

Software Certification Approval Form

Page 1 of 1

Identification			
Software Title: MALOCS			Software Version: 1-0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Certification			
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Keyes A. Niemer	Date: 3/7/94	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer, concurrence with content of certification.)			
Print Name	Signature	Date	Organization
Technical Reviewer (All technical review comments have been resolved.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3/10/94	Organization: SRTC/APG
Software Quality Coordinator (Package meets QAP IV-9 and task plan requirements.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3/10/94	Organization: SRTC/APG
Responsible Manager (Accepts software as being certified.)			
Print Name: C. E. Apperson	Signature: C E Apperson	Date: 3-10-94	Organization: SRTC/APG
Customer (Accepts the software as being certified and meeting deliverable requirements.)			
Print Name: C. E. Apperson	Signature: C E Apperson	Date: 3-10-94	Organization: SRTC/APG

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K. A. Niemer, 786-1A

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Refer to NRTSC procedure QAP IV-9, "Software Certification," for additional information.

OSR 24-A2704 (8-5-91)

Software Certification Approval Form

Page 1 of 1

Identification			
Software Title: NITAWL			Software Version: 1-0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Certification			
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Keith A. Niemer	Date: 3/7/94	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer, concurrence with content of certification.)			
Print Name	Signature	Date	Organization
Technical Reviewer (All technical review comments have been resolved.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3/10/94	Organization: SRTC/APG
Software Quality Coordinator (Package meets QAP IV-9 and task plan requirements.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3/10/94	Organization: SRTC/APG
Responsible Manager (Accepts software as being certified.)			
Print Name: C. E. Apperson	Signature: C E Apperson	Date: 3-10-94	Organization: SRTC/APG
Customer (Accepts the software as being certified and meeting deliverable requirements.)			
Print Name: C. E. Apperson	Signature: C E Apperson	Date: 3-10-94	Organization: SRTC/APG

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K. A. Niemer, 786-1A

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Refer to NRTSC procedure QAP IV-9, "Software Certification," for additional information.

OSR 94-A3704 (9-5-91)

Software Certification Approval Form

Page 1 of 1

Identification			
Software Title: ROLAIDS			Software Version: 1-0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Certification			
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Kenneth A. Niemer	Date: 3/7/94	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer, concurrence with content of certification.)			
Print Name	Signature	Date	Organization
Technical Reviewer (All technical review comments have been resolved.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3-10-94	Organization: SRTC/APG
Software Quality Coordinator (Package meets QAP IV-9 and task plan requirements.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3-10-94	Organization: SRTC/APG
Responsible Manager (Accepts software as being certified.)			
Print Name: C. E. Apperson	Signature: C E Apperson	Date: 3-10-94	Organization: SRTC/APG
Customer (Accepts the software as being certified and meeting deliverable requirements.)			
Print Name: C. E. Apperson	Signature: C E Apperson	Date: 3-10-94	Organization: SRTC/APG

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K. A. Niemer, 786-1A

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Refer to NRTSC procedure QAP IV-9, "Software Certification," for additional information.

OSR 34-A3704 (9-5-91)

Software Certification Approval Form

Page 1 of 1

Identification			
Software Title: SMUG			Software Version: 1-0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Certification			
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Keyes A. Niemer	Date: 3/7/94	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer, concurrence with content of certification.)			
Print Name	Signature	Date	Organization
Technical Reviewer (All technical review comments have been resolved.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3-10-94	Organization: SRTC/APG
Software Quality Coordinator (Package meets QAP IV-9 and task plan requirements.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3-10-94	Organization: SRTC/APG
Responsible Manager (Accepts software as being certified.)			
Print Name: C. E. Apperson	Signature: C E Apperson	Date: 3-10 94	Organization: SRTC/APG
Customer (Accepts the software as being certified and meeting deliverable requirements.)			
Print Name: C. E. Apperson	Signature: C E Apperson	Date: 3-10-94	Organization: SRTC/APG

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K. A. Niemer, 786-1A

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Refer to NRTSC procedure QAP IV-9, "Software Certification," for additional information.

OSR 24-A2704 (9-5-91)

Software Certification Approval Form

Page 1 of 1

Identification			
Software Title: XSDRNPM			Software Version: 1-0
Task Title: AMPX-77 Criticality Code Certification			Task No.: 93-006-M-A-1
Software Certification			
Preparer (Task leader or designee)			
Print Name: K. A. Niemer	Signature: Keyes A. Niem	Date: 3/7/94	Organization: SRTC/APG
Approvals			
Task Leader (If different than preparer, concurrence with content of certification.)			
Print Name	Signature	Date	Organization
Technical Reviewer (All technical review comments have been resolved.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3-10-94	Organization: SRTC/APG
Software Quality Coordinator (Package meets QAP IV-9 and task plan requirements.)			
Print Name: R. E. Pevey	Signature: Ronald E Pevey	Date: 3-10-94	Organization: SRTC/APG
Responsible Manager (Accepts software as being certified.)			
Print Name: C. E. Apperson	Signature: C E Apperson	Date: 3-10-94	Organization: SRTC/APG
Customer (Accepts the software as being certified and meeting deliverable requirements.)			
Print Name: C. E. Apperson	Signature: C E Apperson	Date: 3-10-94	Organization: SRTC/APG

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K. A. Niemer, 786-1A

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DATE

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7/8/94

END