RSICC CODE PACKAGE CCC-112

1. NAME AND TITLE

SAND II: Neutron Flux Spectra Determination by Multiple Foil Activation - Iterative Method.
We recommend PSR-345/SNL-SAND-II.

AUXILIARY ROUTINES

CSTAPE: Generates Cross-Section Data Library for Calculation of Foil Activities.
SLACTS: Generates Spectral and Activities Data for SLTAPE.
SLTAPE: Generates Reference Spectrum Data Library.
SAND II: Neutron Flux Spectra Determination.
DIF: Set of Function Routines.

An early version (1968) of SAND was received through the services of the General Electric Company, TEMPO, Data Center, Santa Barbara, California, and Computer Sciences, Richland Washington. Many revisions have been made as the result of user feedback and interaction with the American Society for Testing and Materials (ASTM) Standards Committee E10. Nuclear Technology and Applications and Subcommittee E10.05 Nuclear Radiation Metrology. The SAND II code package is included in the ASTM Proposed Standard Recommended Practices for the Application of Neutron Spectrum Adjusted Methods in Reactor Surveillance. The PC version was packaged in September 1993 and updated in May 2007; it is a conversion of the C00112/I3675/00 release last updated in August 1977. The basic physics and operation of SAND-II are unchanged from the 1970's.

2. CONTRIBUTORS

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3. CODING LANGUAGE AND COMPUTER

Fortran; CDC 6600/7600, IBM 360, and IBM PC (RSICC ID: C00112MNYCP03).

4. NATURE OF PROBLEM SOLVED

Neutron energy spectra are determined by an analysis of experimental activation detector data.

5. METHOD OF SOLUTION

An iterative perturbation method is used to obtain a ``best fit" neutron flux spectrum for a given input set of infinitely dilute foil activities. The calculational procedure consists of the selection of a known flux spectrum form to serve as the initial approximation to the solution, and subsequent iteration to a form acceptable as an appropriate solution. The solution is specified either as time-integrated flux (fluence) for a pulsed environment or as a flux for a steady-state neutron environment.

A reaction cross-section library is provided with the code.

6. RESTRICTIONS OR LIMITATIONS

None noted.

7. TYPICAL RUNNING TIME

Estimated running time of sample problem: 2!3 minutes on the IBM 360/75;
PC times on Northgate M86/66: CSTAPE = 16.0 sec.
SLACTS2 = 6.5 sec.
SLACTS3 = 7.0 sec.

SLACTS4 = 26.0 sec.
SLTAPE = 1.5 sec.
SANDII = 75.0 sec. (allowing time to view graphs)

8. COMPUTER HARDWARE REQUIREMENTS

The code is operable on Pentium IV, IBM 360/75/91, CDC 6600/7600.

9. COMPUTER SOFTWARE REQUIREMENTS

The Lahey Fortran 95 version 5.5d and Lahey Fortran 90 version 4.5 compilers were used to create executables included in the Windows version. These were tested on 32-bit PC's under Windows XP and Windows Vista. No executables are included in the CDC and IBM mainframe versions of the code, which are written in Fortran IV. These old mainframe versions, which have not been modified since the 1970's, are retained for archival purposes.

10. REFERENCES

F. B. K. Kam, "Notes to User's" (January 1969).

B. Cross, SAND II/CSTAPE (Memo) (June 1975).

W. N. McElroy, S. Berg, T. Crockett, R. G. Hawkins, "A Computer-Automated Iterative Method for Neutron Flux Spectra Determination by Foil Activation, Vol. I: A Study of the Iterative Method," AFWL-TR-67-41 (September 1967).

S. Berg and W. N. McElroy, "A Computer-Automated Iterative Method for Neutron Flux Spectra Determination by Foil Activation, Vol. II: SAND II (Spectrum Analysis by Neutron Detectors II) and Associated Codes," AFWL-TR-67-41 (September 1967).

W. N. McElroy and S. Berg, "A Computer-Automated Iterative Method for Neutron Flux Spectra Determination by Foil Activation, Vol. IV: Reference Spectrum Library for SAND II," AFWL-TR-67-41 (September 1967).

S. Berg, "Modification of SAND II," BNWL-855 (August 1968).

R. L. Simons and W. N. McElroy, "Evaluated Reference Cross Section Library," BNWL-1312 (May 1970).

M. L. Eaton and W. L. Wilcoxson, "Estimating Strengths of Individual Radioisotopes in a Multiple-Isotope Source," Technical Report R-551.

11. CONTENTS OF CODE PACKAGE

Included are the referenced documents and one CD-R disc which contains source codes, Windows executables, data libraries, sample problem input and output. The PC, CDC and IBM mainframe versions were combined into one package in the May 2007 update.

12. DATE OF ABSTRACT

May 1969; updated July 1981, Sept. 1991, Sept. 1993, Jan. 1994, and May 2007.

KEYWORDS: ACTIVATION DETECTOR; UNFOLDING; NEUTRON; MICROCOMPUTER