PACKAGE ID - 000327SUN0000 VIM3.0

KWIC TITLE - Continuous Energy MC Neutron/Photon

AUTHORS - Blomquist, R.N.
Argonne National Lab., IL (United States)

LIMITATION CODE -COPY **AUDIENCE CODE -** LIM

COMPLETION DATE - 10/01/1991 **PUBLICATION DATE -** 10/10/1991

DESCRIPTION - VIM solves the three-dimensional steady-state multiplication eigenvalue or fixed source neutron or photon (VIM3.0) transport problem using continuous energy-dependent nuclear data. It was designed for the analysis of fast critical experiments. In VIM3.0, the photon interactions i.e., pair production, coherent and incoherent scattering, and photoelectric events, and photon heating are tallied by group, region, and isotope.

PACKAGE CONTENTS - Media Directory; Software Abstract; Media Includes Source Code, Sample Problem Input and Output, Cross-Section Library, Machine-Readable User's Guide, Auxiliary Information, Control Information;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 21 3.5 Diskettes

METHOD OF SOLUTION - VIM uses the Monte Carlo technique to estimate eigenvalues by collision, track length, and analog methods. Geometry options include infinite medium, plate cell lattice, general combinatorial geometry, and repeating lattices of hexagonal or rectangular cells constructed using combinatorial geometry. ENDF/B cross section data are used, including thermal scattering law data. Variance reduction options available include several splitting and Russian roulette techniques, any linear combination of analog and absorption neutron weighting, and combined eigenvalue estimators. An easy-to-use restart option is also available. In VIM3.0, photon cross sections are defined by composition independent microscopic datasets in the energy range from 1 keV to 100 MeV. Coherent and incoherent scattering, pair production, and photoelectric cross section data are described by pointwise values with log-log interpolation. Photon heating numbers are specified pointwise with linear-log interpolation. Pair production is simulated by creation of a double-weighted photon of energy 0.511008 MeV, and production by fluorescence is treated explicitly. The Klein-Nishina distribution is sampled exactly for secondary angle and energy during incoherent scattering events.

COMPUTER - SUN

OPERATING SYSTEMS - UNIX 4.1.1

PACKAGE ID - 000327SUN0000 VIM3.0

PROGRAMMING LANGUAGES - FORTRAN 77 and BAL

SOFTWARE LIMITATIONS - Maximum of 40 isotopes.

SOURCE CODE AVAILABLE (Y/N) - Y

UNIQUE FEATURES - VIM uses continuous energy cross section data with very fine energy detail rather than multigroup cross sections. It has been extensively benchmarked on fast reactor problems using both experimental measurements and analytical comparisons.

RELATED SOFTWARE - The packages include a number of auxiliary codes: XSEDIT, a BCD-to-binary or binary-to-BCD cross section editing program; FILEONE, a cross section library preparation code which develops variable dimensioning information for BANDIT, a program to select the isotopes for a specific set of problems and segment the cross section data into energy bands to reduce memory requirements; RETALLY, a code to reprocess VIM history data, collapsing the edit energy groups and homogenizing regions for processing selected batches; and KEFCODE, which reedits the eigenvalue estimators for a subset of batches. The original VIM system was developed at Atomics International by L.B. Levitt and R.C. Lewis.

HARDWARE REQS - Variable dimensioning is used throughout VIM. Storage requirements depend linearly on the number of isotopes in the problem and also on the edit detail in space and energy. VIM3.0 requires at least 750 Kbytes of memory.

TIME REQUIREMENTS - The running time of VIM varies widely with problem characteristics. It depends linearly on the number of isotopes and is also dependent on the number of geometrical zones and the desired statistics. NESC executed the VIM3.0 sample problem in approximately 6 minutes on a SUN SPARC.

REFERENCES - L.J. Milton, VIM Users' Guide, ANL Applied Physics Division Memorandum, June 24, 1981; R.N. Blomquist, VIM Users' Guide, ANL Applied Physics Division Memorandum, November 14, 1986\ R.E. Prael, Cross Section Preparation for the Continuous-Energy Monte Carlo Code VIM, Proceedings of the Conference on Nuclear Cross Sections and Technology, March 3-7, 1975, NBS Special Publication 425, pp. 447-450; R.E. Prael and H. Henryson, II, A Comparison of VIM and MC**2-2 - Two Detailed Solutions of the Neutron Slowing-Down Problem, Proceedings of the Conference on Nuclear Cross Sections and Technology, March 3-7, 1975, NBS Special Publication 425, pp. 451-454; L.B. Levitt and R.C. Lewis, VIM1, A Non-multigroup Monte Carlo Code for Analysis of Fast Critical Assemblies, AI-AEC-12951, May 15, 1970.

ABSTRACT STATUS - Abstract first distributed October 1972. VIM3.0 SUN version submitted August 1991, sample problems executed by NESC October 1991 on a SUN SPARC.

PACKAGE ID - 000327SUN0000 VIM3.0

ABSTRACT STATUS -(CONT)
SUBJECT CLASS CODE - JB

KEYWORDS -
COMPUTER PROGRAM DOCUMENTATION
V CODES
PHOTON TRANSPORT
EIGENVALUES
NEUTRON TRANSPORT
CRITICALITY
HEXAGONAL LATTICES
MONTE CARLO METHOD
NEUTRON TRANSPORT THEORY
SHIELDING
REACTOR LATTICES
SLOWING-DOWN
ZPR-3 REACTOR
ZEBRA REACTOR

EDB SUBJECT CATEGORIES -
990200 220100 663600

SPONSOR - DOE/NE

PACKAGE TYPE - TESTED