NUCLEAR SCIENCE AND ENGINEERING: 23, 206-207 (1965)

Computer Code Abstracts

CCA -112

1. Name of Code: AISITE II
2. Computer for Which Code is Designed and Others Upon Which it is Operable: IBM 7094
3. Nature of Physical Problem Solved: AISITE II is a code for the investigation of reactor-siting requirements and is largely based on methods proposed by the AEC in TID-14844 but differs in certain of the assumptions and models. The code automatically varies any one of 46 parameters such as reactor power, building leak rate, iodine cleanup rate, halogen filter efficiency, etc., and computes the exclusion area and low- and center-population-boundary zones as functions of that parameter. The edit includes dose-vs-distance data, fractional contribution by isotope group to the inhalation dose and critical distances and provides both printed and graphical data. Three models are available for fission product release with up to 4 levels of containment.
4. Method of Solution: Analytic solutions to the differential equations are evaluated.
5. Restrictions of the Complexity of the Problem:

   100 Isotopes
   20 Distances
   10 Values of variable parameter
   8 Organs
   4 Levels of containment

6. Typical Running Time: One case with 10 distances and 10 values of the variable parameter requires about 20 sec for both printed and graphical output.
7. Unusual Features of the Program: AISITE II has been optimized to reduce running time by keeping track of those portions of the calculation which need not be re-evaluated; i.e., are not affected by the variable parameter. This optimization resulted in up to a factor of 10 savings over the earlier version of the code.
8. Related and Auxiliary Programs: None
9. Status: In production
10. *References:*

    [1]R. A. Blaine and E. L. Bramblett, "AISITE II, A Digital Computer Program for Investigation of Reactor Siting," NAA-SR-9982 (September 1964).

    [2]M. Hoffman and W. A. Rhoades, "AICRT3, A General Code for Display of Digital Data," NAA-SR-MEMO-9069 (October 1963).
11. Machine Requirements:

    32k, IBM 7094
    SC-4020 graphical display device
12. Programing Languages Used: FORTRAN II (90%) and FAP (10%)
13. Operating System or Monitor Under Which Program is Executed: Standard IBM FORTRAN Monitor.
14. Any Other Programing or Operating Information or Restrictions: If an SC-4020 graphical display device is not available, dummy routines can be used for subroutines GRAPH and AICRT3, or these routines can be rewritten.

    The NAA SC-4020 subroutine package is available through:

    UAIDE Librarian
    c/o Stromberg-Carlson
    P. O. Box 2449
    San Diego, California
15. Material Available:
    (a) Source deck (3000 cards)
    (b) Sample case
    (c) Documents
    (d) Abstract

R. A. Blaine

Supervisor, Nuclear Codes Unit
Mathematics and Computer Applications Group
Atomics International
P. O. Box 309
Canoga Park, California

Received April 6, 1965

CCA - 113

1. Name of Program: DPN-FIT
2. Computer for Which Program is Designed: IBM-709 Programing Language: FORTRAN II with one tape unit.
3. Nature of the Problem Solved: The code performs a least-mean-squares fit of the analytic double P_N characteristic solutions to a set of measured scalar fluxes[1]. From the fitting coefficients the code reconstructs the angular flux that must be associated with the measured scalar fluxes. Then the code calculates the statistical uncertainty in the reconstructed angular flux caused by statistical uncertainty in the measured scalar fluxes.
4. Method of Solution: The fitting is done with the standard linear least-mean-squares technique and is implemented using simple matrix manipulations. The reconstruction process is reduced to a series of matrix operations as is the error analysis. The problem must be essentially spectrum independent.
5. Basic Physics Approximations: The spatial dependence of any sources present must be known in advance. A finite-order double P_N approximation must be able to represent the angular distribution (i.e., no delta functions in angle).

6. Restrictions on the Complexity: The number of scalar-flux data points, the number of x coordinates and μ coordinates at which the angular flux is to be reconstructed must each be less than 46.
7. Typical Running Time: IBM-709: One minute.
8. Related Program: The program uses the general matrix algebra program RAMP[2], which is supplied as part of the operating package. The program DPN-FIT is in fact a set of instruction-data cards which control the operation of RAMP.
9. Present Status: In use.
10. *References:*

[1]G. R. Dalton and H. G. Cofer, "Neutron Angular Flux Measurements Without Collimators," being reviewed for *Nucl. Sci. Eng.*

[2]Private communication from M. J. Ohanian (1964).

G. R. Dalton

College of Engineering
University of Florida
Gainesville, Florida

Received April 26, 1965

CCA - 114

1. Name of Program: ISOPOWER
2. Computer for Which Program is Designed: IBM 7090 Programing System: FORTRAN II
3. Nature of Problem Solved: ISOPOWER can be used to calculate the power output of radioisotopes in W/g, W/cm^3, and curie/g of source. The program calculates and sums the contributions to the total power output from all isotopes in a decay chain and from different chains of a mixed radioisotopic power source. The results will be printed out and, if desired, plotted as power output vs time curves on an associated electroplotter.
4. Method of Solution: The growth and decay of members of each decay chain are computed using a generalized solution to the Bateman equations, which describe such processes. Input data to ISOPOWER must include the amount of each parent radioisotope present, the half-lives and average energy of radiation for all members of each chain, and the densities of the various elements or their compounds which are used in the source.
5. Basic Physics Approximations in the Problem Formulation: The results calculated using program ISOPOWER are maximum theoretical power output values which assume, in a thermal application, that all the radiation coming from a source is converted to thermal energy either within the source itself or in associated shielding.
6. Restrictions on Complexity of the Problem: This program will handle up to 20 isotopes in a chain and sum the contributions to total power output from up to 20 chains.
7. Typical Running Time: (IBM 7090)—This program performed calculations for several cases with an output of 480 lines in 72 sec. The average rate was 10 calculations/sec.
8. Related Programs: ISOPOWER requires a subroutine for the particular electroplotter associated with the computer being used. At present, this program uses a plotting subroutine written for the Benson-Lehner Model-J Electroplotter.
9. Status: Presently in use.
10. *Reference:*

[1]Charles W. Friend and J. R. Knight, "ISOPOWER—Computer Program for Calculating Power Output of Single or Mixed Radioisotopic Power Sources Written in FORTRAN II," USAEC Rept. ORNL-3826, Oak Ridge National Laboratory (to be published).

11. Material Available: Program decks and referenced document from the authors.

Charles W. Friend

Oak Ridge National Laboratory*
Oak Ridge, Tennessee

J. R. Knight

CDPF, Oak Ridge Gaseous Diffusion Plant*
Oak Ridge, Tennessee

Received May 19, 1965

*Operated by Union Carbide Corporation for the U. S. Atomic Energy Commission.