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Computer Code Abstracts

AGN-GAM

1. Name of Code: AGN-GAM (an IBM 7090/94 code to calculate spectra and group constants).
2. Computer for which Code is Designed: IBM 7090/94.
3. Nature of Physical Problem Solved: AGN-GAM calculates the subgroup fluxes and current terms from a solution of the P_1 or B_1 equations. The P_1 equations incorporate both volume and surface sources, allowing spectral calculations in reflector regions. Other spectral options are flux known, current term calculated, and both flux and current terms known. The age for the material is obtained from a second-moments calculation. The method of Adler, Hinman, and Nordheim is used to calculate resonance absorption and fission cross sections. Multigroup constants are generated by spectral averaging over the subgroups.
4. Method of Solution: Multigroup theory.
5. Restrictions on the Complexity of the Problem: 32 fast groups, 33 groups down scatter, in the output matrices.
6. Typical Running Time: 1 min.
7. Unusual Features of the Program: Punched output for Los Alamos S_n codes, ZOOM, PDQ, etc.
8. Related and Auxiliary Programs: Library tape (75 subgroups) employing 180 materials; programs to update the library tape.
9. Status: In production.
10. *References*:

[1]T. P. Wilcox and S. T. Perkins, "AGN-GAM, an IBM 7090 Code to Calculate Spectra and Multigroup Constants," AGN-TM-407, Aerojet-General Nucleonics, San Ramon, California (April 1965).

11. Machine Requirements: 32K IBM 7090/94 with 6 tape units.
12. Programming Language Used: FORTRAN-II (100%).
13. Operating System or Monitor under which Program is Executed: Standard IBM FORTRAN-II monitor.
14. Material Available through Argonne Code Center:
    a) FORTRAN-II source deck and sample problem
    b) Library tape
    c) Programs to update library tape
    d) Reference document

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AGN-SIGMA

1. Name of code: AGN-SIGMA
2. Computer for which program is designed: IBM-7090/94
3. Nature of physical problem solved: AGN-SIGMA calculates the Legendre components of the multigroup transfer matrices $\sigma_{\ell_{g\to g+n}}$ for fast neutrons. Reactions considered are elastic scattering, inelastic scattering (level excitation and the evaporation model), and the following five decay modes for the $(n, 2n)$ reaction: $A(n, n_1)A^*(n_2)(A-1)^*$, 3- and 4-body phase space model, evaporation model, and the cluster model. All nuclear levels involved in the transitions are discrete. The code may also be used to calculate group averaged cross sections as well as manipulate, e.g., add, multiply, etc., the output matrices. The neutron spectrum may be a combination of fission and $1/E$ or arbitrary input data.
4. Method of solution: All integrations are performed by an iterative Simpson's rule. The transfer cross sections $\sigma_{\ell_{g\to g+n}}$ (given g, n, all ℓ) are calculated concurrently by series-parallel passing through the integration scheme. Subranges on the integrations are specified between all input data points.
5. Restrictions on the complexity of the problem: 100 groups, 50 groups down scatter and the transfer matrices calculated up through the fifth degree (except for the evaporation model which is isotropic). The center-of-mass differential cross section is expressed by a Legendre expansion up through the tenth degree.
6. Typical running time: four minutes to calculate the P_1 elastic scattering matrices for 66 groups, 2 groups down scatter and cross section data at 66 energy points with a P_6 expansion of the differential cross section.
7. Unusual features of the code: Both printed and punched output.
8. Status: In production.
9. *References:* S. T. Perkins, D. W. Thompson, and P. J. DuBois, "Users Manual for AGN-SIGMA: A Code to Calculate the Legendre Components of the Multigroup Transfer Matrices and the Group Cross Sections," AN-1447 (October 1965).
10. Machine requirements: 32K IBM 7090/94; 4-11 tape units, depending upon the specified value of ℓ.
11. Programming language used: FORTRAN II
12. Operating System or Monitor under which program is executed: Standard IBM FORTRAN II monitor.

13. Material available: (a) FORTRAN II source deck (on BCD tape) and sample problem and (b) reference document.

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CHAD

1. Name of Code: CHAD, for analysis of differential neutron scattering.
2. Computer for Which Code is Designed: IBM-7094. Programming Languages: FORTRAN IV (85%); MAP (15%).
3. Nature of Problem Solved: CHAD is designed to facilitate analysis and handling of differential neutron scattering data. It produces Legendre scattering coefficients from angular distribution data tabulated in many different formats. It can transform angular data into Legendre scattering coefficients in either the laboratory or the center-of-mass frame of reference. It calculates the average cosine of the scattering angle in the laboratory system and the average logarithmic energy decrement per elastic collision.
4. Method of Solution: A recursive method is used for calculating the transformation matrices which convert Legendre coefficients from one frame of reference (laboratory or center of mass) to the other. The Legendre scattering coefficients, the average cosine of the scattering angle in the laboratory system, and the average logarithmic energy decrement per elastic collision are obtained analytically from an angular distribution of scattered neutrons represented by a discrete set of points in either the laboratory or center of mass system, assuming that the differential cross-section is a linear function between points.
5. Restrictions on Complexity:
   30 Legendre coefficients;
   100 cosines of the scattering angle;
   Atomic mass > 1.0.
6. Typical Running Time: One minute for a case with 10 coefficients desired at 36 energy points, including printed, punched, and graphical output.
7. Unusual Features: CHAD punches output which is compatible with the Atomics International Evaluated Nuclear Data File (AIENDF). The program can use an SC-4020 graphical display device for plotting results.
8. Related and Auxiliary Programs: None.
9. Status: In production.
10. Machine Requirements: 32 k, IBM 7094.
11. Operating System: IBSYS
12. Any Other Programming or Operating Information or Restrictions: If an SC-4020 graphical display device is available, the subroutine DUMMY should be replaced with the subroutine AICRT3. The FORTRAN IV AICRT3 subroutine and the NAA SC-4020 subroutine package are available through: UAIDE Librarian, c/o Stromberg-Carlson, P. O. Box 2449, San Diego, California.
13. *References*:

[1]R. F. Berland, "CHAD - Code to Handle Angular Data," North American Aviation Report NAA-SR-11231 (December 1965).

[2]M. Hoffman and W. A. Rhodes, "AICRT3, A General Code for Display of Digital Data," North American Aviation Report NAA-SR-Memo-9069 (October 1963).

14. Material Available:
    a) Source deck (1400 cards)
    b) Sample case
    c) Documents
    d) Abstract

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