NUCLEAR SCIENCE AND ENGINEERING: 25, 306-307 (1966)

Computer Code Abstracts

COINC

1. Name of Program: COINC, Computer Code for Reduction of Coincidence Counting Data*.
2. Computer for Which Program is Designed: IBM-704; DDP-24; CDC-3600
   Programming System: FORTRAN II.
3. Nature of Problem Solved: *Coincidence counting data* are treated to obtain specific disintegration rates, channel efficiencies and count rates, weighted means, and all associated standard errors. *Corrections* are made for unequal deadtime loss in each channel, coincidence resolving time losses, decay during counting, decay from a reference time, and background in each of the three channels. *Input variables* include sample identification, start time for counting, sample reference time, counting interval, total number of counts in two single channels and one coincidence channel, and normalizing sample volume; *input parameters* contain deadtimes of each single channel, coincidence resolving time for each channel, decay constant, background count rate for all three channels, and standard errors for each of the above parameters; *optional input* allows date, group classification, and some coding. *Output* contains corrected single channel, coincidence, and disintegration rates referred to start of count; specific disintegration rate (counts/sec/unit volume or weight) referred to reference time; weighted mean and error of any number of problems in a group; efficiencies of the two independent detector channels; date, summary of background values used, identification number, count start time; and upper and lower limit (one standard deviation) of each of the computed quantities.
4. Restrictions on the Complexity of the Problem: ($\lambda > 0$) (500 problems per set for IBM-704; 20 for DDP-24).
5. Typical Running Time: 68 problems/min on IBM-704.
6. Unusual Features of the Code: A very simple input format is available, allowing application to essentially any coincidence decay scheme. Input data may be transcribed by hand and punched from standard format onto cards, or automatic punched card output may be utilized. Modifications for paper tape are in progress. Complex adjustments of the accidental coincidence rates affected by deadtime are made. Both Poisson statistics for total accumulated counts and error propagation for correlated and uncorrelated quantities are compounded in determination of standard deviations. The program was designed for absolute $\beta\gamma$ coincidence counting, but it has also been used for $\gamma\gamma$ and neutron-fission coincidence work. Compensation for radioactive decay can be made to any reference time for any number of days.
7. Present Status: Production available... address authors who will also provide complete set of current equations.
8. *References:* ANL-6760; *Int. J. Appl. Rad. Isotopes* (to be published).

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Received December 17, 1965
Revised January 24, 1966

*Work performed under the auspices of the USAEC.

DTF-IV*

1. Name of Program: DTF-IV
2. Computer for which Program Designed: IBM-7030. Also operable on IBM-7090/IBM-7094 with minor modification.
3. Nature of Physical Problem Solved: The linear time-independent Boltzmann equation for particle transport is solved for the energy, space, and angular dependence of the particle distribution in one-dimensional slabs, cylinders, and spheres. Independent source or eigenvalue (multiplication, time absorption, element concentration, zone thickness, or system dimension) problems are solved subject to vacuum, reflective, or periodic boundary conditions. A complete energy-transfer scattering matrix is allowed for each Legendre component of scattering cross-section matrices.
4. Method of Solution: Energy dependence is treated by the multigroup approximation and angular dependence by a general discrete-ordinates approximation. Anisotropic scattering is approximated by a truncated Spherical Harmonics expansion of the scattering kernel. Within-group scattering and up-scattering (if any) iteration processes are accelerated by system-wide renormalization procedures. Approximations and iterative cycles are described in detail by Lathrop[1].
5. Restrictions on the Complexity of the Problem: The variable dimensioning capability of FORTRAN IV has been utilized so that any combination of number of groups, number of spatial intervals, size of angular quadrature, etc., can be used that will fit within the total core storage available to a user. The code itself requires about 8000 words, but it can be shortened by deleting certain subroutines which perform optional calculations.

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6. Typical Running Time: (IBM-7030 FORTRAN) a) One-group, S_{16}, 40 spatial intervals, spherical critical radius search, 0.833 min. b) Six-group, S_{48}, 160 spatial intervals, spherical criticality search, 29.73 min.

7. Unusual Features of the Program: General anisotropic scattering capability is provided in each of the three geometries, up-scattering convergence acceleration is used, an optional group- and point-wise convergence test is available, and a neutron-conserving negative-flux correction routine is used.

8. Related and Auxiliary Programs: The code is a major revision of the DTF[2] code. In addition to the differences noted in items 5 and 7 above, DTF-IV differs from DTF in 12 other ways which are listed by Lathrop[1]. The code GAMLEG[3] provides, in a form suitable for input to DTF-IV, cross sections for photon transport problems.

9. Status: In use. Last debugging correction made in July 1965.

10. *References:*

[1]K. D. Lathrop, "DTF-IV, a FORTRAN-IV Program for Solving the Multigroup Transport Equation with Anisotropic Scattering," Los Alamos Scientific Laboratory Report LA-3373 (1965).

[2]B. G. Carlson, W. J. Worlton, W. Guber, and M. Shapiro, "DTF Users Manual," United Nuclear Corporation Report UNC Phys/Math 3321, Vol. I and Vol. II (1963).

[3]K. D. Lathrop, GAMLEG, Computer Code Abstract, *Nucl. Sci. Eng.*, **24**, 218 (1966).

11. Machine Requirements: No disks or tapes are used. A clock is used but, by removing a few program statements, this requirement can be eliminated.

12. Programming Language: FORTRAN-IV is used, primarily to utilize variable dimensioning and logical branching capabilities.

13. Material Available: FORTRAN Deck and Test Problems available from Argonne Code Center or Oak Ridge Radiation Shielding Information Center (RSIC).

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Received January 21, 1966