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G. R. DALTON
Department of Nuclear Engineering
University of Florida
Gainesville, Florida

DETECTOR

1. Name of code: DETECTOR.
2. Computer for which code was designed: IBM 704; programing system: FORTRAN II.
3. Nature of problem solved: The one speed thermal neutron transport equation is solved in and around a right circular cylindrical neutron detector for either the wire or the coin case. The initial undisturbed flux is assumed to be isotropic and the detector is assumed to be located far from any other disturbing factors such as other detectors or boundaries.
4. Restrictions on the complexity of the problem: The calculation cannot be applied to extremely long wires nor to large radii coins, i.e., maximum dimension larger than about 5 cm. Furthermore it will break down if applied to extremely black absorbers such as control rods, i.e., minimum dimension times detector absorption cross section must be less than about 0.5.
5. Typical running time: 10 min per detector (IBM 704).
6. Unusual features of the code: The program solves the transport equation for the disturbed scalar flux at a series of up to 6620 points within the detector. By use of axial and midplane symmetry this is reduced to a series of 11 radial and 10 axial grid surfaces. The code also calculates the scalar flux component of the solution of the transport equation at a series of radial and axial points outside the detector. Finally, the ratio of the average scalar flux in the detector relative to the undisturbed flux is calculated.
7. Present status: In use on Oak Ridge National Laboratory Central Data Processing's IBM 7090. Available in standard FORTRAN II language.
8. *References:* G. R. Dalton, Some Aspects of Thermal Neutron Detectors, Thesis, University of Michigan, 1960, available from University Microfilm, Inc., Ann Arbor, Michigan.

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G. R. DALTON
Department of Nuclear Engineering
University of Florida
Gainesville, Florida

TRAC-1

1. Name of code: TRAC-1.
2. Computer for which code is designed: Philco-2000; programming system: TAC (for use with BKS sequencing system).
3. Nature of problem solved: Monte Carlo estimation of a regionwise distribution of neutron absorption probabilities in a two-dimensional quarter-cell rectangular region with symmetry boundary conditions, either in a one-energy mode or with a slowing-down mode ahead of the one-energy mode.
4. Restrictions on the complexity of the problem: Maximum number of subregions of the quarter-cell—75; maximum number of groups of subregions for the edit—99; epithermal absorption is required to be of the form "c/v"; heavy element scattering is assumed to be isotropic in the laboratory system; hydrogen scattering is assumed to be isotropic in the center of mass system at epithermal energies and linear in the cosine of the scattering angle in the one-group mode. Machine requirements: 32K core storage with seven tape units.
5. Typical running time: Variable, depending on the statistical accuracy required and the average number of collisions made to absorption. "Average" problems may be solved in from 5 to 20 min.
6. Unusual features of the code: TRAC-1 estimates absorption probabilities in arbitrary groupings of subregions of the quarter-cell by combining an estimate based on the average distance traveled by the neutrons in each region with an estimate based on the final distribution of absorptions. This technique is like that introduced in the KAPL code TRAM. Making use of a technique due to C. W. Maynard based on the reciprocity theorem, the variance in estimating the absorption probability in a single region or group of regions may be significantly reduced. The same technique may be used to estimate the scalar flux at a single point of the quarter-cell by starting all of the neutron histories at this point.
7. Present status: In production use at BAPL. Copies of the program may be obtained from Mr. Robert A. Cohen, Manager, Customer Services, Philco Corp., Government and Industrial Group, Computer Division, 3900 Welsh Road, Willow Grove, Pennsylvania.
8. *References:* H. J. Berwind and J. Spanier, TRAC-1, A Monte Carlo Philco-2000 program for the calculation of neutron capture probabilities, WAPD-TM-229 (March, 1961).

R. B. Smith and C. H. Hunter, The BKS system for the Philco-2000 computer, WAPD-TM-233 (April, 1961).

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JEROME SPANIER
Bettis Atomic Power Laboratory
Westinghouse Electric Corporation
Pittsburgh, Pa.