Computer Code Abstracts

BRT-I

Battelle Revised Thermos

1. Name of Program: BRT-I (Battelle-Revised-THERMOS-I)
2. Computer for Which Program is Designed: UNIVAC 1108
3. Nature of Physical Problem Solved: The code computes the space-dependent thermal-neutron density, flux and current spectra over the energy range 0 to 0.683 eV in either slab or cylindrical geometry.
4. Method of Solution: The neutron density is computed from the collision probability form of the integral transport-theory matrix equation using either a combination of power iteration, overrelaxation and extrapolation, or straight power iteration. The neutron currents are computed from either the gradient of the scaler flux or the uncollided flux matrix. The flux and current spectra are used to weight point thermal cross sections (σ_a, σ_f, $\nu\sigma_f$, σ_{s0}, σ_{s1}, σ_{tr}) over an arbitrary thermal-energy range for use in multigroup transport or diffusion theory codes.
5. Restrictions on the Complexity of the Problem: Number of space points $\leq$30, number of isotopes $\leq$30, number of speed points $\leq$30, number of material mixtures $\leq$8, slab or cylindrical geometry.
6. Typical Running Time: With the direct access library: 1 min with a reflecting boundary condition and 30 sec with a white boundary condition. Succeeding cases using the same cross sections take about 15 sec each.
7. Unusual Features of the Program: White albedo boundary condition, current calculation, transverse buckling, linear anisotropic scattering correction, and smeared-cell punched-card output which can be used as region input for a succeeding case, are several of the options available to the user. A direct access library can be stored as a data element on drum or disk memory, if available, resulting in a considerable decrease in running time.
8. Related and Auxiliary Programs: RLITHE, updates and/or prints the BRT data tape or direct access data element.
9. Status: BRT-I is in production use on the UNIVAC-1108 computer used by Pacific Northwest Laboratory, Richland, Washington.
10. Machine Requirements: 64K memory, normal input, output, program, and punch units, 1 unit for library, 1 scratch unit or its equivalent on drum.
11. Programming Language Used: FORTRAN-IV.
12. Operating System under which Program is Executed: Computer Sciences Corporation CSCX.
13. Other Programming Information: BRT consists of 23 subroutines and is a 3-level overlay of 10 separate links. RLITHE contains 8 subroutines and is not overlayed.
14. Material Available: The following material may be obtained either through the Argonne Code Center at Argonne National Laboratory or from Pacific Northwest Laboratory in Richland, Washington.

    BRT-I Source Deck (2539 cards)
    RLITHE Source Deck (483 cards)
    Sample problem (30 cards)
    Library Source Deck (13,687 cards)
    Reference Report, BNWL-1434

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16. *References:*

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DBLSCAT

A Computer Code for Double Scattering Corrections

1. Name of Code: DBLSCAT[1]
2. Computer for Which Program is Designed: IBM-360

3. Nature of Problem Solved: DBLSCAT is a code to evaluate the second-order scattering correction for double differential neutron-scattering experiments in an infinite-plane slab geometry. Both transmission- and reflection-type experiments are considered.

4. Method of Solution: The method used to calculate double-scattering correction is based on Vineyard's approach[2] except there are no limitations on the scattering cross section. The double-differential scattering cross section is input to the code in the form of the scattering law $S(\kappa, \omega)$ for a range of momentum κ and energy transfer ω variables. Triple integrations in the expression for second-scattered neutron current are carried out using a specified number of mesh points.

5. Restrictions on the Complexity of the Problem: The code is written for double scattering correction in an infinite slab geometry. Correction due to finiteness of sample and higher order scattering correctness are not included.

6. Typical Running Time: Typical running time depends on the number of mesh points specified for triple integrations. In the quasi-elastic region a typical calculation takes approximately one minute; in the inelastic region only ten seconds are required.

7. Unusual Features of the Program: This code is rather fast and applicable to both transmission- and reflection-type scattering experiments.

8. Status: In use.

9. Machine Requirements: DBLSCAT is written for the IBM 360/75. It requires an 85K memory.

10. Related and Auxiliary Programs: None

11. Programming Language Used: FORTRAN IV

12. Materials Available: A source deck, source listing, input instructions, sample problem, and sample problem results are available from the authors.

13. *Acknowledgment*: This work was performed under the auspices of the U.S. Atomic Energy Commission.

14. *References:*

[1]A. K. AGRAWAL and S. G. DAS, "DBLSCAT, A Computer Code for Double Scattering Corrections," Argonne National Laboratory Report (to be published).
[2]G. H. VINEYARD, *Phys. Rev.*, **96**, 93 (1954).

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