Computer Code Abstract

LAPHAN

1. Name of Code: LAPHAN, A code to compute the P_0 to P_4 multigroup photon production matrices.[1]

2. Computer for Which Program Is Designed: CDC 6600, CDC 7600.

3. Nature of Physical Problem Solved: LAPHAN retrieves photon production cross sections or multiplicities, photon emission angular distributions, and corresponding neutron interaction cross sections from the ENDF/B data file, applies suitable weighting functions over specified neutron fine and broad groups, as well as specified photon groups, and constructs photon production matrices for Legendre orders up to P_4. The photon energy production matrices are also computed. Input is in the DTF-IV format, and output is in DTF-IV and FIDO format, allowing direct coupling to transport codes.

4. Method of Solution: LAPHAN first constructs photon production cross sections, pointwise in neutron and photon energy, from the ENDF/B data. These cross sections are then integrated over photon energy groups with either constant or direct energy weighting. Integrations including the photon angular distribution functions and optional weighting spectra are performed over neutron energy in all neutron fine groups. Weighting in neutron broad groups is by input fine-group weighting functions, usually the scalar fluxes from a fine-group neutronics calculation. At Los Alamos Scientific Laboratory (LASL), the MC^2 code has been modified to provide the weighting functions in the LAPHAN input format. Macroscopic photon production matrices and photon energy production matrices are then computed by scalar multiplication.

5. Restrictions on the Complexity of the Problem: The microscopic pointwise data must be in ENDF/B format.

6. Typical Machine Time: The central processor time for a sample P_4 problem with eight photon groups, ten neutron fine groups, five neutron broad groups, and selected MT numbers was <3 min.

7. Auxiliary Programs: CHECKER, format syntax checking code for ENDF/B; VIXEN, a code to check physical consistency of photon production data in revised ENDF format.

8. Computer Hardware Requirements: (a) CDC 6600, 65 k_{10} words of memory or CDC 7600; (b) one magnetic tape, the ENDF/B data tape, is designated as tape 20. All other tapes are virtual tapes on disk.

9. Computer Software Requirements: The code runs under SCOPE 3.2 System for the CDC 6600 and the LASL Chili Ridge Operating System (CROS) for the CDC 7600.

10. Contents of Code Package: The package contains the following items:

    1. the reference document

    2. a reel of magnetic tape with the following files: (a) a card-image copy of the BCD source deck, (b) the sample problem input in BCD card image, and (c) the sample problem output in BCD.

11. Material Available: Inquiries or requests for the code package may be mailed to

    > CODES COORDINATOR
    > Radiation Shielding Information Center
    > Oak Ridge National Laboratory
    > Post Office Box X
    > Oak Ridge, Tennessee 37830,

    or telephoned to

    > Area Code 615/483-8611, Extension 3-6944
    > or to FTS 615/483-6944.

    Persons requesting the package should send one reel of magnetic tape to the above address.

12. *Reference:*
    1. DONALD J. DUDZIAK and GERALD E. BOSLER, "LAPHAN, A Code to Compute the P_0 to P_4 Multigroup Photon-Production Matrices," LA-4963, Los Alamos Scientific Laboratory (1973).

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