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Computer Code Abstracts

LIPRECAN I

1. Code name: LIPRECAN I
2. Computer for which code is designed: IBM 7090 Programming system: Fortran II
3. Nature of the problem solved: LIPRECAN I is a two-dimensional Monte Carlo code which computes the penetration and energy deposition of neutrons in pure hydrogenous media. The code offers three possible geometries; i.e., conical, cylindrical, and one-dimensional infinite slab geometry (this latter option to the extent that an infinite slab may be approximated by a cylinder of large radius). The code may be used with a monodirectional point or beam source and could be modified quite easily to handle angular distributions. Isotropic scattering in the center of mass system is assumed thereby limiting the validity of the code to the range from 0.1 ev to 14.0 Mev, the actual cutoff energy remaining an input parameter. The following results are tabulated with each summary:
   a. Energy deposition distribution.
   b. Particle deposition distribution.
   c. Particle leakage fraction.
   d. Particle absorption fraction.
   e. The fraction of particles reaching the cutoff energy which have neither leaked nor have been absorbed.
   f. The average energy per particle leaking from the system.
   g. The average energy per particle remaining in the system as heat generation.
   h. The average number of collisions per history.
   i. The total number of histories currently being summarized.
   j. The average energy deposition per history through absorption.
   k. The average energy of particles absorbed.
4. Restrictions on the complexity of the problem: The code is equipped with a 218 point hydrogen cross section library. An interpolation routine is used to determine the cross section for discrete particle energies. As many as 200 energy groups may be used to specify the incident spectrum. Geometry-wise, the program is limited to the systems described under item 3. A maximum 50 by 50 grid may be specified. Machine requirements include 32K memory and the number of tape units peculiar to the Fortran II system.
5. Typical running time: The running time is a function of several things including the incident spectra, the cutoff energy and the system geometry. Depending, therefore, on the problem specification, running times of the order of 0.1 to 0.2 sec per history may be anticipated.
6. Unusual features:
   a. An exceptionally good cross section description in the energy range from 0.1 ev to 14.0 Mev.
   b. A choice of first collision distance determination by direct analog or linear biasing.
   c. Leakage biasing and absorption biasing are performed with each collision to increase the validity of results pertaining to albedo and particle deposition.
   d. Complete summaries are calculated and printed at specified intervals.
7. Present status: In use, available.
8. *References:* R. H. Karcher, "The LIPRECAN I Code—A Monte Carlo Program for Two-Dimensional Neutron Penetration and Energy Deposition in Liquid Hydrogen." Douglas Report SM 43594 (April 5, 1963).

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SPECTRUM 400

1. Code: Spectrum 400
2. Computer for which code is designed: Bendix G 15 D with magnetic tape, graph plotter, and flexowriter. Programming system: Machine language
3. Nature of problem solved: Spectrum 400 provides a command structure for rapid treatment of activation data from pulse height analysis. It provides such operations as spectrum stripping, peak integration, half-life determinations, and quantitative analysis.
4. Restrictions: A maximum of 800 PHA channels in 100 channel blocks can be processed at one time—normally two 400 PHA channel spectra.
5. Typical running time: Variable depending upon the task assigned. The shortest running time might be a few seconds, up to several minutes for a complete operation. The longest single step is curve plotting which takes about one minute for 100 PHA channels.
6. Unusual features: The system could be used for any type of spectrum such as infrared, ultraviolet, mass spectra, gas liquid chromatography, etc., if the spectrum is first converted to compatible digital data tapes. The magnetic tape storage facilitates the assembly of a large library of standard spectra with a very rapid access time.
7. Present status: The system is fully operational at the present time, but the half-life, integration, and quantitative analysis (activation equation) systems are still in INTERCOM 500 language. These systems are presently being incorporated into the basic machine language interpretive routine package. The system has provision for interconversion data between Spectrum 400 and Intercom 500.
8. *References:* CDC User's Organization User Project 758. For program, flow sheet, or punched program tape, write the authors.

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The problem, a chemical one, was formulated by Dr. Ryan, and after some false starts, was explained well enough to Mr. Buchholz that he could write first an INTERCOM version, later a combination INTERCOM and machine language version, and finally a version in which only the appendices (peak summation, activation equation, etc.), remained in INTERCOM.

Mr. Buchholz died in an airplane wreck on April 20, 1963. Mr. Sedlacek and Mr. Sander-Cederlof collaborated in placing the program into publishable form.