Computer Code Abstract

ACCEPT

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1. Program Identification: ACCEPT is a three-dimensional electron/photon Monte Carlo transport code using combinatorial geometry.[1]

2. Function: ACCEPT describes the generation and transport of the electron/photon cascade from several MeV down to 1.0 and 10.0 keV for electrons and photons, respectively, through three-dimensional multimaterial geometries specified by the combinatorial method.[2,3] Source particles can be either electrons or photons; monoenergetic sources or source spectra are allowed; and source angular distributions can be monodirectional, cosine law, or isotropic. The most important output data are (a) charge and energy deposition profiles, (b) integral energy and number escape coefficients for both electrons and photons, and (c) escape coefficients for electrons and photons that are differential in energy and angle.

3. Method of Solution: The ACCEPT code combines condensed-history electron Monte Carlo[4] with conventional single-scattering photon Monte Carlo. The electron transport treats energy-loss straggling, elastic scattering, impact ionization and the production of knock-on electrons, continuous bremsstrahlung radiation, and annihilation radiation. Photon transport treats photoionization, incoherent scattering, and pair production, along with the generation of the corresponding secondary particles. Electron cross sections and sampling distributions are obtained from DATAPAC-4 and LIBRARY TAPE 2 of the ETRAN Monte Carlo code system.[5] Photon cross sections are the analytical fits of Biggs and Lighthill.[6] ACCEPT is a user-oriented code in the sense that it was designed to provide both experimentalists and theorists with a method for the routine, but sophisticated, solution of basic transport problems. On the other hand, the completeness with which ACCEPT describes the radiation transport and the flexibility of its construction makes it possible for the user to tailor the model to specific applications and to extend its capabilities significantly through relatively simple update procedures. Every output quantity is followed by the best estimate of its statistical standard error.

4. Related Material: ACCEPT is the fourth of a series of user-oriented multimaterial electron/photon transport codes[7-9] in which emphasis is placed on operational simplicity without sacrificing rigorous treatment of the important phenomena. ACCEPT extends this series to full three dimensionality through incorporation of a versatile combinatorial geometry package.[2,3]

5. Restrictions: Without update, a problem cannot involve more than five unique homogeneous materials, each of which contains no more than ten elements. Because of the close-packed storage of the combinatorial geometry data in a one-dimensional array, it is not possible to give a precise limit on the number of input zones. If the liberal provision of the packaged code is exceeded, the user may increase the length of this array through update. The model is more accurate at higher energies, with a less rigorous description of the cascade at energies where the shell structure of the transport media becomes important.

6. Computer: CDC-7600 or CDC-6600.

7. Running Time: So many parameters affect the problem run time that it is not possible to estimate a "typical" machine time. However, comparison runs with the CYLTRAN code[8] indicate that the more versatile combinatorial geometry scheme employed in the ACCEPT code results in an increase in run time by about a factor of two.

8. Programming Languages: The code is written in FORTRAN IV. A major effort was made to remove nonstandard and installation-dependent usages.

9. Operating System: The CDC-7600 (6600) code runs under the SCOPE 2.1 (3.3) system with the FTN, OPT = 2 compiler.

10. Machine Requirements: Four input-output files (two input cross-section files and two scratch files) and two system input/output files are required. On the CDC-7600, the Small Core Memory storage requirement is 141 000 octal words. In addition, 218 000 octal words of Large Core Memory are required. Data are transmitted to and from Large Core Memory in blocks of variable size, so that, with some program modifications, one may substitute disk, drum, or tape storage.

11. Material Available: Source desk, cross-section files, test problem, results of executed test problem, and the reference document[1] are available from the Oak Ridge Radiation Shielding Information Center.

12. Acknowledgment: This work was supported by the U.S. Department of Energy.

13. *References:*

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