SAND2004-2632P

Enabling dose profiles for forward Monte Carlo radiation transport with CAD geometry models: Volumes of part intersections with cells

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The advent of parallel computing has allowed physics simulations of great complexity to be performed. Specifically, simulation in the area of radiation transport has benefited by allowing more detailed models to be analyzed. The Integrated Tiger Series (ITS) software is a Monte Carlo radiation transport suite that has the ability to use CAD models as input for its dose profiling calculations in a parallel environment. A limiting factor for the forward calculation in the ITS software has been the ability to know the volume of the intersection between the subgrid cell overlay and the CAD model. This quantity is key for the normalization of dose profile calculations. A method for achieving this calculation was reached by using the solid geometry modeling techniques in the ACIS 6.0 environment. Through the use of Boolean operations on ACIS primitives, the Combinatorial Geometry representation of the cell bodies was conveyed into the CAD portion of ITS. Intersections with these cells and the body being analyzed results in a volume that is necessary for the deposition calculation. Another benefit derived from this is that efficiency improvements can be made in the calculations through electron trapping logic.

Sandia is a multiprogramming laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under Contract DE-AC04-94AL85000.