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NASA TECH BRIEF

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Deep Gamma Ray Penetration in Thick Shields

The results of an analytical study show that the successful application of the Monte Carlo method to problems involving the deep penetration of radiation requires the specification of an appropriate importance function and sampling scheme. Such a function (the V° importance function), based on the first term of the series solution of the value function equation, has been formulated. For the case of 1 Mev gamma rays incident normally on thick homogeneous slabs of lead and water, use of the V° importance function provides considerable improvement over the conventional exponential transform method, in which only the spatial dependence of the value-function is considered. For the same computation times, the variance of the dose buildup factor for slabs having a 21-mean-free-path thickness was reduced by a factor of approximately 125 for a lead medium and approximately 50 for a water medium. For the particular source-geometry configuration studied, the improvement was contributed approximately equally by the spatial and polar angle biasing; essentially no improvement was provided by the azimuthal angle biasing.

Note:

Complete details of this study may be obtained from:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B68-10143

Patent status:

No patent action is contemplated by NASA.

Source: T. W. Armstrong and P. N. Stevens
of the University of Tennessee
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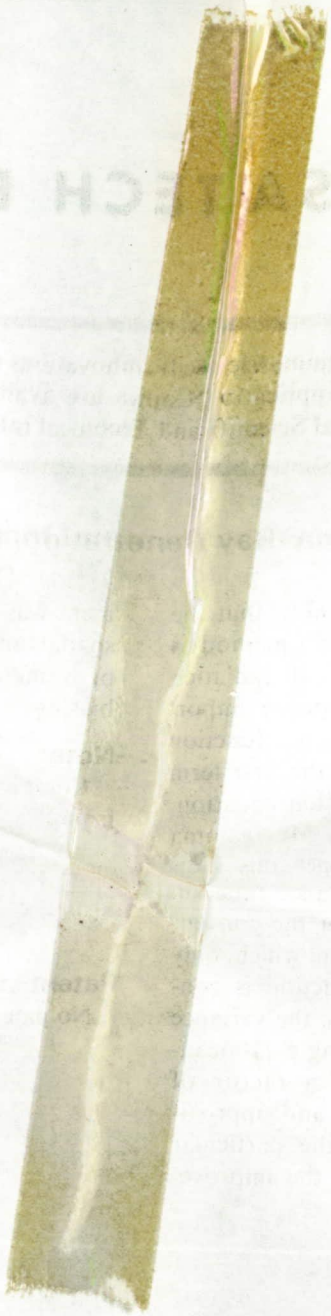
Category 02

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