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NOTE

A FORTRAN Program for Calculating the Solid Angle Subtended by One Circular Disk at Another[1]

A knowledge of the solid angle subtended by a circular disk to another which faces it from any direction is frequently of value in physics. There are, for instance, two important types of measurements in nuclear physics and associated technology. The first is in absolute radioactive source strength measurements where the source is laid uniformly on a circular disk immediately below the detector which has a circular window [1]. The second situation is in absolute differential cross-section measurements, where it is common to use a detector with a circular collimator to record the scattered and transmitted particles from a thin target bombarded by a beam of particles that has a circular profile.

Exact calculation of the solid angle by analytical calculus, except for the case of a point source, is prohibitively difficult. However, a numerical integration by the Monte Carlo method, performed on a computer, can calculate the solid angle to any desired degree of accuracy.

The program, written in FORTRAN IV, as an ORNL Report [2], and also ALGOL, allows as input variables the radii of the two disks, their center-to-center separation and the angle of obliquity of one with respect to the normal through the center of the source disk. The output is the transmission as a fraction of 4π and also its standard deviation. This is a simple case but it is the basis for more complicated situations for which unpublished codes have been written and used. Examples are the case in which a source of radiation is not uniformly distributed over the source disk, the case where the source and detector have complex shapes and the case [3] where the radiation from the source traverses curved trajectories due to a force field. The codes may be obtained from the authors.

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