ABSTRACT

Determination of the Intensity of Scattered Radiation and the Performance of Grids in Diagnostic Radiology by Monte Carlo Methods

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Scattered radiation constitutes a large, and often, major contribution to the formation of the radiological image. The aim of this study has been to supply a versatile method for determining data on scattered radiation in arbitrary radiologic situations. A computational method employing the Monte Carlo principle was chosen and is described in detail.

The intensity of singly and multiply scattered radiation is calculated as a function of energy, field size and shape, object thickness, and object-to-detector distance in terms of the scatter fraction F, which is defined as the ratio of the intensities of scattered and total radiation. The energy dependence is investigated thoroughly. The influence of different detector thickness and materials on the scatter fraction results is determined. The distribution of scattered radiation in the image plane is determined under variation of the above parameters.

The effect of grids was successfully included in the simulation. All scatter fractions were determined with and without grid.

In addition, several types of grids are evaluated. This possibility is of great interest due to the extreme difficulty in the manufacture of new grid types. The scatter transmission T_s for two linear grids, two cross grids, and for several zigzag grids is given under ICRU measuring conditions and with the parameters varied.

All results are compared to available results of earlier investigations with generally good agreement. Possible applications of the method and the data are briefly outlined.

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