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ANAIS - PROCEEDINGS

DETERMINATION OF PHOTOELECTRIC COUNTING EFFICIENCY IN A WHOLE
BODY COUNTER USING MONTE CARLO METHOD AND A SMALL MICRO-
COMPUTER SINCLAIR TYPE (16K)

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Sumário

Foi desenvolvido um programa computacional em linguagem basic, para micro computador tipo Sinclair, para calcular a eficiência de contagem do Contador de Corpo Inteiro do IPEN, utilizando-se o método de Monte Carlo.

Abstract

It was developed a program in Basic language applied to Sinclair type personal computer. The code is able to calculate the Whole Body counting efficiency when applying a cylindrical type detector. The scope of the code made use of the Monte Carlo Method.

The radioactivity level in the human body estimated by whole body counter (WBC), requires the knowledge of counting efficiency of the system. Frequently, this is achieved by adding a known quantity of radioisotope in a phantom and then comparing the counts with the absolute value. Although this procedure is reliable but not practical when we desire know the efficiency for several gamma ray energy levels and different geometrical configurations of the phantom.

In this work was developed a program for the efficiency determination on the photoelectric counts by using Monte Carlo Method.

The characteristic of the phantom analytical models were described by Snyder et. al. with small modifications, which include: i) head only a elliptical cylinder ii) legs-cylindricals. The program was written in BASIC language for the Sinclair personal computer (16K). The data inputs require the personal anthropometrics parameters that include: 1) the major and minor axis of the head and the trunk, 2) mean radius of the legs, 3) height of the head, trunk and legs, 4) energy of the gamma ray sources, 5) profile of the superficial fat tissue (optional, but without it, is assumed as zero), 6) height and diameter of the detector. The processing speed is about 4,5 hours/1000 history. To test accuracy of the analytical models applied to the program were added about 10 micro-curie ($3,7 \times 10^4$ Bq) ^{99m}Tc and ^{131}I in the Alderson phantom. The measurements of these activities were made in WBC with a 20 x 8 cm NaI (Tl) detector. The phantom was placed at a stretcher and the distance between the detector face plane and the neighbourhood of the phantom gravity mass was 150 cm. The preliminary results indicated high correlation between the calculated and experimental data:

Energy (MeV)	D = 100 cm		D = 145 cm	
	Adult Phantom	Child Phantom	Adult Phantom	Child Phantom
0.364	0.0011 (E)	0.0014 (E)	0.00063 (E)	0.00069 (E)
	0.0011 (P)	0.0015 (P)	0.00061 (P)	0.00075 (P)
1.52	0.00088 (E)	0.0015 (E)	0.00046 (E)	0.00064 (E)
	0.00110 (P)	0.0015 (P)	0.00053 (P)	0.00082 (P)

E - Experimental value

P - Program value

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