k being the photoelectron-dose conversion factor which may be determined experimentally (Zaránd and Polgár 1984a). It should be emphasised that A is to be expressed in the same units as its denominator. We have confirmed these results experimentally (Zaránd and Polgár 1984b, Zaránd *et al* 1983). This equation can be expressed in terms of D_{LDL} (lowest detection limit $= 3\sigma_B$), $D = nD_{\mathrm{LDL}}$.

The value A^2 is the sum $(\sigma_{B_1}^2 + \sigma_{B_2}^2)$ where the first term is the variance of the reading of the undosed detector (including the variance of the PM dark current) and the second term has a similar meaning since the reading of a detector irradiated with a dose D can be considered as a sum of TL yield due to D and the background pulses. σ_{B_1} may be different from σ_{B_2} depending on the background subtraction method used (Zaránd and Polgár 1983a). However, it is always greater than σ_{B_1}, the absolute standard deviation for the zero-dose reading of the detector.

I have compared my model with the Burgkhardt–Piesch model and find a good agreement in the majority of commerical systems especially if the background variation of unirradiated dosemeters is high. The highest difference between the two models is expected in the $(10–100)D_{\mathrm{LDL}}$ range.

P Zaránd
Oncoradiological Centre,
'Emil Weil' Hospital,
Uzsoki u 29
H-1145
Budapest, Hungary

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On the reproducibility of ultra-thin $CaSO_4$:Dy thermoluminescent detectors

The Editor,
Sir,

After the interesting comments of Zaránd (1987) on the reproducibility of thermoluminescent (TL) detectors, I decided to test the theoretical model on the relative standard deviation of TLD systems, proposed by Zaránd and Polgár (1983, 1984) on my experimental values, obtained with ultra-thin $CaSO_4$:Dy TL detectors (da Rosa and

Caldas 1986), and also to compare the result obtained with the curve which I got using the two-parameter fit proposed by Burgkhardt and Piesch (1980).

According to Zaránd and Polgár (1984), the relative standard deviation, S, of the TL dose measurements has the form

$$S=(A^2/D^2+B^2+1/kD)^{1/2}. \quad (1)$$

In this equation D is the absorbed dose, the constant A is expressed in dose units and $A^2=(\sigma_{B_1}^2+\sigma_{B_2}^2)$. The first term in parentheses is incorporated in practical measurements in the standard deviation of the signal (= TL yield + background), while the second one is dependent on the applied background method. K is the photoelectron-to-dose conversion factor which may be determined experimentally according to the method suggested by Zaránd and Polgár (1984). The constant B is the high dose limit of the performance of the whole system.

The two-parameter fit suggested by Burgkhardt and Piesch (1980) has the form

$$S=(A^2/D^2+B^2)^{1/2} \quad (2)$$

where S is the relative standard deviation of the TLD system for an absorbed dose value D, A is the absolute standard deviation at very low doses and B is the relative standard deviation at high doses.

According to Zaránd and Polgár (1984), the two models may have practically the same results if

$$(2kAB)^{-1} \ll 1. \quad (3)$$

Zaránd (1987) also states that the Burgkhardt–Piesch model results in a good approximation in the majority of commercial systems, especially if the background variation of unirradiated dosemeters is high.

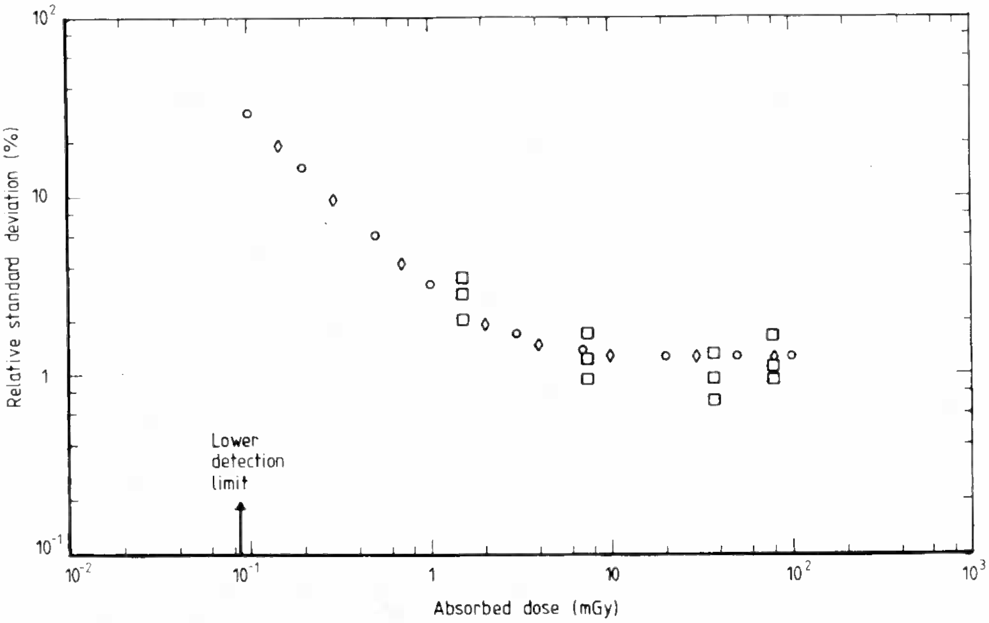

Figure 1. Relative standard deviation against absorbed dose curve of ultra-thin $CaSO_4$:Dy TL detectors. □, experimental values (da Rosa and Caldas 1986); ○, Zaránd–Polgár model; ◇, Burgkhardt–Piesch model.

Figure 1 shows the result of the application of both models on my experimental results. As can be observed, both models provide practically the same fit for them. The value of $(2kAB)^{-1}$ was found to be 0.16. Therefore, I conclude that the two-parameter fit model of Burgkhardt and Piesch can give a reasonably good description of the characteristic shape of the relative standard deviation against absorbed dose curve of ultra-thin $CaSO_4$:Dy TL detectors.

Luiz A R da Rosa
Instituto de Pesquisas Energéticas e Nucleares/CNEN,
CP 11049, 05508 São Paulo,
Brazil

6 April 1987

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