

COMPUTER AIDED EVALUATION OF THERMOLUMINESCENCE DOSIMETERS IN ROUTINE CONTROL OF OCCUPATIONALLY EXPOSED PERSONS

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Personal doses of occupationally exposed persons in Western Austria are measured by means of thermoluminescence dosimeters (TLD). TLD-100 dosimeter batches are used and read-out in HARSHAW 2271 automatic readers. The dose values and the corresponding dosimeter identifications are routed on-line into a TEXAS INSTRUMENTS 990/10 system for further evaluation. The dose distribution of different user groups is given for the years 1978-1984.

Introduction

In Austria there are about 25,000 occupationally exposed persons. Monthly the individual doses of these persons have to be measured by means of TLD or film badges, according to Austrian legal regulations. For this purpose 4 official institutions have been authorized by the government. Starting 1978 a slowly increasing number of dosimeters has been handled and in the following the equipment and procedures as well as the results of the dose measurements are presented.

Instrumentation

The great advantage of TLD's is their possibility for fully automated read-out of dose values and card identification. The read-out facilities were chosen with respect to full computerization with a minimum risk of data loss [1]. At first one, two years later a second HARSHAW 2271 reader were installed, equipped with automatic dose calibrators. For external dose calibrations and cross measurements and the measurement of energy dependency of new dosimeter materials a STUDSVIK dose calibrator, a Cs-137 calibration source and a 250 kV X-ray facility were taken into operation as well as a 5 TBq Co-60 irradiation source for high dose measurements and an optical multichannel analyser was constructed for the wavelength measurement of the TL light emission of new dosimeter materials. For single crystals a HARSHAW 2000D machine is used, for instance for the measurement of finger doses, phantom applications in radiotherapy and new TL materials. The 3 dosimeter readers are routed to 2 minicomputer systems as shown in the following Figure.

The binary parallel output of the HARSHAW readers is serialized by two interfaces, one feeding the data via V.24 into the TI 990/10, another is a current loop driver for ASR 33 with paper punch facility, in accordance with the legal regulation that there must be a non-destructive primary data backup storage possibility. Dose values (DOS 1 and DOS 2) and the dosimeter

In Table II the general dose distributions are given for the years 78-84. The dose values are summarized in 5 groups, the last containing dose values greater than 4 mSv.

Table II
General dose distribution 78-84

Year	0 - 0.1	0.1 - 0.3	0.3 - 1.0	1.0 - 4.0	4.0 -	mSv
1978	87.5 %	9.7 %	2.2 %	0.4 %	0.2 %	
1979	93.0 %	5.5 %	1.2 %	0.2 %	0.1 %	
1980	85.0 %	12.0 %	2.2 %	0.5 %	0.3 %	
1981	87.2 %	10.3 %	1.9 %	0.4 %	0.2 %	
1982		96.4 % *	2.9 %	0.5 %	0.2 %	
1983		96.6 % *	2.8 %	0.4 %	0.2 %	
1984	90.1 %	7.5 %	1.8 %	0.5 %	0.1 %	

* 1982 and 1983 the statistics program did not distinguish between the first two ranges; it was set to 0-0.3 mSv.

It is interesting to see the dose distribution within the various user groups as given in the following example for the year 1984:

Table III
Dose distribution within the user groups (1984)

Groups	0 - 0.1	0.1 - 0.3	0.3 - 1.0	1.0 - 4.0	4.0 -	mSv
Hospital	90.5 %	7.8 %	1.2 %	0.3 %	0.2 %	
Dentist	89.7 %	7.9 %	1.9 %	0.5 %	0	
Med.Pr.	88.1 %	6.8 %	3.4 %	1.7 %	(0.02 %)	
Radiol.	86.8 %	9.7 %	3.5 %	(0.02 %)	0	
Indust.	97.6 %	2.0 %	0.3 %	0	0.1 %	
Inst.	90.5 %	7.3 %	2.2 %	0	0	

As shown, about 90 % of the measured doses are in the range from 0-0.1 mSv and indicate an outstanding conscience for health physics. The very small percentage of excess doses although justifies the perpetual surveillance.

References

1. R.Früh, P.Brunner, O.Bobleter, Automatic TLD-Readers-Comparison of Three Commercially Available Instruments, ATKE 31, Lfg.2 (1978) 127.