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IMPROVEMENT OF PERSONAL DOSIMETRY - DIGITAL POCKET DOSEMETER

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INTRODUCTION

Physical dosimetric surveillance of professional groups working with various radiation sources is a regular procedure in Croatia, established almost 40 years ago. Data available point out that the majority of professionals under surveillance are those employed in medical facilities, most of them working with X-ray sources. Depending on the nature of professional activities, personnel occupationally exposed to radiation sources are obliged to wear either film badge, TLD or film+TLD badge. Unfortunatelly, due to the line of data processing, all standard dosemeters have the same disadvantage i.e. up to 40 days delay in dose reporting, regarding the time of actual exposure. The significance of such a delay raises in cases when radiation dose was received within the short time or when technical failure on the operating unit(s) is suspected. Bearing this in mind, the additional dosimetric monitoring becomes an imperative. Therefore, we decided to introduce a palette of digital pocket dosemeters, meant to be used in different workplaces in the radiation zone, each of them being ajusted to the specificities of a particular workplace.

DIGITAL POCKET DOSEMETER-GENERAL IDEA, TECHNICAL FEATURES AND BASIC PERFORMANCES

Several types of pocket dosemeters are already available on the market, but all constructed in such a manner that they measure irradiation doses from a broad and/or mixed energy spectra. Consequently, a considerable lack of accuracy of the obtained results should be expected, especially when it commes to the X-ray spectrum. If performed, the measurement of irradiation doses from that spectrum requires recalibration and recalculation of the obtained data. In attempt to avoid all those problems, we constructed a palette of digital pocket dosemeters, calibrated in accordance to the main specificities of a workplace i.e. the energies a particular radiation source is emitting and the exposure regimens.

All of our dosemeters contain Geiger-Müller tube as an active electronic element, but each type has a specific software, enabling data processing in accordance to the workplace items.

Main parameters such devices are able to measure are the following:

1. Irradiation dose ranging from 0,10 to 19990 μGy (with the existing possibility of resetting the dose). The purpose of such a measurement is to establish a radiation dose received within a particular professional activity (Figure 1.);
2. Dose-rate ranging from 10 to 19990 μGy /hour ;
3. Cumulative irradiation dose ranging from 0,10 to 19990 μGy (with nonexisting possibility of resetting the dose). The data obtained by this measurement could serve as a basis for comparison to the results obtained by standard dosemeters (Figure 2.);
4. Duration of exposure in the radiation field having dose-rate over 10 μGy per hour (Figure 3.);
5. Time that was consumpted for the cumulation of the dose described in the above item 3.

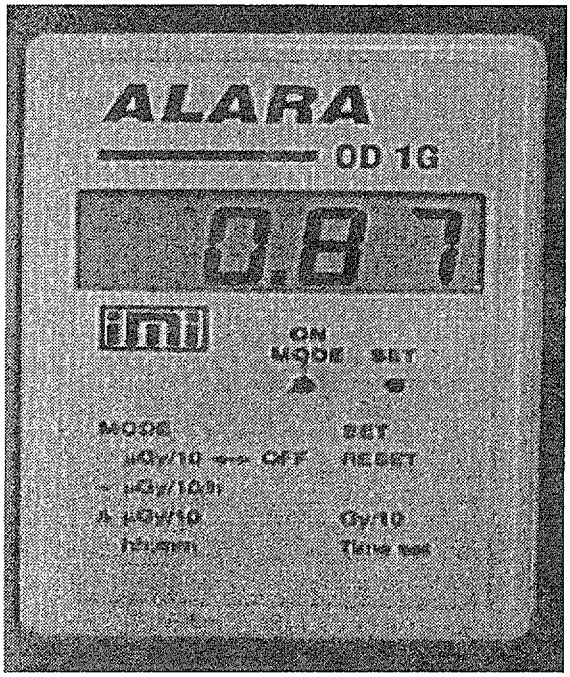

Fig. 1: Irradiation dose received within a particular professional activity.

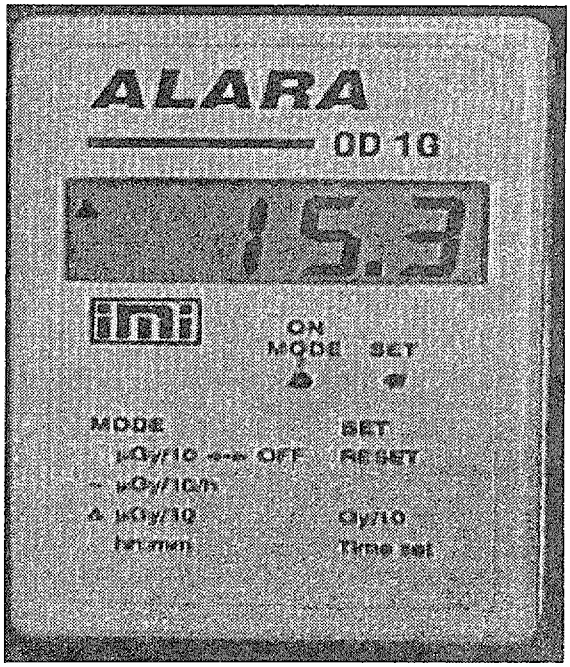

Fig. 2: Cumulative irradiation dose (possibility of resetting the dose non-existing).

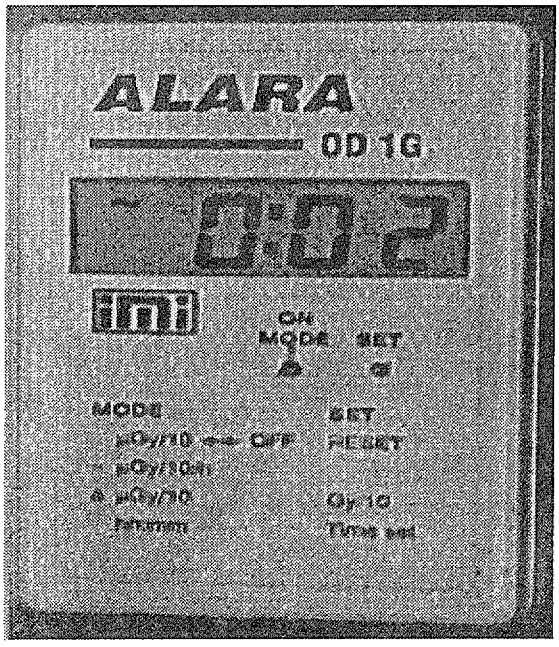

Fig. 3: Duration of exposure in the radiation field having dose-rate over 10 μGy/h.

Fig. 4: One of the possible dose limit settings, beyond which the alarm device can be activated.

Each of our digital pocket dosemeters contains a watch showing the user the actual time of the day, but, what's more important, one can set the device to make an alarm sound when the user remains working in the radiation field after the dose limit had been exceeded (Figure 4.). The limit value dose can be picked out of the dose range from 50 to 10000 μGy.

CONCLUDING REMARKS

Pocket dosemeters are to be considered the addition to the common state dosimetry, able to complete the information on occupational radiation exposure. In case of any irregularities, the information on the issue is promptly obvious to the user and can be instantly reported to the health officer in charge, so that the cause can be efficiently eliminated. Besides, on the grounds of data provided for a particular professional activity, some of the radiological procedures applied in the daily routine might as well be adjusted to the lower dose levels. That would represent a remarkable contribution to the efforts constantly made in radiation protection i.e. the reduction of noxius impact of ionizing radiation on the exposed individuals.

REFERENCES

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