PERSONAL PHOTOGRAPHIC DOSIMETRY AT IPEN

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ABSTRACT

The data related to personal monitoring of the IPEN workers from 1961 to 1992 have been collected and treated in order to obtain a general view of the annual average dose equivalent level. Three different situations were analyzed : dose equivalent level of the whole IPEN , dose equivalent level of each department and some individual cases. Data related to the Goiânia accident are discussed separately.

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1. INTRODUCTION

The personal dosemeter system of IPEN is based on film dosimetry. Personal doses at IPEN are mainly due to X or gamma radiation (1).

A singular advantage of film as a dosemeter is its high spatial resolution and due its small size it can be insert into radiation fields with minimum pertubation (2).

The use of personal photographic dosemeters involves two steps : firstly, data acquisition including their evaluation with respect to the calibration quantity and secondly, the interpretation of the data in terms of effective dose equivalent.

2. MATERIALS AND METHODS

The photographic dosemeters used at the IPEN are made up of two parts:

a) the Personal Monitoring 2/10 film (AGFA - GEVAERT) , consisting of two emulsions.

b) the holder containing four filters (plastic , lead, copper and cadmium) and an open window.

With the aid of these filters , observations about the radiation field and the irradiation conditions can be made. They permit in many cases an assessment of radiation energy. The area of the filters is sufficiently large to avoid edge effects.

Each film has a code number for easy identification and the measurement of radiographic film density is performed using a transmission densitometer MacBeth TD 904. Density measurements are made always on the same side of the film surface.

Quality control is carry out using a ^{14}C plane source. The difference between the maximum and the minimum optical density values for each sample is determined and the standard deviation of the mean for each film batch is calculated. The lower detection limit is 5.2×10^{-6} C Kg^{-1} (20 mR) of ^{60}Co gamma radiation.

3. RESULTS

The annual average dose equivalent level of the whole IPEN is showed in Fig. 1. In this case it was taken 50% of the monitorred workers in each year. It can be seen that only in 1964 the value of the average dose equivalent is higher than 4.0 mSv/year. The Brasililian's rules indicates that the maximum average dose for nuclear installations with many workers is 5.0 mSv/year.

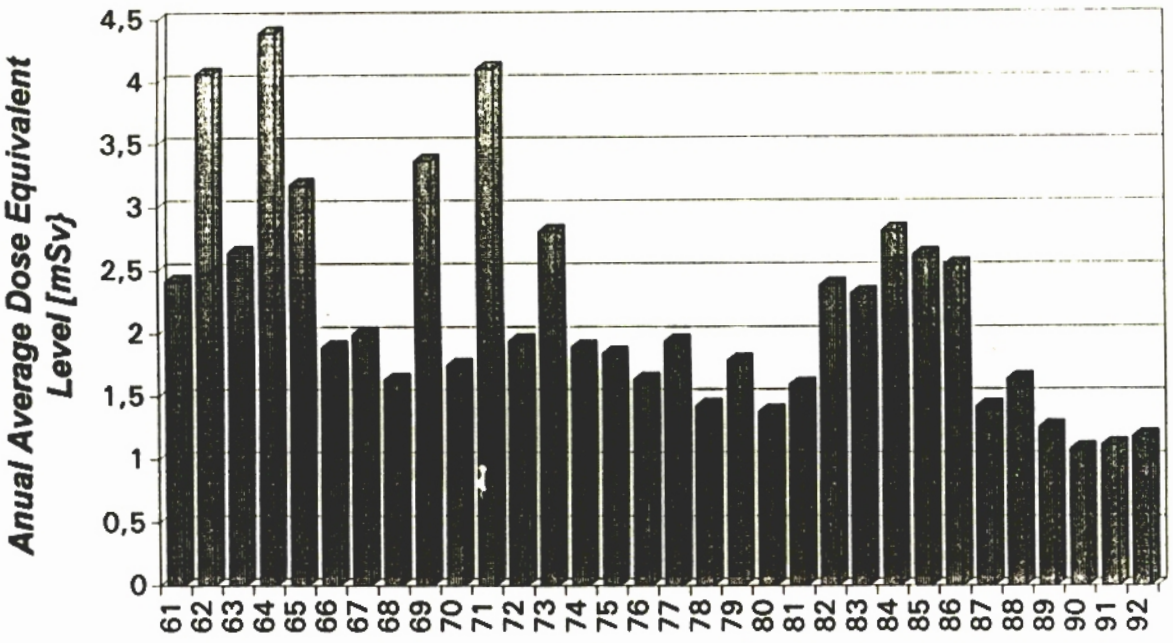

Figure 1 : Annual Average Dose Equivalent Level of the IPEN.

The annual average dose equivalent level of each Department of IPEN is showed in Fig. 2. It can be seen that are only local dose peaks, related with some special work.

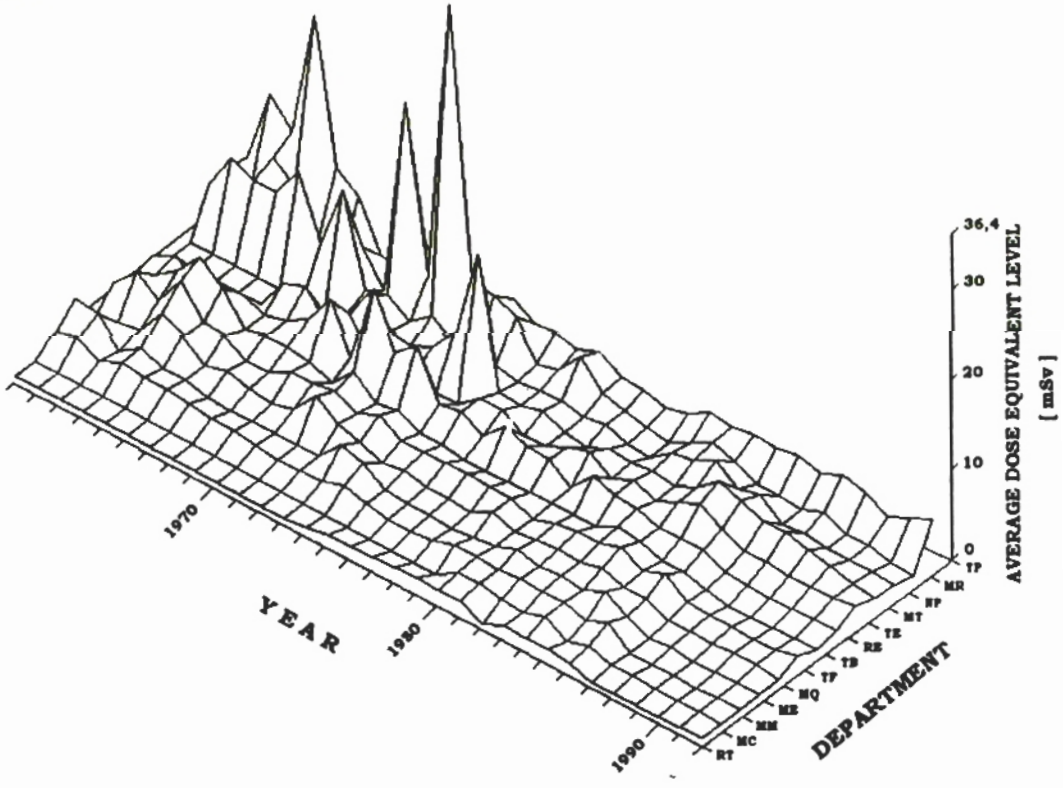

Figure 2: Distribution of the Annual Average Dose Equivalent Level of Each Department of IPEN.

TP : Radioisotopes Production
MR : Radioactive Wastes
NP : Radiological Protection
MT : Uranium Processing
TE : Radioisotopes Industrial Applications
RE : Nuclear Reactor Operation
TB : Mediacl and Biological Applications
TF : Nuclear Physics
MQ : Chemical Engineering
ME : Materials Characterization
MM : Metalic Materials Characterization
MC : Ceramic Materials Characterization
RT : Nuclear Reactor Tecnology

The maximum individual annual dose equivalent is showed in Fig. 3, there are only four cases in thirty one years were the individual dose equivalent is higher than 50 mSv/year.

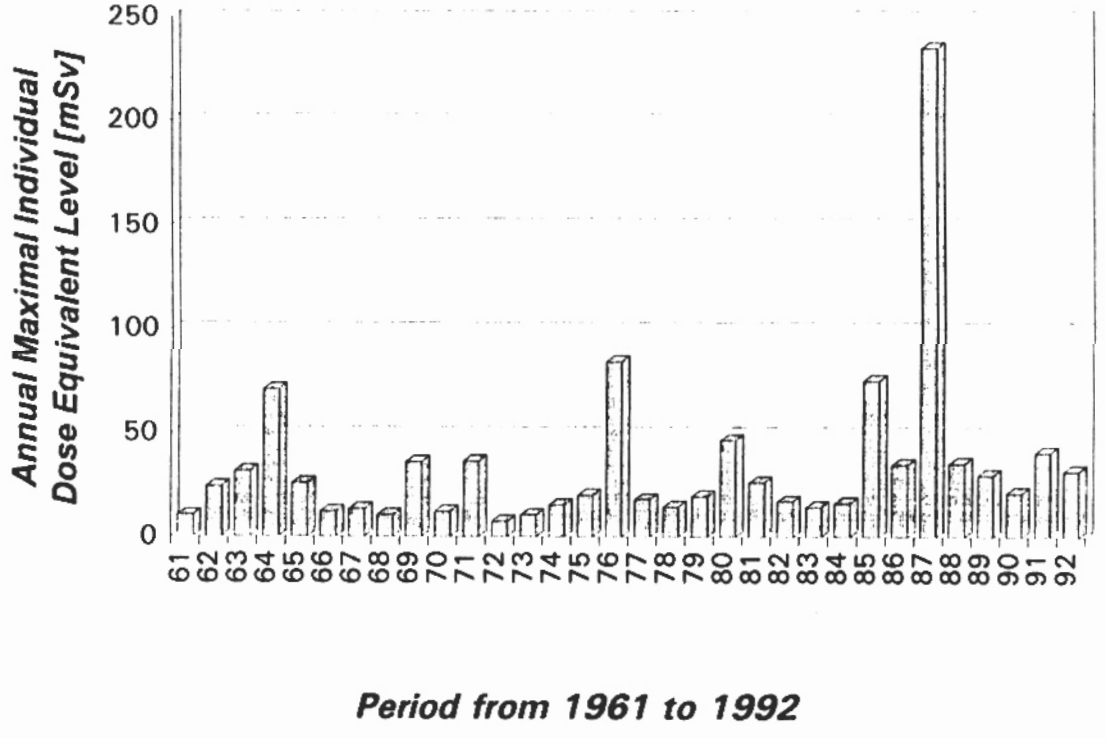

Figure 3 : Maximum Individual Annual Dose Equivalent of IPEN Workers.

Finally, in Fig. 4 is showed the distribution of the dose equivalent received by the IPEN workers during the Goiânia operations between october and december of 1987. Only one worker received 12 mSv/three months. The maximum dose equivalent limit for workers for three months it was 30 mSv in this time.

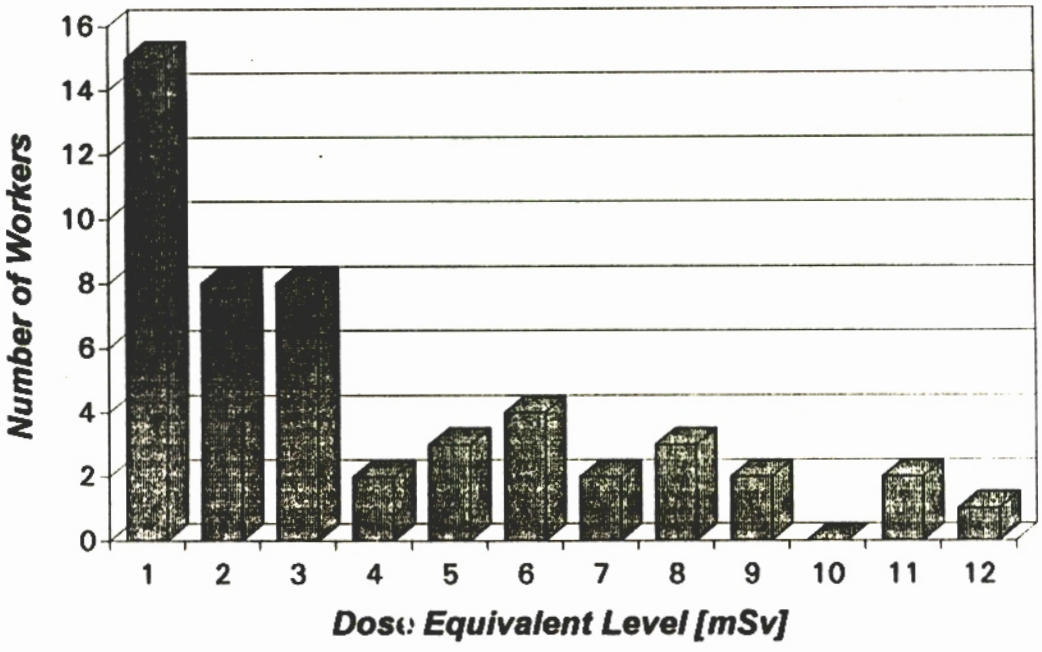

Figure 4 : Distribution of the Dose Equivalent of IPEN Workers during Goiânia Operations.

4. CONCLUSIONS

These results show the attention related with workers heath and welfare of the IPEN workers as well as the efficiency of the Radiation Protection Department.

5. REFERENCES

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