

# 1.THE COMPUTER SYSTEM OF AUTOMATICAL MICROSCOPE ANALYSIS OF MINERS' INDIVIDUAL DOSIMETERS.\*)

A.Zorawski, M.Hawrynski, D.Kluszczyński.

Institute of Occupational Medicine,90-950 Lodz,8 Teresy Str,P.O.Box 199,Poland

The Institute of Occupational Medicine (IOM) carries on routine investigations on miners' individual exposure to radon and its alpha radioactive daughters in Polish mines [1]. Evaluation of miners' exposure is based on automatic analysis of track detectors by computer SYSTEM RADON. The IOM used detectors of size 2x3 cm cut from Kodak LT115 or LR115 dosimetry foil. The scheme of the system is presented in Fig.1 whereas Table 1 includes specification of its elements.

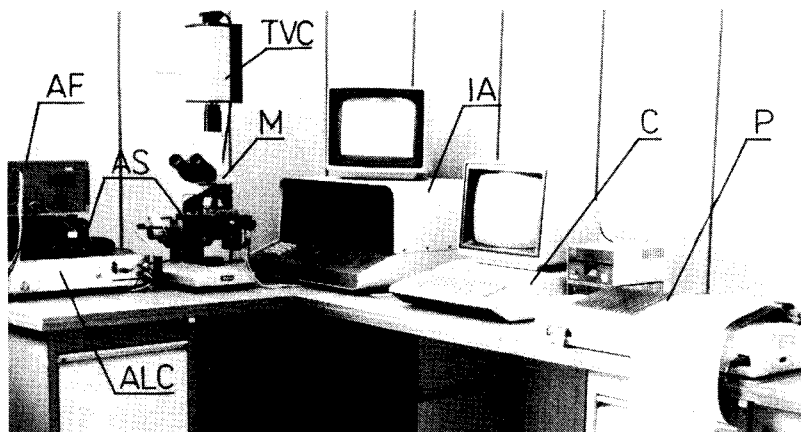


Fig.1. General scheme of SYSTEM RADON (abbreviations - see Table 1).

Table 1. Specification of main elements of SYSTEM RADON.

Abbreviations used in Fig.1 and text	Element	Producer
IA	Image Analyser	Analytical Measuring Systems Ltd England
AS	Auto Stepping Stage	
AF	Auto Focus	
C	APPLE IIe computer	Apple Computer Inc. USA
ALC	Auto Light Control	IOM Poland
M	Nikon Labophot Microscope	Nippon Kogaku K.K. Japan
P	Epson FX100 Printer	Epson Corporation Japan
TVC	TV Camera	Robert Bosch GMB Germany

\* ) Completed under project CPBR 11.5.65.2.

The detectors are subject to chemical etching [2] and next placed under the microscope M and viewed at magnification 20x through TVC. The image generated by TVC is analysed by IA with resolution of 280x384 piksels. The tracks on the detector's surface are counted by IA when the degree of 'greyness' is higher than the 'greyness' corresponding to the determined by the user detection level and when the surface area is within the determined limit of areas. Control range of detection level ranges from 0 to 99, whereas the limit of areas may be changed within the range from 0 to 99999 piksels. The analysed image is projected on IAM monitor. The automatic detector's stepping under the microscope M objective is controlled by AS and the picture sharpness is corrected by AF. The precision of detector's framing under the M objective amounts to 0.1mm. During the analysis, the intensity of light passing through the analysed field is measured by ALC. Hence, an information on the detector's thickness is obtained which is next used, after completing the analysis, to calculate the miner's exposure on the basis of the tracks density. The operations of the system's elements: IA, AS, AF, ALC are controlled by the measuring program introduced into the computer C. The program has been created by the Institute of Occupational Medicine in two languages: UCSD Pascal 1.2 and Assembler 6502. During detector's analysis the data from IA such as: the number of tracks and light intensity for particular analysed fields are passed into the computer's C memory. These data are not accepted by C when summary tracks area exceeds the limit of areas determined by the user and when light intensity passing through analysed foil exceeds the predetermined limit of intensities. To eliminate the influence of artefacts being an effect of e.g. detector's mechanical abrasions of size comparable to the tracks size on the determination of tracks density, a statistical verification of the collected data is performed. This verification is being made after completing the detector's read out. Due to verification all the fields on which tracks density differs from the mean tracks density, calculated for all analysed fields, by a defined by user number of standard deviations, are rejected. After completing statistical verification, the miner's exposure to radon and its progeny is calculated. These results, together with the basic data on the analysis process that has been carried out are printed on the printer P. The measurement program allows also to obtain the distribution of tracks density according to their diameters and to test the correctness of setting the principal parameters of the detector's analysis, such as detection level and intensity of light falling on the detector. The analyser IA used in SYSTEM RADON cannot distinguish the shapes of the analysed tracks, however, the presented above way of read-out causes that this option is not necessary for automatic reading-out the track detectors. The relative error does not exceed 30% , including the inherent error of the method (inaccuracy caused by the radon/daughters equilibrium). Duration of detector's analysis has been decrease in this system to 2 minutes. The results of the analyses are sent from computer C through IEEE 488 interface to IBM PC/XT computer and collected in the data base on hard disk. This data base comprises the data on all miners covered by the radiological protection system implemented in Poland.

#### REFERENCES

1. Chruscielewski W., Domanski T.: System of personal dosimetry introduced in Polish nonuranium mines. Proc. International Conference on Radiation Hazard in Mining, Colorado School of Mines, Golden, USA, 4-9 Oct. 1981, New York 1981.
2. Chruscielewski W., Orzechowski W., Domanski T., Swiatnicki G.: Measurement of exposure to radon and its progeny using Kodak LR-115 type II foil. Proc. Radon Specialist Meeting N.E.A. Roma-Casaccia CNEN, Italy, 3-7 March 1980. RD Press Radiobiology Division, University of Utah, Salt Lake City, 30-38, 1980.