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ЦЕНТРАЛЬНАЯ ЛАБОРАТОРИЯ РАДИОЛОГИЧЕСКОЙ ЗАЩИТЫ



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The System for Measurements
of Radioactive Contamination
of Environment and Food
in Poland

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WARSAW

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THE SYSTEM FOR MEASUREMENTS OF RADIOACTIVE
CONTAMINATION OF ENVIRONMENT AND FOOD
IN POLAND

D. Grabowski, W. Kurowski

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The monitoring of radioactive contamination of the environment and foodstuffs in Poland is being carried out by the Service for Measurements of Radioactive Contamination supervised by the National Atomic Energy Agency.

The Service comprises:

1. A network of measuring stations acting within the meteorological stations, stations for sanitary supervision, veterinary hygiene establishments, chemical-agricultural stations, centers for environmental research and surveillance, water supply and sewage units, as well as some research institutes of appropriate profile.

In total there are 152 measuring stations. The location of measuring stations on the territory of the country is shown in Fig. 1.

The task of these stations consists of systematic measuring the radioactivity level in samples of components of the environment and foodstuffs in order to detect any possible increase of contamination.

2. The Center of Radioactive Contamination Measurements supervises and co-ordinates all activities related to the detection and measurements of radioactive contamination all over the country and carries out the necessary research.

The function of this Center is being executed by the Central Laboratory for Radiological Protection. The task of the Center is following: – elaboration of measurements program stations, – elaboration of unified measurement methods, – equipment design for the stations, – collection and elaboration of measurement results provided by the stations, – elaboration of reports and analyses on the radiological hazard level.

The structure of the Service for Measurements of Radioactive Contamination is shown in Fig. 2.

The monitoring of radioactive contamination is conducted with regard to air (aerosols), total fallout, atmospheric precipitations, surface water, tap water, sewage, soil, plants, foodstuffs.

Types of samples tested by each measurement station depend on the profile of activity of the institution in which that station operates:

Item No.	Name of the Institution	Number of measurement stations	Samples to the monitoring of radioactive contamination
1.	Stations of the Institute of Meteorology and Water Management	10	air, total, fallout, atmospheric precipitations
2.	Centers for Research and Control of the Environment	43	surface water, sewage, total fallout, soil
3.	Provincial Sanitary-Epidemiological Stations	47	total fallout, milk, food products
4.	Regional Chemical-Agricultural Stations	14	agricultural products, cereals, vegetables, fruits
5.	Provincial Veterinary Hygiene Units	16	meat, fodder, grass
6.	Water Supply and Sewage Establishments	11	tap water, communal sewage
7.	Institutes, high schools	11	specialistic measurements

The stations situated in 10 meteorological stations perform a duty of alarm stations with regard to the extraordinary increase of radioactivity level on the territory of the country; they form an alarm system.

They are carrying out continuous measurements of gamma radiation dose rates and radioactivity measurements of 24-hours samples of air (aerosols) and total fallout.

Considering that aerosol filters collect both artificial and natural (mainly short-lived products of ^{222}Rn and ^{220}Rn) radioactive substances. The radioactivity of collected material is measured immediately after collection, after 1 hour and after 5 day. The results of two first measurements serve as evidence for possible appearance of an abnormal increase of radioactive contamination of the air. On the territory of each province there are selected points for sampling of environmental materials and food. Frequency of sampling depends on material being collected.

The radioactivity level checking is based on total beta activity measurements carried out according to the methodology unified. It makes possible to follow the changes of contamination level throughout the country. The most important isotopes of radioactive fallout are determined periodically in collective samples. The determination is carried out by radiochemical methods at some stations. Also spectrometric methods are being applied by few stations.

In the case of finding out an increase of radioactivity level (increase of gamma dose rate and air contamination) the frequency of sampling and number of sampling points are augmented.

All measuring stations can operate, according to the situation, continuously. Emergency measurement methods enable the measurement, of total gamma activity with no chemical processing of samples as well as the determination of single isotope (iodine - 131, caesium - 137) by a simple spectrometric method and the measurement of radioiodine content in milk and water by rapid radiochemical methods. Specialistic stations in the institutes carry out full spectrometric analyses of representative samples.

The standard equipment of a measuring station is as follows;

- measurement system type "SAPOS-90"* ensuring continuous automatic measurement and registration of gamma dose rates in the range from natural background $\mu\text{A}/\text{kg}$ [$\mu\text{R}/\text{h}$] to $10 \mu\text{A}/\text{kg}$ [$140 \text{ R}/\text{h}$] as well as laboratory measurements of samples (total beta and gamma activity, activity of the selected three radioisotopes);
- radiometers and dosimetric equipment;
- laboratory space and appliances for radiochemical separation and determination.

Some of alarm and specialistic measuring stations have at their disposal a scintillation spectrometer with multichannel pulse height analyser "TRISTAN 1024"*. Moreover, alarm stations operating within meteorological stations are equipped with aerosol sampling systems: it is planned to equip them with measurement system for continuous automatic control of radioactive contamination (alpha and beta) of the lowest layer from surface of the atmosphere.

These measurement systems are to perform alarming function in the event of air contamination increasing and the related to that necessity of appropriate decision undertaking.

The specialistic measuring stations will be equipped with 4000-channel analysers connected with microcomputer of the series IBM/XT/AT with extensive software, prepared to the operation together with a scintillation or semiconductor detector.

The measurement results are transmitted from stations to the Center by telex and, periodically, as written reports; those from meteorology-linked stations are transmitted daily. In case of finding out an increase of contami-

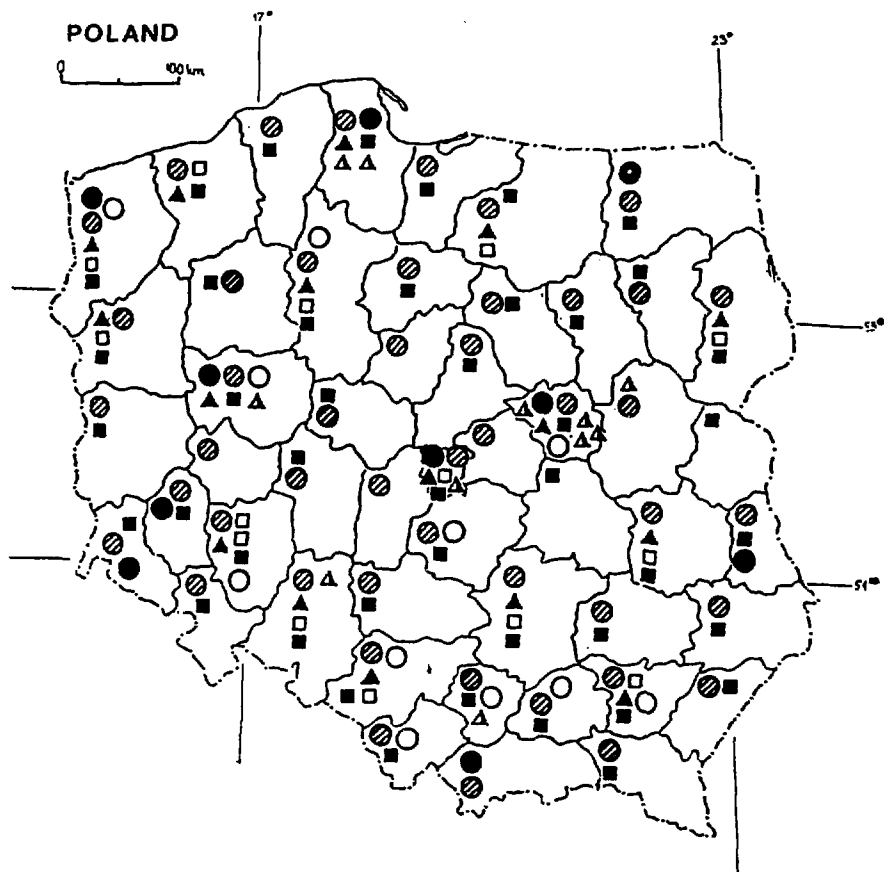
*) Produced by Nuclear Techniques Plant "POLON", Warsaw, Poland.

nation the relevant information is transmitted instantly from alarm – stations by telex network of the meteorological service to the twenty-four hour duty service at the Central Laboratory for Radiological Protection.

The increase of gamma dose rate and air radioactivity above alarm level is a signal of occurrence of abnormal level of radioactive contamination of the environment.

It has been assumed by alarm – stations of the Service for Measurement of Radioactive Contamination that the alarm situation occurs if:

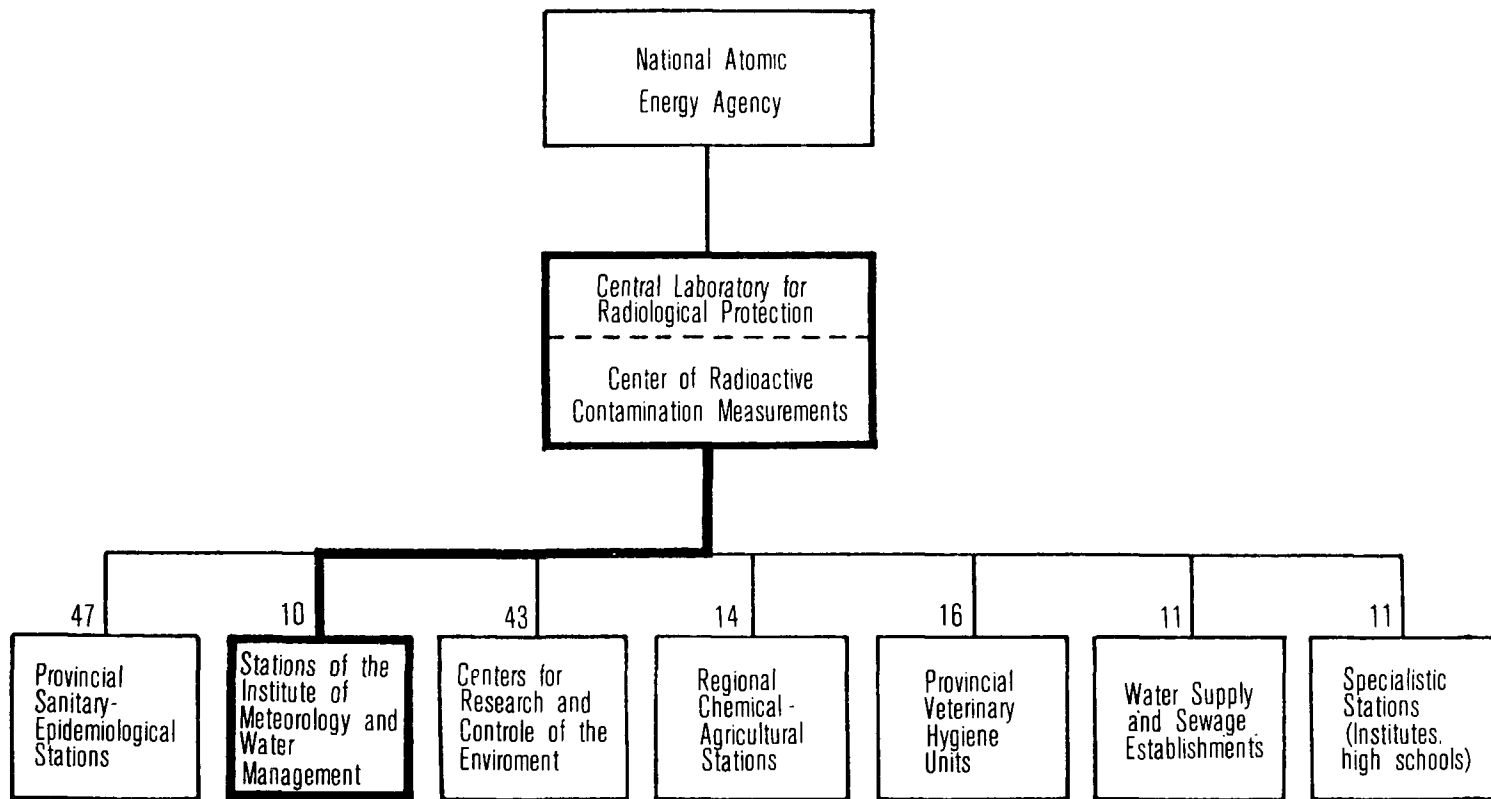
1. Gamma dose rate increases to 1.5 times of the value of natural gamma background and keeps that level for some hours;
2. Air contamination measured immediately after sampling aerosols on a filter is in excess of 3 Bq/m^3 and during 1 hour decreases less than 20 per cent; this is proof that the increase of radioactivity is connected with the appearance of artificial radioisotopes in the air being monitored.



- Meteorological stations
- ◐ Stations for Sanitary Supervision
- ▲ Veterinary hygiene establishments
- ◑ Chemical-agricultural stations
- Center for environment research and surveillance
- Water supply and sewage units
- ▲ Specialistic stations (institutes, high schools)

Figure 1. Location of measurement stations of the Service for Measurements of Radioactive Contamination. The division of the country into voivodship (provinces) is shown.

SERVICE FOR MEASUREMENTS OF RADIOACTIVE CONTAMINATION (SMRC)



▭ - alarm system.

47 - number of measurement stations

Figure 2.