# SYSTEMATIC APPROACH TO THE ORGANIZATION OF MEASUREMENT ASSURANCE IN RADIOECOLOGY

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1. Radiation conditions of the environment are characterized by a great number of various parameters which, relative to radiation, describe different objects and for the measurement of which the use is made of various analytical methods in field and laboratory conditions. To ensure the required level of reliability of the results of radioecological studies on large territories, it is suggested to set the list of parameters to be measured depending upon the problem to be solved and the object under study, as well as to establish the requirements for the accuracy of determination of those parameters.

2. All radiometrical methods used in radioecology can be divided into three groups according to the measurement conditions. The first group includes measurements directly in natural beddings, i.e. in blast-holes/wells and on the day surface. Parameters: fractions of total mass and specific effective activity of natural radionuclides (NRN), specific and surface activities of radionuclides of artificial origin (ARN) and value of their reserve per unit of surface, air kerma (dose equivalent) rate of gamma-radiation.

The second group contains radon measurements in the earth (soil) and free air. Parameters: radon concentration, volume effective equilibrium activity of radon and daughter products of its decay.

The third group consists of methods of lithochemical sampling of water and bottom sediments. Parameters: NRN and ARN concentration in water, NRN and ARN content in bottom sediment samples.

3. Parameters characterizing radiation sources in every group are mutually connected. Thus, to provide for the measurement assurance, it is necessary to correlate parameters of standard measuring means (MM) applied for organizing the measurement assurance (MA), by choosing a metrological model reflecting adequately the conditions of measurement of the physical parameters in every group and of certification of the standard MM's by the set of parameters to be measured. The metrological model describing the measurement of parameters with a guaranted uncertainty, must be chosen by the following scheme:

physical object ))→ physical model → mathematical model → metrological model

4. Physico-mathematical analysis carried out for the first-group methods, establishes the correlation between the parameters of this group. For this group there are stated requirements to the unified measurement chain for the MA of radiometers applied in complex radioecological studies. Such a chain should have at least three levels.

The first level of standard reference MM's (SRMM) - standards includes:

a) Set of standard reference materials (SRM) of the NRN and ARN content and the ARN surface activity to maintain and reproduce the units of fractions of total mass of NRN's and of specific activities of ARN's in the model "homogenious space" or "homogenious half-space", as well as those of surface activity of ARN's of the

specified content in the model "thin film". SRM dimensions must ensure "saturation by gamma-radiation" in the measurement condition of "difference effect": for 4 geometry - 140 cm in diameter and 150 cm in height with the bulk density 1.5 g/cm$^3$; for 2 geometry - 100 cm in diameter and 50 cm in height for the model "homogenious half-space" and 30 - 50 cm in diameter for the model "thin film".

b) Working standard to maintain and reproduce the unit of air kerma (equivalent dose) rate of gamma-radiation.

c) Standard multichannel gamma-radiometer (gamma-spectrometer) to control stability of the parameters of the SRM set and to transfer the units to standard and working MM's.

The second level consists of standard MM's. To measure in 4 geometry, standard MM's are built as SRMM's. For ground-based and aerogamma- surveys it is recommended to use as standard MM's the SRM's in the form of testing grounds certified by transferring the unit from SRMM's.

The third level includes working MM's.

5. The suggested measurement chain ensures for working MM's the estimation of parameters by the first-group methods with the confidence basic uncertainty less than 10 % when measuring in 4 geometry. The confidence uncertainty won't be higher than 20 and 30 % (0.95) when measuring the surface activity and air kerma (equivalent dose) rate of gamma-radiation by the methods of ground-based and aerogamma-surveys, respectively.