



## **The Development of the improved equipment for the measurement radionuclides of xenon in atmospheric air**

S. A. Pakhomov and Y. V. Dubasov

Khlopin Radium Institute, St. Petersburg, Russia (pakhomov@khlopin.ru)

The Radium Khlopin Institute have developed the mobile (vehicle based) equipment attended for the providing of the monitoring of radioactive xenon isotopes in atmospheric air on territories, neighboring with NPP. This equipment comprises the improved sampling installation with sample-processing unit and specialized spectrometer of –coincidences.

The principal specificity of sampling installation is the using of the gas-cooling machine attended for the reaching of the cryogenic temperatures, which works without helium, using for cooling the processed air itself. The capacity of sampling reaches 20 cubic meters per hour with the xenon extraction factor of 75%. The duration of the sampling cycle forms 3 - 7 hours depending of the xenon volume requirements.

The sample-processing unit is designed on preparative gas chromatograph scheme. Duration of sample-processing procedure does not exceed one and half hour. The volume of the prepared sample is around half liter, it contains 3 - 7 cubic centimeters of the xenon, depending of sampling cycle time.

For measurements of xenon radioisotopes containing in obtained sample, was developed a –coincidences spectrometer on the base of the "ORTEC" HP Ge detector equipped with scintillation -detector designed as Marinelli chamber of 700 cm<sup>3</sup> volume. This spectrometer allows to reduce the ambient background more than in 20 times, with -channel efficiency reduction not more than in 1.5 times. The minimum detectable activity of 133 (MDA), evaluated by Currie formula for probability 95 % is 0.05 Bq at the exposition of 20 hours.

Spectrometer is also intended for determination of the stable krypton and xenon concentrations in -chamber by X-ray-fluorescent method. Therefore, in a shield of the spectrometer collimating pinhole is made and 241Am source is installed.

To improve the sensitivity of the analysis beryllium window is made in -chamber wall, adjoining to the HPGe detector. X-ray-fluorescent analysis allows to surely define Xe volumetric concentration of 0.05% in -cell, that is equivalent less then 0,5 cm<sup>3</sup> of Xe.

The first approbation of described equipment was fulfilled in St. Petersburg at autumn of 2007 year and have shown that the spectrometer allows to measure 133Xe concentration at the level of 2 mBq/m<sup>3</sup>, and this value is in a good agreement with the results of other measurements.

Described equipment was practically approbated in field conditions on 2008 year during the expeditionary work carryout in Sosnovyi Bor, Udomlya and Polyarnie Zori – the cities of North-West of Russia, which are located in close neighboring with acting NPP.