

**Recent Activities in Activity Measurement at the
Czech Metrology Institute**

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The work during 2007-9 was focused on these areas:

- 1. Routine activities**
- 2. International comparisons**
- 3. Digital coincidence counting**
- 4. Source preparation**
- 5. Radon-in-water standard**
- 6. Spectrometry and decay data evaluation**

1. Routine activities

More than 25 radionuclides (^{22}Na , ^{24}Na , ^{51}Cr , ^{54}Mn , ^{56}Mn , ^{55}Fe , ^{57}Co , ^{58}Co , ^{60}Co , ^{65}Zn , ^{88}Y , ^{85}Sr , ^{89}Sr , ^{90}Sr , ^{109}Cd , ^{113}Sn , ^{125}I , ^{131}I , ^{133}Ba , ^{134}Cs , ^{137}Cs , ^{139}Ce , ^{152}Eu , ^{192}Ir , ^{203}Hg , ^{210}Pb , ^{241}Am) have been measured for the production of standards.

2. International comparisons

CMI has participated in the EUROMET 907 – Sb-124 Activity Measurements and Determination of Photon Emission Intensities and will participate in the ongoing comparison of activity measurements of Kr-85 and in the International Comparison of Activity Measurements of a Solution of H-3.

3. Digital coincidence counting

In recent years, the digital coincidence counting system for absolute activity measurement has been developed in the Czech Metrology Institute. Current research is focused on utilization of the system for more precise setting of coincidence parameters of nuclides with complex decay scheme, eg. ^{124}Sb , ^{152}Eu . The results will be presented at the ICRM 2009 conference.

4. Source preparation

New method for preparation of ^{124}Sb sources containing HCl was developed. After drying in H_2S with 65% humidity, the efficiency detection in the β -channel was more than 98 % and volatility was less than 0.02%.

Utilizing of „wet“ extrapolation for activity standardisation of electron capture nuclides was verified.

5. Radon-in-water standard

The radon-in-water standard installed in the Czech Metrology Institute in 1994 is based on the generator producing the radon solution and on the measurement system used for calibration and stability checking.

The standard is used approximately fifteen times a year for calibration of devices measuring radon concentration in drinking water.

The 15-year experience in the use of standard was summarised and presented on 5-th International Conference on Radionuclide Metrology Low-Level- Radioactivity Measurement Techniques in Braunschweig.

6. Spectrometry and decay data evaluation

Methodics of noble gas ^{41}Ar standardization and reference material preparation has been improved.

Coincidence probabilities and correction factors of true summation effect have been calculated for following radionuclides: ^{22}Na , ^{24}Na , ^{46}Sc , ^{51}Cr , ^{52}Fe , ^{54}Mn , ^{56}Co , ^{57}Co , ^{58}Co , ^{59}Fe , ^{60}Co , ^{64}Cu , ^{65}Zn , ^{67}Cu , ^{68}Ge – ^{68}Ga , ^{75}Se , ^{85}Sr , ^{88}Y , ^{94}Nb , $^{108\text{m}}\text{Ag}$, ^{109}Cd , ^{111}In , ^{124}Sb , ^{125}Sb , ^{125}I , ^{131}I , ^{132}Cs , ^{133}Ba , ^{134}Cs , ^{139}Ce , ^{152}Eu , ^{153}Sm , ^{153}Gd , ^{155}Eu , $^{166\text{m}}\text{Ho}$, ^{169}Yb , ^{177}Lu , ^{186}Re , ^{207}Bi , ^{208}Tl , ^{212}Pb , ^{212}Bi , ^{241}Am . The results will be published in the Journal of Radioanalytical and Nuclear Chemistry in 2009

BEGe detector was included in spectrometry laboratory equipment and detector model has been created for MC calculation of detection efficiency.

The method of evaluation of the amount of ^{238}Pu , ^{239}Pu , ^{240}Pu , ^{241}Pu , ^{242}Pu and ^{241}Am in the Pu-Be neutron sources has been developed using BEGe detector. The amount of the Pu-element was never declared in the Soviet Union Pu-Be sources. The knowledge of the Pu-amount is important from point of legal decommissioning. Signal contribution of dead layer of Ge to total detection efficiency has been estimated using coaxial GC4018 and BEGe5030 detectors.