was chosen. This signal is transformed to a long, TTL pulse, which is used as a veto for spectrometer's ADC. Timing and duration of TTL pulse were also optimised to achieve highest possible effectiveness.

Besides this active shield, the spectrometer has special passive shield (see Fig. 1), which consists of (from outside-to-inside) 8-12 cm of paraffin, 10 cm of standard lead, 2 mm of cadmium, 5 cm of 2500 years old lead and 1 cm of copper. HPGe detector, constructed in the Department of Nuclear Spectroscopy (INP), has aluminium-free cryostat top. The aluminium is not recommended for the construction of the low-background detectors due to the presence of traces of uranium in most aluminium alloys. The inner, shielded volume of spectrometer is flushed with liquid nitrogen vapours, to reduce Rn daughters contribution to the spectra.

The active shield itself reduces continuous spectrometer's background (from 80 keV to 3 MeV) by a factor of about 2 (from 0.88 cps to 0.46 cps), increasing dead-time by less than 0.5%. The influence of each part of a shield (passive and active) on background was studied. Results will be published.

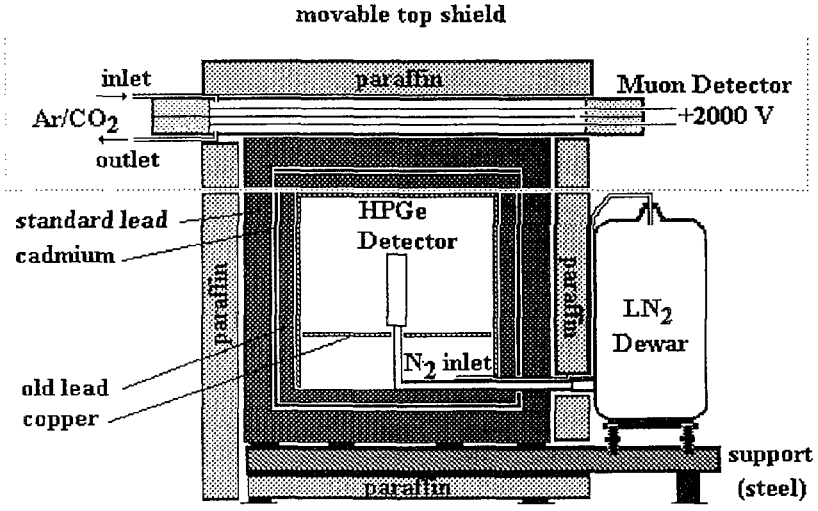

Fig. 1. A scheme of construction of ultra low-level gamma spectrometer shield.

^{90}Sr in Bone of Wild Herbivorous Animals

J.W. Mietelski, P. Gaca, P. Zagrodzki, N. Vajda[1], and E. Dutkiewicz

[1]*Institute of Nuclear Techniques, Technical University Budapest, Hungary*

Activity concentration of ^{90}Sr ($T_{1/2}$ = 28 a) was analysed in thirty-nine samples of animal bones from north-eastern Poland and additional four animal bones from southern Poland. Strontium separation was performed by extraction chromatography. Samples of bone ash were dissolved in concentrated HNO_3.

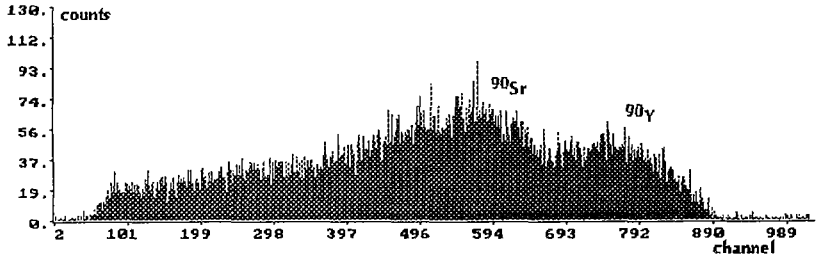

Fig. 1. Example of liquid scintillator beta spectrum of ^{90}Sr-^{90}Y fraction of animal bone ash.

Strontium was co-precipitated with calcium oxalates and centrifuged. Oxalates were destroyed by ashing. The residue was dissolved in 3 M HNO_3 and loaded on the column filled with Sr-Spec (Eichrom Ltd) resin.

Strontium was retained on the column selectively [1]. The ^{90}Sr was eluted along with stable Sr from column by 30 ml of water. Solution was evaporated and transferred to Wallac HiSafe3 scintillator cocktail. After two weeks waiting for the equilibrium between ^{90}Sr and its daughter, ^{90}Y ($T_{1/2}$ = 64 h), the activity was measured on Wallac 1414-003 Guardian liquid scintillator spectrometer. Determination of chemical yield was controlled by means of stable Sr determination at the beginning and the end of the separation procedure. Two methods: PIXE and atomic absorption spectrometry were tested for this purpose. For routine work flame emission spectrometric measurements of Sr concentration were performed on Perkin-Elmer model 5100 ZL. First results suggest ^{90}Sr activity concentration in animal bones on the level of 500 Bq/kg. Project is still in progress.

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Reference:

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^{241}Pu in Bone of Wild Herbivorous Animals

PL0002506

J.W. Mietelski

Looking at fata of the Chernobyl fallout, we examined bones of wild herbivorous animals as possible indicators of migration of plutonium activity in the environment.

Alpha spectrometric measurements of plutonium in 39 animal bone ash samples gave only four results above the detection limit of the spectrometer Silena Alpha Quattro, which is about 0.5 mBq per sample [1].

Although the detection limit of our liquid scintillator spectrometer (Wallac 1414-003 Guardian) is by an order of magnitude higher, beta spectrometry gave more information about the activity concentration of plutonium, which was possible via measurements of the beta-emitter ^{241}Pu ($T_{1/2}$ = 14.4 a) whose activity in the Chernobyl fallout is high relative to $^{238,239,240}Pu$.

To increase plutonium concentration in the available material, thirty five NdF_3-co-precipitated alpha spectrometric sources of the Pu fraction, obtained previously from animal bones from north-eastern Poland, were combined to eight resulting samples, each of which represented an animal species and its living area. The samples were dissolved in hot concentrated nitric acid with an addition of boric acid, evaporated, dissolved in 2.5 ml of 1 M HNO_3, mixed with liquid scintillator cocktail Wallac HiSafe3, and measured on the liquid scintillator spectrometer using alpha/beta discrimination mode. A known alpha activity was used as the tracer of chemical yield which varied from 62% to 90%. Since the maximum energies in beta spectra of ^{241}Pu and ^{3}H are very similar, the activity of ^{241}Pu was determined using ^{3}H quenching correction library supplied by the manufacturer. The obtained results are from 0.17 to 0.45 Bq/kg for bone ash, what suggests alpha activity of the combined samples above the detection limit of our alpha spectrometer. Further alpha spectrometric measurements will be done for plutonium fractions of the combined samples, re-extracted from the liquid scintillator cocktail.

The State Committee for Scientific Research is acknowledged for the financial support (Grant P04G0914).

Reference:

1. J.W. Mietelski, P. Gaca, and M. Jasińska, Proc. of ICRM Meeting, Mol. 1999 (in press in Appl. Radiat. and Isotopes).