

## Report of analysis of sample sampA50715 in NKS-B GammaTest 2013 (water sample from the primary circuit of a research reactor)

### Results from Geislavarnir ríkisins (Icelandic Radiation Safety Authority)

According to our analysis the following radionuclides were found to be in the sample

Radionuclides	Line(s) (keV)	Time of count activity (Bq)	Decay corrected activity (Bq)	Counting SD
Cr-51	320	208	541	2%
Co-60	1173, 1333, 2506 (sum)	1.1	1.2	4%
Co-58	811	0.12	0.18	14%
Zn-65	1115	0.43	0.48	10%
Sb-124	603, 1691	0.16	0.24	13%
La-140	(242), 487, 1595	0.09	0.75	21%
Ba-140	(see below)	0.08	0.65	
Se-75	121, 136, 265, 279, 401	0.26	0.33	7%
Fe-59	1099, 1291	0.33	0.59	11%
Mn-54	835	0.13	0.14	22%

Although it was not mentioned in the instructions that any decay corrections should be done, the header of the sample file stated "Sample date 4 March 2013, 12:00PM", whereas the counting was registered in the file to have taken place 11 April 2013. It was thus assumed that decay correction should be done to the sample date of 4 March 2013.

Analysis was done by first identifying the peaks, they were then quantified using GammaVision with true coincidence correction applied. Then each peak was checked visually and in some cases peaks were eliminated from the final evaluation if the peak area estimate did not seem to be consistent with other means of estimating the peak area. If only one peak was available for a radionuclide, then the GammaVision estimate was used even though in some cases it seemed to overestimate the peak area of weak peaks.

La-140 is a decay product of Ba-140 (with half life of 12.753 d). The amount of Ba-140 in the sample was too small to be detected, but in this analysis it is assumed that the two radionuclides were in equilibrium at the sample date and since. The half life of Ba-140 was thus used for the decay correction. After equilibrium has been reached the activity ratio is  $T1/(T1-T2) = 1.1516$ . The activity of Ba-140 was estimated by dividing the activity of La-140 by this factor.

Naturally occurring radionuclides such as Bi-214 and K-40 were seen in the sample spectrum, but the strength of the lines seemed to be consistent with the supplied background measurement.

No attempt was made to estimate the total uncertainty, as the equipment was unknown to the participants. Counting uncertainty is reported (one standard deviation), it gives some indication of the lower bounds of the total uncertainty which is considerably more, since some of the peaks were just above the detection limits.