

Gamma intercomparison exercise – sample preparation and preliminary results

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Environmental Radiation Surveillance and Emergency Preparedness

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Intercomparison exercise

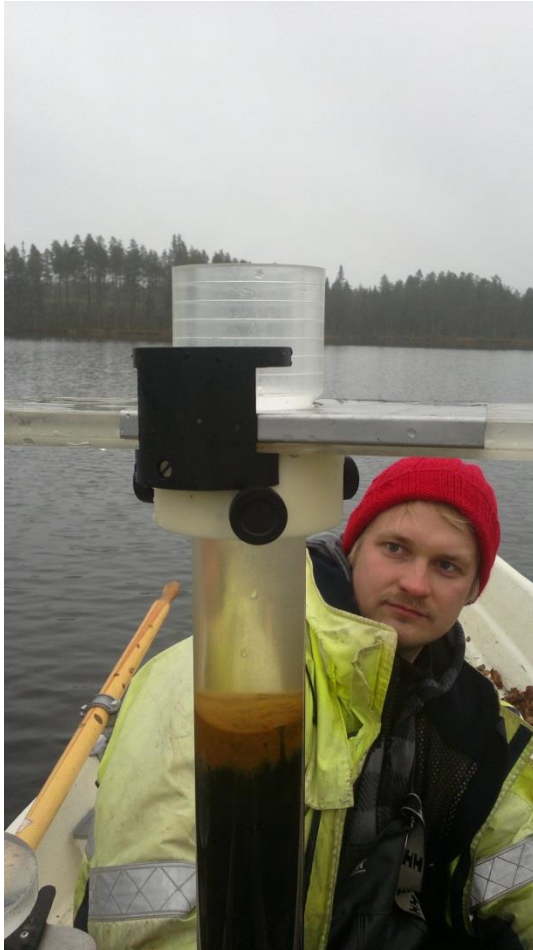
- Two different NKS projects:
 - NKS-CAMNAR (5 laboratories)
 - NKS-GammaSpec2017 (13 laboratories)
- In addition 12 laboratories from CBSS consortium (*Council of the Baltic Sea States*)
- Participants from 10 different countries

Samples

- NO certified reference materials
- Sediment and water sample for gamma intercomparison experiment
- Sediment sampling was performed in 2012 – 2013 in Kuusamo and Sotkamo
 - Bottom sediment samples from several small lakes
- Water sample was collected in May, 2017 from Sipoo
 - Privately owned drilled well, owners use purification system for Rn and U



Sample collection - sediment



- Sediment samples were collected from two areas in Finland as a part of environmental baseline studies of mining sites
 - Kuusamo gold mine area
 - Talvivaara nickel mine area

Sample pretreatment

- Samples were freeze dried after collection
- Different sediment samples were put together and mixed to obtain enough sample material.
- Homogeneity of the material was tested with gamma measurements



Sample collection – water sample



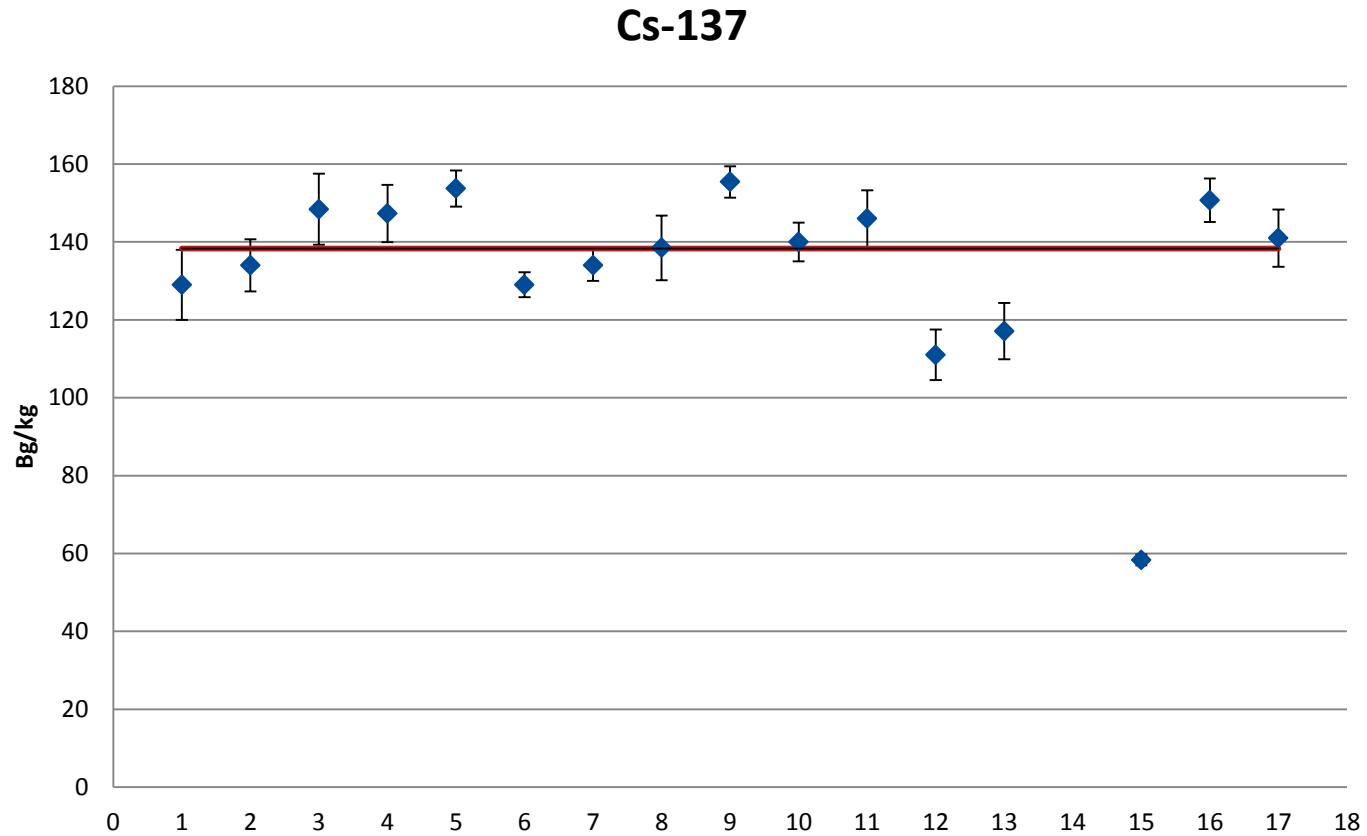
- Purification systems (for Rn and U) were bypassed
- Water was first run for 20 min to empty the pressure vessel and to get the water directly from the well

Sample pretreatment – water sample

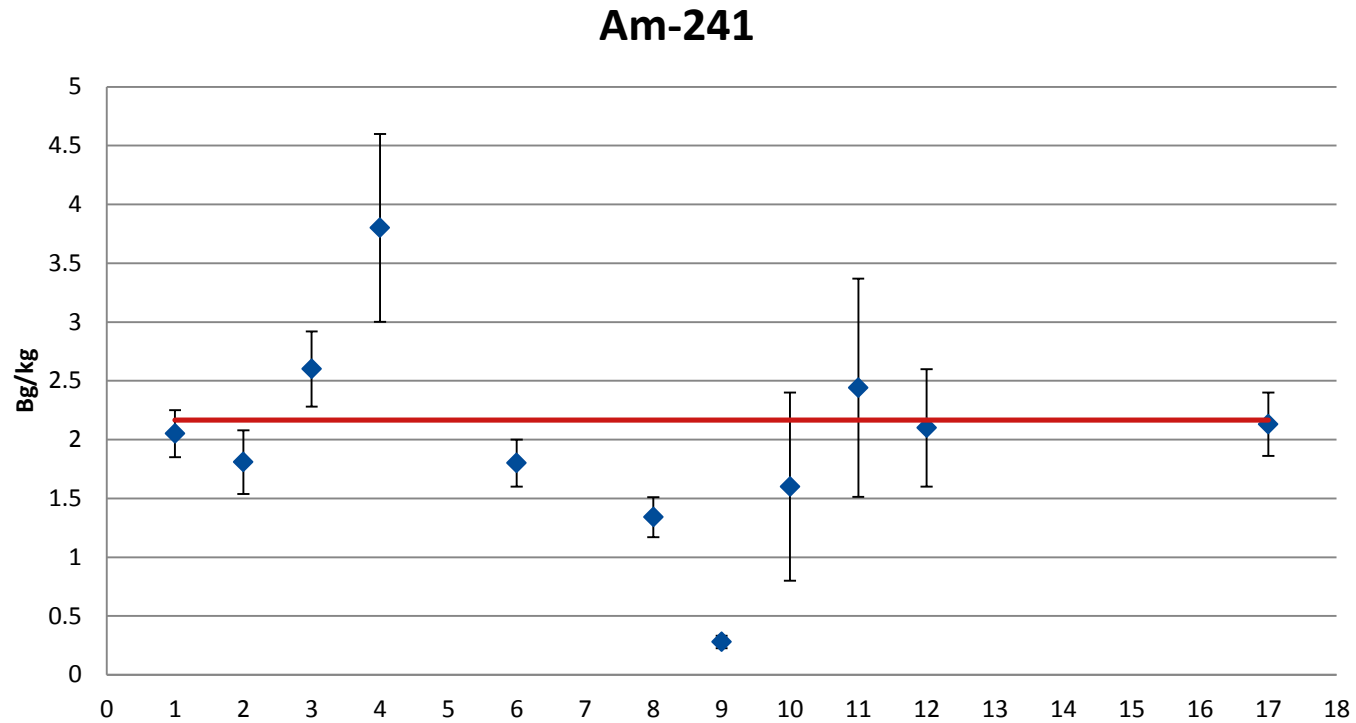
- Water was air bubbled and acidified to remove Rn-222 in water
 - 4-6 kBq/l of Rn was known to be in the water, originating from Ra-226 in the bedrock. However, the concentration of Ra-226 in water is low, so eventually Rn will decay ($T_{1/2} = 3.8$ d).
 - For intercomparison exercise this kind of disequilibrium is not a good thing!
 - CAMNAR laboratories also performed radiochemical analysis (Rn, U, Po, Pb, Ra)



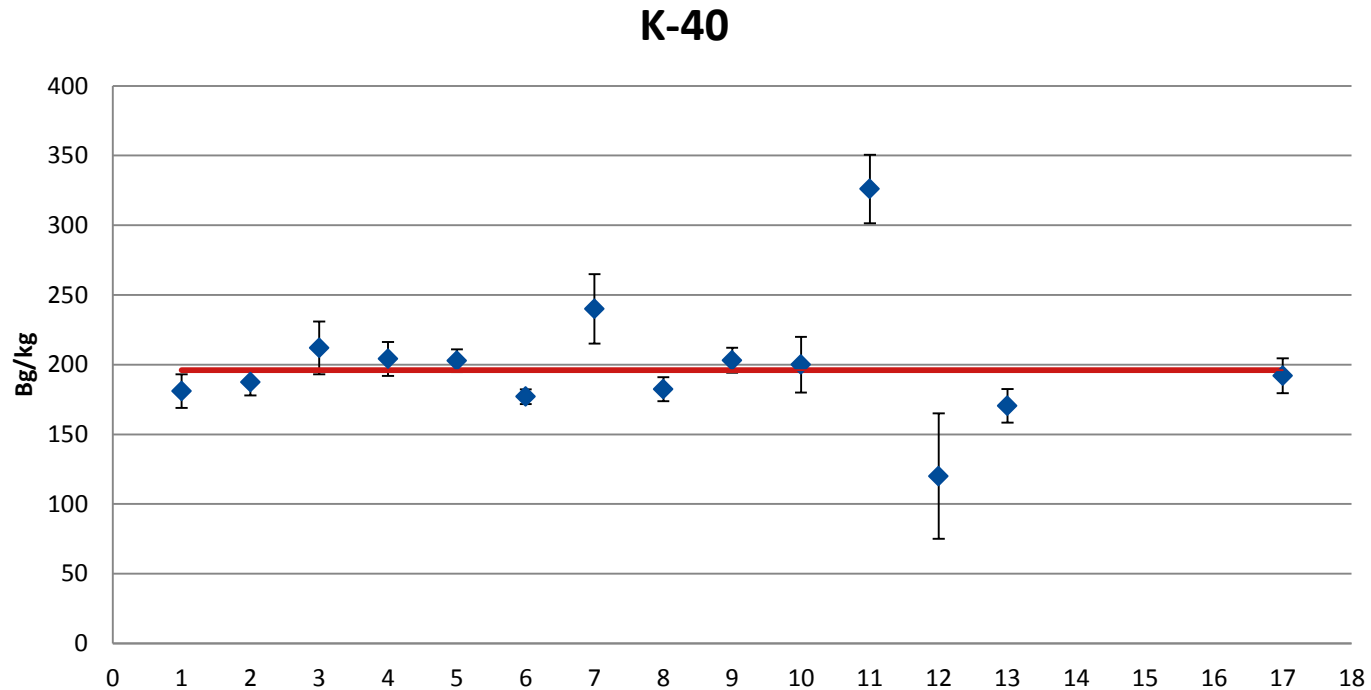
Preliminary results - SEDIMENT



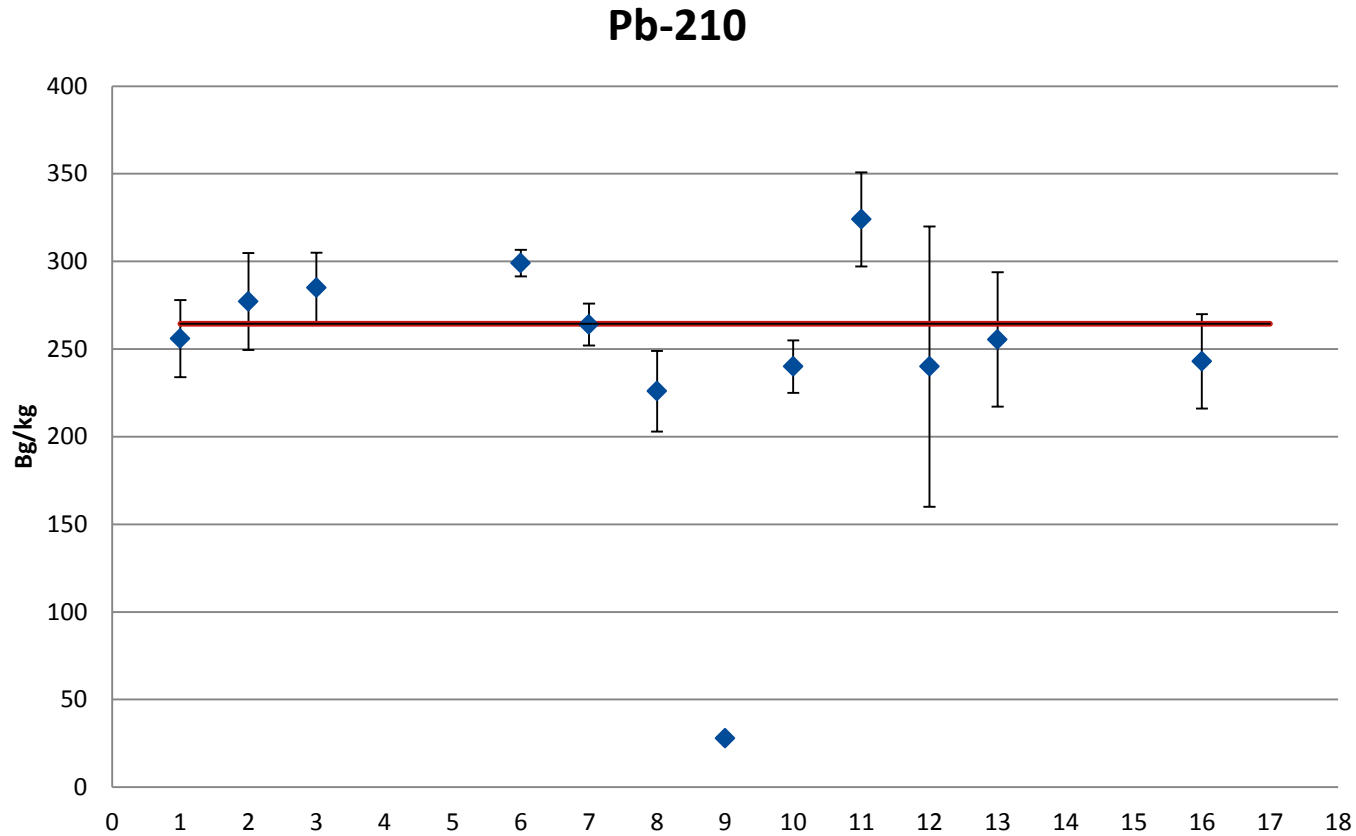
Preliminary results - SEDIMENT



Preliminary results - SEDIMENT

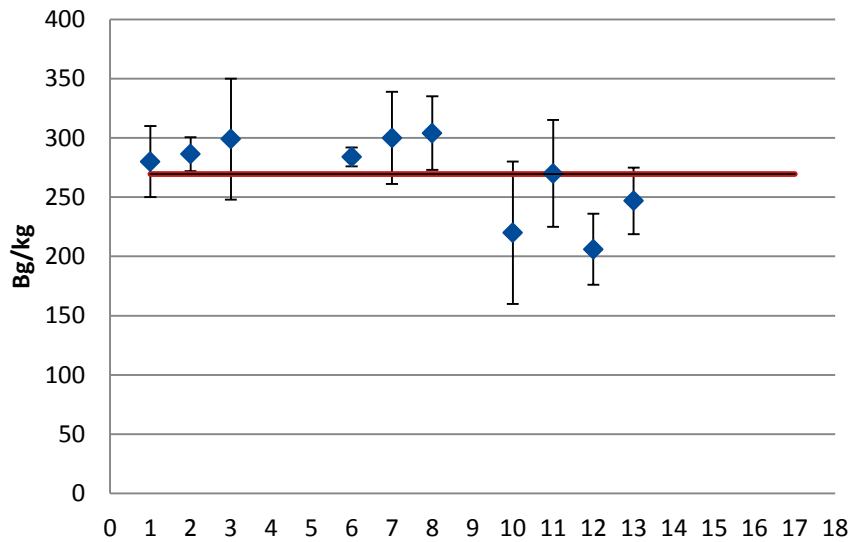


Preliminary results - SEDIMENT

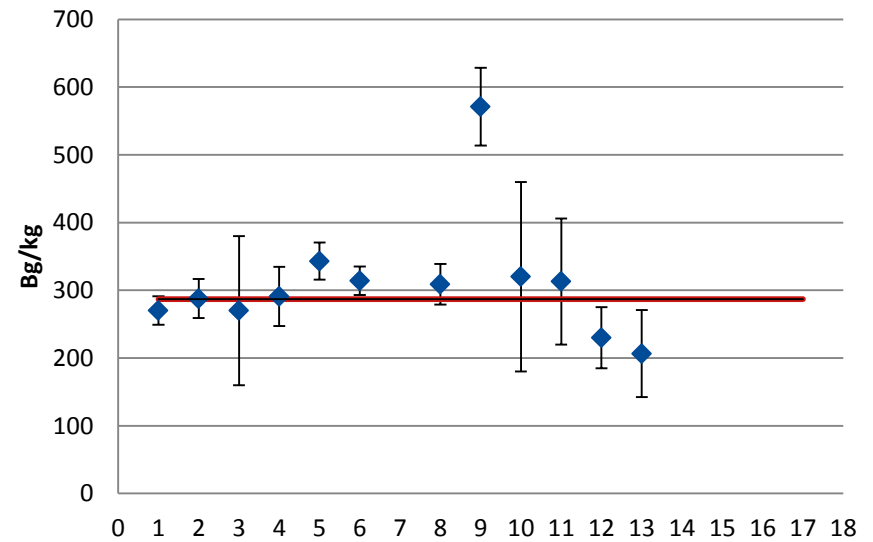


Preliminary results - SEDIMENT

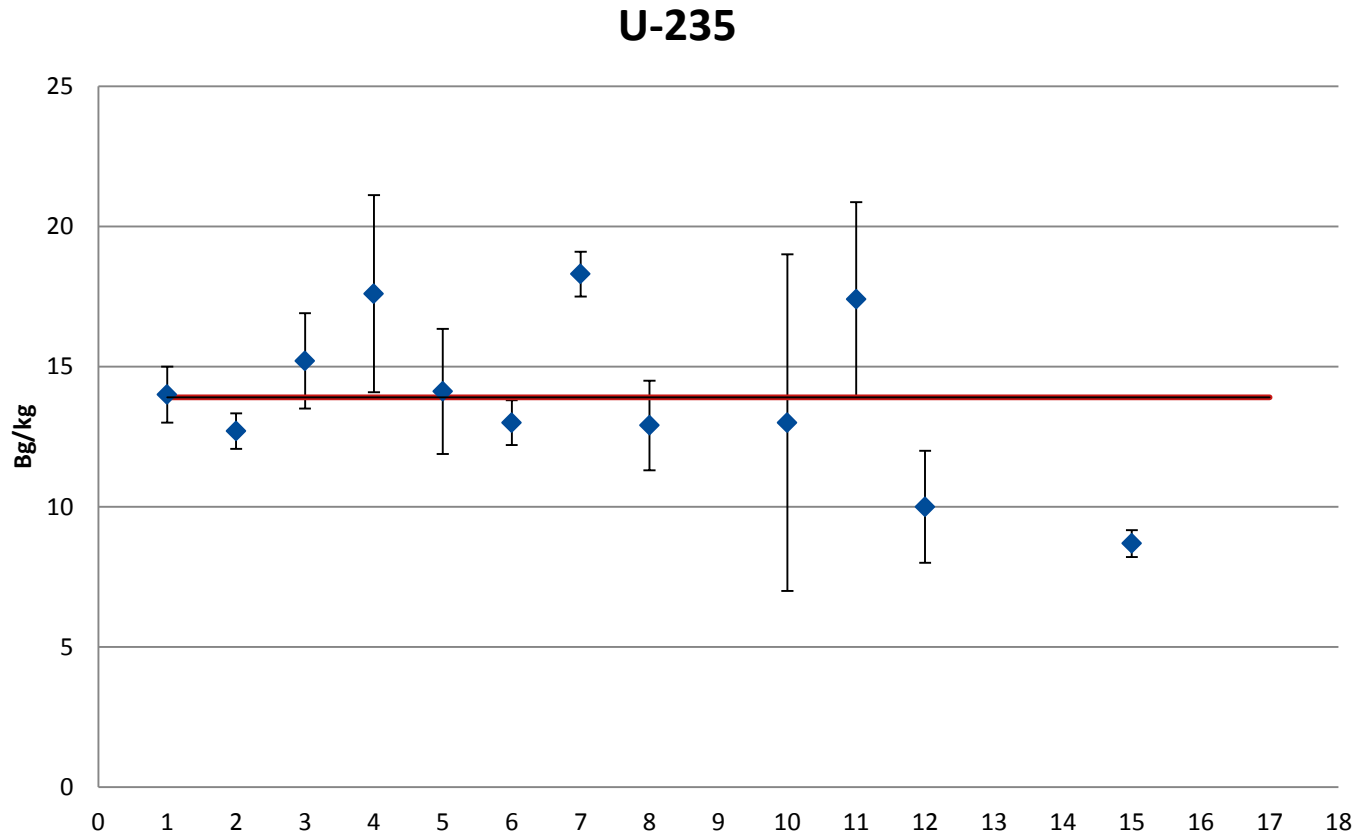
Th-234 (U-238)



Pa-234m (U-238)

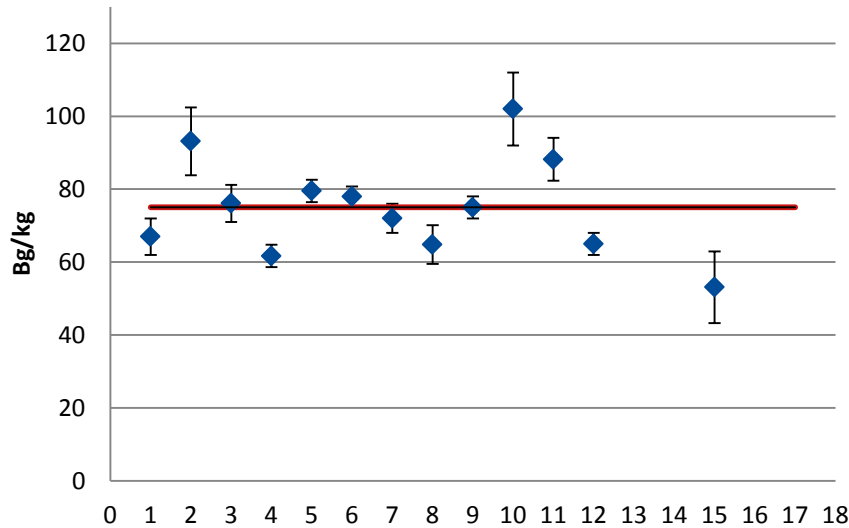


Preliminary results - SEDIMENT

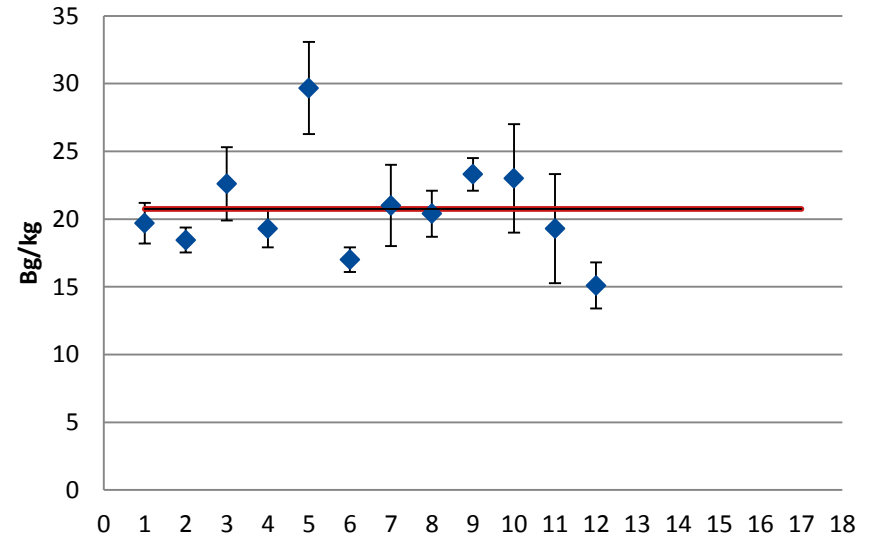


Preliminary results - SEDIMENT

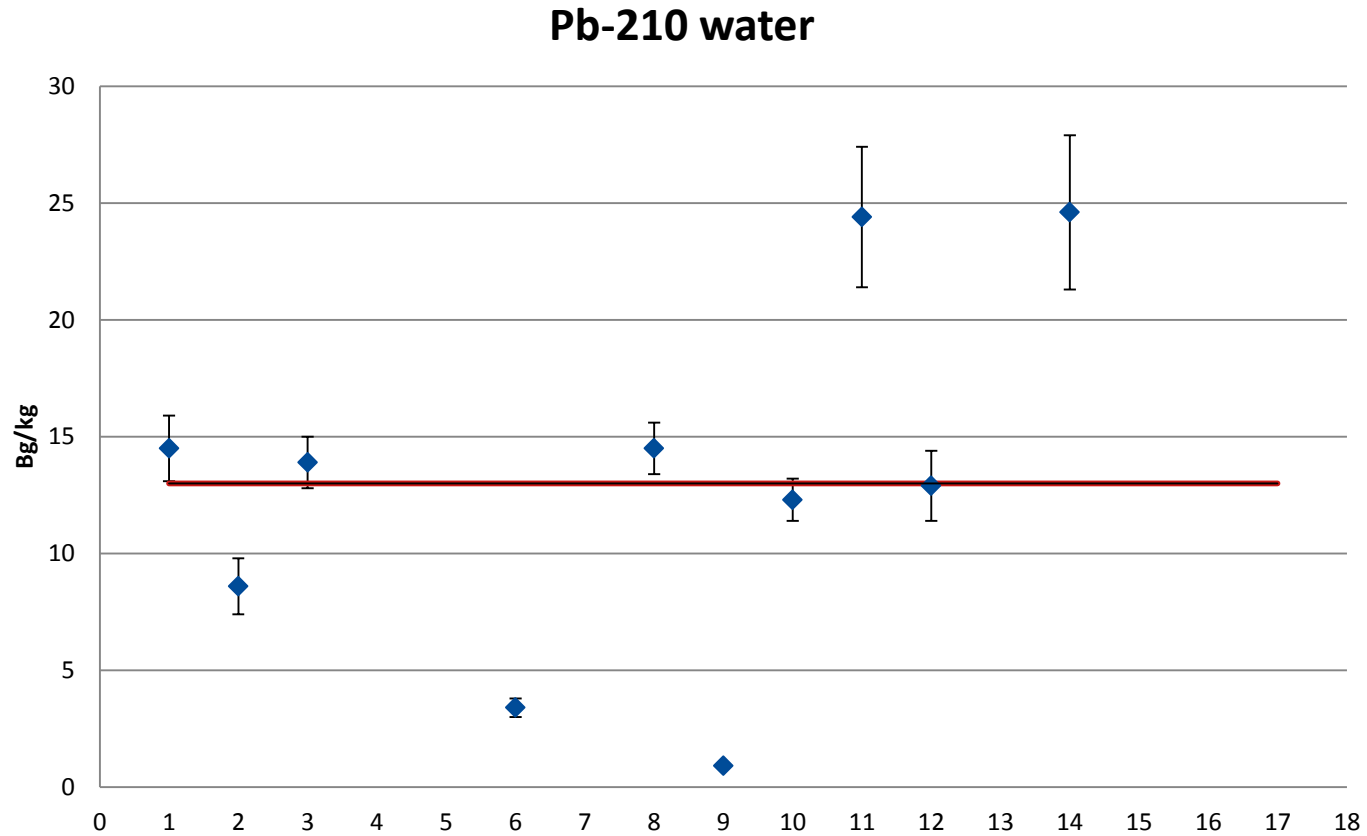
Ra-226



Ra-228

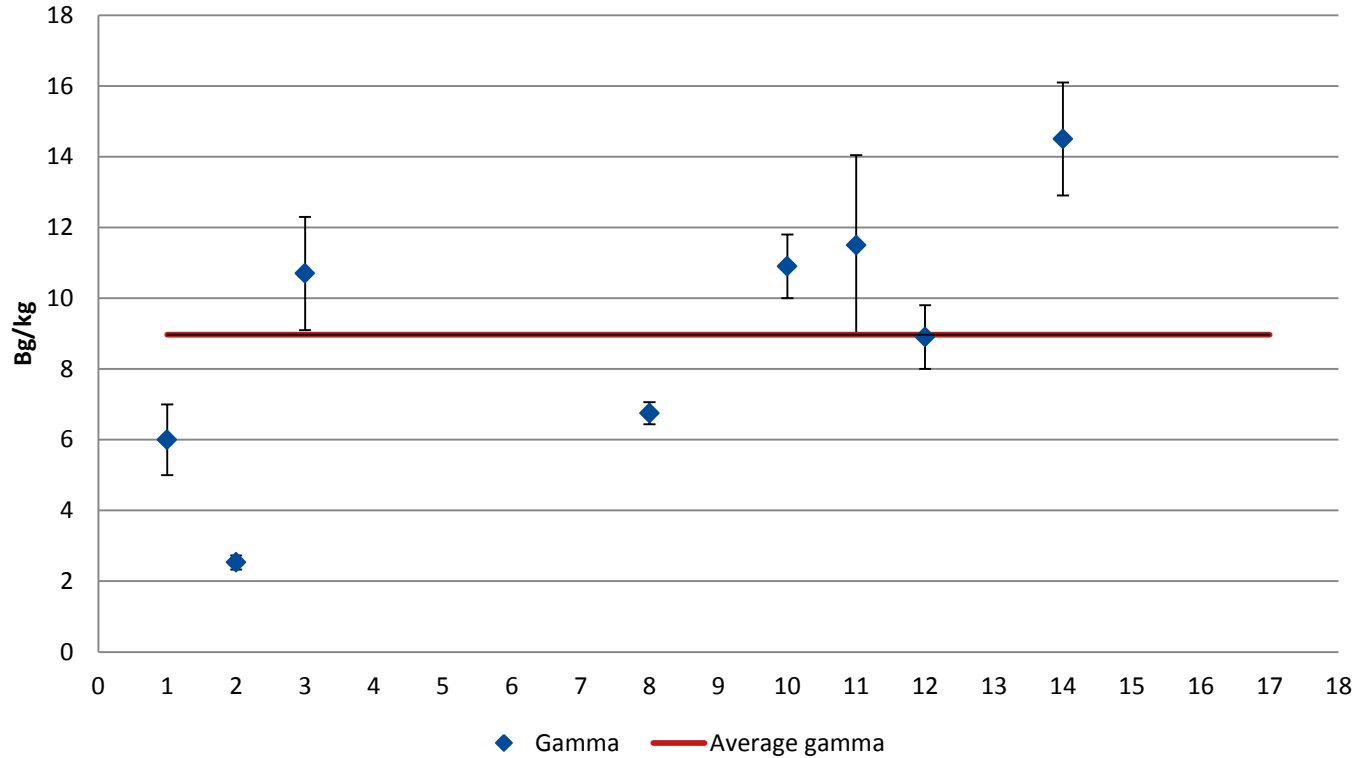


Preliminary results – WATER



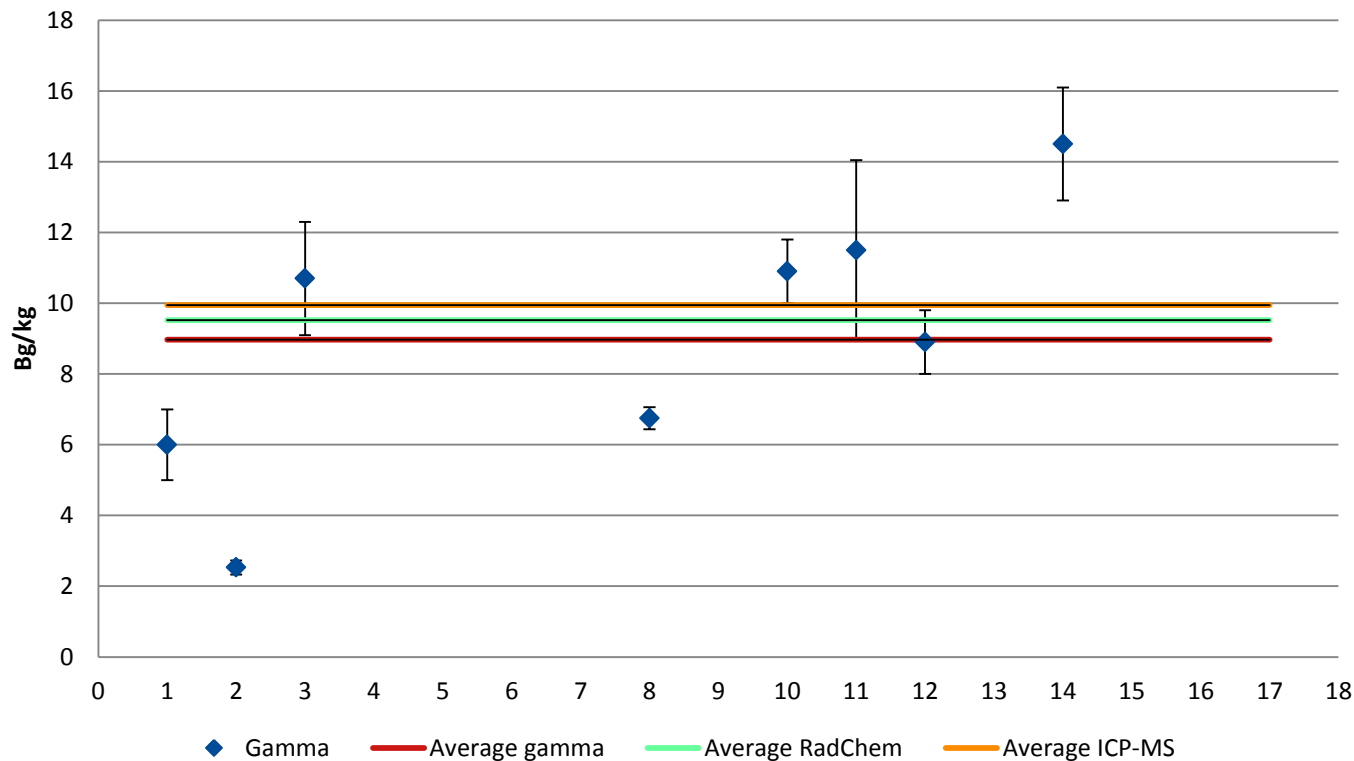
Preliminary results – WATER

Th-234 (U-238) water



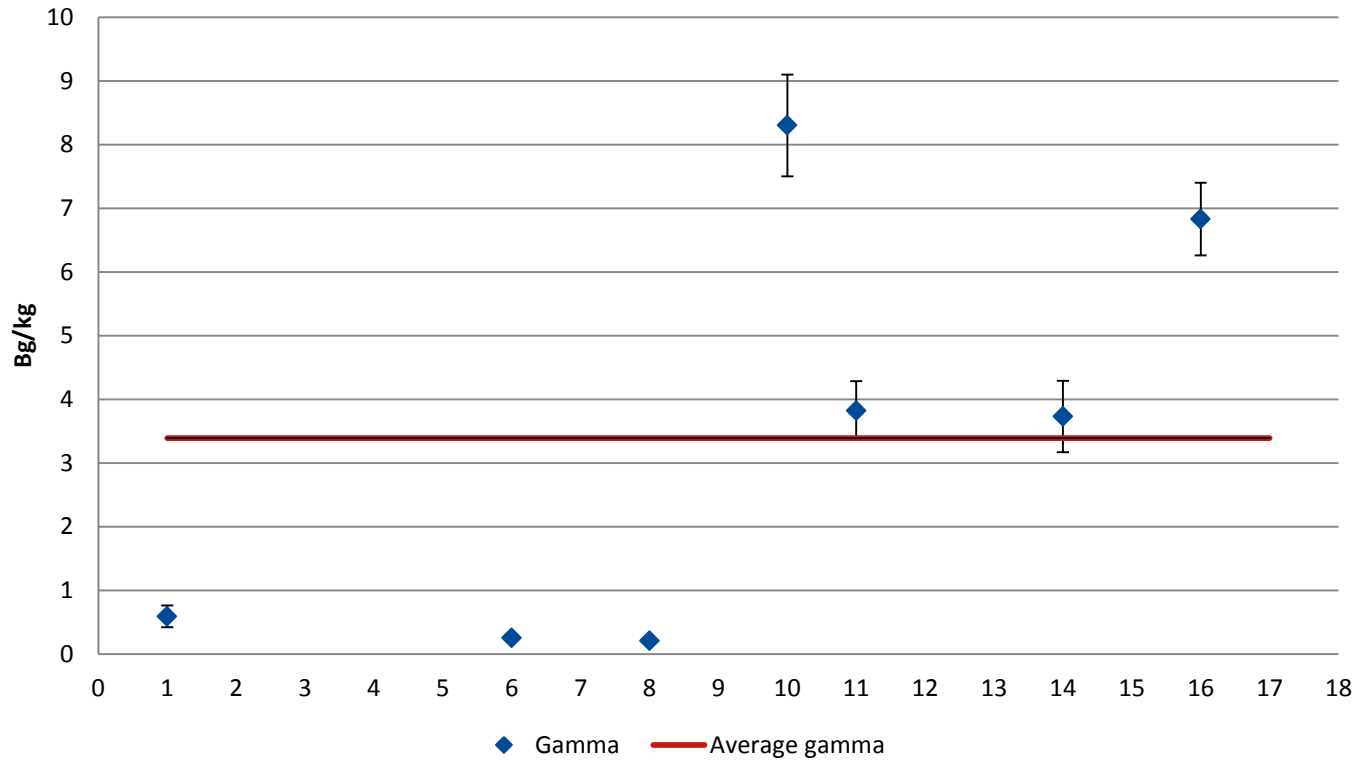
Preliminary results – WATER (gamma and chemistry)

Th-234 (U-238) water

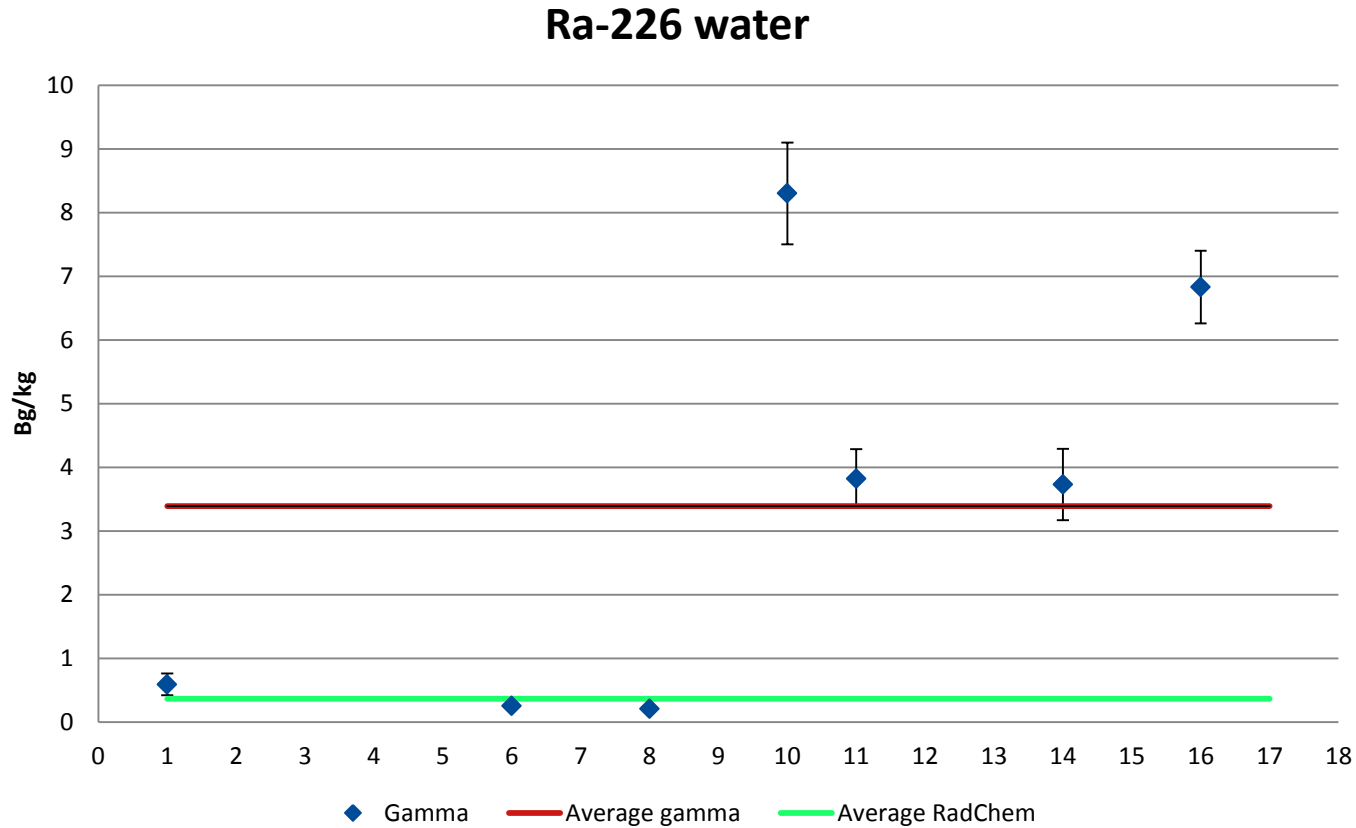


Preliminary results – WATER

Ra-226 water

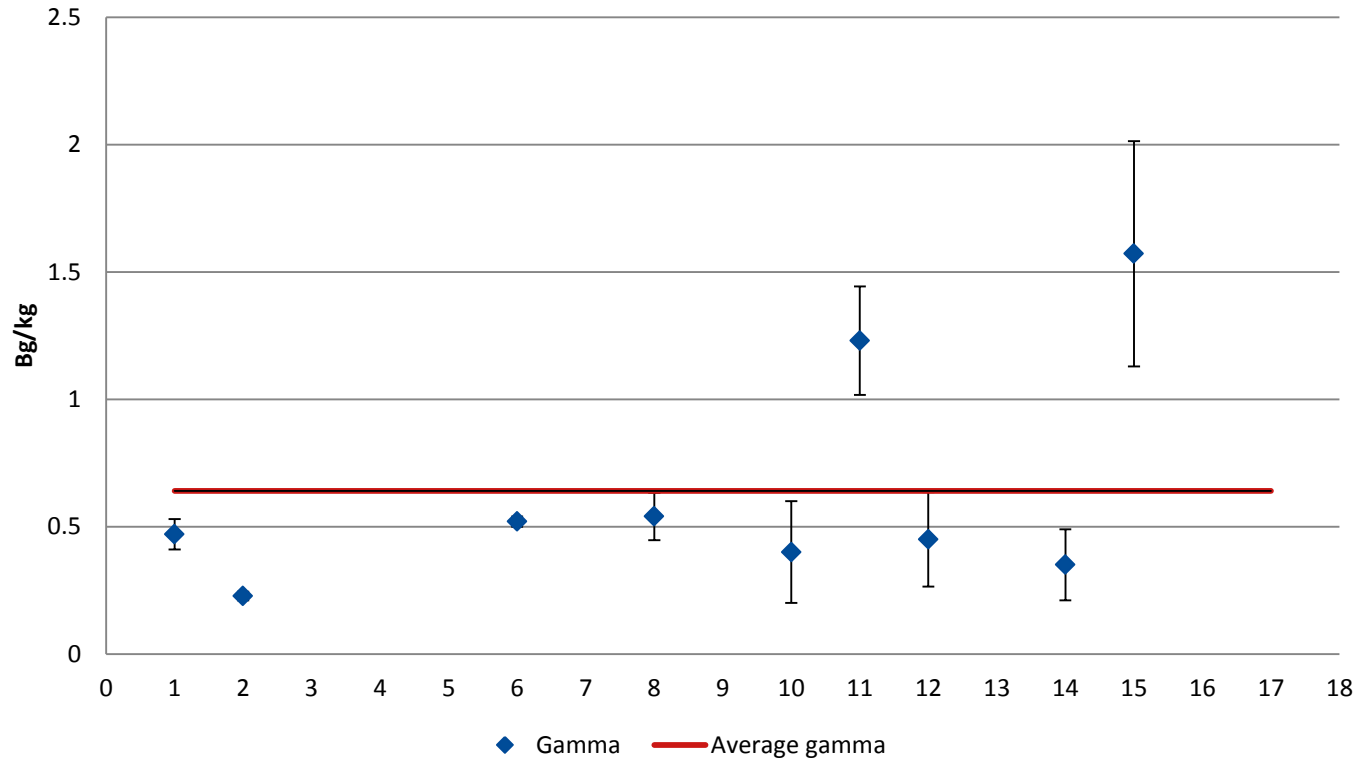


Preliminary results – WATER (gamma and chemistry)



Preliminary results – WATER

U-235 water



Preliminary results – WATER (gamma and chemistry)

U-235 water

