

### ICP-MS

For the intercalibration of different ICP-MS instruments one would need a certain standard distributed between interested institutions. Another option is to take instead samples of metals (relatively easy to process and measure) and plastics (more difficult to prepare for measurements) with the expected U/Th concentrations in the range of some tens of ppt (the samples could be analyzed already before). The idea would be to compare different preparation techniques (applied at different labs) and confirm that all are equivalent (provide the same results).

### Gamma-ray spectrometers

For the cross-check of the measurements performed with gamma-ray spectrometers one can use dedicated extended calibration sources, which contain several isotopes (in a low-density matrix,  $1.15 \text{ g/cm}^3$ ). The selected isotopes have usually simple decay schemes (no complicated cascades) producing gammas in a wide energy range from 26 keV up to 1.33 MeV. Two geometries are available, the so-called “box” (small cylinder, 75 mm diameter, 40 mm height, ~200 g) and the so-called Marinelli with the hole for the detector of 90 mm diameter and 85 mm deep (mass ~1 kg) – see Fig. 1. The absolute activities for both geometries are in the range of kBq for each isotope. In the case of the Marinelli container one has to check in advance that the detector end-cups will fit to the hole. The described sources are available.



Figure 1. Available extended sources for inter-calibration: box (left) and Marinelli (right).

Another option is to use the sources distributed by the IAEA for their annual inter-comparison campaigns organized for interested institutions. IAEA also distributes mixtures of isotopes (typically solutions), where both the composition and the specific activities for all isotopes should be determined.

### $^{222}\text{Rn}$ emanation systems



Figure 2. Dry  $^{222}\text{Rn}$  source enclosed in a CF-40 flange.

To compare different  $^{222}\text{Rn}$  emanation setups one can use sources made by electro-deposition of  $^{226}\text{Rn}$  on stainless steel discs. The sources are enclosed in a small vacuum vessel with a VCR port (Fig. 2), from which one can extract the radon. The available activities are in the range of several tens of mBq.

### Surface assay

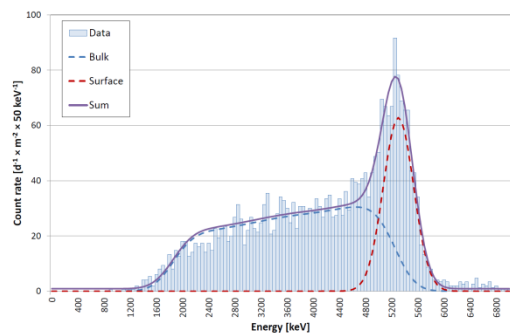


Figure 3. Experimental spectrum obtained for a Ti sample and fitted contributions from the surface and bulk  $^{210}\text{Po}$ .

For the surface contamination with the long-lived  $^{210}\text{Po}$  low-background large surface alpha spectrometers can be applied. No calibration sources exists for this very special instruments. Therefore, one can only use a sample with measurable surface and bulk specific activities and circulate it between laboratories to measure and evaluate the concentrations of  $^{210}\text{Po}$ . To extract both components (surface and bulk) the measurements need to be supported by Monte Carlo simulations to de-convolute form the registered spectrum both components. This is shown in Fig. 3, where to the histogram obtained for a Ti sample a sum of the surface and bulk  $^{210}\text{Po}$  has been fitted.