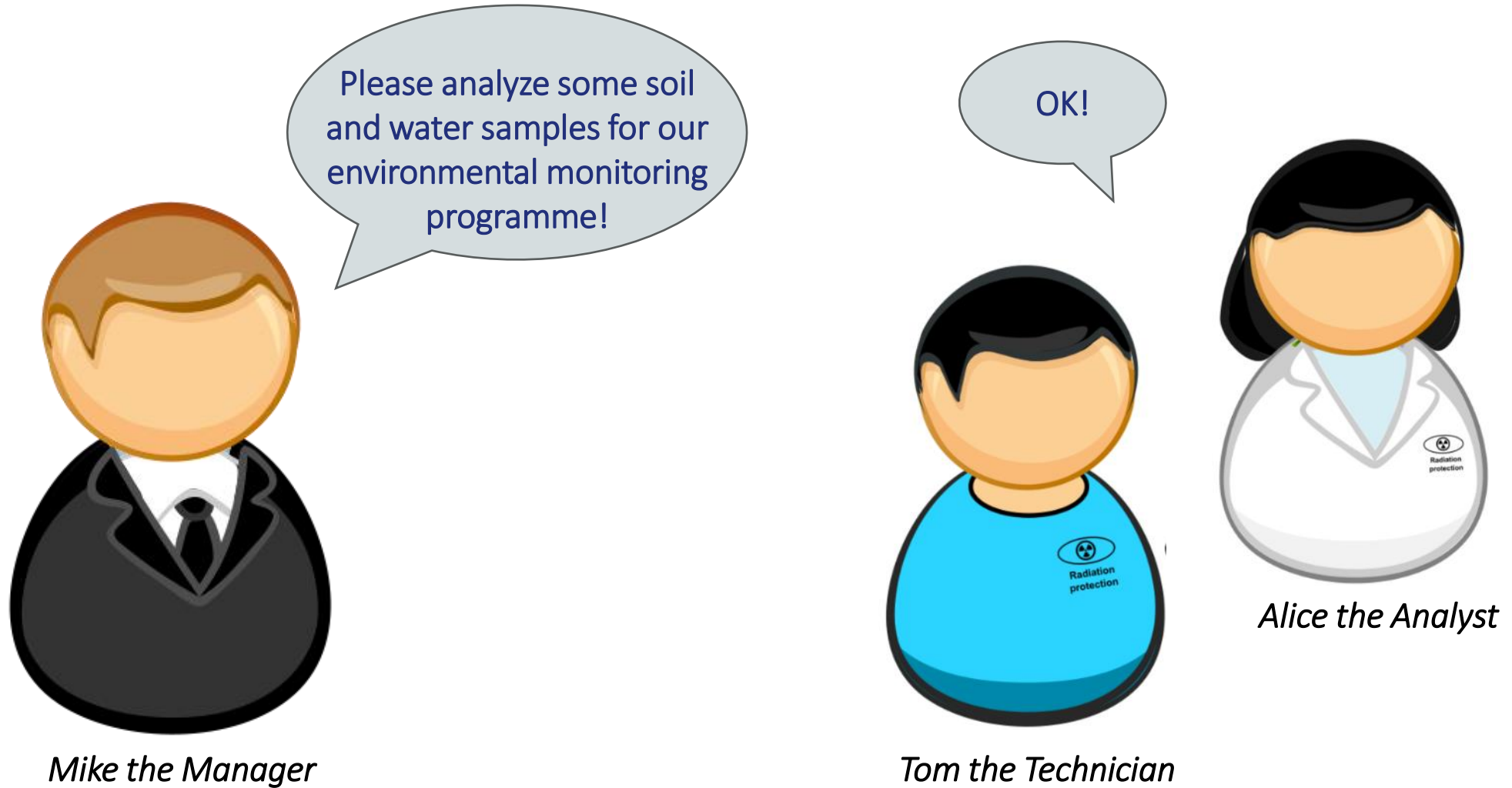




Summary of the measurement process
Introduction to the exercises

Alexander Muring
NKS GammaSkill Training Day, 26.09.2023

The laboratory receives a new request for analysis



Sampling is carried out (optional step)



- Good record keeping is very important if you are carrying out the sampling yourself
- Recommendation: Have defined sampling procedures and standardized forms

Some commonly encountered sample types

- Water
- Soil
- Rocks/minerals
- Plants
- Food products
- Building materials
- Air filters
- Industrial waste products
- ... and many more!



Sample preparation

- Material is processed and prepared into a suitable measurement container
- Typical processing steps for a solid sample material:
 - Removal of foreign objects
 - Drying at “low” temperature
 - Crushing/milling/sieving
 - Homogenization
 - Preparation of all or part of sample into a container
 - Sealing the container



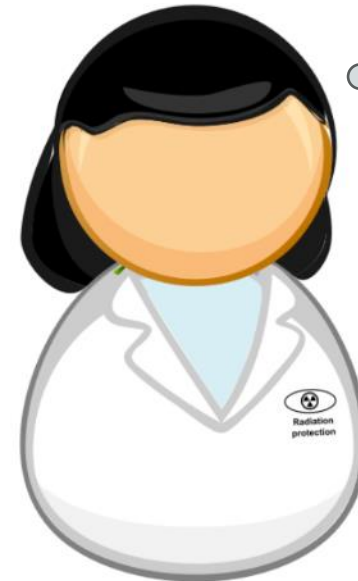
Sample preparation – record keeping

- It's important to keep good records for everything that happens to the sample when it is in the laboratory!
- Some things to record:
 - Date of the sample preparation
 - Unique sample ID code
 - Preparation methodology used / processing steps carried out
 - Weight of final prepared sample
 - Geometry / filling height
 - Equipment that was used
 - Person(s) who did the work

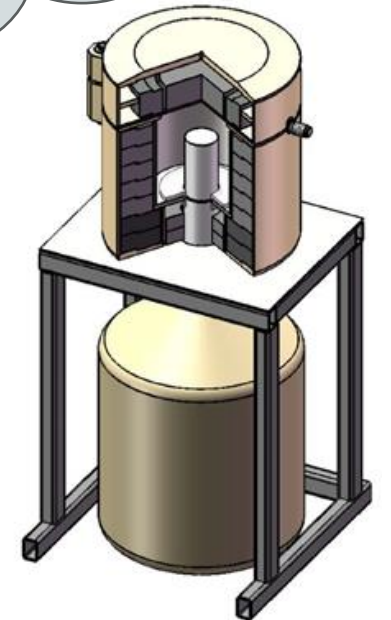


Measuring the sample

- Some considerations for good measurements:
 - Select a detector with valid efficiency calibration for all energies of interest, and acceptable QC results
 - Set a suitable counting time, long enough to get sufficiently low detection limits
 - For longer measurements, it could be a good idea to check the spectrum while the measurement is running, to be sure that you're on the right track

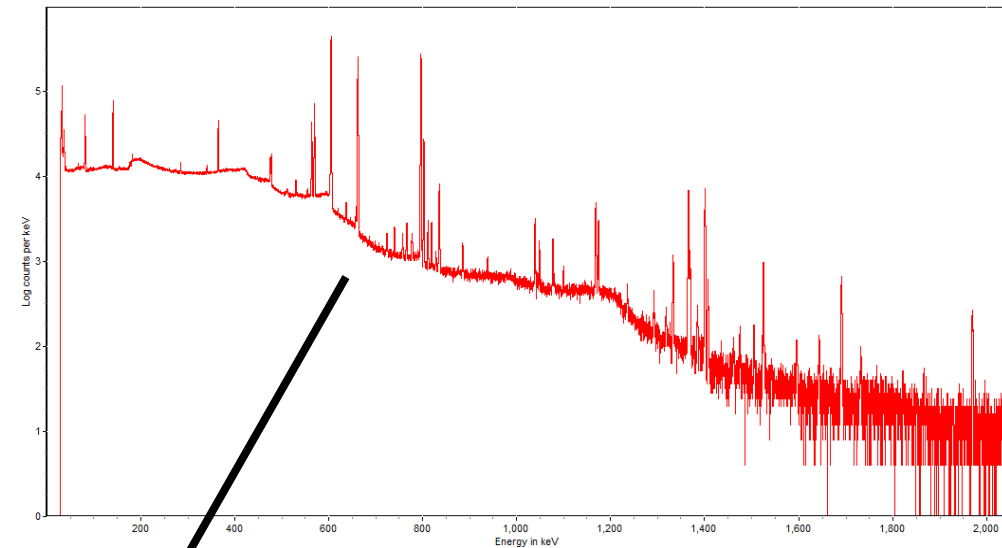


An overnight measurement on detector D2 should yield sufficient detection limits for all radionuclides of interest in this sample.



Spectrum acquisition

- The sample measurement results in a gamma spectrum with several peaks:

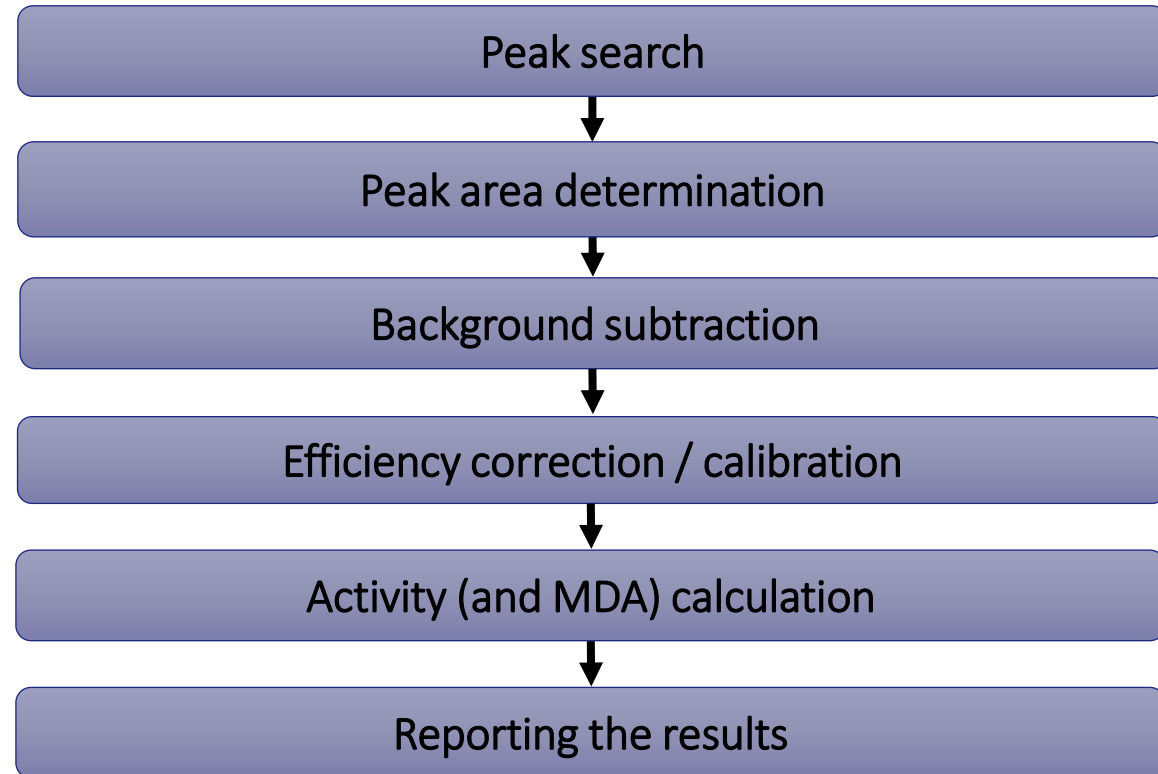
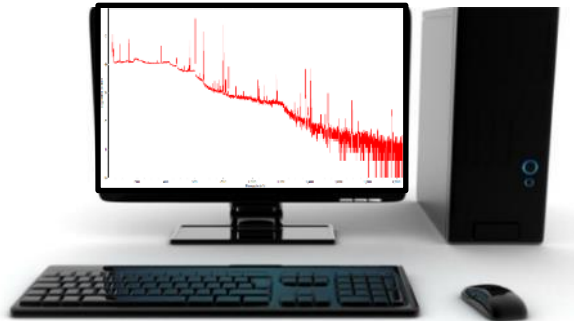


Location of peaks used for nuclide identification
Area of peaks used for activity calculation

Analysis of the gamma spectrum

Spectrum analysis steps

Computer with
spectrum acquisition
and analysis software



Some things to check during the analysis

- Are all full energy peaks of interest correctly defined, and multiple peaks suitably separated in the software?
- Are the activities calculated from different gamma lines of the same radionuclide approximately equal?
 - Do they agree with the “average activity” reported in the software?
- Have all radionuclides of interest been detected?
- Are any of the detected radionuclides “false positives”?
- Are the reported radionuclides and activities reasonable for this sample?


Interpreting and reporting the results

- Results are interpreted, checked and reported in a clear and unambiguous format to the person who requested the analysis



Thanks a lot for the results. Great work!




Gamma-Ray Spectrometry Test Report
101 / 81 / -

Testing laboratory	Counterpart
Terrestrial Environment Laboratory IAEA Laboratories A-2444 Seibersdorf Austria E-mail: NAEL-TEL.Contact-Point@iaea.org Tel.: +43 1 2600 28234	Mr. Felix Wanjala Senior National Liaison Assistant Kenya Nuclear Electricity Board P. O Box 62374-00100 Nairobi Kenya E-mail: felixwanjala@yahoo.com

Req-ID / Result-ID / rev. no	101 / 81 / -
Date of report issue	2018-10-12
Project ID and description	2018-KenyaSamples (Soil and Rock samples)

Date(s) of sample reception	2018-08-20
Date(s) of testing	2018-09-20 to 2018-10-10
Number of test items	4

Method description

Samples have been analysed by gamma-ray spectrometry at TEL using HPGe detectors. Unless otherwise specified, analysis has been carried out using the laboratory's standard procedures according to the active QMS. For measurement of solid materials by gamma-ray spectrometry, the laboratory follows guidelines specified in ISO 18589-3:2015 [1]. More detailed information can be provided upon request.

Test results

TEL ID #	Reference Date	Sample type / external ID	Nuclide	Activity (Bq/kg d.w.) ¹	Accr. (Y/N) ²
444/1	2018-08-20	Soil "M5"	K-40	243 ± 20	N/A
			Pb-210	23.5 ± 3.5	N/A
			Ra-226	16.7 ± 1.4	N/A
			Th-228	23.8 ± 2.0	N/A
			Ra-228	23.5 ± 2.6	N/A
445/1	2018-08-20	Soil "M18"	U-238	20.9 ± 3.4	N/A
			K-40	547 ± 42	N/A
			Pb-210	36.4 ± 4.9	N/A
			Ra-226	25.6 ± 2.1	N/A
			Th-228	46.9 ± 3.6	N/A
446/1	2018-08-20	Soil "OR10"	Ra-228	46.7 ± 5.0	N/A
			U-238	31.1 ± 4.8	N/A
			K-40	154 ± 14	N/A
			Pb-210	14.1 ± 2.7	N/A
			Ra-226	6.6 ± 0.8	N/A
			Th-228	9.1 ± 0.9	N/A
			Ra-228	9.6 ± 1.6	N/A
			U-238	8.7 ± 2.4	N/A

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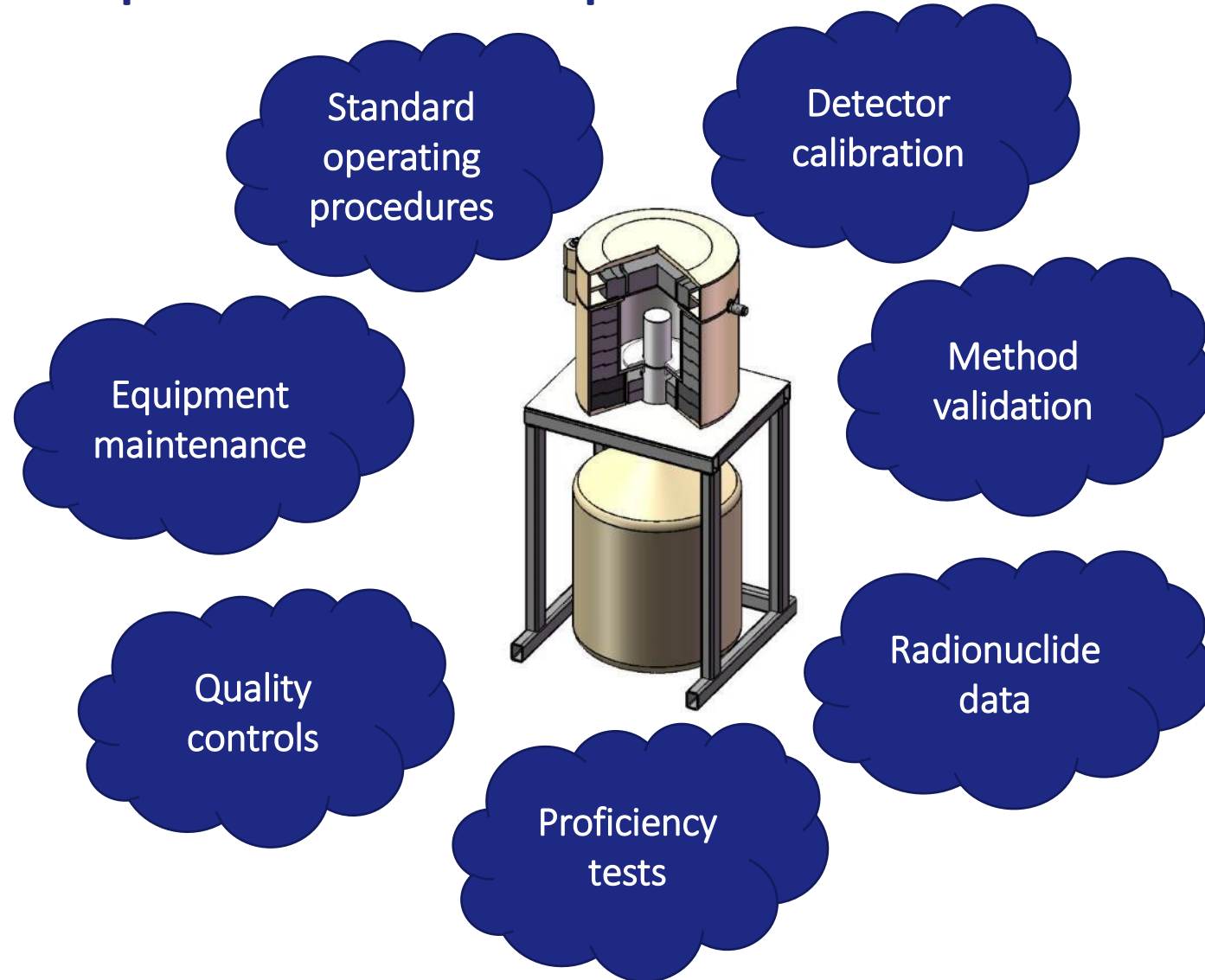
Tracking all of the information – use of LIMS

- Having a **Laboratory Information Management System (LIMS)** can help you with recording and tracking all the necessary information in the laboratory



Especially relevant if you are working in an accredited lab.

Some other pieces of the puzzle...



Time for exercises!

- Link to the exercises (see also Gammawiki):
<https://forms.gle/5ubLmQQKCZTxkdcs7>
- There are 6 different exercises in total
- Exercise responses are **anonymous**
- Using a computer for the exercises is recommended
- You are highly encouraged to work together



Scan me to
access the
exercises!



Thank you for the attention!

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