(How to Ensure) Credibility of Field Measurement Results

Barbara Nadalut
Gamma Spectrometry Specialist
Terrestrial Environmental Radiochemistry Laboratory (TERC), IAEA
B.Nadalut@iaea.org

Supported by work prepared by Alexander Mauring (former IAEA Gamma Spectrometry Specialist)

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Scope and Learning outcomes

- **Scope:**

  Why shall the Field Activities **deliver credible results?**
  How do a tailored **QA/QC** program **and key factors contribute?**

- **Learning outcomes:**

  With this introductory module, the trainees will understand:

- the **importance of ensuring credible results** (reliable and reproducible)
- the **key contributing factors** and related requirements to consider:

1. **Quality approach** for the Field Activities
2. **Training of staff** operating in the field (also referred to as ”operators”)

WHICH International Standards are the most appropriate for Field Activities ?

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General requirements for the competence of testing and calibration laboratories

Exigences générales concernant la compétence des laboratoires d'étalonnages et d'essais

Contents

Page

Foreword v
Introduction vi
1 Scope 1
2 Normative references 1
3 Terms and definitions 1
4 General requirements 3
4.1 Impartiality 3
4.2 Confidentiality 3
5 Structural requirements 4
6 Resource requirements 5
6.1 General 5
6.2 Personnel 5
6.3 Facilities and environmental conditions 6
6.4 Equipment 6
6.5 Metrological traceability 8
6.6 Externally provided products and services 8
7 Process requirements 9
7.1 Review of requests, tenders and contracts 9
7.2 Selection, verification and validation of methods 10
7.2.1 Selection and verification of methods 10
7.2.2 Validation of methods 11
7.3 Sampling 12
7.4 Handling of test or calibration items 12
7.5 Technical records 13
7.6 Evaluation of measurement uncertainty 13
7.7 Ensuring the validity of results 13
7.8 Reporting of results 14
7.8.1 General 14
7.8.2 Common requirements for reports (test, calibration or sampling) 15
7.8.3 Specific requirements for test reports 15
7.8.4 Specific requirements for calibration certificates 16
7.8.5 Reporting sampling – specific requirements 16
7.8.6 Reporting statements of conformity 17
7.8.7 Reporting opinions and interpretations 17
7.8.8 Amendments to reports 17
7.9 Complaints 17
7.10 Nonconforming work 18
7.11 Control of data and information management 19

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General Requirements

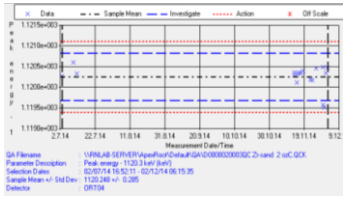
- *Impartiality*
- *Confidentiality*

Resource Requirements

- *Personnel*
- ***Facilities and Environmental conditions***
- ***Equipment***
- **Metrological traceability**
- …

Process Requirements

- **Selection, Verification and validation of methods**
- *Sampling*
- *Handling of test (…) items*
- *Technical Records*
- ***Evaluation of measurement uncertainty***
- ***Ensuring the validity of results***
- Reporting of results
- …



Management System Requirements

- **Control of (…) documents**
- **Control of records**
- Risks and Opportunities
- Improvement
- Corrective Actions
- Internal Audits
- Management reviews

Applicability:

- Chain of custody
- **QA/QC Field Operations**
- *Training*

How do the operators:

- **demonstrate** that all these steps have been performed while at “headquarters”
- **provide evidence** that they followed these requirements?

Through the records that are produced in each process

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What can be done ?

- **Keep good records!**

"If you don't write it down, it didn't happen."

  - Detector logbooks
  - QA/QC records
  - Calibration records
  - Sample tracking
  - Preparation forms
  - Reports of analysis
  - … ……..

How do the operators:

- **demonstrate** that all these steps have been performed while at "headquarters"
- provide evidence that they followed these requirements?

Through the records that are produced in each process

ISO/IEC17025 Requirements

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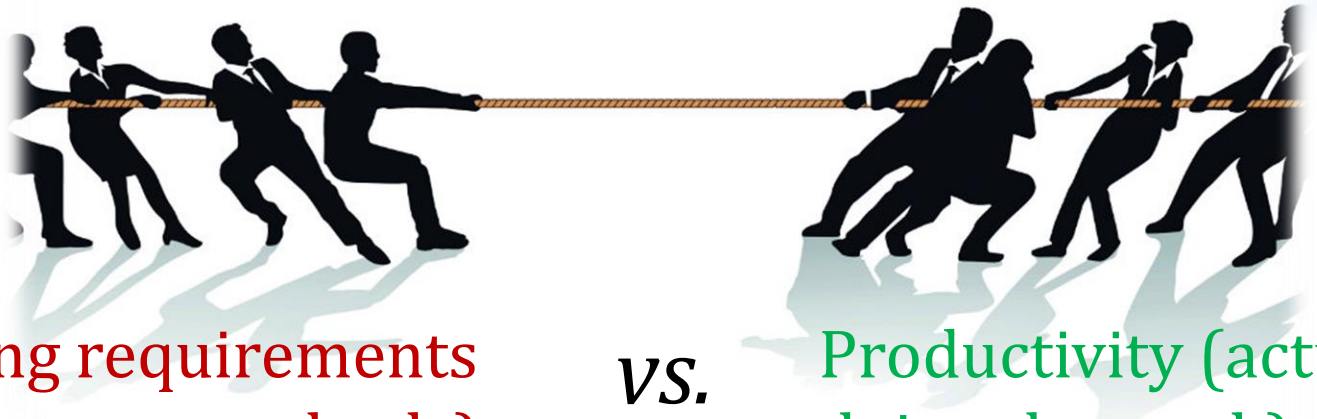
Yes, BUT.....



Following requirements (procedures, standards) *vs.* Productivity (actually doing the work)

Quantity *is not* ***Quality*** ***!***

Documentation must be simple and <u>functional</u>

Especially when working in the field !

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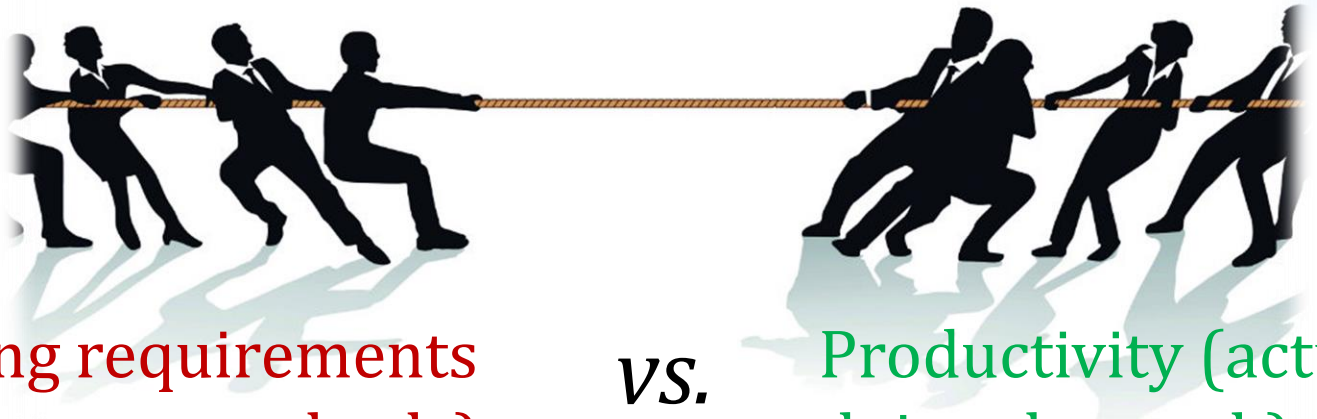
Yes, BUT.....



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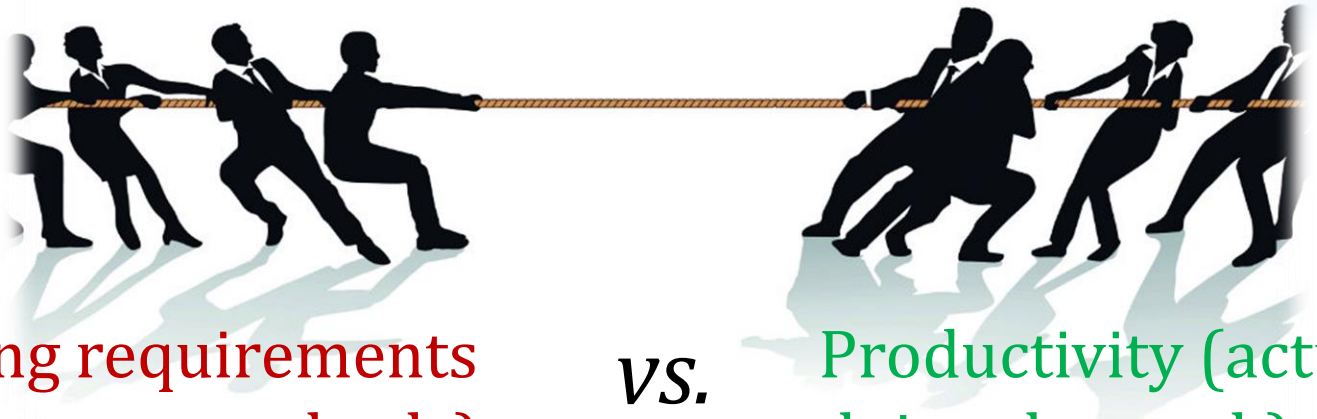

Following requirements (procedures, standards) *vs.* Productivity (actually doing the work)

Quantity *is not* ***Quality*** ***!***

Documentation must be simple and <u>functional</u>

Needs to be USEFUL !

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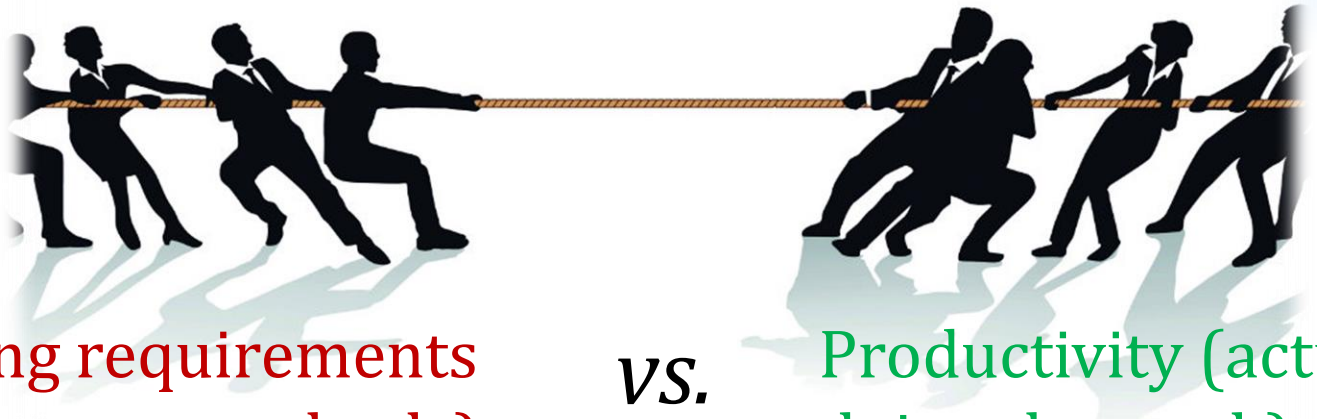
Yes, BUT.....



Following requirements (procedures, standards) *vs.* Productivity (actually doing the work)

Quantity *is not* ***Quality*** ***!***

Documentation must be simple and <u>functional</u>

A procedure is not a document but it is a mechanism;
i.e. a series of steps of doing something in a certain way

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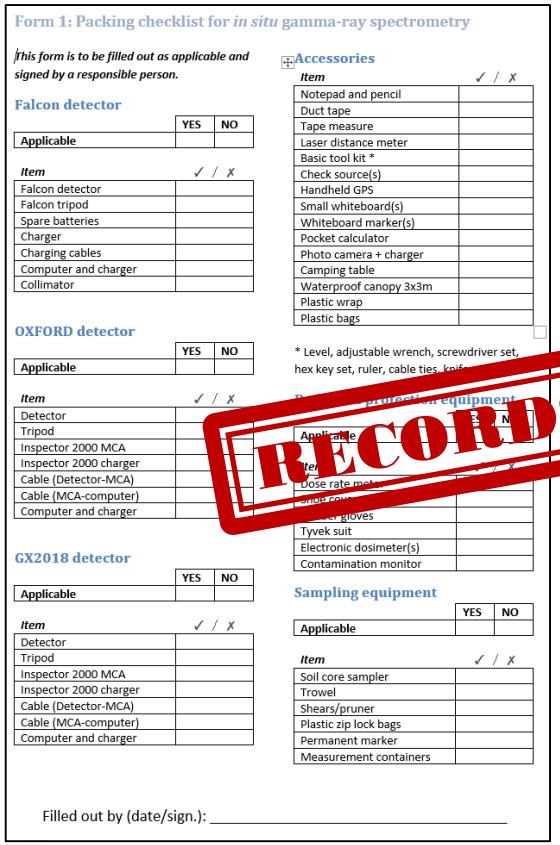
What can be done ?

"Write what you do and keep doing what you wrote"

Procedures should be there to **assist** you, not to **hinder** you

- Turn *"Bla-Bla-Bla"* procedure into a **Form**
- Complete the form, have it **signed with date**
- **Keep it as a Record** (print **if**/as necessary)

~~"The form must include the name of Proposing Unity, the organizing company (proposed Company), the title of the course, participant's name, the days and the place where the course will be held (Subject and purpose of the contract), the course's cost without VAT (total amount of the contract); it must also be stamped and signed by the Head of the participants Unit (fill in the proposing Unit box). The remaining part of the form will be filled in by APA"~~



Form 1: Packing checklist for *in situ* gamma-ray spectrometry

This form is to be filled out as applicable and signed by a responsible person.

Falcon detector

	YES	NO
Applicable		

Item	✓ / ✗
Falcon detector	
Falcon tripod	
Spare batteries	
Charger	
Charging cables	
Computer and charger	
Collimator	

OXFORD detector

	YES	NO
Applicable		

Item	✓ / ✗
Detector	
Tripod	
Inspector 2000 MCA	
Inspector 2000 charger	
Cable (Detector-MCA)	
Cable (MCA-computer)	
Computer and charger	

GX2018 detector

	YES	NO
Applicable		

Item	✓ / ✗
Detector	
Tripod	
Inspector 2000 MCA	
Inspector 2000 charger	
Cable (Detector-MCA)	
Cable (MCA-computer)	
Computer and charger	

Accessories

Item	✓ / ✗
Notepad and pencil	
Duct tape	
Tape measure	
Laser distance meter	
Basic tool kit *	
Check source(s)	
Handheld GPS	
Small whiteboard(s)	
Whiteboard marker(s)	
Pocket calculator	
Photo camera + charger	
Camping table	
Waterproof canopy 3x3m	
Plastic wrap	
Plastic bags	

* Level, adjustable wrench, screwdriver set, hex key set, ruler, cable ties, knife

Protection equipment

	YES	NO
Applicable		

Item	✓ / ✗
Dose rate meter	
Shoe covers	
Latex gloves	
Tyvek suit	
Electronic dosimeter(s)	
Contamination monitor	

Sampling equipment

	YES	NO
Applicable		

Item	✓ / ✗
Soil core sampler	
Trowel	
Shears/pruner	
Plastic zip lock bags	
Permanent marker	
Measurement containers	

Filled out by (date/sign.): _____

RECORDS

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What can be done ?

"Write what you do and keep doing what you wrote"

Procedures should be there to **assist** you, not to **hinder** you

- Turn *"Bla-Bla-Bla"* procedure into **pictures:**
  instead of describing, just "**show**"

Example: "Falcon 5000 setup with frame and tripod"

Figure 1: Tripod and frame

Figure 2: FALCON with frame mounted

Figure 3 FALCON mounted on tripod, without (left) and with (right) plastic protective cover to shield connectors.

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What can be done ?

"Write what you do and keep doing what you wrote"

Procedures should be there to **assist** you, not to **hinder** you

- Turn *"Bla-Bla-Bla"* procedure into **pictures:**
  instead of describing, just "**show**"

Example: "Falcon 5000 batteries"

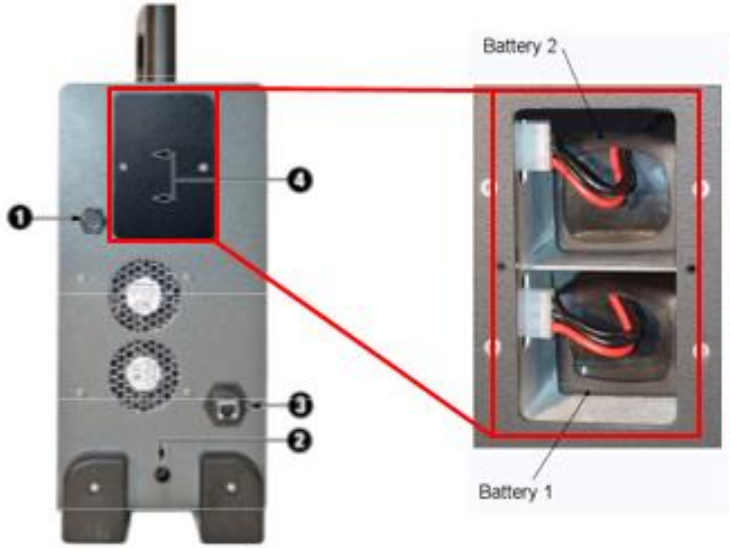

Figure 2 Back of the FALCON detector with power and ethernet connections, battery panel and power push button

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Quality Assurance and Quality Control(QAQC)

- **Quality assurance** minimizes the risk of unacceptable results
- **Quality control** detects unacceptable results that still occur

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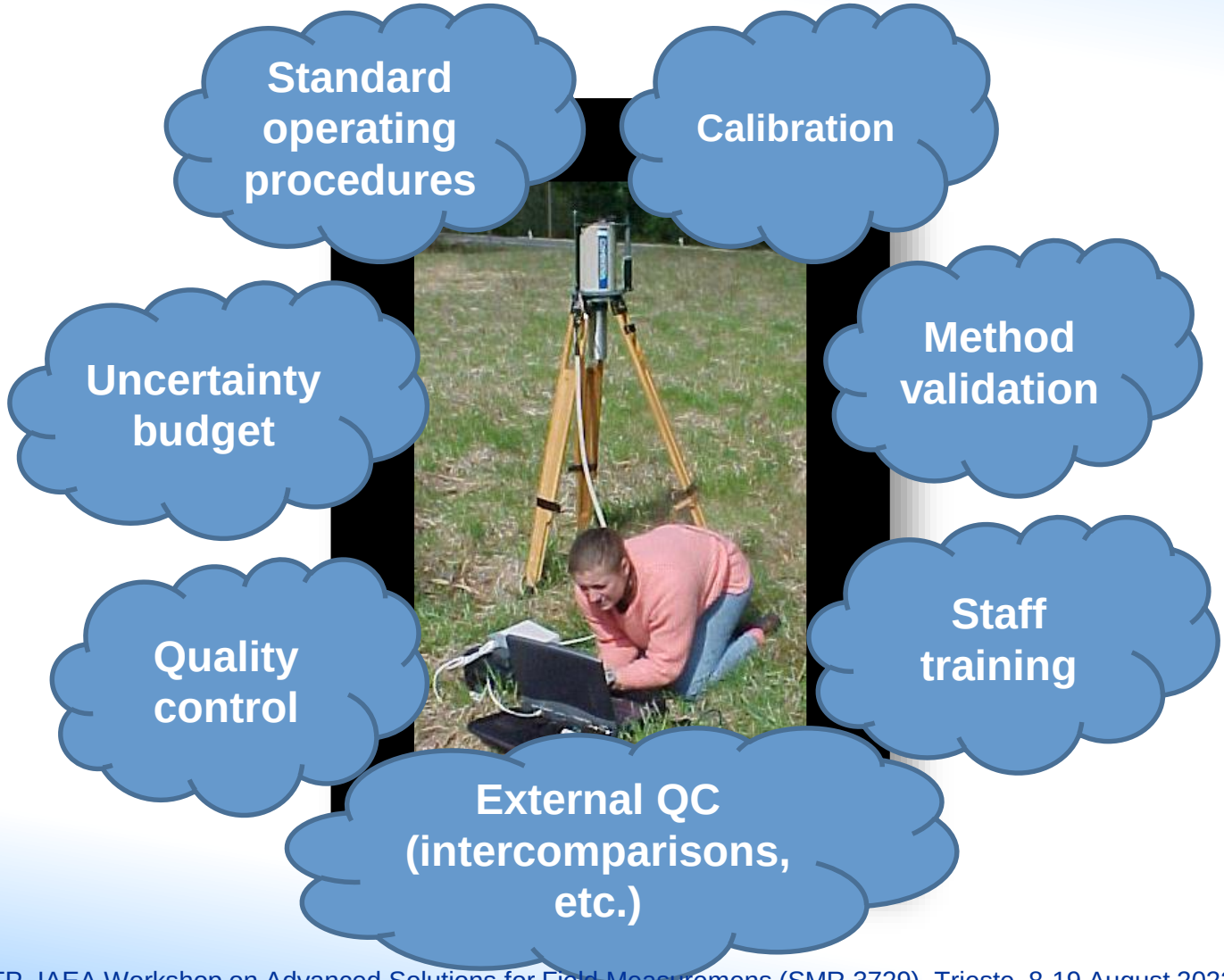
The pieces of the QAQC puzzle



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WHY?

Process Improvement

(Identify/address risks and opportunities)

Is a Management System Requirement

Standard operating procedures

Calibration

Uncertainty budget

Method validation

Quality control

Staff training

External QC (intercomparisons, etc.)

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HOW?

Awareness of operators' role and responsibilities

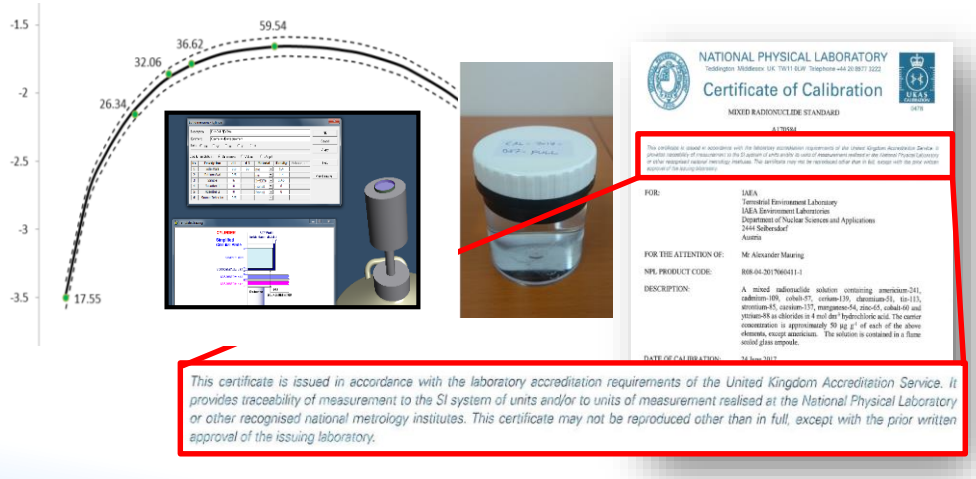
Before each Field mission:

- **Quality Assurance** (QA) Programme for Field Equipment

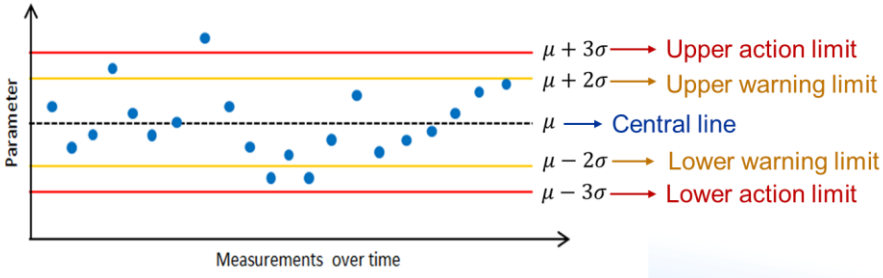
[ISO17025-7.7] The laboratory shall have a procedure for monitoring the validity of results. This monitoring shall be planned and reviewed

Acceptance of new Equipment:
Measurements required

Equipment Calibration:
Metrological traceability ensured



Equipment Functional Checks:
Measurements are repeated regularly (Control charts)



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HOW?

Awareness of operators' role and responsibilities

Before each Field mission:

- **Valid methods** implemented and applied

Now WHAT ELSE?

Gamma spec. method

- ☑ *Methodology selected*
- ☑ *Procedures written*
- ☑ *Method implemented and verified*
- ☑ *Performance parameters calculated*
- ☑ *Calibration done w/ traceable standards*
- ☑ *Software & data set up*
- ☑ *Staff trained*
- ☑ …

→ **Monitoring the performance over time by quality control of equipment**

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HOW?

Awareness of operators' role and responsibilities

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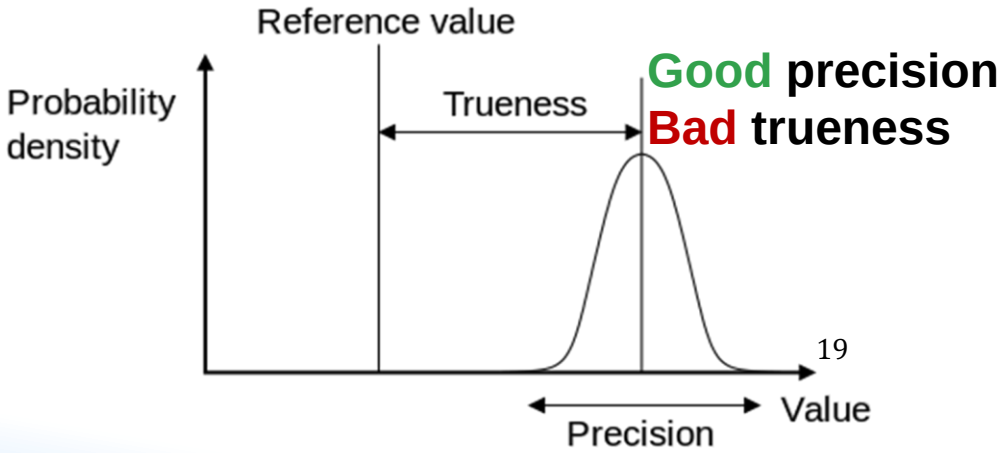
- ☑ …

→ **Monitoring the performance over time by quality control of equipment**

Now WHAT ELSE?

- **External QC** (QA) for Field Equipment

Be careful! If you have a systematic error in your method (for example from using incorrect calibration), this may not always be detected in your QC charts



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HOW?

Awareness of operators' role and responsibilities

Before each Field mission:

- **Contamination Prevention** Protocols (Equipment):

During each Field mission:

- **Contamination Control** Protocols (Field environment and equipment):

[ISO17025-6.3] For the purpose of ensuring that environmental conditions do not adversely affect the validity of results (i.e. cross contamination of samples, increased background,…).

- Use of PPE
- Separation between "dirty" and "clean" areas,"people" and instruments

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HOW?

Awareness of operators' role and responsibilities

During each Field mission:

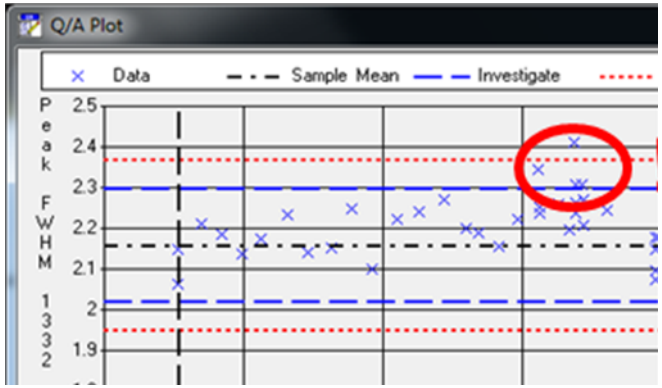
- **Quality Control (QC)** of Field Equipment:

[ISO17025-6.4] For the purpose of ensuring that the Lab equipment requirements are met

Equipment daily functional checks

Parameter	Monitored through…
Gain stability	Peak position
Energy resolution	Peak FWHM
Detector efficiency	Decay corrected peak cps

Equipment verification and adjustments



Example of "out of control" measurements

Nuclide	Peak energy (keV)	Typical centroid position (ch)	Acceptable range (ch)	Typical FWHM (keV)	Acceptable range (keV)
Am-241	59.5	239	237-241	1.0	FWHM < 1.2
Cs-137	661.7	2647	2644-2650	1.4	FWHM < 1.7
Co-60	1332.5	5330	5327-5333	1.9	FWHM < 2.2

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HOW?

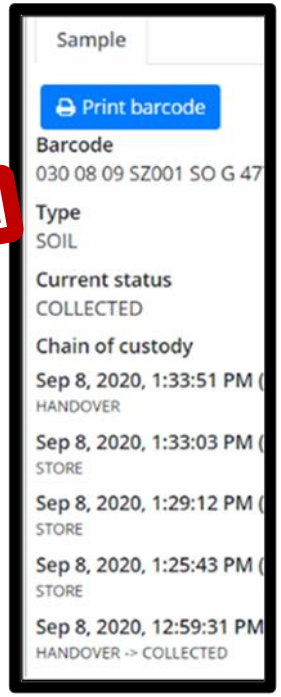
Awareness of operators' role and responsibilities

During each Field mission:

- **"Chain of Custody"** of samples (when applicable) and sample data

[ISO17025-7.3] For the purpose of identifying and protecting the integrity of the sample (avoid deterioration, contamination, loss or damage to the sample during handling, transporting, storing).

[ISO17025-7.11] For the purpose of ensuring the integrity of the data and information.



Thank you !

Any questions?