



# 5 Years' Systematic Review of ISO Standards

- Standard 10703
- Standard 9696

**WG04 Members: Mr. Calmet (Chairman/Convenor of WG14-FR), Mr. Capra (IT), Mr. Hawes (AU), Mr. Hollensteiner (AT), , Mr. Kassai (SK), Mr. Krajewski (PL), Mr. Simons (UK), Mr Kwakman (H).**

**Mr Diakonoff (Afnor secretary)**

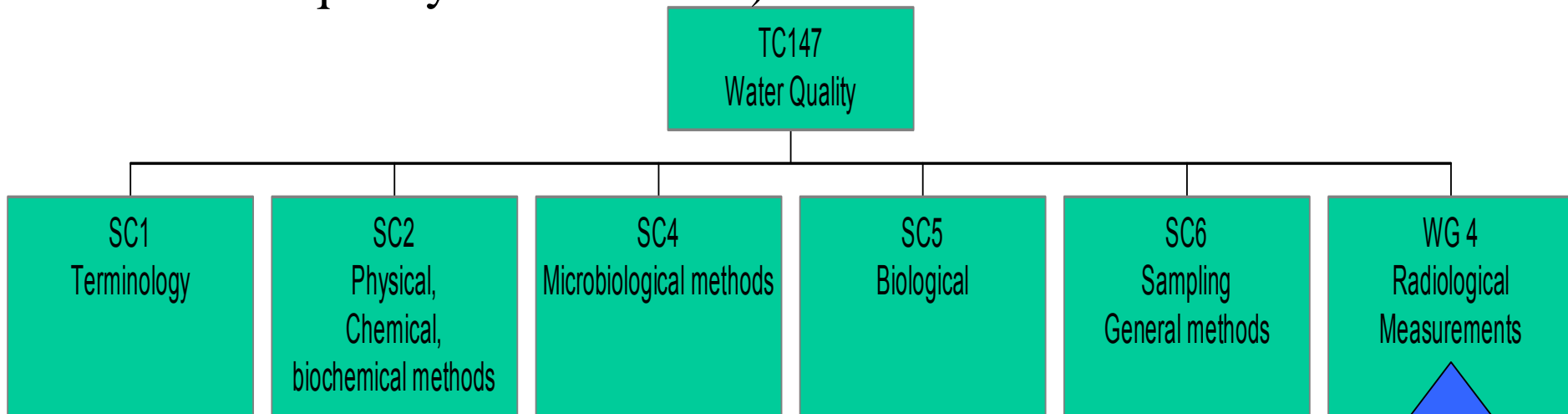
# **SUMMARY**

---

- 1. Scope of ISO/TC 147 on WATER QUALITY**
- 2. Development of ISO Standards**
- 3. Review of ISO 10703**
- 4. Review of ISO 9696**
- 5. EC Directive on Drinking Water Quality**

# ISO/TC 147 on WATER QUALITY

**Scope:** Standardization in the field of water quality, including definition of terms, sampling of water, measurement and reporting of water characteristics (limits of acceptability for water quality are excluded ).



**Participating countries: 32**

**Observer countries: 44**

**Total number of ISO published standards: 212**

# Stages of the development of ISO Standards



# ISO Standards on Radioactivity Measurements

---



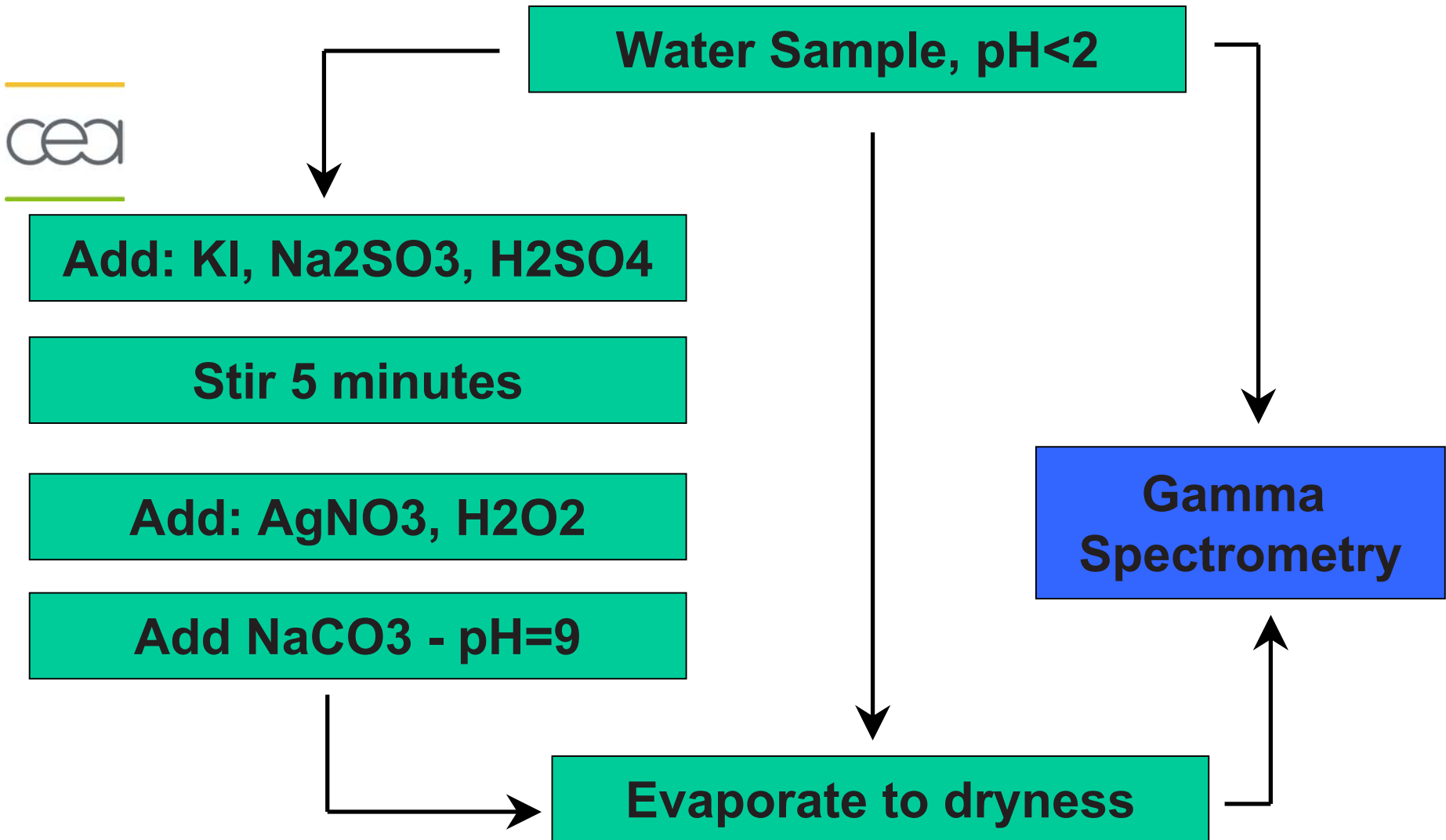
- ISO 5667-3 Sampling — Part 3: Guidance on the preservation and handling of samples — Table 4 (ISO TC 147/SC 6)
- **ISO 9696 (1997) Measurement of gross alpha activity in non-saline water — Thick source method (ISO TC 147/WG4)**
- ISO 9697 (1992) Measurement of gross beta activity in non-saline water (ISO TC 147/WG4)
- ISO 9698 (1989) Determination of tritium activity concentration — Liquid scintillation counting method (ISO TC 147/WG4)
- **ISO 10703 (1997) Determination of the activity concentration of radionuclides by high resolution gamma-ray spectrometry (ISO TC 147/WG4)**

## Determination of the activity concentration of radionuclides by high resolution gamma-ray spectrometry



- This International Standard allows, after proper sampling, sample handling and, when necessary or desirable, sample preparation, the simultaneous determination of the activity concentration of gamma-ray emitting radionuclides in water samples by gamma-ray spectrometry using high purity germanium [HPGe] or lithium drifted germanium [Ge(Li)] detectors.
- It includes the procedures for energy calibration, determination of the energy dependent sensitivity of the measuring system, the analysis of the spectra and the determination of the activity concentration of the various radionuclides in the sample studied. Samples with activities typically between 1 Bq and  $10^4$  Bq can be measured as such, i.e. without dilution or concentration of the sample.

# Procedure for gamma spectrometry measurement



# Systematic Review on ISO 10703: Results (1)

Member body	Member status	Evaluation	Recommended action			Priority for revision	National adoption	Used "per se"	Participation	Comments enclosed	No reply (optional)
	P/O	Points	withdraw	revise	confirm		Y/N	Y/N	Y/N		
Australia	P	6			x	2	N	N	Y		
Austria	P	9			x	3	N	N	Y		
Czech Republic	P	14			x	1	Y		N		
Denmark	P	12			x	1	N	N	N		
Finland	P	9		x		1	N	Y	N	x	
France	P	11			x		N	N	Y		
Germany	P	7			x	1		N			
Italy	P	6			x		N	N	Y		
Japan (Abstention)											
The Netherlands	P	9			x	1	N	Y	N		
Poland	P	12		x		3	Y		Y		
Slovakia	P	10			x		Y		Y		
South Africa	P	9			x	3	N	Y	N		
Spain	P	9			x		N	N	N		
Sweden	P	10			x	2	N	Y	N		
Turkey	P	14			x		N	Y	N		
<b>United Kingdom</b>	<b>P</b>	<b>9</b>	<b>x</b>			<b>3</b>	<b>N</b>	<b>N</b>	<b>N</b>		
<b>Totals (P-members only)</b>	<b>16</b>	<b>156</b>	<b>1</b>	<b>2</b>	<b>13</b>	<b>-</b>					

Abstentions and incomplete votes are not counted

Total number of points awarded by voting P-members (y): 156

Total of P-members voting (x): 16

Average points per P-member voting (y/x): 9,75



# Systematic Review on ISO 10703: Results (2)

**Results** (the compilation of results is given as an annex)

The following criteria have been met

- 1  Average points (y/x) awarded by P-members for market relevance is equal to or greater than 9
- 2 A simple majority of voting P-members has proposed the following action:
  - a  withdrawal
  - b  revision/amendment
  - c  confirmation (with or without correction)
- 3  Has been adopted/is intended to be adopted (with or without change), or is used "per se", by at least 5 P-members
- 4  No changes other than corrections are proposed by any P-member

In the light of results, this International Standard is proposed for:

- Withdrawal** [criterion 1 not met - average points (y/x) < 9, see Note 1]  
Note 1: If the average points scored is less than 9 the standard should normally be proposed for withdrawal, irrespective of whether any of criteria 2-4 are met.
- Revision** [criteria 1, 2b, 3 met – see Note 2]
- Amendment** [criteria 1, 2b, 3 met – see Note 2]  
Note 2: To be determined by the committee secretariat. The choice between revision and amendment is essentially based on an assessment of whether or not the changes are limited (amendment) or if they require the redevelopment the whole document (revision).
- Confirmation** [criteria 1, 2c, 3, 4 met]
- Other**
  - errors have been identified that require a Technical Corrigendum
  - no final decision can yet be taken for the following reason(s):

**Further procedures** (attribution to TC/SC/WG, Project Leader, development procedure, meetings, etc.)

- The proposed priority for the envisaged amendment/revision is [1 (low) – 5 (high)]
- The proposed amendment/revision is to be registered as a Preliminary Work Item

Other: **Wait for the answer to the attached coverletter**

# Systematic Review on ISO-10703: Comments

## •Finland

ch. 2: additionally IEC 1452 (1995); several typing errors, especially in ch. 10 (e.g. equation 12 should be 15)



## •Poland

1. In paragraph 7 the same symbol " $\rho$ " has been used for density (specific mass) items 7.1 and 7.2 and for solution concentration items 7.3, 7.4 and 7.6. It should be clarified.

2. Paragraph 8.8 recommends general software abilities to perform a proper gamma spectrometric analysis of the particular sample. However, in the following parts of the paragraph 10.6 entitled "**Expression of results**", recommended algorithms are not only unique solution, especially as commercially available current software offers much more sophisticated methods of spectra analysis. Therefore, the formulas in para. 10.6 need to be reconsidered and described as only example of the possible and alternative methods.

•3. Paragraph 10.2. The statement "Determine relationship between energy and channel number with mathematical expression which expresses this relationship with an accuracy of 0,1 keV or better" is at least unclear. For very flexible number of channels suggested eg. 1 024 in paragraph 8.7 or 4 096 in paragraph 10.2 and covered the energy range of 0-2000 keV, the recommended accuracy of 0,1 keV without numerous energy lines is hardly achievable, ...

# Bibliography is updated

- [1] IAEA TECDOC 1011 Intercomparison of gamma ray analysis software packages (1998), Vienna.
- [2] IAEA TECDOC 1275 Specialized software utilities for gamma ray spectrometry (2002), Vienna.
- [3] Knoll, G.F., Radiation Detection and Measurement, 3rd Edition, Wiley, New York, (2000), pp 405-456, 577-710, 757-776
- [4] Gehrke, R.J. and Davidson, J.R., 'Acquisition of quality  $\gamma$ -ray spectra with HPGe spectrometers', *Appl.Radiat.Isot.*, 62, 479-499, (2005)
- [5] Bureau International des Poids et Mesures, Table of Radionuclides, Monographie *BIPM-5*, (2004)
- [6] OECD Nuclear Energy Agency, Joint Evaluation File, JEF 2.2, Java-based Nuclear Data Display Program, Data Bank available from [www.nea.fr/janis](http://www.nea.fr/janis).
- [7] X-ray and gamma-ray standards for detector calibration, IAEA-TECDOC-619, (1991)
- [8] DEBERTIN, K. and HELMER, R.G. *Gamma- and X-ray spectrometry with semiconductor detectors*, Elsevier Science Publishers, Amsterdam (1988)
- [9] DEBERTIN, K. and SCHÖTZIG, U. Bedeutung von Summationskorrekturen bei der Gammastrahlen-Spektrometrie mit Germaniumdetektoren, *PTB-Bericht Ra-24*, Braunschweig (1990), ISSN 0341-6747, ISBN 3-89429-010-2
- [10] DEBERTIN, K. and SCHÖTZIG, U. Coincidence summing corrections in Ge(Li)-spectrometry at low source-to-detector distances, *Nucl. instr. and methods* 158 (1979), p. 471
- [11] G. Gilmore, J. Hemingway, *Practical gamma ray spectrometry*, John Wiley & sons, 1995 (ISBN 0471 95150 1)

# Result of voting on the Committee Draft



Country	Approval	Disapproval	Abstention	Comments
Australia	x			
Austria	x			x
Canada			x	
Finland	x			x
France	x			x
Germany	x			
Russ. Fed.			x	
Slovakia	x			x
Spain	x			
Sweden			x	
Switzerland	x			
Turkey	x			x
United Kingdom	x			
Total	10	0	3	

# CD Comments and planned corrections

---

## • 10.5.4 Calculation of the decision threshold and the limit of detection.

• Application of ISO 11929-7 (2005): *Determination of the detection limit and decision threshold for ionizing radiation measurements* that promotes the use of Bayesian statistical methods to compute the “characteristic limits”:

❖ the **decision threshold**, which allows a decision to be made for a measurement with a given probability of error as to whether the result of the measurement indicates the presence of the physical effect quantified by the measurand.

❖ the **detection limit**, which specifies the minimum true value of the measurand which can be detected with a given probability of error using the measuring procedure in question.

❖ the **limits of the confidence interval**, which define an interval which contains the true value of the measurand with a given probability.

# ISO 9696 (1997) Revision 2002-2005

---

## Measurement of gross alpha activity in non-saline water — Thick source method



- This international Standard specifies a method for the determination of gross alpha activity in non-saline waters for alpha-emitting radionuclides which are not volatile below 350 ° C.

# Procedure for Gross Alpha Measurement

---



**Water Sample**

**Evaporate to 50 mL**

**Add: H<sub>2</sub>SO<sub>4</sub>**

**Evaporate to dryness**

**Ignite at 350°C**

**Deposit on planchette**

**Alpha Counting**

# Systematic Review on ISO 9696: Results (1)

Member body	Member status	Evaluation	Recommended action			Priority for revision	National adoption	Used "per se"	Participation	Comments enclosed	No reply (optional)
	P/O	Points	withdraw	revise	confirm		Y/N	Y/N	Y/N		
Australia	P	6			x	2	N	N	Y		
Austria	P	9			x	3	N	N	Y		
Czech Republic	P	9			x	1	N	N	N		
Denmark	P	12			x	1	N	N	N		
Finland	P	9		x		1	N	Y	N		
France	P	11		x		5	N	N	Y	x	
Germany	P	7			x	1	N	N			
Italy	P	10			x		N		Y		
Japan (Abstention)											
The Netherlands	P	9			x	1	N	Y	N		
Poland	P	9			x	1	Y		N		
Slovakia	P	6		x		4	N	N	Y		
South Africa	P	9			x	3	N	Y	N		
Spain	P	9			x		N		N		
Sweden	P	10			x	2	N	Y	N		
Turkey	P	13			x		N	Y	N		
United Kingdom	P	9			x	3	Y		N		
Totals (P-members only)	16	147	0	3	13	-					

Abstentions and incomplete votes are not counted

Total number of points awarded by voting P-members (y): 147

Total of P-members voting (x): 16

Average points per P-member voting (y/x): 9,19

# Systematic Review on ISO 9696: Results (2)

**Results** (the compilation of results is given as an annex)

The following criteria have been met

- 1  Average points (y/x) awarded by P-members for market relevance is equal to or greater than 9
- 2 A simple majority of voting P-members has proposed the following action:  
a  withdrawal      b  revision/amendment      c  confirmation (with or without correction)
- 3  Has been adopted/is intended to be adopted (with or without change), or is used "per se", by at least 5 P-members
- 4  No changes other than corrections are proposed by any P-member

In the light of results, this International Standard is proposed for:

- Withdrawal** [criterion 1 not met - average points (y/x) < 9, see Note 1]  
Note 1: If the average points scored is less than 9 the standard should normally be proposed for withdrawal, irrespective of whether any of criteria 2-4 are met.
- Revision** [criteria 1, 2b, 3 met – see Note 2]
- Amendment** [criteria 1, 2b, 3 met – see Note 2]  
Note 2: To be determined by the committee secretariat. The choice between revision and amendment is essentially based on an assessment of whether or not the changes are limited (amendment) or if they require the redevelopment the whole document (revision).
- Confirmation** [criteria 1, 2c, 3, 4 met), but kindly see explanation in the coverletter
- Other**
  - errors have been identified that require a Technical Corrigendum
  - no final decision can yet be taken for the following reason(s):

**Further procedures** (attribution to TC/SC/WG, Project Leader, development procedure, meetings, etc.)


- The proposed priority for the envisaged amendment/revision is 3 [1 (low) – 5 (high)]
- The proposed amendment/revision is to be registered as a Preliminary Work Item

Other: **as CD**

# Systematic Review on ISO-9696: Comments

---

## •France

- 
- 1 - for sanitary purposes, calcined samples are not representative of dried samples
  - 2 - the method of fixed weight is unworkable as a routine control for the very soft or soft water, as it involves the evaporation of very large quantities of water
  - 3 - the calibration with a quantity of  $10 \text{ mg.cm}^{-2}$  makes the control of auto-absorption very difficult
  - 4 - the use of many reagents is to be avoided; the preparation is very time-consuming unadapted to the routine control, due to the necessary counting time to attain the (proposed) mandatory european detection limit ( $0,04 \text{ Bq.L}^{-1}$ ).

# Proposed modifications

---



- As a response the WG decided to propose
- that the choice of the certified reference solution is left open to the laboratory. It can be either Am-241, Pu-239 and U (with natural isotopic composition)
- the drafting of two alternative standards (new work items) to determine the gross alpha activities using:
  - Proportional counter to measure thin source obtained with a direct deposit method;
  - alpha/bêta discrimination liquid scintillation counting (LSC) by measurement of a dried resin used for extraction of alpha-emitting nuclides.

# Result of voting on the Committee Draft

Country	Approval	Disapproval	Abstention	Comments
Australia	x			
Austria	x			x
Belgium				
Canada			x	
Finland	x			
France	x			
Germany	x			
Russ. Fed.			x	
Slovakia	x			x
Spain	x			
Sweden			x	
Switzerland	x			
Turkey	x			x
United Kingdom	x			
Total	10	0	3	

# EC Directive on Drinking Water Quality

❖ The Directive of the European Union on the quality for drinking water (JO L 330 - 5.12.1998) requires water supplies providing 10m<sup>3</sup>/day or more or serving 50 or more persons to meet specified quality standards.

The Directive specifies maximum values for indicator parameters (Annex 1, part C) which include a **'total indicative dose' of 0.1 mSv y<sup>-1</sup> from radioactivity and 100 Bq l<sup>-1</sup> for tritium**. However, it specifies that the calculation of total indicative dose should exclude tritium, potassium-40 and radon and its decay products but **must include all other natural series radionuclides** (JO L 344/85 - 28.12.2001).

❖ European Union recommend (2001/928/Euratom) that, for public water supplies, Member States should set a reference level of 100 Bq l<sup>-1</sup> for radon, above which there should be consideration as to whether remedial action is needed. Above 1000 Bq l<sup>-1</sup> remedial action is deemed to be justified. In this case the radionuclides that are the major contributor must be identified.

Reference levels are 0,1 Bq.l<sup>-1</sup> for polonium-210 and 0,2 Bq.l<sup>-1</sup> for lead-210.

**Measurements should be made with appropriate methods and equipment which have undergone approved calibration and quality assurance programmes.**