Schedule of Accreditation

issued by

United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

0296

Accredited to ISO/IEC 17025:2017

AWE Plc

Issue No: 036 **Issue date:** 24 June 2024

Building A6.1
AWE Aldermaston
Reading
Berkshire
RG7 4PR

Contact: Mr Mark Weakley
Tel: +44 (0)118 982 5780
Fax: +44 (0)118 982 5796
E-Mail: Mark.Weakley@awe.co.uk

Calibration performed at the above address only

Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
GAMMA-RAY DOSIMETRY			
Air Kerma Rate	^{60}Co: 20 mGyh^{-1} to 1 Gyh^{-1} ^{137}Cs: 2 μGyh^{-1} to 0.5 Gyh^{-1} ^{241}Am: 30 μGyh^{-1} to 215 μGyh^{-1}	 3.0 % 3.0 % 5.0 %	Calibration of air kerma/air kerma rate monitors using air kerma rates to national standards through a secondary standard dosemeter. The stated air KERMA rate ranges may vary due to half-life decay and source replacement.
Ambient Dose Equivalent Rate	^{60}Co: 25 mSvh^{-1} to 1.2 Svh^{-1} ^{137}Cs: 2.5 μSvh^{-1} to 0.5 Svh^{-1} ^{241}Am: 90 μSvh^{-1} to 110 μSvh^{-1}	 6.0 % 6.0 % 7.0 %	Calibration of ambient dose equivalent/dose rate monitors using air kerma rates traceable to national standards through a secondary standard electrometer and ionisation chamber and using appropriate conversion coefficients given in ISO4037-3:2019(E). The stated ambient dose equivalent rate ranges quoted may vary due to source decay and/or replacement.
Personal Dose Equivalent: Performance of personal Dosimetry Services for External Radiations	HSE Protocols	CMCs as for ^{60}Co and ^{137}Cs Air Kerma: 3.0 %	Calibration of electronic personal dosemeters using air kerma rates to national standards through a secondary standard dosemeter, and using appropriate coefficients given in ISO Standards for Hp(10).
Routine Irradiation of Personal Dosemeters Calibration process of gamma RPI is completed as per the guidance of GPG 14, GPG 29 & GPG113	100 μSv to 50 mSv	7.0 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
NEUTRON MEASUREMENTS			
4π neutron emission rate	Radionuclide neutron sources ^{252}Cf and ^{241}Am/Be $1x10^4$ to $1x10^8$ s^{-1} (Standard capsules with NPL defined anisotropy factors)	^{252}Cf: 3 % ^{241}Am/Be: 5 %	Calibration of neutron source emission rate to national standards through a secondary standard neutron monitor (DePangher Long Counter)
Ambient H*(10) and Personal $H_p(10)$ dose equivalents and dose equivalent rates	^{252}Cf: 10 μSv to 10 mSv 2.5μSvh^{-1} to 1.5mSvh^{-1} ^{241}Am/Be: 10 μSv to 10 mSv 10 μSvh^{-1} to 100 μSvh^{-1}	^{252}Cf: 5% ^{241}Am/Be: 10%	Calibration of dose equivalent monitors using dose equivalent rates to UK Primary Standard for 4π neutron emission rate measurements and using appropriate coefficients given in ISO Standards for H*(10) and $H_p(10)$ Irradiations are carried out at source to detector distances ranging from 40 to 140 cm. The stated dose equivalent rates quoted are correct on 23/1/17. Actual dose equivalent rates will change over time due to source decay.
Calibration process of gamma RPI is completed as per the guidance of GPG 14, GPG 29 & GPG113			Calibration of dose equivalent monitors using dose equivalent rates to UK Primary Standard for 4pi neutron emission rate measurements and using appropriate coefficients given in ISO Standards for H*(10) and Hp(10)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
EMISSION RATES			
α-particle reference sources	Planchet sources up to 200 mm diameter Planar Sources up to 250 x 200 mm backing 10 to 10,000 particles s^{-1}	3.0 %	Calibrations performed in accordance with ISO8769 using windowed or windowless proportional counters. Uniformity of emissions is measured when dictated by the standard using an appropriate detector and masking method. The uncertainty of measurements in Emission Rate or uniformity is dependent on the method of measurement, individual radionuclides, source strength and source format. The CMC values quoted are those obtained in the most favourable circumstances.

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
EMISSION RATES (cont'd)			
β-particle reference sources	Planchet sources up to 200 mm diameter Planar Sources up to 250 x 200 mm backing 10 to 10,000 particles s^{-1}	3.0 %	Calibrations performed in accordance with ISO8769 using windowed or windowless proportional counters. Uniformity of emissions is measured when dictated by the standard using an appropriate detector and masking method. The uncertainty of measurements in Emission Rate or uniformity is dependent on the method of measurement, individual radionuclides, source strength and source format. The CMC values quoted are those obtained in the most favourable circumstances.
Photon reference sources (ISO 8769-2016)	Un-Filtered 100x100mm active area sources ^{55}Fe Maximum of 10,000 emissions s^{-1}	6.1 %	Calibrations performed in accordance with ISO8769 using a windowed proportional counter. Uniformity of emissions is measured using a highly collimated single aperture scintillation detector. The CMC values quoted are those obtained in the most favourable circumstances.
Photon reference sources (ISO 8769)	Filtered 100x100mm active area sources ^{241}Am ^{57}Co* ^{129}I ^{60}Co ^{137}Cs ^{238}Pu Max 0f 10,000 emissions s^{-1} *Max 35,000 emissions s^{-1}	2.1 % 2.2 % 1.9 % 1.6 % 1.9 % 6.2 % Uniformity 0.2 %	Calibrations performed against UK Primary Standard for 2π photon emission rate in accordance with ISO8769 using large area NaI detector. Uniformity of emissions is measured using a highly collimated single aperture scintillation detector. The CMC values quoted are those obtained in the most favourable circumstances.

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
SURFACE CONTAMINATION MONITOR RESPONSE Calibration process of is completed as per the guidance of GPG 14	150x100mm, 100x100mm Planar and 50mmØ Planchet sources Alpha-emitting nuclides: ^{Nat}U, ^{230}Th, ^{234}U, 239Pu, ^{238}Pu,^{241}Am Approx. 10-2000 emissions s^{-1} Beta-emitting nuclides: ^{3}H, ^{63}Ni, ^{14}C, ^{147}Pm, ^{99}Tc, ^{60}Co, ^{137}Cs, ^{36}Cl, $^{90}Sr/^{90}Y$ 200-4000 emissions s^{-1}	Approximately 3% to 20%	Calibrations performed using radioactive sources. Methods and sources can differ depending on instruments. Instrument count rates depend on instrument efficiency to specific nuclide. The uncertainty of measurements for each test performed is dependent on the method of measurement, Individual radionuclides, source Activity/emission and Detector/Ratemeter combination
cps/emission rate cps/ Bq cm^{-2} (via a P-factor) Linearity of Response Uniformity of Response Alpha Cross talk Beta Rejection γ/N Response (E.g.: cps/(μSv h^{-1})	Filtered Photon-emitting nuclides (conforming to ISO8769): ^{238}Pu, ^{129}I, ^{241}Am, ^{57}Co, ^{137}Cs, ^{60}Co Approx. 400-10000 emissions s^{-1} Un-Filtered Photon-emitting nuclides ^{55}Fe Approx. 1000 emissions s^{-1} ^{241}Am Alpha Linearity Sources from approximately 15 to 1400 emissions s^{-1} (16mmØ), 4500 emissions s^{-1} (25mmØ) ^{90}Sr Beta Linearity Sources from approximately 20 to 2000 emissions s^{-1} (16mmØ), 12000 emissions s^{-1} (25mmØ) ^{241}Am gamma Linearity Sources from approximately 500Bq to 250kBq (Point) ^{14}C and ^{99}Tc Beta 16mmØ Uniformity sources Approx. 300 emissions s^{-1} ^{230}Th Alpha 16mmØ Uniformity sources Approx. 100 emissions s^{-1}		

END

Appendix - Calibration and Measurement Capabilities

Introduction

The definitive statement of the accreditation status of a calibration laboratory is the Accreditation Certificate and the associated Schedule of Accreditation. This Schedule of Accreditation is a critical document, as it defines the measurement capabilities, ranges and boundaries of the calibration activities for which the organisation holds accreditation.

Calibration and Measurement Capabilities (CMCs)

The capabilities provided by accredited calibration laboratories are described by the Calibration and Measurement Capability (CMC), which expresses the lowest measurement uncertainty that can be achieved during a calibration. If a particular device under calibration itself contributes significantly to the uncertainty (for example, if it has limited resolution or exhibits significant non-repeatability) then the uncertainty quoted on a calibration certificate will be increased to account for such factors.

The CMC is normally used to describe the uncertainty that appears in an accredited calibration laboratory's schedule of accreditation and is the uncertainty for which the laboratory has been accredited using the procedure that was the subject of assessment. The measurement uncertainty is calculated according to the procedures given in the GUM and is normally stated as an expanded uncertainty at a coverage probability of 95 %, which usually requires the use of a coverage factor of $k = 2$. An accredited laboratory is not permitted to quote an uncertainty that is smaller than the published measurement uncertainty in certificates issued under its accreditation.

Expression of CMCs - symbols and units

It should be noted that the percentage symbol (%) represents the number 0.01. In cases where the measurement uncertainty is stated as a percentage, this is to be interpreted as meaning percentage of the measurand.
Thus, for example, a measurement uncertainty of 1.5 % means $1.5 \times 0.01 \times q$, where q is the quantity value.

The notation Q[a, b] stands for the root-sum-square of the terms between brackets: $Q[a, b] = [a^2 + b^2]^{1/2}$