


Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

 <p>UKAS CALIBRATION</p> <p>0296</p> <p>Accredited to ISO/IEC 17025:2017</p>	<p>AWE Plc</p> <p>Issue No: 031 Issue date: 01 September 2021</p>	
	<p>Building A6.1 AWE Aldermaston Reading Berkshire RG7 4PR</p>	<p>Contact: Mr Ray Rogers Tel: +44 (0)118 982 5780 Fax: +44 (0)118 982 5796 E-Mail: raymond.rogers@awe.co.uk</p>
<p>Calibration performed at the above address only</p>		

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	<p>3.0 %</p> <p>3.0 %</p> <p>5.0 %</p>	<p>Calibration of air kerma/air kerma rate monitors using air kerma rates traceable to national standards through a secondary standard dosimeter.</p> <p>The stated air KERMA rate ranges may vary due to half-life decay and source replacement.</p>
Ambient Dose Equivalent Rate	⁶⁰ Co: 25 mSvh ⁻¹ to 1.2 Sv ¹³⁷ Cs: 2.5 μSvh ⁻¹ to 0.5 Sv ²⁴¹ Am: 90 μSvh ⁻¹ to 110 μSvh ⁻¹	<p>3.0 %</p> <p>3.0 %</p> <p>5.0 %</p>	<p>Calibration of ambient dose equivalent/dose rate monitors using air kerma rates traceable to national standards through a secondary standard dosimeter and using appropriate coefficients given in ISO Standards for H*(10).</p> <p>The stated ambient dose equivalent rate ranges may vary due to half-life decay and source replacement.</p>
Personal Dose Equivalent: Performance Testing of personal Dosimetry Services for External Radiations Routine Irradiation of Personal Dosimeters Statutory tests of gamma RPI	HSE Protocols 100 μSv to 50 mSv To protocols based on GPG 14, GPG29 and GPG113	CMCs as for ⁶⁰ Co and ¹³⁷ Cs Air Kerma: 3.0 % 7.0 %	Calibration of electronic personal dosimeters using air kerma rates traceable to national standards through a secondary standard dosimeter, and using appropriate coefficients given in ISO Standards for Hp(10).



0296
Accredited to
ISO/IEC 17025:2017

Schedule of Accreditation
issued by
United Kingdom Accreditation Service
2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

AWE Plc
Issue No: 031 Issue date: 01 September 2021

Calibration performed at main address only

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ($k = 2$)	Remarks
NEUTRON MEASUREMENTS 4π neutron emission rate	Radionuclide neutron sources ^{252}Cf and $^{241}\text{Am/Be}$ 10^5 to 10^7 s^{-1} (Standard capsules with NPL defined anisotropy factors)	 ^{252}Cf : 4 % $^{241}\text{Am/Be}$: 5 %	Calibration of neutron source emission rate traceable 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 2.5 μSvh^{-1} to 1.5mSvh $^{-1}$ $^{241}\text{Am/Be}$: 10 μSv to 10 mSv 10 μSvh^{-1} to 100 μSvh^{-1}	^{252}Cf : 5% $^{241}\text{Am/Be}$: 10%	Calibration of dose equivalent monitors using dose equivalent rates traceable 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 course decay.
Statutory tests of Neutron RPI	To protocols based on GPG 14 and GPG113		Calibration of dose equivalent monitors using dose equivalent rates traceable to UK Primary Standard for 4π neutron emission rate measurements and using appropriate coefficients given in ISO Standards for $H^*(10)$ and $H_p(10)$
EMISSION RATES α -particle reference sources	Point sources Extended area sources up to 200 mm diameter 10 to 10,000 particles s^{-1}	3.0 %	Calibrations performed using windowed or windowless proportional counters the uncertainty of measurements and Emission Rate 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.



0296
Accredited to
ISO/IEC 17025:2017

Schedule of Accreditation
issued by
United Kingdom Accreditation Service
2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

AWE Plc
Issue No: 031 Issue date: 01 September 2021

Calibration performed at main address only

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ($k = 2$)	Remarks
EMISSION RATES (cont'd) β -particle reference sources	Point sources Extended area sources up to 200 mm diameter 10 to 10,000 particles s^{-1}	3.0 %	Calibrations performed using windowed or windowless proportional counters the uncertainty of measurements and Emission Rate 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 ^{59}Fe Maximum of 10,000 emissions s^{-1}	10.0 %	Calibrations performed using windowed proportional counters using large area NaI detector
Photon reference sources (ISO 8769-2016)	Filtered 100x100mm active area sources ^{241}Am $^{57}Co^*$ ^{129}I ^{60}Co ^{137}Cs ^{238}Pu Max Of 10,000 emissions s^{-1} *Max 35,000 emissions s^{-1}	10.0 % 11.0 % 16.0 % 7.0 % 9.0 % 15.0 %	Calibrations performed against UK Primary Standard for 2π photon emission rate using large area NaI detector
SURFACE CONTAMINATION MONITOR RESPONSE Radiological Type Tests Statutory Tests (Test before first use, Re- Test after Repair, Periodic Tests) to protocols based on GPG14 including:	150x100mm, 100x100mm Planar and 50mm \varnothing Planchet sources Alpha-emitting nuclides: ^{238}Pu , ^{234}Th , ^{234}U , ^{239}Pu , ^{241}Am Approx. 10-2000 emissions s^{-1} Beta-emitting nuclides: 3H , ^{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 traceable radioactive sources. Test 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



0296
Accredited to
ISO/IEC 17025:2017

Schedule of Accreditation
issued by
United Kingdom Accreditation Service
2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

AWE Plc
Issue No: 031 **Issue date:** 01 September 2021

Calibration performed at main address only

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ($k = 2$)	Remarks
<p>SURFACE CONTAMINATION MONITOR RESPONSE (cont'd)</p> <p>cps/emission rate cps/ Bq cm⁻² (via a P-factor) Linearity of Response Uniformity of Response Alpha Cross talk</p> <p>Beta Rejection γ/N Response (E.g.: cps/(μSv h⁻¹))</p>	<p>Filtered Photon-emitting nuclides (conforming to ISO8769): ²³⁸Pu, ¹²⁹I, ²⁴¹Am, ⁵⁷Co, ¹³⁷Cs, ⁶⁰Co Approx. 400-10000 emissions s⁻¹</p> <p>Un-Filtered Photon-emitting nuclides ⁵⁵Fe</p> <p>Approx. 1000 emissions s⁻¹</p> <p>²⁴¹Am Alpha Linearity Sources from approximately 15 to 1400 emissions s⁻¹ (16mm\emptyset), 4500 emissions s⁻¹ (25mm\emptyset)</p> <p>⁹⁰Sr Beta Linearity Sources from approximately 20 to 2000 emissions s⁻¹ (16mm\emptyset), 12000 emissions s⁻¹ (25mm\emptyset)</p> <p>²⁴¹Am gamma Linearity Sources from approximately 500Bq to 250kBq (Point)</p> <p>¹⁴C and ⁹⁹Tc Beta 16mm\emptyset Uniformity sources Approx. 300 emissions s⁻¹</p> <p>²³⁰Th Alpha 16mm\emptyset Uniformity sources Approx. 100 emissions s⁻¹</p>		
END			



0296
Accredited to
ISO/IEC 17025:2017

Schedule of Accreditation
issued by
United Kingdom Accreditation Service
2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

AWE Plc
Issue No: 031 **Issue date:** 01 September 2021

Calibration performed at main address only

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: $Q[a, b] = [a^2 + b^2]^{1/2}$