24･04･19-NITE-AC-002
2024-11-01

Certificate of Accreditation

International Accreditation Japan (IAJapan) hereby accredits the following conformity assessment body as a calibration laboratory of ASNITE accreditation program.

Accreditation Identification: ASNITE 0001 Calibration-Phys

Name of Conformity Assessment Body: National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology

Name of Legal Entity: National Institute of Advanced Industrial Science and Technology

Location of Conformity Assessment Body: 1-1-1 Umezono, Tsukuba-shi, Ibaraki 305-8563, JAPAN

Scope of Accreditation: as the following pages

Accreditation Requirement: ISO/IEC 17025:2017*

* The relevant accreditation requirements described in the Accreditation Scheme Document for ASNITE-C(NMI) are also applied.

Effective Date of Accreditation: 2024-11-01

Expiry Date of Accreditation: 2029-10-31

Date of Initial Accreditation: 2002-08-15

K. Horisaka

HORISAKA Kazuhide
Chief Executive, International Accreditation Japan (IAJapan)
National Institute of Technology and Evaluation

- International Accreditation Japan (IAJapan) is a laboratory accreditation body which has signed MRAs of ILAC (International Laboratory Accreditation Cooperation) and APAC (Asia Pacific Accreditation Cooperation).
- MRA requirements are, in addition to relevant international standards and guides, requirements for participation in proficiency testing programs, surveillance and reassessment, and the policy for the traceability of measurement for MRA purpose.
- This laboratory fulfills ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation means this laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results and calibrations (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).
- The latest accreditation information is publicly available on IAJapan Website as an accreditation certificate.

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Mass	Mass standard (True mass)	100 g		0.012 mg	2023-02-21
		200 g		0.022 mg	
		500 g		0.033 mg	
		1 kg		0.068 mg	
		2 kg		0.23 mg	
		5 kg		0.45 mg	
		10 kg		0.85 mg	
	Mass standard (Conventional mass)	1 mg		0.0006 mg	
		2 mg		0.0006 mg	
		5 mg		0.0006 mg	
		10 mg		0.0008 mg	
		20 mg		0.0010 mg	
		50 mg		0.0012 mg	
		100 mg		0.0015 mg	
		200 mg		0.0020 mg	
		500 mg		0.0025 mg	
		1 g		0.0030 mg	
		2 g		0.0040 mg	
		5 g		0.0050 mg	
		10 g		0.0060 mg	
		20 g		0.0080 mg	
		50 g		0.010 mg	
		100 g		0.015 mg	
		200 g		0.030 mg	
		500 g		0.075 mg	
		1 kg		0.15 mg	
		2 kg		0.30 mg	
		5 kg		0.75 mg	
		10 kg		1.5 mg	
		20 kg		3.0 mg	
		50 kg		0.008 g	
		100 kg		0.16 g	
		200 kg		0.36 g	
		500 kg		0.82 g	
		1000 kg		3.0 g	
		2000 kg		7.6 g	
		5000 kg		19 g	

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Force	Force measuring device	1 N to 500 kN	Compression and tension	2.0×10^{-5}	2023-02-21
		500 kN to 1 MN	Compression and tension	1.0×10^{-4}	
		1 MN to 20 MN	Compression	1.0×10^{-4}	
Torque	Torque measuring device	0.1 N·m to 5 N·m	Clockwise and counterclockwise torques	7.0×10^{-5}	
		5 N·m to 1 kN·m	Clockwise and counterclockwise torques	5.0×10^{-5}	
		1 kN·m to 20 kN·m	Clockwise and counterclockwise torques	7.0×10^{-5}	
	Reference torque wrench	0.1 N·m to 5 N·m	Clockwise and counterclockwise torques	3.0×10^{-4}	
		5 N·m to 1 kN·m	Clockwise and counterclockwise torques	7.0×10^{-5}	
		1 kN·m to 5 kN·m	Clockwise and counterclockwise torques	1.0×10^{-4}	

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty When the symbol % is used: Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Hardness	Rockwell hardness standard block	From 30 HRBW up to 100 HRBW		0.60 HRBW	2022-05-18
		From 20 HRC less than 40 HRC		0.34 HRC	
		From 40 HRC up to 65 HRC		0.30 HRC	
	Vickers hardness standard block	200 HV to 950 HV		a) $d \leqq 200$:$[1 + (200/d)]$ % b) $d \geqq 200$:2.0 % where d is the diagonal length of the Vickers indentation in μm	
	Brinell hardness standard block	200 HBW to 500 HBW		$U = \left[0.89 + \frac{0.19}{d} - 1.1 \times 10^{-3}H\right]$ % where d is the diameter of indentation in mm and H is the Brinell hardness in HBW	

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty When the symbol % is used: Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Fluid Flow	ISO type sonic nozzles	0.005 g/min to 0.1 g/min	Nitrogen & dry air	$(0.0006/Q_m + 0.045)$ % Q_m : mass flow [g/min]	2023-01-13
		0.1 g/min to 400 g/min		$(0.001Q_m + 0.05)$ % Q_m : mass flow [g/min]	
		0.01 g/min to 0.2 g/min	Argon	$(0.002/Q_m + 0.04)$ % Q_m : mass flow [g/min]	
		0.2 g/min to 110 g/min		$(0.0006Q_m + 0.05)$ % Q_m : mass flow [g/min]	
		0.1 g/min to 0.5 g/min	Helium	$(0.02/Q_m + 0.02)$ % Q_m : mass flow [g/min]	
		0.5 g/min to 30 g/min		$(0.005Q_m + 0.06)$ % Q_m : mass flow [g/min]	
		0.005 g/min to 0.3 g/min	Hydrogen	$(0.002/Q_m + 0.055)$ % Q_m : mass flow [g/min]	
		0.3 g/min to 110 g/min		$(0.0024Q_m + 0.06)$ % Q_m : mass flow [g/min]	
		0.008 g/min to 0.3 g/min	Methane	$(0.0013/Q_m + 0.055)$ % Q_m : mass flow [g/min]	
		0.3 g/min to 300 g/min		$(0.0006Q_m + 0.06)$ % Q_m : mass flow [g/min]	
	Gas flow calibration facilities (On-site)	0.005 g/min to 0.1 g/min	Nitrogen & dry air	$(0.0006/Q_m + 0.045)$ % Q_m : mass flow [g/min]	
		0.1 g/min to 400 g/min		$(0.001Q_m + 0.05)$ % Q_m : mass flow [g/min]	
		0.01 g/min to 0.2 g/min	Argon	$(0.002/Q_m + 0.04)$ % Q_m : mass flow [g/min]	
		0.2 g/min to 110 g/min		$(0.0006Q_m + 0.05)$ % Q_m : mass flow [g/min]	
		0.1 g/min to 0.5 g/min	Helium	$(0.02/Q_m + 0.02)$ % Q_m : mass flow [g/min]	
		0.5 g/min to 30 g/min		$(0.005Q_m + 0.06)$ % Q_m : mass flow [g/min]	
		0.005 g/min to 0.3 g/min	Hydrogen	$(0.002/Q_m + 0.055)$ % Q_m : mass flow [g/min]	
		0.3 g/min to 110 g/min		$(0.0024Q_m + 0.06)$ % Q_m : mass flow [g/min]	
		0.008 g/min to 0.3 g/min	Methane	$(0.0013/Q_m + 0.055)$ % Q_m : mass flow [g/min]	
		0.3 g/min to 300 g/min		$(0.0006Q_m + 0.06)$ % Q_m : mass flow [g/min]	
	ISO type sonic nozzles & Low gas flow meters	0.005 g/min to 0.1 g/min	Nitrogen gas & dry air	$(0.0006/Q_m + 0.065)$ % Q_m : mass flow [g/min]	
		0.1 g/min to 400 g/min		$(0.0011Q_m + 0.07)$ % Q_m : mass flow [g/min]	
		0.005 g/min to 0.3 g/min	Hydrogen gas	$(0.0033/Q_m + 0.09)$ % Q_m : mass flow [g/min]	
		0.3 g/min to 110 g/min		$(0.0024Q_m + 0.10)$ % Q_m : mass flow [g/min]	
		3 g/min to 300 g/min	Methane gas	$(0.0006Q_m + 0.08)$ % Q_m : mass flow [g/min]	
	Low gas flow meters	0.01 mg/min to 5 mg/min	Nitrogen gas & dry air	0.42 %	
	ISO type sonic nozzles	5 m^3/h to 200 m^3/h	In the pressure range of 0.1 MPa to 0.5 MPa	0.17 %	
	Gas flow meters	5 m^3/h to 1000 m^3/h	In the pressure range of 0.1 MPa to 0.5 MPa	0.28 %	
	Very low air speed wind tunnels (On-site)	0.05 m/s to 1.5 m/s		$[0.0069 + (0.025v + 0.005)^2]$ m/s v : air speed [m/s] excluding uncertainties dependent on calibration item	
	Anemometers	0.05 m/s to 1.5 m/s		$[0.0069 + (0.025v + 0.005)^2]$ m/s v : air speed [m/s]	
	LDVs	1.3 m/s to 27.5 m/s		$[0.091 + 0.22 / (v^2 - 0.9v)]$ % v : air speed [m/s]	
		27.5 m/s to 40 m/s		$(-0.0002386v^3 + 0.02331v^2 - 0.7409v + 7.801)$ % v : air speed [m/s]	
	Anemometers (Ultrasonic anemometer etc.)	1.3 m/s to 27.5 m/s		$[0.297 + 0.27 / (v^2 - 0.77v)]$ % v : air speed [m/s]	
		27.5 m/s to 40 m/s		$(-0.0001185v^3 + 0.01157v^2 - 0.3677v + 4.124)$ % v : air speed [m/s]	
	Pitot tubes	40 m/s to 90 m/s		0.63 %	

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Fluid Flow	Water flow meters	750 m^3/h to 12000 m^3/h	Reference standard: reference flowmeters	0.081 %	2023-01-13
		50 m^3/h to 3000 m^3/h	Weighing tank: 50 t	0.060 %	
		5 m^3/h to 300 m^3/h	Weighing tank: 5 t	0.042 %	
		0.3 m^3/h to 30 m^3/h	Weighing tank: 500 kg	0.044 %	
		0.002 m^3/h to 1.2 m^3/h	Weighing tank: 10 kg	0.039 %	
	Water flow calibration facilities (On-site)	50 m^3/h to 3000 m^3/h	Weighing tank: 50 t	0.060 %	
		5 m^3/h to 300 m^3/h	Weighing tank: 5 t	0.042 %	
		0.3 m^3/h to 30 m^3/h	Weighing tank: 500 kg	0.044 %	
		0.005 m^3/h to 1.2 m^3/h	Weighing tank: 10 kg	0.039 %	
	Oil flow meters (Volume flow rate)	0.1 m^3/h to 300 m^3/h	Light oil, kerosene, (below 15 m^3/h) spindle oil, industrial gasoline	0.030 %	
	Oil flow meters (Mass flow rate)	0.022 kg/s to 67 kg/s	Light oil, kerosene, (below 3.4 kg/s) spindle oil, industrial gasoline	0.020 %	
	Oil flow meters (Volume flow rate)	0.02 L/h to 1 L/h	Light oil, kerosene	0.078 %	
		1 L/h to 100 L/h	Light oil, kerosene	0.064 %	
		0.02 L/h to 1 L/h	Industrial gasoline	0.080 %	
		1 L/h to 100 L/h	Industrial gasoline	0.068 %	
	Oil flow meters (Mass flow rate)	4.4×10^{-6} kg/s to 2.2×10^{-4} kg/s	Light oil, kerosene, industrial gasoline	0.050 %	
		2.2×10^{-4} kg/s to 2.2×10^{-2} kg/s	Light oil, kerosene, industrial gasoline	0.020 %	

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Density	Silicon single crystal (Hydrostatic weighing)	2320 kg/m^3 to 2340 kg/m^3	20 ºC 30 g to 1000 g	$(0.87/V + 0.0000022V - 0.0014)$ kg/m^3 (V[cm^3]: The volume of artefact)	2023-02-21
			20 ºC 1000 g to 1010 g	0.00070 kg/m^3	

Quantity	Calibration and Measurement Capabilities					Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range		Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty When the unit is %: Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Pressure and vacuum	Pressure balance	Gas gauge pressure	5 kPa to 175 kPa		(100 + 14 p) mPa p : pressure [kPa]	2021-08-23
			175 kPa to 7000 kPa		20 p mPa p : pressure [kPa]	
		Gas absolute pressure	5 kPa to 175 kPa		(400 + 13 p) mPa p : pressure [kPa]	
			175 kPa to 7000 kPa		(400 + 20 p) mPa p : pressure [kPa]	
		Hydraulic pressure	1 MPa to 100 MPa		(80 + 24 p + 0.081 p^2) Pa p : pressure [MPa]	
			100 MPa to 500 MPa		(1300 + 11 p + 0.12 p^2) Pa p : pressure [MPa]	
	Pressure measuring device	Gas gauge pressure	5 kPa to 175 kPa		(100 + 14 p) mPa p : pressure [kPa]	
			175 kPa to 7000 kPa		20 p mPa p : pressure [kPa]	
			7 MPa to 20 MPa		28 p mPa p : pressure [kPa]	
			20 MPa to 100 MPa		40 p mPa p : pressure [kPa]	
		Gas absolute pressure	1 Pa to 1 kPa	Comparison with pressure measuring device	(120 + 20 p) mPa p : pressure [kPa]	
			1 kPa to 10 kPa		(150 + 55 p) mPa p : pressure [kPa]	
			5 kPa to 175 kPa		(400 + 13 p) mPa p : pressure [kPa]	
			175 kPa to 7000 kPa		(400 + 20 p) mPa p : pressure [kPa]	
			7 MPa to 20 MPa		28 p mPa p : pressure [kPa]	
			20 MPa to 100 MPa		40 p mPa p : pressure [kPa]	
		Gas differential pressure	1 Pa to 10 kPa	[Line pressure 100 kPa ± 10 kPa (absolute pressure)]	(11 + 14 p) mPa p : pressure [kPa]	
		Hydraulic pressure	1 MPa to 100 MPa		(80 + 24 p + 0.081 p^2) Pa p : pressure [MPa]	
			100 MPa to 500 MPa		(1300 + 11 p + 0.12 p^2) Pa p : pressure [MPa]	
			500 MPa to 1000 MPa		(1000 + 12 p + 0.18 p^2) Pa p : pressure [MPa]	
	Spinning rotor gauge	1.0×10^{-4} Pa to 1.0×10^{-3} Pa			0.91 %	2021-08-23
		1.0×10^{-3} Pa to 1.0×10^{-2} Pa			0.38 %	
		1.0×10^{-2} Pa to 0.1 Pa			0.35 %	
		0.1 Pa to 1.0 Pa			0.35 %	
		1.0 Pa to 10.0 Pa			0.32 %	
	Capacitance diaphragm gauge	0.1 Pa to 0.2 Pa			2.8 %	
		0.2 Pa to 0.4 Pa			1.2 %	
		0.4 Pa to 0.6 Pa			0.60 %	
		0.6 Pa to 0.8 Pa			0.40 %	
		0.8 Pa to 1.0 Pa			0.20 %	
		1.0 Pa to 2.0×10^3 Pa			0.18 %	
	Ionization gauge	1.0×10^{-9} Pa to 1.0×10^{-6} Pa			5.7 %	
		1.0×10^{-6} Pa to 2.0×10^{-6} Pa			4.3 %	
		2.0×10^{-6} Pa to 3.0×10^{-6} Pa			3.3 %	
		3.0×10^{-6} Pa to 1.0×10^{-4} Pa			3.0 %	
	Partial pressure gauge	2.0×10^{-6} Pa to 1.0×10^{-4} Pa		N_2	7.2 %	
		2.0×10^{-6} Pa to 1.0×10^{-4} Pa		Ar	7.4 %	
		2.0×10^{-6} Pa to 5.0×10^{-6} Pa		He	8.1 %	
		5.0×10^{-6} Pa to 1.0×10^{-4} Pa			7.4 %	
		2.0×10^{-6} Pa to 5.0×10^{-6} Pa		H_2	8.1 %	
		5.0×10^{-6} Pa to 1.0×10^{-4} Pa			7.4 %	
	Leak artifact	1.0×10^{-10} Pa m^3/s to 1.0×10^{-8} Pa m^3/s [Leak rate (23 ℃)]		Gas specie: He Downstream pressure: vacuum	4.5 %	
		1.0×10^{-8} Pa m^3/s to 2.5×10^{-8} Pa m^3/s [Leak rate (23 ℃)]			4.0 %	
		2.5×10^{-8} Pa m^3/s to 8.0×10^{-8} Pa m^3/s [Leak rate (23 ℃)]			3.7 %	
		8.0×10^{-8} Pa m^3/s to 1.0×10^{-6} Pa m^3/s [Leak rate (23 ℃)]			3.2 %	
		1.0×10^{-6} Pa m^3/s to 1.0×10^{-4} Pa m^3/s [Leak rate (23 ℃)]		Gas species: N_2, He, Ar Downstream pressure: vacuum	1.0 %	
		5.0×10^{-7} Pa m^3/s to 7.0×10^{-7} Pa m^3/s [Leak rate (23 ℃)]		Gas species: N_2, He, R134a, Ar, $H_2$5%$N_2$95% mixture gas Downstream pressure: atmosphreic pressure	2.9 %	
		7.0×10^{-7} Pa m^3/s to 1.0×10^{-6} Pa m^3/s [Leak rate (23 ℃)]			2.3 %	
		1.0×10^{-6} Pa m^3/s to 1.0×10^{-4} Pa m^3/s [Leak rate (23 ℃)]			1.7 %	
	Standard conductance element	1×10^{-11} m^3/s to 1×10^{-8} m^3/s [conductance]		N_2 equivalent	6.3 %	

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	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)		Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Frequency	Frequency standard (Direct frequency measurement method)	1 MHz 5 MHz 10 MHz 100 MHz	Measurement time of 10000 s		1×10^{-13} Hz/Hz	2021-05-31
	Frequency standard (Time interval measurement method)	5 MHz 10 MHz	Measurement time of 86400 s		5×10^{-14} Hz/Hz	
	Frequency standard (Remote frequency calibration method)	5 MHz 10 MHz	Single-Channel GPS Receiver	Baseline length 0 km to 50 km	1.7×10^{-13} Hz/Hz	
				Baseline length 50 km to 500 km	2.4×10^{-13} Hz/Hz	
				Baseline length 500 km to 1600 km	9.3×10^{-13} Hz/Hz	
			Multi-Channel GPS Receiver	Baseline length 0 km to 50 km	1.1×10^{-13} Hz/Hz	
				Baseline length 50 km to 500 km	1.4×10^{-13} Hz/Hz	
				Baseline length 500 km to 1600 km	4.9×10^{-13} Hz/Hz	
				Baseline length 1600 km to 5000 km	5.0×10^{-13} Hz/Hz	

Note: In the CMC column, the values of Frequency standard exclude sources of uncertainty attributed to a unit under test.

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Optical frequency	Stabilized laser	Frequency : 178 THz to 600 THz		1.4×10^{-13} (Relative uncertainty)	2024-11-01
		Vacuum wavelength : 500 nm to 1684 nm		1.4×10^{-13} (Relative uncertainty)	
End Standards	Step gauge (CMM with laser interferometer)	up to 1020 mm		$\sqrt{(0.17\ \mu\mathrm{m})^2 + (0.48 \times 10^{-6} L)^2}$ (L : nominal length) (steel gauge)	2024-11-01
CMM Artefact	Ball bar (CMM with laser interferometer)	up to 720 mm		$\sqrt{(0.26\ \mu\mathrm{m})^2 + (0.34 \times 10^{-6} L)^2}$ (L : nominal length) (steel gauge)	
	Ball bar (CMM and reference gauge)	up to 1020 mm		$\sqrt{(0.32\ \mu\mathrm{m})^2 + (0.68 \times 10^{-6} L)^2}$ (L : nominal length) (steel gauge)	
	Ball plate (CMM with laser interferometer)	up to 560 mm × 560 mm		$\sqrt{(0.24\ \mu\mathrm{m})^2 + (0.56 \times 10^{-6} L)^2}$ (L : nominal length) (steel gauge)	
	Ball plate (CMM and reference gauge)	up to 700 mm × 700 mm		$\sqrt{(0.36\ \mu\mathrm{m})^2 + (0.86 \times 10^{-6} L)^2}$ (L : nominal length) (steel gauge)	
	Hole plate (CMM with laser interferometer)	up to 560 mm × 560 mm		$\sqrt{(0.48\ \mu\mathrm{m})^2 + (0.88 \times 10^{-6} L)^2}$ (L : nominal length) (low thermal expansion glass gauge)	
	Hole plate (CMM and reference gauge)	up to 700 mm × 700 mm		$\sqrt{(0.72\ \mu\mathrm{m})^2 + (1.4 \times 10^{-6} L)^2}$ (L : nominal length) (low thermal expansion glass gauge)	
Gear Standards	Cylindrical involute gear: profile slope deviation (CMM)	up to 0.2 mm	Base diameter : 25 mm to 200 mm	0.52 µm	
	Cylindrical involute gear: profile form deviation (CMM)	up to 0.2 mm	Base diameter : 25 mm to 200 mm	0.52 µm	
	Cylindrical involute gear: profile deviation, total (CMM)	up to 0.2 mm	Base diameter : 25 mm to 200 mm	0.52 µm	
	Cylindrical involute gear: helix slope deviation (CMM)	up to 0.2 mm	Reference diameter : 25 mm to 200 mm Helix angle : 0° to 45°	1.3 µm	
	Cylindrical involute gear: helix form deviation (CMM)	up to 0.2 mm	Reference diameter : 25 mm to 200 mm Helix angle : 0° to 45°	1.3 µm	
	Cylindrical involute gear: helix deviation, total (CMM)	up to 0.2 mm	Reference diameter : 25 mm to 200 mm Helix angle : 0° to 45°	1.3 µm	
	Cylindrical involute gear: single pitch deviation (CMM)	up to 0.2 mm	Reference diameter : 60 mm to 300 mm	0.22 µm	
	Cylindrical involute gear: cumulative pitch deviation (CMM)	up to 0.2 mm	Reference diameter : 60 mm to 300 mm	0.78 µm	
Surface Texture Standards	Depth standard: Groove depth (Stylus instrument with laser interferometry)	0.5 µm to 10 µm		$\sqrt{(7.8\ \mathrm{nm})^2 + (2.8 \times 10^{-3}\ D)^2}$ (D : nominal value of groove depth)	2022-01-31
	Roughness standard (Stylus instrument with laser interferometry)	0.1 µm to 3.0 µm		$\sqrt{(7.4\ \mathrm{nm})^2 + (2.8 \times 10^{-3}\ Ra)^2}$ (Ra : nominal value of roughness parameter)	
Roundness Standards	Sphere, hemisphere (Multi-step, stylus on spindle roundness instrument)	0 µm to 1 µm	Diameter: 5 mm to 100 mm	4.0 nm	
End Standards	Gauge block (Laser interferometer)	0.5 mm to 250 mm		$\sqrt{(23\ \mathrm{nm})^2 + (0.10 \times 10^{-6} L)^2}$ (L :nominal length)	2024-11-01
		150 mm to 1000 mm	Material: Any but low thermal expansion coefficient material	$\sqrt{(20\ \mathrm{nm})^2 + (0.17 \times 10^{-6} L)^2}$ (L :nominal length)	
			Material: Low thermal expansion coefficient material	$\sqrt{(28\ \mathrm{nm})^2 + (56 \times 10^{-9} L)^2}$ (L :nominal length)	

Note: In the CMC column, the values of Stabilized laser exclude sources of uncertainty attributed to a unit under test.

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Line Standards	Precision line scale: line spacing, L (Laser interferometer)	up to 1000 mm		$\sqrt{(58\ \mathrm{nm})^2 + (0.13 \times 10^{-6}\ L)^2}$ (L : nominal length)	2022-01-31
	One-dimensional grating (Metrological AFM and interferometer)	23 nm to 8 μm		$\sqrt{(3.4 \times 10^{-2}\ \mathrm{nm})^2 + (20 \times 10^{-6}\ L)^2}$ (L : pitch)	
Length Instruments	Distance meter (Laser interferometer and seven pillars)	5 m to 200 m		Proportional factor：0.4×10^{-6} Offset value：0.05 mm	
	Laser interferometer (Laser interferometer)	up to 93 m		1.7 μm	
Angle	Rotary encoder	0° to 360°		0.010”	2024-11-01
	Autocollimator	-5° to +5°		0.010”	
	Polygon mirror		up to 48 faces	0.09”	
Flatness	Optical flat (Fizeau interferometer)	0 μm to 10 μm	Maximum diameter: 300 mm	10 nm	
Refractive index, spectral	Triangular prism (Laser interferometer)	1.51 to 1.52	Wavelength (in vacuum): 632.99 nm, Material: BK7 or equivalent glass, Size of triangular prism (every side): 40 mm to 80 mm	2.2×10^{-6}	2022-01-31
		1.51 to 1.53	Wavelength (in vacuum): 546.2 nm, Material: BK7 or equivalent glass, Size of triangular prism (every side): 40 mm to 80 mm	1.4×10^{-5}	

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Pressure sensitivity level	Measurement microphone, Type LS1P (Laser pistonphone method)		1 Hz ≦ f ≦ 2 Hz	0.2 dB	2023-07-11
			2 Hz ＜ f ≦ 20 Hz	0.1 dB	
	Measurement microphone, Type LS1P (Coupler reciprocity method)		20 Hz ≦ f ≦ 4 kHz	0.04 dB	
			4 kHz ＜ f ≦ 8 kHz	0.05 dB	
			8 kHz ＜ f ≦ 10 kHz	0.15 dB	
			10 kHz ＜ f ≦ 12.5 kHz	0.17 dB	
	Measurement microphone, Type LS2aP (Coupler reciprocity method)		20 Hz ≦ f ＜ 25 Hz	0.07 dB	
			25 Hz ≦ f ＜ 31.5 Hz	0.06 dB	
			31.5 Hz ≦ f ＜ 40 Hz	0.05 dB	
			40 Hz ≦ f ≦ 12.5 kHz	0.04 dB	
			12.5 kHz ＜ f ≦ 16 kHz	0.05 dB	
			16 kHz ＜ f ≦ 20 kHz	0.12 dB	
Free-field sensitivity level	Measurement microphone, Type WS1 (Comparison in a free field)		20 Hz ≦ f ≦ 6.3 kHz	0.2 dB	
			6.3 kHz ＜ f ≦ 8 kHz	0.3 dB	
			8 kHz ＜ f ≦ 12.5 kHz	0.4 dB	
	Measurement microphone, Type WS2 (Comparison in a free field)		20 Hz ≦ f ≦ 6.3 kHz	0.2 dB	
			6.3 kHz ＜ f ≦ 8 kHz	0.3 dB	
			8 kHz ＜ f ≦ 20 kHz	0.4 dB	
	Measurement microphone, Type WS3 (Comparison in a free field)		20 Hz ≦ f ＜ 31.5 Hz	0.6 dB	
			31.5 Hz ≦ f ≦ 1.6 kHz	0.4 dB	
			1.6 kHz ＜ f ≦ 8 kHz	0.5 dB	
			8 kHz ＜ f ≦ 20 kHz	0.8 dB	
	Measurement microphone, Type WS3 (Reciprocity in a free field)		20 kHz ≦ f ≦ 100 kHz	1.0 dB	
Sound pressure level	Sound calibrator		31.5 Hz ≦ f ＜ 63 Hz	0.09 dB	
			63 Hz ≦ f ≦ 8 kHz	0.08 dB	
			8 kHz ＜ f ≦ 12.5 kHz	0.10 dB	
			12.5 kHz ＜ f ≦ 16 kHz	0.14 dB	
Free-field response level	Sound level meter		20 Hz ≦ f ≦ 2 kHz	0.2 dB	
			2 kHz ＜ f ≦ 6.3 kHz	0.3 dB	
			6.3 kHz ＜ f ≦ 12.5 kHz	0.5 dB	
Sound power level	Reference sound source		50 Hz ≦ f ＜ 63 Hz	1.1 dB	
			63 Hz ≦ f ＜ 80 Hz	1.0 dB	
			80 Hz ≦ f ＜ 100 Hz	0.9 dB	
			100 Hz ≦ f ＜ 125 Hz	0.8 dB	
			125 Hz ≦ f ＜ 160 Hz	0.6 dB	
			160 Hz ≦ f ＜ 250 Hz	0.5 dB	
			250 Hz ≦ f ≦ 2.5 kHz	0.4 dB	
			2.5 kHz ＜ f ≦ 5 kHz	0.5 dB	
			5 kHz ＜ f ≦ 8 kHz	0.6 dB	
			8 kHz ＜ f ≦ 16 kHz	0.9 dB	
			16 kHz ＜ f ≦ 20 kHz	1.0 dB	

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Ultrasound Free-field sensitivity	Hydrophone (Comparison with reference hydrophone)		0.5 MHz	7.9 %	2022-05-18
			1 MHz	7.8 %	
			2 MHz	7.3 %	
			3 MHz	6.7 %	
			4 MHz	6.1 %	
			5 MHz	6.1 %	
			6 MHz	6.6 %	
			7 MHz	6.6 %	
			8 MHz	6.6 %	
			9 MHz	6.7 %	
			10 MHz	6.7 %	
			11 MHz	6.9 %	
			12 MHz	7.0 %	
			13 MHz	7.1 %	
			14 MHz	7.2 %	
			15 MHz	7.3 %	
			16 MHz	7.8 %	
			17 MHz	8.0 %	
			18 MHz	8.3 %	
			19 MHz	8.5 %	
			20 MHz	8.8 %	
Voltage sensitivity (Modulus)	Acceleration measuring chain		0.1 Hz to 200 Hz	0.2 %	2024-06-13
			200 Hz to 4 kHz	0.4 %	
			4 kHz to 10 kHz	0.5 %	
Charge sensitivity (Modulus)	Accelerometer		10 Hz to 4 kHz	0.4 %	
			4 kHz to 10 kHz	0.5 %	
Shock voltage sensitivity (Modulus)	Acceleration measuring chain		50 m/s^2 to 10000 m/s^2	0.6 %	

Quantity/Class	Calibration and Measurement Capabilities					Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable	Remarks	Expanded Uncertainty (Level of Confidence Approximattely 95%)	
DC voltage sources: single values	Solid state voltage standard	1 V to 10 V	Temperature: 23 °C	See Mx1.1.1	1 V, 1.018 V: 8 nV (k=2), 10 V: 45 nV (k=2, 2.8)	2020-04-30
DC resistance standards and sources: low values	Fixed resistor	0.001 Ω to 1 Ω	Temperature: 20 °C, 23 °C, 25 °C Test current: 31.6 mA to 1 A	See Mx2.1	0.068 μΩ/Ω to 1.5 μΩ/Ω	
DC resistance standards and sources: intermediate values	Fixed resistor	10 Ω to 1.00E+6 Ω	Temperature: 20 °C, 23 °C, 25 °C Test current: 0.0316 mA to 4 mA Test voltage (1 MΩ): 10 V, 100 V	See Mx2.1	0.056 μΩ/Ω to 0.64 μΩ/Ω	
DC resistance standards and sources: high values	Fixed resistor	1.00E+7 Ω to 1.00E+12 Ω	Temperature: 23 °C Test voltage: 100 V	See Mx2.1	1.1 μΩ/Ω to 23 μΩ/Ω	
AC resistance: real component and imaginary component	Fixed resistor : real component	10 Ω to 100000 Ω	Frequency: 1 kHz, 10 kHz	See Mx4.1.1	0.060 μΩ/Ω to 8.0 μΩ/Ω	
AC resistance: real component and imaginary component	Fixed resistor: imaginary component	-500 μrad to 500 μrad	Frequency: 1 kHz, 10 kHz Resistance: 10 Ω to 100 kΩ	See Mx4.1.1	7.6 μrad to 76 μrad	
Capacitance: capacitance and dissipation factor for low loss capacitors	Standard capacitor (dry-nitrogen or fused silica dielectric): capacitance	10 pF to 1000 pF	Frequency: 1 kHz, 1.592 kHz	See Mx4.2	0.072 μF/F to 0.14 μF/F	
Capacitance: capacitance and dissipation factor for low loss capacitors	Standard capacitor (dry-nitrogen or fused silica dielectric): dissipation factor	0 μrad to 50 μrad	Frequency: 1 kHz, 1.592 kHz Capacitance: 10 pF to 1000 pF	See Mx4.2	7.6 μrad to 12 μrad	
Capacitance: capacitance and dissipation factor for dielectric capacitors	Fixed capacitor: capacitance	0.01 μF to 10 μF	Frequency: 1 kHz, 1.592 kHz	See Mx4.2	0.76 μF/F to 4.0 μF/F	
Capacitance: capacitance and dissipation factor for dielectric capacitors	Fixed capacitor: dissipation factor	0 μrad to 500 μrad	Frequency: 1 kHz, 1.592 kHz Capacitance: 0.01 μF to 10 μF	See Mx4.2	12 μrad to 13 μrad	
Inductance: self inductance and equivalent series resistance, intermediate values	Fixed inductor	10 mH to 100 mH	Frequency: 1 kHz, 1.592 kHz	See Mx4.3.2	28 μH/H to 33 μH/H	
AC/DC transfer difference at low voltages	Thermal converter	0.01 V to 1 V	Frequency: 10 Hz to 1 MHz	See Mx5.1	2 μV/V to 130 μV/V	
AC/DC transfer difference at medium voltages	Thermal converter	2 V to 20 V	Frequency: 10 Hz to 1 MHz	See Mx5.1	2 μV/V to 33 μV/V	
AC/DC transfer difference at higher voltages	Thermal converter	20 V to 1000 V	Frequency: 10 Hz to 1 MHz	See Mx5.1	5 μV/V to 48 μV/V	
AC voltage	AC voltmeter	1 V to 10 V	Frequency: 4 Hz to 100 kHz	See Mx5.2	9 μV/V to 150 μV/V	
AC voltage ratio: real component and imaginary component	Inductive voltage divider: real component	-0.1 to 1.1	Frequency: 50 Hz to 100 kHz Voltage: 10 V, 100 V	See Mx5.3.1	0.04E-08 to 2.9E-06	
AC voltage ratio: real component and imaginary component	Inductive voltage divider: imaginary component	-0.1 to 1.1	Frequency: 50 Hz to 100 kHz Voltage: 10 V, 100 V	See Mx5.3.1	0.09E-08 to 1.5E-06	
AC/DC current transfer	Thermal converter	10 mA	Frequency: 40 Hz to 100 kHz	See Mx6.1	3 μA/A to 4 μA/A	
AC current ratio: real component and imaginary component	Current comparator & current transformer: real component	1 to 1000	Frequency: 45 Hz to 4000 Hz Primary current: 5 A to 50 A Ratio: 1 to 1000	See Mx6.3.1	0.4 μA/A to 55 μA/A	
AC current ratio: real component and imaginary component	Current comparator & current transformer: imaginary component	-10^{-3} rad to 10^{-3} rad	Frequency: 45 Hz to 4000 Hz Primary current: 5 A to 50 A Ratio: 1 to 1000	See Mx6.3.1	0.21 μrad to 77 μrad	
Current and voltage waveform	Nonsinusoidal power source: voltage amplitude	1 V to 100 V	Harmonic order: Fundamental to 50th Fundamental frequency: 62.5 Hz	See Mx9.3	42 μV/V to 60 μV/V	
Current and voltage waveform	Nonsinusoidal power source: current amplitude	1 A to 5 A	Harmonic order: Fundamental to 50th Fundamental frequency: 62.5 Hz	See Mx9.3	45 μA/A to 79 μA/A	
Current and voltage waveform	Nonsinusoidal power source: phase angle	-π rad to π rad	Harmonic order: Fundamental to 50th Fundamental frequency: 62.5 Hz	See Mx9.3	14 μrad to 22 μrad	

Mx1.1.1 DC voltage

	Method	Coverage factor	Level of confidence / (%)	Expanded uncertainty / (nV)
1 V	Conventional JVS / Programmable JVS	2	95	8
1.018 V	Conventional JVS / Programmable JVS	2	95	8
10 V	Conventional JVS	2.8	95	45
10 V	Programmable JVS	2	95	45

Mx2.1 DC resistance

	Test current/voltage	Method	Relative expanded uncertainty / (μΩ/Ω)
1 mΩ	1.0 A	DCC with range extender	1.5
10 mΩ	0.316 A	DCC with range extender	0.76
100 mΩ	0.1 A	DCC	0.18
1 Ω	31.6 mA	QHR and CCC	0.068
1 Ω	50 mA	DCC	0.10
10 Ω	3.16 mA	DCC	0.10
25 Ω	4 mA	QHR and CCC	0.084
100 Ω	2.7 mA	QHR and CCC	0.056
100 Ω	1 mA	DCC	0.11
1 kΩ	0.316 mA	DCC	0.13
10 kΩ	0.0316 mA	QHR and CCC	0.058
10 kΩ	0.1 mA	DCC	0.16
1 MΩ	10 V, 100 V	Modified Wheatstone bridge	0.64
10 MΩ	100 V	Modified Wheatstone bridge	1.1
100 MΩ	100 V	Modified Wheatstone bridge	1.9
1 GΩ	100 V	Modified Wheatstone bridge	3.2
10 GΩ	100 V	Modified Wheatstone bridge	6.2
100 GΩ	100 V	Modified Wheatstone bridge	12
1 TΩ	100 V	Modified Wheatstone bridge	23

Mx4.1.1 AC resistance

	Frequency	Relative expanded uncertainty / (μΩ/Ω)	Expanded uncertainty / (μrad)
		Real component	Imaginary component
10 Ω	1 kHz	8.0	9.2
100 Ω	1 kHz	1.6	7.8
1 kΩ	1 kHz	0.10	7.6
10 kΩ	1 kHz	0.060	7.6
10 kΩ	10 kHz	1.4	76
100 kΩ	1 kHz	0.064	7.6

Mx4.2 Capacitance

	Frequency	Relative expanded uncertainty / (μF/F)	Expanded uncertainty / (μrad)
		Capacitance	Dissipation factor
10 pF	1 kHz	0.14	7.6
10 pF	1.592 kHz	0.14	12
100 pF	1 kHz	0.076	7.6
100 pF	1.592 kHz	0.076	12
1000 pF	1 kHz	0.072	7.6
1000 pF	1.592 kHz	0.072	12
0.01 μF	1 kHz	0.76	12
0.01 μF	1.592 kHz	0.96	12
0.1 μF	1 kHz	0.79	12
0.1 μF	1.592 kHz	0.99	12
1 μF	1 kHz	1.4	12
1 μF	1.592 kHz	1.5	12
10 μF	1 kHz	4.0	13

Mx4.3.2 Inductance

	Frequency	Relative expanded uncertainty / (μH/H)
10 mH	1 kHz	33
10 mH	1.592 kHz	28
100 mH	1 kHz	28

	Relative expanded uncertainty / (µV/V)										
	10 Hz to 40 Hz	40 Hz to 50 Hz	50 Hz to 100 Hz	100 Hz to 200 Hz	200 Hz to 1 kHz	1 kHz to 10 kHz	10 kHz to 20 kHz	20 kHz to 50 kHz	50 kHz to 100 kHz	100 kHz to 500 kHz	500 kHz to 1 MHz
10 mV	86	86	69	69	66	68	78	78	130	-	-
30 mV	41	41	29	29	26	29	29	29	57	-	-
60 mV	40	40	29	29	25	28	28	28	57	-	-
100 mV	24	24	13	13	10	11	12	12	13	-	-
200 mV	24	24	13	13	10	11	12	12	13	-	-
300 mV	23	23	11	11	7	7	8	8	9	21	36
600 mV	15	15	7	7	4	4	5	5	6	17	32
1 V	10	10	6	6	2	3	4	4	6	14	28
2 V to 3 V	8	5	5	5	2	2	2	4	4	9	25
3 V to 5 V	11	5	5	5	2	2	2	4	4	9	25
5 V to 6 V	7	4	4	4	3	3	3	4	4	10	30
6 V to 10 V	30	10	10	10	3	3	3	4	4	10	30
10 V to 12 V	6	4	4	4	4	4	4	5	5	11	33
12 V to 20 V	27	8	8	8	4	4	4	5	5	11	33
20 V to 50 V	17	17	9	5	5	5	6	7	7	-	-
50 V to 100 V	26	26	11	7	7	7	7	9	9	-	-
100 V to 200 V	32	32	14	8	8	8	9	12	12	-	-
200 V to 400 V	-	-	24	14	14	10	12	16	18	-	-
400 V to 700 V	-	-	29	19	19	16	19	29	48	-	-
700 V to 1000 V	-	-	29	19	19	16	19	29	-	-	-

Mx5.2 AC voltage

	Relative expanded uncertainty / (µV/V)							
	4 Hz to 10 Hz	40 Hz to 50 Hz	50 Hz to 0.4 kHz	0.4 kHz to 10 kHz	10 kHz to 20 kHz	20 kHz to 50 kHz	50 kHz to 70 kHz	70 kHz to 100 kHz
1 V	150	-	-	-	-	-	-	-
10 V	110	31	13	9	11	17	21	25

Frequency	Voltage	Ratio	Expanded uncertainty	
			Real component	Imaginary component
50 Hz to 60 Hz	100 V	0.9	0.27×10^{-8}	0.36×10^{-8}
50 Hz to 60 Hz	100 V	0.8	0.25×10^{-8}	0.33×10^{-8}
50 Hz to 60 Hz	100 V	0.7	0.23×10^{-8}	0.30×10^{-8}
50 Hz to 60 Hz	100 V	0.6	0.20×10^{-8}	0.27×10^{-8}
50 Hz to 60 Hz	100 V	0.5	0.18×10^{-8}	0.24×10^{-8}
50 Hz to 60 Hz	100 V	0.4	0.16×10^{-8}	0.21×10^{-8}
50 Hz to 60 Hz	100 V	0.3	0.13×10^{-8}	0.17×10^{-8}
50 Hz to 60 Hz	100 V	0.2	0.10×10^{-8}	0.14×10^{-8}
50 Hz to 60 Hz	100 V	0.1	0.07×10^{-8}	0.09×10^{-8}
50 Hz to 60 Hz	100 V	0.95	0.29×10^{-8}	0.38×10^{-8}
50 Hz to 60 Hz	100 V	0.9	0.27×10^{-8}	0.36×10^{-8}
50 Hz to 60 Hz	100 V	0.85	0.26×10^{-8}	0.34×10^{-8}
50 Hz to 60 Hz	100 V	0.8	0.24×10^{-8}	0.32×10^{-8}
50 Hz to 60 Hz	100 V	0.75	0.23×10^{-8}	0.30×10^{-8}
50 Hz to 60 Hz	100 V	0.7	0.22×10^{-8}	0.29×10^{-8}
50 Hz to 60 Hz	100 V	0.65	0.20×10^{-8}	0.27×10^{-8}
50 Hz to 60 Hz	100 V	0.6	0.19×10^{-8}	0.25×10^{-8}
50 Hz to 60 Hz	100 V	0.55	0.17×10^{-8}	0.23×10^{-8}
50 Hz to 60 Hz	100 V	0.5	0.16×10^{-8}	0.21×10^{-8}
50 Hz to 60 Hz	100 V	0.45	0.15×10^{-8}	0.20×10^{-8}
50 Hz to 60 Hz	100 V	0.4	0.14×10^{-8}	0.18×10^{-8}
50 Hz to 60 Hz	100 V	0.35	0.12×10^{-8}	0.16×10^{-8}
50 Hz to 60 Hz	100 V	0.3	0.11×10^{-8}	0.15×10^{-8}
50 Hz to 60 Hz	100 V	0.25	0.10×10^{-8}	0.13×10^{-8}
50 Hz to 60 Hz	100 V	0.2	0.09×10^{-8}	0.12×10^{-8}
50 Hz to 60 Hz	100 V	0.15	0.08×10^{-8}	0.11×10^{-8}
50 Hz to 60 Hz	100 V	0.1	0.07×10^{-8}	0.10×10^{-8}
50 Hz to 60 Hz	100 V	0.05	0.07×10^{-8}	0.09×10^{-8}
120 Hz	100 V	0.9	0.27×10^{-8}	0.37×10^{-8}
120 Hz	100 V	0.8	0.25×10^{-8}	0.34×10^{-8}
120 Hz	100 V	0.7	0.23×10^{-8}	0.31×10^{-8}
120 Hz	100 V	0.6	0.20×10^{-8}	0.28×10^{-8}
120 Hz	100 V	0.5	0.18×10^{-8}	0.25×10^{-8}
120 Hz	100 V	0.4	0.16×10^{-8}	0.22×10^{-8}
120 Hz	100 V	0.3	0.13×10^{-8}	0.18×10^{-8}
120 Hz	100 V	0.2	0.10×10^{-8}	0.14×10^{-8}
120 Hz	100 V	0.1	0.07×10^{-8}	0.10×10^{-8}
120 Hz	100 V	0.95	0.29×10^{-8}	0.39×10^{-8}
120 Hz	100 V	0.9	0.27×10^{-8}	0.37×10^{-8}
120 Hz	100 V	0.85	0.26×10^{-8}	0.35×10^{-8}
120 Hz	100 V	0.8	0.24×10^{-8}	0.33×10^{-8}
120 Hz	100 V	0.75	0.23×10^{-8}	0.31×10^{-8}
120 Hz	100 V	0.7	0.22×10^{-8}	0.29×10^{-8}
120 Hz	100 V	0.65	0.20×10^{-8}	0.27×10^{-8}
120 Hz	100 V	0.6	0.19×10^{-8}	0.25×10^{-8}
120 Hz	100 V	0.55	0.17×10^{-8}	0.24×10^{-8}
120 Hz	100 V	0.5	0.16×10^{-8}	0.22×10^{-8}
120 Hz	100 V	0.45	0.15×10^{-8}	0.20×10^{-8}
120 Hz	100 V	0.4	0.14×10^{-8}	0.18×10^{-8}
120 Hz	100 V	0.35	0.12×10^{-8}	0.17×10^{-8}
120 Hz	100 V	0.3	0.11×10^{-8}	0.15×10^{-8}
120 Hz	100 V	0.25	0.10×10^{-8}	0.13×10^{-8}
120 Hz	100 V	0.2	0.09×10^{-8}	0.12×10^{-8}
120 Hz	100 V	0.15	0.08×10^{-8}	0.11×10^{-8}
120 Hz	100 V	0.1	0.07×10^{-8}	0.10×10^{-8}
120 Hz	100 V	0.05	0.07×10^{-8}	0.09×10^{-8}

Frequency	Voltage	Ratio	Expanded uncertainty	
			Real component	Imaginary component
200 Hz	10 V	1.1	0.10×10^{-8}	0.16×10^{-8}
200 Hz	10 V	0.9	0.28×10^{-8}	0.32×10^{-8}
200 Hz	10 V	0.8	0.26×10^{-8}	0.30×10^{-8}
200 Hz	10 V	0.7	0.24×10^{-8}	0.28×10^{-8}
200 Hz	10 V	0.6	0.22×10^{-8}	0.28×10^{-8}
200 Hz	10 V	0.5	0.20×10^{-8}	0.28×10^{-8}
200 Hz	10 V	0.4	0.20×10^{-8}	0.24×10^{-8}
200 Hz	10 V	0.3	0.16×10^{-8}	0.20×10^{-8}
200 Hz	10 V	0.2	0.12×10^{-8}	0.14×10^{-8}
200 Hz	10 V	0.1	0.08×10^{-8}	0.10×10^{-8}
200 Hz	10 V	-0.1	0.08×10^{-8}	0.10×10^{-8}
400 Hz	10 V	1.1	0.04×10^{-8}	0.10×10^{-8}
400 Hz	10 V	0.9	0.22×10^{-8}	0.32×10^{-8}
400 Hz	10 V	0.8	0.16×10^{-8}	0.30×10^{-8}
400 Hz	10 V	0.7	0.18×10^{-8}	0.28×10^{-8}
400 Hz	10 V	0.6	0.12×10^{-8}	0.28×10^{-8}
400 Hz	10 V	0.5	0.10×10^{-8}	0.26×10^{-8}
400 Hz	10 V	0.4	0.10×10^{-8}	0.22×10^{-8}
400 Hz	10 V	0.3	0.08×10^{-8}	0.20×10^{-8}
400 Hz	10 V	0.2	0.06×10^{-8}	0.16×10^{-8}
400 Hz	10 V	0.1	0.04×10^{-8}	0.10×10^{-8}
400 Hz	10 V	-0.1	0.04×10^{-8}	0.10×10^{-8}
1 kHz	10 V	1.1	0.08×10^{-8}	0.20×10^{-8}
1 kHz	10 V	0.9	0.36×10^{-8}	0.78×10^{-8}
1 kHz	10 V	0.8	0.32×10^{-8}	0.72×10^{-8}
1 kHz	10 V	0.7	0.30×10^{-8}	0.66×10^{-8}
1 kHz	10 V	0.6	0.26×10^{-8}	0.62×10^{-8}
1 kHz	10 V	0.5	0.24×10^{-8}	0.54×10^{-8}
1 kHz	10 V	0.4	0.20×10^{-8}	0.46×10^{-8}
1 kHz	10 V	0.3	0.16×10^{-8}	0.38×10^{-8}
1 kHz	10 V	0.2	0.14×10^{-8}	0.30×10^{-8}
1 kHz	10 V	0.1	0.08×10^{-8}	0.20×10^{-8}
1 kHz	10 V	-0.1	0.08×10^{-8}	0.20×10^{-8}
10 kHz	10 V	1.1	1.4×10^{-8}	2.0×10^{-8}
10 kHz	10 V	0.9	5.6×10^{-8}	8.2×10^{-8}
10 kHz	10 V	0.8	5.2×10^{-8}	7.6×10^{-8}
10 kHz	10 V	0.7	4.7×10^{-8}	6.8×10^{-8}
10 kHz	10 V	0.6	4.2×10^{-8}	6.2×10^{-8}
10 kHz	10 V	0.5	3.7×10^{-8}	5.5×10^{-8}
10 kHz	10 V	0.4	3.2×10^{-8}	4.7×10^{-8}
10 kHz	10 V	0.3	2.7×10^{-8}	4.0×10^{-8}
10 kHz	10 V	0.2	2.1×10^{-8}	3.1×10^{-8}
10 kHz	10 V	0.1	1.4×10^{-8}	2.0×10^{-8}
10 kHz	10 V	-0.1	1.4×10^{-8}	2.0×10^{-8}
100 kHz	10 V	1.1	0.73×10^{-6}	0.37×10^{-6}
100 kHz	10 V	0.9	2.9×10^{-6}	1.5×10^{-6}
100 kHz	10 V	0.8	2.6×10^{-6}	1.4×10^{-6}
100 kHz	10 V	0.7	2.4×10^{-6}	1.2×10^{-6}
100 kHz	10 V	0.6	2.2×10^{-6}	1.1×10^{-6}
100 kHz	10 V	0.5	2.0×10^{-6}	0.98×10^{-6}
100 kHz	10 V	0.4	1.7×10^{-6}	0.87×10^{-6}
100 kHz	10 V	0.3	1.4×10^{-6}	0.72×10^{-6}
100 kHz	10 V	0.2	1.1×10^{-6}	0.55×10^{-6}
100 kHz	10 V	0.1	0.73×10^{-6}	0.37×10^{-6}
100 kHz	10 V	-0.1	0.73×10^{-6}	0.37×10^{-6}

Mx6.1 AC/DC current transfer

	Relative expanded uncertainty / (μA/A)							
	40 Hz to 60 Hz	60 Hz to 100 Hz	100 Hz to 200 Hz	200 Hz to 1 kHz	1 kHz to 10 kHz	10 kHz to 20 kHz	20 kHz to 50 kHz	50 kHz to 100 kHz
10 mA	4	3	3	3	3	3	4	4

Mx6.3.1 AC current ratio

Frequency	Primary current / (A)	Ratio	Expanded uncertainty (Instrument:CT)		Expanded uncertainty (Instrument:CC)	
			Real component / (μA/A)	Imaginary component / (μrad)	Real component / (μA/A)	Imaginary component / (μrad)
45 Hz to 60 Hz	5, 10, 20, 25, 50	1 to 10	1.1	1.2	1.1	1.2
45 Hz to 60 Hz	5, 10, 20, 25, 50	10 to 100	1.1	1.7	1.1	1.7
45 Hz to 60 Hz	5	100 to 1000	7.2	14	-	-
120 Hz	5, 10, 20, 25, 50	1 to 10	0.6	0.61	0.6	0.61
120 Hz	5, 10, 20, 25, 50	10 to 100	0.58	2.4	0.58	2.4
120 Hz	5	100 to 1000	3.7	24	-	-
200 Hz	5, 10, 20, 25, 50	1 to 10	0.42	0.37	-	-
200 Hz	5, 10, 20, 25, 50	10 to 100	0.42	3.9	-	-
200 Hz	5	100 to 1000	2.6	39	-	-
400 Hz	5, 10, 20, 25, 50	1 to 10	0.4	0.21	-	-
400 Hz	5, 10, 20, 25, 50	10 to 100	0.66	7.7	-	-
400 Hz	5	100 to 1000	5.6	77	-	-
700 Hz	5, 10, 20, 25, 50	1 to 10	0.58	0.21	-	-
700 Hz	5, 10, 20, 25, 50	10 to 100	1.8	13	-	-
1000 Hz	5, 10, 20, 25, 50	1 to 10	0.84	0.26	-	-
1000 Hz	5, 10, 20, 25, 50	10 to 100	3.5	19	-	-
2000 Hz	5, 10, 20, 25, 50	1 to 10	1.9	0.51	-	-
2000 Hz	5, 10, 20, 25, 50	10 to 100	14	38	-	-
4000 Hz	5, 10, 20, 25, 50	1 to 10	5.2	1	-	-
4000 Hz	5, 10, 20, 25, 50	10 to 100	55	77	-	-

Mx9.3 Current and voltage waveform

	Harmonic order	Frequency	Measurement conditions	Relative expanded uncertainty / (μV/V)	Relative expanded uncertainty / (μA/A)	Expanded uncertainty / (μrad)
Voltage	1st	62.5 Hz	100 V	42	-	-
	2nd to 50th	125 Hz to 3125 Hz	10 V	60	-	-
Current	1st	62.5 Hz	5 A	-	45	-
	2nd to 50th	125 Hz to 3125 Hz	3 A	-	79	-
Phase angle	1st	62.5 Hz	100 V / 5 A	-	-	14
	2nd to 50th	125 Hz to 3125 Hz	10 V / 3 A	-	-	22

Quantity	Calibration and Measurement Capabilities					Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable	Remarks	Expanded Uncertainty When the unit is %: Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Scalar RF reflection coefficient and attenuation: attenuation in coaxial line	Pasive device: variable and fixed attenuators	0 dB to 110 dB	100 kHz to 50 GHz	See Mx11.2.3a	0.002 dB to 0.068 dB	2020-04-30
Scalar RF reflection coefficient and attenuation: phase shift in coaxial line	Pasive device: variable phase shifters and attenuators	-180° to 180°	Loss : 0 dB to 60 dB Frequency : 10 MHz to 1 GHz	See Mx11.2.3b	0.029° to 0.056°	
Scalar RF reflection coefficient and attenuation: attenuation in waveguide	Passive device: variable attenuator	0 dB to 60 dB	18 GHz to 40 GHz、 50 GHz to 75 GHz	See Mx11.2.4	0.005 dB to 0.058 dB	
Antenna properties: antenna gain	Horn antenna	14 dB to 30 dB	18 GHz to 40 GHz	See Mx11.5.2	0.22 dB to 0.8 dB	2023-05-17
Antenna properties: antenna gain	Horn antenna	14 dB to 30 dB	50 GHz to 110 GHz	See Mx11.5.2	0.28 dB to 0.50 dB	
Antenna properties: antenna gain	Horn antenna	14 dB to 30 dB	220 GHz to 330 GHz	See Mx11.5.2	0.34 dB to 0.50 dB	
Electric field stength	Electric field probe	10 V/m, 20 V/m	20 MHz to 4 GHz	See Mx10.3.1	5 % to 15 %	
Scattering parameters: reflection coefficient (S_{ii}) in coaxial line	Passive device: one and two port devices	Reflection coefficient: 0 to 1	9 kHz to 40 GHz	See Mx11.3.1a	0.00028 to 0.032	2020-04-30
Scattering parameters: reflection coefficient (S_{ii}) in coaxial line	Passive device: one and two port devices	Reflection coefficient: 0° to 180°	9 kHz to 40 GHz	See Mx11.3.1a	0.20° to 180°	
Scattering parameters: transmission coefficient (S_{ij}) in coaxial line	Passive device: two port devices	Transmission coefficient: 0 to 1	9 kHz to 40 GHz	See Mx11.3.3a	2.3×10^{-6} to 0.016	
Scattering parameters: transmission coefficient (S_{ij}) in coaxial line	Passive device: two port devices	Transmission coefficient: 0° to 180°	9 kHz to 40 GHz	See Mx11.3.3a	0.030° to 24°	
Scattering parameters: reflection coefficient (S_{ii}) in coaxial line	Passive device: two port devices (air line)	$\|S_{ii}\| < 0.1$, $\|S_{ij}\| \approx 1$	10 MHz to 33 GHz	See Mx11.3.1b	1.8×10^{-6} to 4.8×10^{-4}	
Scattering parameters: reflection coefficient (S_{ii}) in coaxial line	Passive device: two port devices (air line)	Reflection coefficient: 0° to 180°	10 MHz to 33 GHz	See Mx11.3.1b	0.0010° to 180°	
Scattering parameters: transmission coefficient (S_{ij}) in coaxial line	Passive device: two port devices (air line)	$\|S_{ij}\| \approx 1$, $\|S_{ii}\| < 0.1$	10 MHz to 33 GHz	See Mx11.3.3b	2.7×10^{-5} to 2.1×10^{-3}	
Scattering parameters: transmission coefficient (S_{ij}) in coaxial line	Passive device: two port devices (air line)	Transmission coefficient: 0° to 180°	10 MHz to 33 GHz	See Mx11.3.3b	1.0×10^{-4} to 3.0×10^{-2}	
Noise: noise temperature or excess noise ratio in coaxial line	Noise source	150 K to 12000 K	2 GHz to 18 GHz	See Mx11.4.1	1.5 % to 3.7 %	
Radio frequency power: calibration factor and efficiency in coaxial line	Power sensor	0.9 W/W to 1 W/W	10 MHz to 18 GHz	See Mx11.1.3a	0.34 % to 1.20 %	
Radio frequency power: calibration factor and effective efficiency in coaxial line	Power sensor	0.8 W/W to 1 W/W	10 MHz to 40 GHz	See Mx11.1.3b	0.6 % to 2.4 %	
Radio frequency voltage and current: RF voltage meters	Thermistor mount	0.9 V/V to 1 V/V	10 MHz to 1 GHz	See Mx11.7.3a	0.3 % to 0.6 %	
Radio frequency voltage and current: RF voltage meters	RF voltage meters	0.5 V	10 MHz to 1 GHz	See Mx11.7.3b	0.0016 V to 0.0070 V	
Antenna properties: antenna factor	Loop antenna	-60 dB(S/m) to 100 dB(S/m)	20 Hz to 30 MHz	See Mx11.5.1	0.4 dB to 5.6 dB	2023-05-17
	Linear antenna	-5 dB(1/m) to 50 dB(1/m)	30 MHz to 2000 MHz	See Mx11.5.1	0.4 dB to 0.7 dB	
	Broadband horn antenna	20 dB(1/m) to 45 dB(1/m)	1 GHz to 18 GHz	See Mx11.5.1	0.8 dB to 1.2 dB	

Mx11.2.3a Scalar RF reflection coefficient and attenuation: attenuation in coaxial line

Attenuator type	Connector	Attenuation: A / (dB)	Frequency: f	Expanded uncertainty / (dB)
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$0 \leqq A \leqq 20$	100 kHz ≦ f ≦ 10 MHz	0.003
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$0 \leqq A \leqq 20$	10 MHz ≦ f ≦ 12 GHz	0.002
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$0 \leqq A \leqq 20$	12 GHz < f ≦ 18 GHz	0.005
Variable attenuator	PC-3.5, PC-2.92, PC-2.4	$0 \leqq A \leqq 20$	18 GHz < f ≦ 26.5 GHz	0.005
Variable attenuator	PC-2.92, PC-2.4	$0 \leqq A \leqq 20$	26.5 GHz < f ≦ 40 GHz	0.006
Variable attenuator	PC-2.4	$0 \leqq A \leqq 20$	40 GHz < f ≦ 50 GHz	0.006
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$20 < A \leqq 40$	100 kHz ≦ f ≦ 10 MHz	0.003
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$20 < A \leqq 40$	10 MHz ≦ f ≦ 12 GHz	0.005
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$20 < A \leqq 40$	12 GHz < f ≦ 18 GHz	0.008
Variable attenuator	PC-3.5, PC-2.92, PC-2.4	$20 < A \leqq 40$	18 GHz < f ≦ 26.5 GHz	0.009
Variable attenuator	PC-2.92, PC-2.4	$20 < A \leqq 40$	26.5 GHz < f ≦ 40 GHz	0.012
Variable attenuator	PC-2.4	$20 < A \leqq 40$	40 GHz < f ≦ 50 GHz	0.012
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$40 < A \leqq 60$	100 kHz ≦ f ≦ 10 MHz	0.005
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$40 < A \leqq 60$	10 MHz ≦ f ≦ 12 GHz	0.007
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$40 < A \leqq 60$	12 GHz < f ≦ 18 GHz	0.011
Variable attenuator	PC-3.5, PC-2.92, PC-2.4	$40 < A \leqq 60$	18 GHz < f ≦ 26.5 GHz	0.016
Variable attenuator	PC-2.92, PC-2.4	$40 < A \leqq 60$	26.5 GHz < f ≦ 40 GHz	0.038
Variable attenuator	PC-2.4	$40 < A \leqq 60$	40 GHz < f ≦ 50 GHz	0.038
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$60 < A \leqq 80$	100 kHz ≦ f ≦ 10 MHz	0.006
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$60 < A \leqq 80$	10 MHz ≦ f ≦ 12 GHz	0.008
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$60 < A \leqq 80$	12 GHz < f ≦ 18 GHz	0.014
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$80 < A \leqq 100$	100 kHz ≦ f ≦ 10 MHz	0.016
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$80 < A \leqq 100$	(10, 30, 60, 100, 500) MHz、(1, 5, 10, 12) GHz	0.020
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$80 < A \leqq 100$	(15, 18) GHz	0.022
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$100 < A \leqq 110$	(10, 30, 60, 100, 500) MHz、(1, 5, 10, 12) GHz	0.033
Variable attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$100 < A \leqq 110$	(15, 18) GHz	0.034
Waveguide below cutoff attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$0 \leqq A \leqq 40$	30 MHz	0.002
Waveguide below cutoff attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$40 < A \leqq 60$	30 MHz	0.005
Waveguide below cutoff attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$60 < A \leqq 80$	30 MHz	0.008
Waveguide below cutoff attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$80 < A \leqq 100$	30 MHz	0.018
Fixed attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$0 \leqq A \leqq 20$	10 MHz ≦ f ≦ 18 GHz	0.008
Fixed attenuator	PC-3.5, PC-2.92, PC-2.4	$0 \leqq A \leqq 20$	18 GHz < f ≦ 26.5 GHz	0.010
Fixed attenuator	PC-2.92, PC-2.4	$0 \leqq A \leqq 20$	26.5 GHz < f ≦ 40 GHz	0.010
Fixed attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$20 < A \leqq 40$	10 MHz ≦ f ≦ 18 GHz	0.009
Fixed attenuator	PC-3.5, PC-2.92, PC-2.4	$20 < A \leqq 40$	18 GHz < f ≦ 26.5 GHz	0.016
Fixed attenuator	PC-2.92, PC-2.4	$20 < A \leqq 40$	26.5 GHz < f ≦ 40 GHz	0.016
Fixed attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$40 < A \leqq 60$	10 MHz ≦ f ≦ 18 GHz	0.012
Fixed attenuator	PC-3.5, PC-2.92, PC-2.4	$40 < A \leqq 60$	18 GHz < f ≦ 26.5 GHz	0.040
Fixed attenuator	PC-2.92, PC-2.4	$40 < A \leqq 60$	26.5 GHz < f ≦ 40 GHz	0.040
Fixed attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$60 < A \leqq 80$	10 MHz ≦ f ≦ 18 GHz	0.068

Mx11.2.3b Scalar RF reflection coefficient and attenuation: phase shift in coaxial line

Device type	Connector	Phase shift: P / (°)	Loss: L / (dB)	Frequency: f	Expanded uncertainty / (°)
Variable phase shifter/ attenuator	Type-N: 50 Ω, PC-7, PC-3.5, PC-2.92, PC-2.4	$-180 \leqq P \leqq 180$	$L \leqq 20$	10 MHz ≦ f ≦ 1 GHz	0.029
			$L \leqq 40$		0.031
			$L \leqq 60$		0.056

Mx10.3.1 Electric field strength

Electric field strength	Frequency: f	Relatove Expanded uncertainty / (%)
10 V/m, 20 V/m	20 MHz ≦ f ≦ 800 MHz	5
10 V/m, 20 V/m	900 MHz ≦ f ≦ 2000 MHz	10
10 V/m, 20 V/m	2200 MHz ≦ f ≦ 4000 MHz	15

Mx11.2.4 Scalar RF reflection coefficient and attenuation: attenuation in waveguide

Attenuation: A	Frequency: f	Expanded uncertainty / (dB)
Attenuation: 0 dB ≦ A ≦ 20 dB	18 GHz ≦ f ≦ 26.5 GHz	0.005
Attenuation: 0 dB ≦ A ≦ 20 dB	26.5 GHz < f ≦ 40 GHz	0.005
Attenuation: 0 dB ≦ A ≦ 20 dB	50 GHz ≦ f ≦ 75 GHz	0.008
Attenuation: 20 dB < A ≦ 40 dB	18 GHz ≦ f ≦ 26.5 GHz	0.010
Attenuation: 20 dB < A ≦ 40 dB	26.5 GHz < f ≦ 40 GHz	0.011
Attenuation: 20 dB < A ≦ 40 dB	50 GHz ≦ f ≦ 75 GHz	0.023
Attenuation: 40 dB < A ≦ 60 dB	18 GHz ≦ f ≦ 26.5 GHz	0.025
Attenuation: 40 dB < A ≦ 60 dB	26.5 GHz < f ≦ 40 GHz	0.041
Attenuation: 40 dB < A ≦ 60 dB	50 GHz ≦ f ≦ 75 GHz	0.058

Mx11.5.2 Antenna properties: antenna gain

Waveguide designation	Frequency: f (GHz)	Expanded uncertainty / (dB)	Note
WR-42	18 ≦ f < 22	0.22	-
	22 ≦ f ≦ 26.5	0.34	-
WR-28	26.5 ≦ f ≦ 40	0.8	Type of input port is limited to 2.92 mm or 2.4 mm coaxial connector.
WR-15	50 ≦ f < 55	0.28	-
	55 ≦ f < 65	0.30	-
	65 ≦ f < 70	0.32	-
	70 ≦ f ≦ 75	0.34	-
WR-10	75 ≦ f < 80	0.36	-
	80 ≦ f < 85	0.38	-
	85 ≦ f < 90	0.42	-
	90 ≦ f < 95	0.44	-
	95 ≦ f < 105	0.48	-
	105 ≦ f ≦ 110	0.50	-
WR-3.4	220 ≦ f < 230	0.34	-
	230 ≦ f < 240	0.36	-
	240 ≦ f < 250	0.38	-
	250 ≦ f < 260	0.40	-
	260 ≦ f < 270	0.42	-
	270 ≦ f < 300	0.46	-
	300 ≦ f < 310	0.48	-
	310 ≦ f ≦ 330	0.50	-

Connector	Measurand range ($\|S_{ij}\|$=0)	Frequency: f	Expanded uncertainty	
			Magnitude	Phase / (°)
PC-7	$\|S ii\| \leqq 0.1$	9 kHz ≦ f < 500 kHz	0.00028 to 0.00041	0.68 to 180
PC-7	$\|S ii\| \leqq 0.1$	500 kHz ≦ f ≦ 30 MHz	0.00030 to 0.0019	0.69 to 180
PC-7	$0.1 < \|S ii\| \leqq 0.3$	9 kHz ≦ f < 500 kHz	0.00029 to 0.00046	0.58 to 0.75
PC-7	$0.1 < \|S ii\| \leqq 0.3$	500 kHz ≦ f ≦ 30 MHz	0.00031 to 0.0027	0.59 to 1.6
PC-7	$0.3 < \|S ii\| \leqq 0.5$	9 kHz ≦ f < 500 kHz	0.00033 to 0.00062	0.57 to 0.60
PC-7	$0.3 < \|S ii\| \leqq 0.5$	500 kHz ≦ f ≦ 30 MHz	0.00037 to 0.0039	0.58 to 1.1
PC-7	$0.5 < \|S ii\| \leqq 1.0$	9 kHz ≦ f < 500 kHz	0.00049 to 0.0018	0.57 to 0.62
PC-7	$0.5 < \|S ii\| \leqq 1.0$	500 kHz ≦ f ≦ 30 MHz	0.00055 to 0.0085	0.58 to 1.0
PC-7	$\|S ii\| \leqq 0.1$	40 MHz ≦ f < 2 GHz	0.0013 to 0.0016	0.74 to 180
PC-7	$\|S ii\| \leqq 0.1$	2 GHz ≦ f ≦ 18 GHz	0.0014 to 0.0028	0.80 to 180
PC-7	$0.1 < \|S ii\| \leqq 0.3$	40 MHz ≦ f < 2 GHz	0.0013 to 0.0017	0.29 to 0.87
PC-7	$0.1 < \|S ii\| \leqq 0.3$	2 GHz ≦ f ≦ 18 GHz	0.0014 to 0.0031	0.30 to 1.60
PC-7	$0.3 < \|S ii\| \leqq 0.5$	40 MHz ≦ f < 2 GHz	0.0015 to 0.0038	0.23 to 0.32
PC-7	$0.3 < \|S ii\| \leqq 0.5$	2 GHz ≦ f ≦ 18 GHz	0.0016 to 0.0037	0.23 to 0.59
PC-7	$0.5 < \|S ii\| \leqq 1.0$	40 MHz ≦ f < 2 GHz	0.0020 to 0.0035	0.20 to 0.24
PC-7	$0.5 < \|S ii\| \leqq 1.0$	2 GHz ≦ f ≦ 18 GHz	0.0020 to 0.0062	0.20 to 0.43
Type-N: 50 Ω	$\|S ii\| \leqq 0.1$	9 kHz ≦ f < 5 MHz	0.00050 to 0.00090	0.80 to 180
Type-N: 50 Ω	$\|S ii\| \leqq 0.1$	5 MHz ≦ f ≦ 30 MHz	0.0010 to 0.0029	1.1 to 180
Type-N: 50 Ω	$0.1 < \|S ii\| \leqq 0.3$	9 kHz ≦ f < 5 MHz	0.00050 to 0.0010	0.63 to 0.80
Type-N: 50 Ω	$0.1 < \|S ii\| \leqq 0.3$	5 MHz ≦ f ≦ 30 MHz	0.0011 to 0.0032	0.73 to 1.4
Type-N: 50 Ω	$0.3 < \|S ii\| \leqq 0.5$	9 kHz ≦ f < 5 MHz	0.00070 to 0.0013	0.61 to 0.67
Type-N: 50 Ω	$0.3 < \|S ii\| \leqq 0.5$	5 MHz ≦ f ≦ 30 MHz	0.0012 to 0.0037	0.68 to 1.0
Type-N: 50 Ω	$0.5 < \|S ii\| \leqq 1.0$	9 kHz ≦ f < 5 MHz	0.0010 to 0.0029	0.61 to 0.68
Type-N: 50 Ω	$0.5 < \|S ii\| \leqq 1.0$	5 MHz ≦ f ≦ 30 MHz	0.0016 to 0.0062	0.66 to 0.90
Type-N: 50 Ω	$\|S ii\| \leqq 0.1$	40 MHz ≦ f < 1.6 GHz	0.0027 to 0.0035	1.62 to 180
Type-N: 50 Ω	$\|S ii\| \leqq 0.1$	1.6 GHz ≦ f ≦ 18 GHz	0.0027 to 0.0050	1.52 to 180
Type-N: 50 Ω	$0.1 < \|S ii\| \leqq 0.3$	40 MHz ≦ f < 1.6 GHz	0.0029 to 0.0037	0.59 to 1.98
Type-N: 50 Ω	$0.1 < \|S ii\| \leqq 0.3$	1.6 GHz ≦ f ≦ 18 GHz	0.0027 to 0.0055	0.57 to 2.83
Type-N: 50 Ω	$0.3 < \|S ii\| \leqq 0.5$	40 MHz ≦ f < 1.6 GHz	0.0030 to 0.0041	0.41 to 0.70
Type-N: 50 Ω	$0.3 < \|S ii\| \leqq 0.5$	1.6 GHz ≦ f ≦ 18 GHz	0.0030 to 0.0066	0.41 to 1.05
Type-N: 50 Ω	$0.5 < \|S ii\| \leqq 1.0$	40 MHz ≦ f < 1.6 GHz	0.0036 to 0.0062	0.32 to 0.47
Type-N: 50 Ω	$0.5 < \|S ii\| \leqq 1.0$	1.6 GHz ≦ f ≦ 18 GHz	0.0036 to 0.0109	0.34 to 0.76

Connector	Measurand range ($\|S_{ij}\|$=0)	Frequency: f	Expanded uncertainty	
			Magnitude	Phase / (°)
PC-3.5	$\|S_{ii}\| \leqq 0.1$	9 kHz ≦ f ≦ 90 MHz	0.0014 to 0.024	1.4 to 180
PC-3.5	$0.1 < \|S_{ii}\| \leqq 0.3$	9 kHz ≦ f ≦ 90 MHz	0.0014 to 0.024	0.80 to 9.8
PC-3.5	$0.3 < \|S_{ii}\| \leqq 0.5$	9 kHz ≦ f ≦ 90 MHz	0.0015 to 0.024	0.66 to 3.3
PC-3.5	$0.5 < \|S_{ii}\| \leqq 1.0$	9 kHz ≦ f ≦ 90 MHz	0.0018 to 0.024	0.66 to 2.0
PC-3.5	$\|S_{ii}\| \leqq 0.1$	100 MHz ≦ f < 1 GHz	0.0030 to 0.0035	1.77 to 180
PC-3.5	$\|S_{ii}\| \leqq 0.1$	1 GHz ≦ f < 6.5 GHz	0.0035 to 0.0042	2.03 to 180
PC-3.5	$\|S_{ii}\| \leqq 0.1$	6.5 GHz ≦ f < 33 GHz	0.0035 to 0.0061	2.01 to 180
PC-3.5	$0.1 < \|S_{ii}\| \leqq 0.3$	100 MHz ≦ f < 1 GHz	0.0030 to 0.0038	0.63 to 2.04
PC-3.5	$0.1 < \|S_{ii}\| \leqq 0.3$	1 GHz ≦ f < 6.5 GHz	0.0035 to 0.0044	0.73 to 2.38
PC-3.5	$0.1 < \|S_{ii}\| \leqq 0.3$	6.5 GHz ≦ f < 33 GHz	0.0035 to 0.0068	0.74 to 3.51
PC-3.5	$0.3 < \|S_{ii}\| \leqq 0.5$	100 MHz ≦ f < 1 GHz	0.0033 to 0.0044	0.45 to 0.73
PC-3.5	$0.3 < \|S_{ii}\| \leqq 0.5$	1 GHz ≦ f < 6.5 GHz	0.0038 to 0.0049	0.49 to 0.84
PC-3.5	$0.3 < \|S_{ii}\| \leqq 0.5$	6.5 GHz ≦ f < 33 GHz	0.0039 to 0.0081	0.52 to 1.30
PC-3.5	$0.5 < \|S_{ii}\| \leqq 1.0$	100 MHz ≦ f < 1 GHz	0.0039 to 0.0068	0.36 to 0.50
PC-3.5	$0.5 < \|S_{ii}\| \leqq 1.0$	1 GHz ≦ f < 6.5 GHz	0.0043 to 0.0073	0.38 to 0.56
PC-3.5	$0.5 < \|S_{ii}\| \leqq 1.0$	6.5 GHz ≦ f < 33 GHz	0.0045 to 0.0133	0.42 to 0.93
PC-2.92	$\|S_{ii}\| \leqq 0.1$	10 MHz ≦ f ≦ 70 MHz	0.018 to 0.023	20 to 180
PC-2.92	$\|S_{ii}\| \leqq 0.1$	70 MHz < f < 1 GHz	0.0030 to 0.012	12 to 180
PC-2.92	$\|S_{ii}\| \leqq 0.1$	1 GHz ≦ f ≦ 9 GHz	0.0082 to 0.013	15 to 180
PC-2.92	$\|S_{ii}\| \leqq 0.1$	9 GHz < f ≦ 40 GHz	0.0035 to 0.010	12 to 180
PC-2.92	$0.1 < \|S_{ii}\| \leqq 0.3$	10 MHz ≦ f ≦ 70 MHz	0.018 to 0.023	7.8 to 23
PC-2.92	$0.1 < \|S_{ii}\| \leqq 0.3$	70 MHz < f < 1 GHz	0.0030 to 0.012	5.0 to 17
PC-2.92	$0.1 < \|S_{ii}\| \leqq 0.3$	1 GHz ≦ f ≦ 9 GHz	0.0082 to 0.013	5.9 to 18
PC-2.92	$0.1 < \|S_{ii}\| \leqq 0.3$	9 GHz < f ≦ 40 GHz	0.0036 to 0.011	5.1 to 16
PC-2.92	$0.3 < \|S_{ii}\| \leqq 0.5$	10 MHz ≦ f ≦ 70 MHz	0.018 to 0.024	4.8 to 8.8
PC-2.92	$0.3 < \|S_{ii}\| \leqq 0.5$	70 MHz < f < 1 GHz	0.0032 to 0.013	3.1 to 6.7
PC-2.92	$0.3 < \|S_{ii}\| \leqq 0.5$	1 GHz ≦ f ≦ 9 GHz	0.0083 to 0.013	3.7 to 6.8
PC-2.92	$0.3 < \|S_{ii}\| \leqq 0.5$	9 GHz < f ≦ 40 GHz	0.0038 to 0.012	3.2 to 6.4
PC-2.92	$0.5 < \|S_{ii}\| \leqq 1.0$	10 MHz ≦ f ≦ 70 MHz	0.018 to 0.032	2.2 to 5.4
PC-2.92	$0.5 < \|S_{ii}\| \leqq 1.0$	70 MHz < f < 1 GHz	0.0035 to 0.018	1.4 to 4.2
PC-2.92	$0.5 < \|S_{ii}\| \leqq 1.0$	1 GHz ≦ f ≦ 9 GHz	0.0086 to 0.014	1.7 to 4.2
PC-2.92	$0.5 < \|S_{ii}\| \leqq 1.0$	9 GHz < f ≦ 40 GHz	0.0043 to 0.018	1.4 to 4.1

Mx11.3.1b Scattering parameters: reflection coefficient (S_{ii}) in coaxial line

Connector	Measurand range ($\|S_{ij}\|$≈1.0)	Frequency: f	Expanded uncertainty	
			Magnitude	Phase / (°)
PC-7, Type-N: 50 Ω	$\|S_{ii}\| \leqq 0.1$	10 MHz ≦ f ≦ 18 GHz	3.5×10^{-6} to 4.8×10^{-4}	0.0020 to 180
PC-3.5	$\|S_{ii}\| \leqq 0.1$	10 MHz ≦ f ≦ 33 GHz	1.8×10^{-6} to 4.7×10^{-4}	0.0010 to 180

Connector	Measurand range ($\|S_{ii}\|$=0)	Frequency: f	Expanded uncertainty	
			Magnitude	Phase / (°)
PC-7	$\|S_{ij}\| = 1$	9 kHz ≦ f < 500 kHz	0.00018 to 0.00020	0.25
PC-7	$\|S_{ij}\| = 1$	500 kHz ≦ f ≦ 30 MHz	0.00015 to 0.00039	0.24 to 0.26
PC-7	0.1 ≦ $\|S_{ij}\|$ < 1.0	9 kHz ≦ f < 500 kHz	0.000026 to 0.00020	0.25
PC-7	0.1 ≦ $\|S_{ij}\|$ < 1.0	500 kHz ≦ f ≦ 30 MHz	0.000024 to 0.00039	0.24 to 0.26
PC-7	0.01 ≦ $\|S_{ij}\|$ < 0.1	9 kHz ≦ f < 500 kHz	0.000018 to 0.000028	0.25 to 0.34
PC-7	0.01 ≦ $\|S_{ij}\|$ < 0.1	500 kHz ≦ f ≦ 30 MHz	0.0000037 to 0.000040	0.25 to 0.34
PC-7	0.001 ≦ $\|S_{ij}\|$ < 0.01	9 kHz ≦ f < 500 kHz	0.000018	0.34 to 1.3
PC-7	0.001 ≦ $\|S_{ij}\|$ < 0.01	500 kHz ≦ f ≦ 30 MHz	0.0000023 to 0.000018	0.26 to 1.3
PC-7	$\|S_{ij}\| = 1$	40 MHz ≦ f < 0.5 GHz	0.0022 to 0.0025	0.13 to 0.14
PC-7	$\|S_{ij}\| = 1$	0.5 GHz ≦ f ≦ 18 GHz	0.0022 to 0.0036	0.13 to 0.21
PC-7	0.1 ≦ $\|S_{ij}\|$ < 1.0	40 MHz ≦ f < 0.5 GHz	0.00019 to 0.0025	0.11 to 0.14
PC-7	0.1 ≦ $\|S_{ij}\|$ < 1.0	0.5 GHz ≦ f ≦ 18 GHz	0.00018 to 0.0036	0.10 to 0.21
PC-7	0.01 ≦ $\|S_{ij}\|$ < 0.1	40 MHz ≦ f < 0.5 GHz	0.000025 to 0.00021	0.11 to 0.56
PC-7	0.01 ≦ $\|S_{ij}\|$ < 0.1	0.5 GHz ≦ f ≦ 18 GHz	0.000024 to 0.00037	0.11 to 0.58
PC-7	0.001 ≦ $\|S_{ij}\|$ < 0.01	40 MHz ≦ f < 0.5 GHz	0.000017 to 0.000097	0.15 to 5.45
PC-7	0.001 ≦ $\|S_{ij}\|$ < 0.01	0.5 GHz ≦ f ≦ 18 GHz	0.000015 to 0.0036	0.14 to 5.48
Type-N: 50 Ω	$\|S_{ij}\| = 1$	9 kHz ≦ f < 10 MHz	0.00022 to 0.00051	0.25 to 0.26
Type-N: 50 Ω	$\|S_{ij}\| = 1$	10 MHz ≦ f ≦ 30 MHz	0.00060 to 0.00072	0.27 to 0.28
Type-N: 50 Ω	0.1 ≦ $\|S_{ij}\|$ < 1.0	9 kHz ≦ f < 10 MHz	0.000042 to 0.00017	0.25 to 0.27
Type-N: 50 Ω	0.1 ≦ $\|S_{ij}\|$ < 1.0	10 MHz ≦ f ≦ 30 MHz	0.000061 to 0.00024	0.27 to 0.28
Type-N: 50 Ω	0.01 ≦ $\|S_{ij}\|$ < 0.1	9 kHz ≦ f < 10 MHz	0.0000069 to 0.000038	0.27 to 0.44
Type-N: 50 Ω	0.01 ≦ $\|S_{ij}\|$ < 0.1	10 MHz ≦ f ≦ 30 MHz	0.0000075 to 0.000023	0.27 to 0.28
Type-N: 50 Ω	0.001 ≦ $\|S_{ij}\|$ < 0.01	9 kHz ≦ f < 10 MHz	0.0000047 to 0.000035	0.32 to 2.3
Type-N: 50 Ω	0.001 ≦ $\|S_{ij}\|$ < 0.01	10 MHz ≦ f ≦ 30 MHz	0.0000047 to 0.0000052	0.33 to 0.50
Type-N: 50 Ω	$\|S_{ij}\| = 1$	40 MHz ≦ f < 0.5 GHz	0.0035 to 0.0036	0.20 to 0.21
Type-N: 50 Ω	$\|S_{ij}\| = 1$	0.5 GHz ≦ f ≦ 18 GHz	0.0036 to 0.0078	0.20 to 0.45
Type-N: 50 Ω	0.1 ≦ $\|S_{ij}\|$ < 1.0	40 MHz ≦ f < 0.5 GHz	0.00032 to 0.0036	0.18 to 0.21
Type-N: 50 Ω	0.1 ≦ $\|S_{ij}\|$ < 1.0	0.5 GHz ≦ f ≦ 18 GHz	0.000033 to 0.0079	0.18 to 0.45
Type-N: 50 Ω	0.01 ≦ $\|S_{ij}\|$ < 0.1	40 MHz ≦ f < 0.5 GHz	0.000035 to 0.00033	0.18 to 0.57
Type-N: 50 Ω	0.01 ≦ $\|S_{ij}\|$ < 0.1	0.5 GHz ≦ f ≦ 18 GHz	0.000035 to 0.00079	0.19 to 0.71
Type-N: 50 Ω	0.001 ≦ $\|S_{ij}\|$ < 0.01	40 MHz ≦ f < 0.5 GHz	0.000017 to 0.00010	0.21 to 5.45
Type-N: 50 Ω	0.001 ≦ $\|S_{ij}\|$ < 0.01	0.5 GHz ≦ f ≦ 18 GHz	0.000015 to 0.00012	0.20 to 5.49

Connector	Measurand range ($\|S_{ii}\|$=0)	Frequency: f	Expanded uncertainty	
			Magnitude	Phase / (°)
PC-3.5	$\|S_{ij}\| = 1$	9 kHz ≦ f ≦ 90 MHz	0.00021 to 0.016	0.030 to 0.28
PC-3.5	0.1 ≦ $\|S_{ij}\|$ < 1.0	9 kHz ≦ f ≦ 90 MHz	0.000042 to 0.016	0.030 to 0.28
PC-3.5	0.01 ≦ $\|S_{ij}\|$ < 0.1	9 kHz ≦ f ≦ 90 MHz	0.0000050 to 0.00012	0.27 to 0.44
PC-3.5	0.001 ≦ $\|S_{ij}\|$ < 0.01	9 kHz ≦ f ≦ 90 MHz	0.0000024 to 0.000035	0.030 to 0.21
PC-3.5	$\|S_{ij}\| = 1$	100 MHz ≦ f < 1 GHz	0.0036 to 0.0037	0.20 to 0.21
PC-3.5	$\|S_{ij}\| = 1$	1 GHz ≦ f ≦ 33 GHz	0.0036 to 0.0075	0.21 to 0.43
PC-3.5	0.1 ≦ $\|S_{ij}\|$ < 1.0	100 MHz ≦ f < 1 GHz	0.00032 to 0.0037	0.19 to 0.21
PC-3.5	0.1 ≦ $\|S_{ij}\|$ < 1.0	1 GHz ≦ f ≦ 33 GHz	0.00033 to 0.0075	0.19 to 0.43
PC-3.5	0.01 ≦ $\|S_{ij}\|$ < 0.1	100 MHz ≦ f < 1 GHz	0.000032 to 0.00033	0.18 to 0.20
PC-3.5	0.01 ≦ $\|S_{ij}\|$ < 0.1	1 GHz ≦ f ≦ 33 GHz	0.000035 to 0.00075	0.20 to 0.43
PC-3.5	0.001 ≦ $\|S_{ij}\|$ < 0.01	100 MHz ≦ f < 1 GHz	0.0000055 to 0.000035	0.18 to 0.71
PC-3.5	0.001 ≦ $\|S_{ij}\|$ < 0.01	1 GHz ≦ f ≦ 33 GHz	0.000013 to 0.000089	0.20 to 2.80
PC-2.92	$\|S_{ij}\| = 1$	10 MHz ≦ f ≦ 70 MHz	0.0041 to 0.0095	0.74 to 1.1
PC-2.92	$\|S_{ij}\| = 1$	70 MHz < f < 1 GHz	0.0025 to 0.0040	0.65 to 0.74
PC-2.92	$\|S_{ij}\| = 1$	1 GHz ≦ f ≦ 6 GHz	0.0028 to 0.0071	0.66 to 0.91
PC-2.92	$\|S_{ij}\| = 1$	6 GHz < f ≦ 40 GHz	0.0030 to 0.0095	0.68 to 1.1
PC-2.92	0.1 ≦ $\|S_{ij}\|$ < 1.0	10 MHz ≦ f ≦ 70 MHz	0.00046 to 0.0085	0.74 to 1.1
PC-2.92	0.1 ≦ $\|S_{ij}\|$ < 1.0	70 MHz < f < 1 GHz	0.00030 to 0.0036	0.65 to 0.77
PC-2.92	0.1 ≦ $\|S_{ij}\|$ < 1.0	1 GHz ≦ f ≦ 6 GHz	0.00033 to 0.0071	0.66 to 0.93
PC-2.92	0.1 ≦ $\|S_{ij}\|$ < 1.0	6 GHz < f ≦ 40 GHz	0.00035 to 0.0095	0.68 to 1.2
PC-2.92	0.01 ≦ $\|S_{ij}\|$ < 0.1	10 MHz ≦ f ≦ 70 MHz	0.00017 to 0.00098	0.77 to 1.1
PC-2.92	0.01 ≦ $\|S_{ij}\|$ < 0.1	70 MHz < f < 1 GHz	0.000057 to 0.00046	0.71 to 2.9
PC-2.92	0.01 ≦ $\|S_{ij}\|$ < 0.1	1 GHz ≦ f ≦ 6 GHz	0.000076 to 0.00073	0.69 to 1.1
PC-2.92	0.01 ≦ $\|S_{ij}\|$ < 0.1	6 GHz < f ≦ 40 GHz	0.00011 to 0.0011	0.71 to 2.9
PC-2.92	0.001 ≦ $\|S_{ij}\|$ < 0.01	10 MHz ≦ f ≦ 70 MHz	0.00016 to 0.00019	1.5 to 9.8
PC-2.92	0.001 ≦ $\|S_{ij}\|$ < 0.01	70 MHz < f < 1 GHz	0.000040 to 0.00017	0.83 to 9.8
PC-2.92	0.001 ≦ $\|S_{ij}\|$ < 0.01	1 GHz ≦ f ≦ 6 GHz	0.000052 to 0.00010	0.94 to 6.0
PC-2.92	0.001 ≦ $\|S_{ij}\|$ < 0.01	6 GHz < f ≦ 40 GHz	0.000097 to 0.00041	1.2 to 24

Mx11.3.3b Scattering parameters: transmission coefficient (S_{ij}) in coaxial line

Connector	Measurand range ($\|S_{ii}\|$<0.1)	Frequency: f	Expanded uncertainty	
			Magnitude	Phase / (°)
PC-7, Type-N: 50 Ω	$\|S_{ij}\| \approx 1.0$	10 MHz ≦ f ≦ 18 GHz	6.5×10^{-5} to 1.5×10^{-3}	2.0×10^{-4} to 3.0×10^{-2}
PC-3.5	$\|S_{ij}\| \approx 1.0$	10 MHz ≦ f ≦ 33 GHz	2.7×10^{-5} to 2.1×10^{-3}	1.0×10^{-4} to 3.0×10^{-2}

Mx11.4.1 Noise: noise temperature or excess noise ratio in coa

Frequency	Relative expanded uncertainty / (%)		
	Noise temperature: 150 K ≦ T < 200 K	Noise temperature: 200 K ≦ T < 2000 K	Noise temperature: 2000 K ≦ T ≦ 12000 K
2 GHz	3.1	2.0	2.5
3 GHz	2.6	1.6	2.0
4 GHz	3.3	2.2	2.8
5 GHz	3.2	2.2	2.7
6 GHz	2.7	1.7	2.1
7 GHz	2.7	1.7	2.1
8 GHz	3.0	1.9	2.4
9 GHz	2.5	1.5	1.8
10 GHz	2.5	1.5	1.8
11 GHz	2.6	1.5	1.9
12 GHz	2.6	1.5	1.9
13 GHz	2.9	1.8	2.3
14 GHz	2.8	1.8	2.2
15 GHz	2.8	1.7	2.1
16 GHz	3.7	2.5	3.2
17 GHz	3.5	2.4	3.0
18 GHz	3.6	2.5	3.1

Mx11.5.1 Antenna properties: antenna factor

Antenna type	Method	Environment	Antenna factor	Frequency: f	Expanded uncertainty / (dB)	Note
Passive loop antenna	Standard antenna method	Free space	0 dB(S/m) to 100 dB(S/m)	20 Hz ≦ f < 30 Hz	5.6	Diameter: 133 mm, Number of turns: 36
Passive loop antenna	Standard antenna method	Free space	0 dB(S/m) to 100 dB(S/m)	30 Hz ≦ f < 60 Hz	3.9	Diameter: 133 mm, Number of turns: 36
Passive loop antenna	Standard antenna method	Free space	0 dB(S/m) to 100 dB(S/m)	60 Hz ≦ f < 100 Hz	3.8	Diameter: 133 mm, Number of turns: 36
Passive loop antenna	Standard antenna method	Free space	0 dB(S/m) to 100 dB(S/m)	100 Hz ≦ f ≦ 200 kHz	3.7	Diameter: 133 mm, Number of turns: 36
Passive loop antenna	Three-antenna method	Free space	-20 dB(S/m) to 80 dB(S/m)	9 kHz ≦ f < 150 kHz	0.7	Diameter: 10 cm
Passive loop antenna	Three-antenna method	Free space	-20 dB(S/m) to 80 dB(S/m)	150 kHz ≦ f < 310 kHz	0.5	Diameter: 10 cm
Passive loop antenna	Three-antenna method	Free space	-20 dB(S/m) to 80 dB(S/m)	310 kHz ≦ f ≦ 30 MHz	0.4	Diameter: 10 cm
Active loop antenna	Standard antenna method	Free space	-60 dB(S/m) to 0 dB(S/m)	9 kHz ≦ f < 150 kHz	3.2	Diameter: 60 cm
Active loop antenna	Standard antenna method	Free space	-60 dB(S/m) to 0 dB(S/m)	150 kHz ≦ f < 500 kHz	2.2	Diameter: 60 cm
Active loop antenna	Standard antenna method	Free space	-60 dB(S/m) to 0 dB(S/m)	500 kHz ≦ f < 15 MHz	2.0	Diameter: 60 cm
Active loop antenna	Standard antenna method	Free space	-60 dB(S/m) to 0 dB(S/m)	15 MHz ≦ f < 30 MHz	1.8	Diameter: 60 cm
Active loop antenna	Standard antenna method	Free space	-60 dB(S/m) to 0 dB(S/m)	f = 30 MHz	1.6	Diameter: 60 cm
Linear dipole antenna	Standard antenna method	Horizontal polarization, 2 m above ground plane	-5 dB(1/m) to 40 dB(1/m)	30 MHz ≦ f ≦ 1000 MHz	0.7	-
Linear dipole antenna	Three-antenna method	Free space	40 dB(1/m) to 50 dB(1/m)	1000 MHz ≦ f ≦ 2000 MHz	0.4	-
Biconical antenna	Three-antenna method	Free space	5 dB(1/m) to 25 dB(1/m)	f = 30 MHz, 35 MHz, 40 MHz	0.7	-
Biconical antenna	Three-antenna method	Free space	5 dB(1/m) to 25 dB(1/m)	45 MHz ≦ f ≦ 300 MHz	0.5	-
Log-periodic antenna	Three-antenna method	Free space	10 dB(1/m) to 35 dB(1/m)	300 MHz ≦ f ≦ 1000 MHz	0.5	-
Hybrid antenna	Three-antenna method	Free space	5 dB(1/m) to 25 dB(1/m)	30 MHz ≦ f ≦ 1000 MHz	0.5	Bow-tie and log-periodic hybrid antenna
Broadband horn antenna	Single-antenna method	Free space	20 dB(1/m) to 45 dB(1/m)*	1 GHz ≦ f < 8 GHz	0.8	Double ridge guide horn antenna *The maximum calibratable antenna factors are limited to their corresponding antenna gains greater than 3 dBi
			20 dB(1/m) to 45 dB(1/m)	8 GHz ≦ f < 10 GHz	0.8	Double ridge guide horn antenna
			20 dB(1/m)* to 45 dB(1/m)	10 GHz ≦ f ≦ 18 GHz	1.2	Double ridge guide horn antenna *The minimum calibratable antenna factors are limited to their corresponding antenna gains smaller than 30 dBi

Mx11.1.3a Radio frequency power: calibration factor and effective efficiency in coaxial line

Frequency: f	Power level / (mW)	Standard	Relative expanded uncertainty / (%)
f = 10 MHz	1	Broadband coaxial calorimeter	0.35
10 MHz < f ≦ 6 GHz	1	Broadband coaxial calorimeter	0.40
6 GHz < f ≦ 11 GHz	1	Broadband coaxial calorimeter	0.60
11 GHz < f ≦ 13 GHz	1	Broadband coaxial calorimeter	0.70
13 GHz < f ≦ 16 GHz	1	Broadband coaxial calorimeter	1.00
16 GHz < f ≦ 18 GHz	1	Broadband coaxial calorimeter	1.20
10 MHz ≦ f ≦ 6 GHz	10	Broadband coaxial calorimeter	0.34
6 GHz < f ≦ 11 GHz	10	Broadband coaxial calorimeter	0.40
11 GHz < f ≦ 13 GHz	10	Broadband coaxial calorimeter	0.60
13 GHz < f ≦ 18 GHz	10	Broadband coaxial calorimeter	1.00
10 MHz ≦ f ≦ 6 GHz	1	Calibrated thermistor mount and thermo-electric sensor by NMIJ	0.40
6 GHz < f ≦ 11 GHz	1	Calibrated thermistor mount and thermo-electric sensor by NMIJ	0.60
11 GHz < f ≦ 13 GHz	1	Calibrated thermistor mount and thermo-electric sensor by NMIJ	0.70
13 GHz < f ≦ 16 GHz	1	Calibrated thermistor mount and thermo-electric sensor by NMIJ	1.00
16 GHz < f ≦ 18 GHz	1	Calibrated thermistor mount and thermo-electric sensor by NMIJ	1.20

Mx11.1.3b Radio frequency power: calibration factor and effective efficiency in coaxial line

Frequency: f	Power level / (mW)	Standard	Relative expanded uncertainty / (%)
10 MHz ≦ f ≦ 14 GHz	1	Broadband coaxial calorimeter	1.0
14 GHz < f ≦ 19 GHz	1	Broadband coaxial calorimeter	1.1
19 GHz < f ≦ 25 GHz	1	Broadband coaxial calorimeter	1.3
25 GHz < f ≦ 40 GHz	1	Broadband coaxial calorimeter	2.4
10 MHz ≦ f ≦ 20 MHz	10	Broadband coaxial calorimeter	1.0
20 MHz < f ≦ 13 GHz	10	Broadband coaxial calorimeter	0.6
13 GHz < f ≦ 19 GHz	10	Broadband coaxial calorimeter	1.0
19 GHz < f ≦ 25 GHz	10	Broadband coaxial calorimeter	1.2
25 GHz < f ≦ 40 GHz	10	Broadband coaxial calorimeter	2.2

Mx11.7.3a Radio frequency voltage and current: RF voltage meters

Frequency: f	Relative expanded uncertainty / (%)
10 MHz ≦ f < 100 MHz	0.30
100 MHz ≦ f ≦ 1 GHz	0.60

Mx11.7.3b Radio frequency voltage and current: RF voltage meters

Frequency: f	Expanded uncertainty / (V)
10 MHz ≦ f < 100 MHz	0.0016
100 MHz ≦ f ≦ 1 GHz	0.0070

Quantity	Calibration and Measurement Capabilities						Effective Date of Accreditation
	Instrument or Artefact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)			Expanded Uncertainty When the unit is %: Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
			Wavelength	Power Level	Other conditions		
Luminous intensity	Tungsten lamp	10 cd to 3000 cd			Correlated colour temperature from 2000 K to 3100 K	0.64 %	2021-05-31
Illuminance	Tungsten lamp	1 lx to 3000 lx			Correlated colour temperature 2856 K	0.70 %	
Illuminance responsivity	Illuminance meter	1 lx to 3000 lx			Correlated colour temperature 2856 K	0.66 %	
Total luminous flux	Tungsten lamp	5 lm to 9000 lm			Correlated colour temperature from 2300 K to 2800 K	0.84 %	
Spectral irradiance	Tungsten lamp	$(3.0 \times 10^{-5} – 9.0 \times 10^{-3})$ W•m^{-2}•nm^{-1}	250 nm ≦ λ ≦ 350 nm			3.8 %	
		$(1.0 \times 10^{-3} – 4.0 \times 10^{-2})$ W•m^{-2}•nm^{-1}	350 nm < λ ≦ 450 nm			3.2 %	
		$(6.0 \times 10^{-3} – 1.5 \times 10^{-1})$ W•m^{-2}•nm^{-1}	450 nm < λ ≦ 600 nm			2.8 %	
		$(2.0 \times 10^{-2} – 2.5 \times 10^{-1})$ W•m^{-2}•nm^{-1}	600 nm < λ ≦ 830 nm			3.0 %	
		$(1.5 \times 10^{-2} – 2.5 \times 10^{-1})$ W•m^{-2}•nm^{-1}	830 nm < λ ≦ 2300 nm			3.4 %	
		$(5.0 \times 10^{-3} – 5.5 \times 10^{-2})$ W•m^{-2}•nm^{-1}	2300 nm < λ ≦ 2500 nm			6.0 %	
Total spectral radiant flux	Tungsten lamp	2 mW nm^{-1} ～ 100 mW nm^{-1}	360 nm ～ 400 nm			4.9 %	
			405 nm ～ 450 nm			4.2 %	
			455 nm ～ 600 nm			3.3 %	
			605 nm ～ 830 nm			3.4 %	
Distribution temperature	Tungsten lamp	2000 K - 3400 K				15 K	
Spectral responsivity (UV, Visible, Near infrared)	Broadband detector (Si photodiode)		200 nm ≦ λ ＜250 nm			(-0.064λ＋17.6) % λ:Wawvelength in nm	
			250 nm ≦ λ ＜380 nm			1.6 %	
			380 nm ≦ λ ＜650 nm			$(-2.04 \times 10^{-3}$ λ ＋ 1.78) % λ: Wawvelength in nm	
			650 nm ≦ λ ＜930 nm			$(3.93 \times 10^{-4}$ λ ＋ 0.195) % λ: Wawvelength in nm	
			930 nm ≦ λ ≦ 1150 nm			$(1.063 \times 10^{-2}$ λ －9.33) % λ: Wawvelength in nm	
	Broadband detector (InGaAs photodiode)		800 nm ≦λ＜935 nm			1.7 % ～ 1.9 %	
			935 nm ≦λ＜1155 nm			1.9 % ～ 2.0 %	
			1155 nm ≦λ＜1340 nm			2.0 % ～ 2.1 %	
			1340 nm ≦λ＜1600 nm			2.1 % ～ 1.9 %	
			1600 nm ≦λ≦1650 nm			1.9 % ～ 2.8 %	
Spectral diffuse reflectance	Spectrally neutral material	0.8000 ≦ R < 1.000	250 nm ≦ λ < 300 nm			1.2 %	
			300 nm ≦ λ < 360 nm			0.78 %	
			360 nm ≦ λ < 440 nm			0.46 %	
			440 nm ≦ λ < 770 nm			0.30 %	
			770 nm ≦ λ < 900 nm			0.42 %	
			900 nm ≦ λ < 1200 nm			0.64 %	
			1200 nm ≦ λ < 2000 nm			0.80 %	
			2000 nm ≦ λ < 2400 nm			0.96 %	
			2400 nm ≦ λ ≦ 2500 nm			1.7 %	

Quantity	Calibration and Measurement Capabilities						Effective Date of Accreditation
	Instrument or Artefact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)			Expanded Uncertainty (Level of Confidence Approximately 95 %)	
			Wavelength	Power Level	Other conditions		
Fiber optic power linearity	Fiber optic power meter	10 dB	852 nm	For lower power relative to 1 mW	Multi-mode fiber GI 50/125	0.0042 dB	2021-05-31
		20 dB				0.0052 dB	
		30 dB				0.0063 dB	
		40 dB				0.0074 dB	
		50 dB				0.0085 dB	
		60 dB				0.0096 dB	
		9 dB	1310 nm	For lower power relative to 1 mW	9 dB step	0.0011 dB	
		18 dB				0.0020 dB	
		27 dB				0.0028 dB	
		36 dB				0.0037 dB	
		45 dB				0.0046 dB	
		54 dB				0.0055 dB	
		63 dB				0.0064 dB	
		72 dB				0.0074 dB	
		81 dB				0.0087 dB	
		90 dB				0.0102 dB	
		10 dB			10 dB step	0.0011 dB	
		20 dB				0.0021 dB	
		30 dB				0.0030 dB	
		40 dB				0.0040 dB	
		50 dB				0.0053 dB	
		60 dB				0.0062 dB	
		70 dB				0.0072 dB	
		80 dB				0.0082 dB	
		90 dB				0.0099 dB	
		9 dB	1550 nm	For lower power relative to 1 mW	9 dB step	0.0005 dB	
		18 dB				0.0009 dB	
		27 dB				0.0013 dB	
		36 dB				0.0018 dB	
		45 dB				0.0021 dB	
		54 dB				0.0025 dB	
		63 dB				0.0030 dB	
		72 dB				0.0034 dB	
		81 dB				0.0039 dB	
		90 dB				0.0045 dB	
		10 dB			10 dB step	0.0006 dB	
		20 dB				0.0011 dB	
		30 dB				0.0015 dB	
		40 dB				0.0020 dB	
		50 dB				0.0024 dB	
		60 dB				0.0028 dB	
		70 dB				0.0033 dB	
		80 dB				0.0038 dB	
		90 dB				0.0052 dB	
		3 dB	1550 nm	For higher power relative to 1 mW		0.0019 dB	
		6 dB				0.0019 dB	
		9 dB				0.0019 dB	
		12 dB				0.0021 dB	
		15 dB				0.0023 dB	
		18 dB				0.0025 dB	
		21 dB				0.0027 dB	
		24 dB				0.0028 dB	
		27 dB				0.0031 dB	
		30 dB				0.0052 dB	

Quantity	Calibration and Measurement Capabilities						Effective Date of Accreditation
	Instrument or Artefact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)			Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
			Wavelength	Power Level	Other conditions		
Fiber optic power responsivity	Fiber optic power meter		852 nm	1 nW ≦ P ≦ 1 mW	Multi-mode fiber GI 50/125	0.19 % to 0.29 %, varies with power level	2021-05-31
			1310 nm	1 pW ≦ P ≦ 1 mW	Single-mode fiber	0.23 % to 0.33 %, varies with power level	
			1550 nm	1 pW ≦ P ≦ 1 mW		0.23 % to 0.26 %, varies with power level	
			1550 nm	1 mW ≦ P ≦ 1 W		0.23 % to 0.26 %, varies with power level	
Laser power	Laser power meter		488 nm, 515 nm	10 mW		0.13 %	
				10 mW < P ≦ 200 mW		0.17 %	
				200 mW < P ≦ 1 W		0.70 %	
			404 nm - 408 nm, 657 nm - 667 nm, 770 nm - 790 nm, 633 nm	0.05 mW ≦ P < 0.1 mW		0.22 %	
				0.1 mW ≦ P < 1 mW		0.17 %	
				1 mW ≦ P ≦ 10 mW		0.13 %	
			1550 nm	0.05 mW ≦ P < 0.1 mW		0.22 %	
				0.1 mW ≦ P < 1 mW		0.17 %	
				1 mW		0.13 %	
Laser power (High)	Laser power meter		1.1 mm	1 W ≦ P < 10 W		1.1 %	
				10 W ≦ P ≦ 100 W		1.8 %	
			10.6 mm	1 W ≦ P < 10 W		1.3 %	
				10 W ≦ P ≦ 100 W		1.9 %	
Laser power responsivity	Laser power meter		Wavelength 266 nm	10 mW to 100 mW	Averaged power	1.5 %	
			Wavelength 355 nm, 532 nm, 1064 nm	10 mW to 1 W			
Laser energy responsivity	Laser energy meter, laser joule meter		Wavelength 266 nm	1 mJ to10 mJ		1.5 %	
			Wavelength 355 nm, 532 nm, 1064 nm	1 mJ to 100 mJ			

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Temperature	Temperature fixed point devices (Water triple point cells)	Triple point of water (0.01 ℃)	Primary Standard Working Standard	0.10 mK 0.16 mK	2024-06-13
	Temperature fixed point devices (Mercury fixed point devices)	Triple point of mercury (-38.8344 ℃)		0.7 mK	
	Temperature fixed point devices (Gallium fixed point cells)	Melting point of gallium (29.7646 ℃)	Primary Standard Working Standard	0.23 mK 0.45 mK	
	Temperature fixed point devices (Indium fixed point devices)	Freezing point of indium (156.5985 ℃)	Primary Standard Working Standard	0.40 mK 1.2 mK	
	Temperature fixed point devices (Tin fixed point devices)	Freezing point of tin (231.928 ℃)	Primary Standard Working Standard	0.7 mK 1.2 mK	
	Temperature fixed point devices (Zinc fixed point devices)	Freezing point of zinc (419.527 ℃)	Primary Standard Working Standard	0.7 mK 1.8 mK	
	Platinum resistance thermometers	-38.8344 ℃		0.8 mK	
		29.7646 ℃	Primary Standard Working Standard	0.26 mK 0.6 mK	
		156.5985 ℃	Primary Standard Working Standard	0.45 mK 1.2 mK	
		231.928 ℃	Primary Standard Working Standard	0.7 mK 1.6 mK	
		419.527 ℃	Primary Standard Working Standard	0.8 mK 2.0 mK	
		660.323 ℃	Primary Standard Working Standard	1.8 mK 3.5 mK	
		961.78 ℃		7 mK	
		0.01 ℃ to 156.5985 ℃		1.8 mK	
		0.01 ℃ to 231.928 ℃		2.3 mK	
		0.01 ℃ to 419.527 ℃		2.0 mK	
		0.01 ℃ to 660.323 ℃		3.5 mK	
		0.01 ℃ to 961.78 ℃		7 mK	
	PRTs with reference resistor	0.01 ℃		0.30 mK	
	Long stem type standard platinum resistance thermometers	83.8058 K		1.5 mK	
	Capsule type standard platinum resistance thermometers	302.9166 K		0.44 mK	
		273.16 K		0.36 mK	
		234.3156 K		0.50 mK	
		83.8058 K		0.36 mK	
		54.3584 K		0.44 mK	
		24.5561 K		0.52 mK	
		20.3 K	The calibration point lies within the range 20.2 K to 20.4 K	1.1 mK	
		17 K	The calibration point lies within the range 16.9 K to 17.1 K	1.1 mK	
		13.8033 K		0.46 mK	
	Low temperature resistance thermometers	0.65 K to 4.1 K		2.5 mK	
		4.1 K to 24.5561 K		1.2 mK	
	Pure metal thermocouples	419.527 ℃		0.09 ℃	
		660.323 ℃		0.07 ℃	
		961.78 ℃		0.08 ℃	
		1084.62 ℃		0.09 ℃	
		1324.0 ℃		0.53 ℃	
		0 ℃ to 1100 ℃		0.12 ℃	
	Noble metal thermocouples	419.527 ℃		0.09 ℃	
		660.323 ℃		0.08 ℃	
		961.78 ℃		0.11 ℃	
		1084.62 ℃		0.12 ℃	
		1324.0 ℃		0.55 ℃	
		1553.5 ℃		0.6 ℃	
		0 ℃ to 1100 ℃		0.14 ℃	

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Temperature	Variable temperature blackbody for clinical thermometer	35 ℃ ≦ t ≦ 42 ℃		0.06 ℃	2024-06-13
	Fixed-point black body cells(Cu)	1084.62 ℃		0.10 ℃	
	Fixed-point black body cells(Ag)	961.78 ℃		0.10 ℃	
	Fixed-point black body cells(Al)	660.323 ℃		0.10 ℃	
	Fixed-point black body cells(Zn)	419.527 ℃		0.10 ℃	
	Fixed-point black body cells(Sn)	231.928 ℃		0.10 ℃	
	Fixed-point black body cells(In)	156.5985 ℃		0.11 ℃	
	Fixed-point black body cells (Tungsten carbide-carbon peritectic point)	2748 ℃		1.3 ℃	
	Fixed-point black body cells (Rhenium-carbon eutectic point)	2474.69 ℃		0.69 ℃	
	Fixed-point black body cells (Platinum-carbon eutectic point)	1738.28 ℃		0.42 ℃	
	Fixed-point black body cells (Palladium-carbon eutectic point)	1492 ℃		0.42 ℃	
	Fixed-point black body cells (Cobalt-carbon eutectic point)	1324.24 ℃		0.30 ℃	
	0.65 μm radiation thermometer	960 ℃		0.23 ℃	
		1000 ℃		0.18 ℃	
		1085 ℃		0.13 ℃	
		1100 ℃		0.13 ℃	
		1200 ℃		0.17 ℃	
		1300 ℃		0.21 ℃	
		1400 ℃		0.27 ℃	
		1500 ℃		0.32 ℃	
		1600 ℃		0.35 ℃	
		1700 ℃		0.37 ℃	
		1800 ℃		0.39 ℃	
		1900 ℃		0.41 ℃	
		2000 ℃		0.44 ℃	
		2100 ℃		0.48 ℃	
		2200 ℃		0.53 ℃	
		2300 ℃		0.58 ℃	
		2400 ℃		0.66 ℃	
		2500 ℃		0.77 ℃	
		2600 ℃		0.93 ℃	
		2700 ℃		1.1 ℃	
		2800 ℃		1.3 ℃	

Quantity	Calibration and Measurement Capabilities				Effective Date of Accreditation
	Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Temperature	0.9 µm radiation thermometer	400 ℃		0.17 ℃	2024-06-13
		420 ℃		0.15 ℃	
		500 ℃		0.14 ℃	
		600 ℃		0.17 ℃	
		660 ℃		0.19 ℃	
		700 ℃		0.21 ℃	
		800 ℃		0.24 ℃	
		900 ℃		0.28 ℃	
		960 ℃		0.23 ℃	
		1000 ℃		0.19 ℃	
		1085 ℃		0.15 ℃	
		1100 ℃		0.15 ℃	
		1200 ℃		0.20 ℃	
		1300 ℃		0.24 ℃	
		1400 ℃		0.29 ℃	
		1500 ℃		0.34 ℃	
		1600 ℃		0.37 ℃	
		1700 ℃		0.41 ℃	
		1800 ℃		0.42 ℃	
		1900 ℃		0.44 ℃	
		2000 ℃		0.50 ℃	
	1.6 µm radiation thermometer	160 ℃		0.10 ℃	
		200 ℃		0.08 ℃	
		230 ℃		0.07 ℃	
		300 ℃		0.07 ℃	
		400 ℃		0.09 ℃	
		420 ℃		0.09 ℃	
		500 ℃		0.11 ℃	
		600 ℃		0.12 ℃	
		660 ℃		0.12 ℃	
		700 ℃		0.13 ℃	
		800 ℃		0.14 ℃	
		900 ℃		0.17 ℃	
		960 ℃		0.20 ℃	

Quantity	Calibration and Measurement Capabilities: Instrument or Artifact	Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty When the unit is %: Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	Effective Date of Accreditation
Temperature	Infrared radiation thermometer	-30 °C ≦ *t* < -20 °C		0.13 °C	2024-06-13
		-20 °C ≦ *t* < -10 °C		0.10 °C	
		-10 °C ≦ *t* < 0 °C		0.08 °C	
		0 °C ≦ *t* < 10 °C		0.07 °C	
		10 °C ≦ *t* < 20 °C		0.05 °C	
		20 °C ≦ *t* < 30 °C		0.05 °C	
		30 °C ≦ *t* < 40 °C		0.05 °C	
		40 °C ≦ *t* < 50 °C		0.05 °C	
		50 °C ≦ *t* < 60 °C		0.05 °C	
		60 °C ≦ *t* < 70 °C		0.06 °C	
		70 °C ≦ *t* < 80 °C		0.07 °C	
		80 °C ≦ *t* < 90 °C		0.07 °C	
		90 °C ≦ *t* ≦ 100 °C		0.09 °C	
		100 °C < *t* < 110 °C		0.10 °C	
		110 °C ≦ *t* < 120 °C		0.11 °C	
		120 °C ≦ *t* < 130 °C		0.12 °C	
		130 °C ≦ *t* < 140 °C		0.12 °C	
		140 °C ≦ *t* < 150 °C		0.13 °C	
		150 °C ≦ *t* ≦ 160 °C		0.15 °C	
		160 °C		0.40 °C	
		200 °C		0.40 °C	
		300 °C		0.41 °C	
		400 °C		0.45 °C	
		500 °C		0.51 °C	
Humidity	Dew-point hygrometer	-70 °C to -60 °C		0.5 °C	2024-02-06
		-60 °C to -50 °C		0.2 °C	
		-50 °C to -10 °C		0.08 °C	
		-10 °C to 0 °C		0.09 °C	
		0 °C to 10 °C		0.04 °C	
		10 °C to 15 °C		0.03 °C	
		15 °C to 45 °C		0.04 °C	
		45 °C to 75 °C		0.05 °C	
		75 °C to 90 °C		0.06 °C	
		90 °C to 95 °C		0.07 °C	
	Trace moisture analyzer	12 nmol/mol to 19 nmol/mol		7.6 %	
		19 nmol/mol to 49 nmol/mol		5.3 %	
		49 nmol/mol to 90 nmol/mol		3.4 %	
		90 nmol/mol to 500 nmol/mol		1.3 %	
		500 nmol/mol to 1400 nmol/mol		0.88 %	
	Trace moisture analyzer (Multi-gas trace moisture generator, N_2)	10 nmol/mol to 19 nmol/mol		6.5 %	
		19 nmol/mol to 49 nmol/mol		3.6 %	
		49 nmol/mol to 90 nmol/mol		1.6 %	
		90 nmol/mol to 490 nmol/mol		1.0 %	
		490 nmol/mol to 2900 nmol/mol		0.78 %	
		2900 nmol/mol to 5300 nmol/mol		0.43 %	
	Trace moisture analyzer (Multi-gas trace moisture generator, Ar)	10 nmol/mol to 19 nmol/mol		11 %	
		19 nmol/mol to 49 nmol/mol		6.6 %	
		49 nmol/mol to 90 nmol/mol		3.7 %	
		90 nmol/mol to 500 nmol/mol		3.2 %	
		500 nmol/mol to 1200 nmol/mol		2.7 %	
	Trace moisture analyzer (Multi-gas trace moisture generator, O_2)	10 nmol/mol to 20 nmol/mol		14 %	
		20 nmol/mol to 50 nmol/mol		9.7 %	
		50 nmol/mol to 100 nmol/mol		4.9 %	
		100 nmol/mol to 500 nmol/mol		3.7 %	
		500 nmol/mol to 1200 nmol/mol		1.8 %	
	Trace moisture analyzer (Multi-gas trace moisture generator, He)	10 nmol/mol to 20 nmol/mol		19 %	
		20 nmol/mol to 50 nmol/mol		17 %	
		50 nmol/mol to 1200 nmol/mol		16 %	

Quantity	Calibration and Measurement Capabilities						Effective Date of Accreditation
	Instrument or Artifact		Source	Measurand Level or Range	remarks	Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Ionizing radiation	γ-ray air kerma	γ-ray dosemeter γ-ray detection device	Cs-137 γ-ray	2.80×10^{-5} Gy to $1.19 \times 10^{+1}$ Gy		0.84 %	2024-11-01
				3.79×10^{-7} Gy to 2.80×10^{-5} Gy		1.7 %	
				2.26×10^{-8} Gy to 3.79×10^{-7} Gy		2.1 %	
				2.81×10^{-9} Gy to 2.26×10^{-8} Gy		2.5 %	
			Co-60 γ-ray	$2.38 \times 10^{+2}$ Gy to $2.68 \times 10^{+3}$ Gy		0.88 %	
				3.88×10^{-4} Gy to $2.38 \times 10^{+2}$ Gy		0.72 %	
				9.48×10^{-7} Gy to 3.88×10^{-4} Gy		0.80 %	
				2.81×10^{-7} Gy to 9.48×10^{-7} Gy		1.1 %	
				5.41×10^{-8} Gy to 2.81×10^{-7} Gy		1.2 %	
				9.66×10^{-9} Gy to 5.41×10^{-8} Gy		1.6 %	
	γ-ray air kerma rate	γ-ray dosemeter	Cs-137 γ-ray	2.80×10^{-6} Gy/s to 6.63×10^{-4} Gy/s		0.84 %	
				3.79×10^{-8} Gy/s to 2.80×10^{-6} Gy/s		1.7 %	
				2.26×10^{-9} Gy/s to 3.79×10^{-8} Gy/s		2.1 %	
				2.81×10^{-10} Gy/s to 2.26×10^{-9} Gy/s		2.5 %	
			Co-60 γ-ray	1.32×10^{-2} Gy/s to 1.49×10^{-1} Gy/s		0.88 %	
				3.88×10^{-5} Gy/s to 1.32×10^{-2} Gy/s		0.72 %	
				9.48×10^{-8} Gy/s to 3.88×10^{-5} Gy/s		0.80 %	
				5.41×10^{-8} Gy/s to 9.48×10^{-8} Gy/s		1.1 %	
				5.35×10^{-9} Gy/s to 5.41×10^{-8} Gy/s		1.2 %	
				9.66×10^{-10} Gy/s to 5.35×10^{-9} Gy/s		1.6 %	

Quantity	Calibration and Measurement Capabilities						Effective Date of Accreditation
	Instrument or Artifact		Source	Measurand Level or Range	remarks	Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Ionizing radiation	γ-ray exposure	γ-ray dosemeter γ-ray detection device	Cs-137 γ-ray	8.23×10^{-7} C/kg to 3.50×10^{-1} C/kg		0.84 %	2024-11-01
				1.11×10^{-8} C/kg to 8.23×10^{-7} C/kg		1.7 %	
				6.64×10^{-10} C/kg to 1.11×10^{-8} C/kg		2.1 %	
				8.26×10^{-11} C/kg to 6.64×10^{-10} C/kg		2.5 %	
			Co-60 γ-ray	6.99×10^{0} C/kg to $7.87 \times 10^{+1}$ C/kg		0.88 %	
				1.14×10^{-5} C/kg to 6.99×10^{0} C/kg		0.72 %	
				2.78×10^{-8} C/kg to 1.14×10^{-5} C/kg		0.80 %	
				1.59×10^{-8} C/kg to 2.78×10^{-8} C/kg		1.1 %	
				1.57×10^{-9} C/kg to 1.59×10^{-8} C/kg		1.2 %	
				2.84×10^{-10} C/kg to 1.57×10^{-9} C/kg		1.6 %	
	γ-ray exposure rate	γ-ray dosemeter	Cs-137 γ-ray	8.23×10^{-8} (C/kg)/s to 1.94×10^{-5} (C/kg)/s		0.84 %	
				1.11×10^{-9} (C/kg)/s to 8.23×10^{-8} (C/kg)/s		1.7 %	
				6.64×10^{-11} (C/kg)/s to 1.11×10^{-9} (C/kg)/s		2.1 %	
				8.26×10^{-12} (C/kg)/s to 6.64×10^{-11} (C/kg)/s		2.5 %	
			Co-60 γ-ray	3.87×10^{-4} (C/kg)/s to 4.37×10^{-3} (C/kg)/s		0.88 %	
				1.14×10^{-6} (C/kg)/s to 3.87×10^{-4} (C/kg)/s		0.72 %	
				2.78×10^{-9} (C/kg)/s to 1.14×10^{-6} (C/kg)/s		0.80 %	
				1.59×10^{-9} (C/kg)/s to 2.78×10^{-9} (C/kg)/s		1.1 %	
				1.57×10^{-10} (C/kg)/s to 1.59×10^{-9} (C/kg)/s		1.2 %	
				2.84×10^{-11} (C/kg)/s to 1.57×10^{-10} (C/kg)/s		1.6 %	
	γ-ray dose equivalent	Dosimeter	Cs-137 γ-ray	8×10^{-9} Sv to 2×10^{1} Sv		3 %	
			Co-60 γ-ray	1×10^{-8} Sv to 4×10^{3} Sv		3 %	
	γ-ray dose equivalent rate	Dosimeter	Cs-137 γ-ray	8×10^{-10} Sv/s to 8×10^{-4} Sv/s		3 %	
			Co-60 γ-ray	1×10^{-9} Sv/s to 2×10^{-1} Sv/s		3 %	
	γ-ray Reference air kerma rate	Well type ionization chamber	Ir-192 HDR source	5 mGy･h^{-1} to 70 mGy･h^{-1}		1.4 %	

Quantity	Calibration and Measurement Capabilities: Instrument or Artifact		X-ray quality		Measurand Level or Range	remarks	Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	Effective Date of Accreditation
Ionizing Radiation	X-ray air kerma	X-ray dosemeter X-ray detection device	Medium energy X-rays (30 kV ～ 300 kV)	QI (0.4 ～ 0.9) BIPM IS04037-1 Narrow spectrum IS04037-1 Low kerma rate IS04037-1 High kerma rate IS04037-1 Wide spectrum	9.0×10^{-8} Gy to 7.0×10^{-7} Gy		1.8 %	2024-11-01
					7.0×10^{-7} Gy to 4.0×10^{-5} Gy		1.6 %	
					4.0×10^{-5} Gy to $3.6 \times 10^{+1}$ Gy		1.5 %	
			Low energy X-rays (10 kV ～ 50 kV)	QI (0.4 ～ 0.8) BIPM IS04037-1 Narrow spectrum	2.5×10^{-5} Gy to 5.0×10^{-5} Gy		1.4 %	
					5.0×10^{-5} Gy to 1.0×10^{-4} Gy		1.2 %	
					1.0×10^{-4} Gy to $1.8 \times 10^{+2}$ Gy		1.1 %	
			Mammography X-rays (10 kV ～ 50 kV)	Mo/0.030 mm Mo Mo/0.032 mm Mo Mo/0.025 mm Rh Rh/0.025 mm Rh W/0.05 mm Rh W/0.05 mm Ag W/0.5 mm Al W/0.7 mm Al	5.0×10^{-5} Gy to 1.0×10^{-4} Gy	1)	1.2 %	
					1.0×10^{-4} Gy to $1.0 \times 10^{+2}$ Gy		1.1 %	
	X-ray air kerma rate	X-ray dosemeter	Medium energy X-rays (30 kV ～ 300 kV)	QI (0.4 ～ 0.9) BIPM IS04037‐1 Narrow spectrum IS04037‐1 Low kerma rate IS04037‐1 High kerma rate IS04037‐1 Wide spectrum	9.0×10^{-9} Gy/s to 7.0×10^{-8} Gy/s		1.8 %	
					7.0×10^{-8} Gy/s to 4.0×10^{-6} Gy/s		1.6 %	
					4.0×10^{-6} Gy/s to 2.0×10^{-3} Gy/s		1.5 %	
			Low energy X-rays (10 kV ～ 50 kV)	QI (0.4 ～ 0.8) BIPM IS04037‐1 Narrow spectrum	2.5×10^{-6} Gy/s to 5.0×10^{-6} Gy/s		1.4 %	
					5.0×10^{-6} Gy/s to 1.0×10^{-5} Gy/s		1.2 %	
					1.0×10^{-5} Gy/s to 1.0×10^{-2} Gy/s		1.1 %	
			Mammography X-rays (10 kV ～ 50 kV)	Mo/0.030 mm Mo Mo/0.032 mm Mo Mo/0.025 mm Rh Rh/0.025 mm Rh W/0.05 mm Rh W/0.05 mm Ag W/0.5 mm Al W/0.7 mm Al	5.0×10^{-6} Gy/s to 1.0×10^{-5} Gy/s	2)	1.2 %	
					1.0×10^{-5} Gy/s to 5.0×10^{-3} Gy/s		1.1 %	

1) The range for the Rh target X-ray tube is 3.0×10^{-4} Gy to $6.0 \times 10^{+1}$ Gy, the range for the W target X-ray tube is 5.0×10^{-4} Gy to $1.0 \times 10^{+2}$ Gy.

2) The range for the Rh target X-ray tube is 3.0×10^{-5} Gy/s to 3.0×10^{-3} Gy/s, the range for the W target X-ray tube is 5.0×10^{-5} Gy/s to 5.0×10^{-3} Gy/s.

Quantity	Calibration and Measurement Capabilities							Effective Date of Accreditation
	Instrument or Artifact		X-ray quality		Measurand Level or Range	remarks	Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Ionizing Radiation	X-ray exposure	X-ray dosemeter X-ray detection device	Medium energy X-rays (30 kV to 300 kV)	QI (0.4 to 0.9) BIPM IS04037-1 Narrow spectrum IS04037-1 Low kerma rate IS04037-1 High kerma rate IS04037-1 Wide spectrum	2.6×10^{-9} C/kg to 2.0×10^{-8} C/kg		1.8 %	2024-11-01
					2.0×10^{-8} C/kg to 1.2×10^{-6} C/kg		1.6 %	
					1.2×10^{-6} C/kg to 1.1×10^{0} C/kg		1.5 %	
			Low energy X-rays (10 kV to 50 kV)	QI (0.4 to 0.8) BIPM IS04037-1 Narrow spectrum	7.4×10^{-7} C/kg to 1.5×10^{-6} C/kg		1.4 %	
					1.5×10^{-6} C/kg to 2.9×10^{-6} C/kg		1.2 %	
					2.9×10^{-6} C/kg to 5.2×10^{0} C/kg		1.1 %	
			Mammography X-rays (10 kV to 50 kV)	Mo/0.030 mm Mo Mo/0.032 mm Mo Mo/0.025 mm Rh Rh/0.025 mm Rh W/0.05 mm Rh W/0.05 mm Ag W/0.5 mm Al W/0.7 mm Al	1.5×10^{-6} C/kg to 2.9×10^{-6} C/kg	1)	1.2 %	
					2.9×10^{-6} C/kg to 3.0×10^{0} C/kg		1.1 %	
	X-ray exposure rate	X-ray dosemeter	Medium energy X-rays (30 kV to 300 kV)	QI (0.4 to 0.9) BIPM IS04037-1 Narrow spectrum IS04037-1 Low kerma rate IS04037-1 High kerma rate IS04037-1 Wide spectrum	2.6×10^{-10} (C/kg)/s to 2.0×10^{-9} (C/kg)/s		1.8 %	
					2.0×10^{-9} (C/kg)/s to 1.2×10^{-7} (C/kg)/s		1.6 %	
					1.2×10^{-7} (C/kg)/s to 5.9×10^{-5} (C/kg)/s		1.5 %	
			Low energy X-rays (10 kV to 50 kV)	QI (0.4 to 0.8) BIPM IS04037-1 Narrow spectrum	7.4×10^{-8} (C/kg)/s to 1.5×10^{-7} (C/kg)/s		1.4 %	
					1.5×10^{-7} (C/kg)/s to 2.9×10^{-7} (C/kg)/s		1.2 %	
					2.9×10^{-7} (C/kg)/s to 2.9×10^{-4} (C/kg)/s		1.1 %	
			Mammography X-rays (10 kV to 50 kV)	Mo/0.030 mm Mo Mo/0.032 mm Mo Mo/0.025 mm Rh Rh/0.025 mm Rh W/0.05 mm Rh W/0.05 mm Ag W/0.5 mm Al W/0.7 mm Al	1.5×10^{-7} (C/kg)/s to 2.9×10^{-7} (C/kg)/s	2)	1.2 %	
					2.9×10^{-7} (C/kg)/s to 1.5×10^{-4} (C/kg)/s		1.1 %	

1) The range for the Rh target X-ray tube is 9.0×10^{-6} C/kg to 1.8×10^{0}C/kg, the range for the W target X-ray tube is 1.5×10^{-5} C/kg to 3.0×10^{0} C/kg.

2) The range for the Rh target X-ray tube is 9.0×10^{-7} (C/kg)/s to 9.0×10^{-5} (C/kg)/s, the range for the W target X-ray tube is 1.5×10^{-6} (C/kg)/s to 1.5×10^{-4} (C/kg)/s.

<table>
<tr><th rowspan="2">Quantity</th><th colspan="6">Calibration and Measurement Capabilities</th><th rowspan="2">Effective Date of Accreditation</th></tr>
<tr><th colspan="2">Instrument or Artifact</th><th>Source</th><th>Measurand Level or Range</th><th>remarks</th><th>Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)</th></tr>
<tr><td rowspan="4">Ionizing Radiation</td><td>Absorbed dose rate to water</td><td>Dosemeter</td><td>Co-60 γ-rays</td><td>1.2×10^{-2} Gy/s</td><td>1)</td><td>0.8 %</td><td rowspan="4">2024-11-01</td></tr>
<tr><td>Absorbed dose to water</td><td>Dosemeter
Detection device</td><td>Co-60 γ-rays</td><td>0.1 Gy to 220 Gy</td><td>1)</td><td>0.8 %</td></tr>
<tr><td rowspan="2">Absorbed dose to water</td><td rowspan="2">Dosemeter
Detection device</td><td>High energy photon beams from clinical linac
(6 MV, 10 MV, 15 MV)</td><td>1 Gy to 200 Gy
(0.02 Gy/s to 0.08 Gy/s)</td><td></td><td>0.8 %</td></tr>
<tr><td>High energy electron beams from clinical linac
(9 MeV, 12 MeV, 15 MeV, 18 MeV)</td><td>1 Gy to 100 Gy
(0.01 Gy/s to 0.07 Gy/s)</td><td></td><td>1.0 %</td></tr>
</table>

1) It is estimated at the distance of 1 m from the source and the water depth of 5 g/cm^2 at 1st May 2009 and it decays due to the half-life (5.2714 years).

Quantity	Calibration and Measurement Capabilities						Effective Date of Accreditation
	Instrument or Artifact		Source	Measurand Level or Range	remarks	Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Ionizing Radiation	β-particle absorbed dose	β-particle dosemeter β-particle detection device	$^{90}Sr/^{90}Y$ source	1.1×10^{-4} Gy to 4.0×10^{-2} Gy	1)	2.8 %	2024-11-01
			^{85}Kr source	3.8×10^{-4} Gy to 1.4×10^{-1} Gy	1)	2.8 %	
			^{147}Pm source	2.0×10^{-5} Gy to 7.2×10^{-3} Gy	1)	4.8 %	
	β-particle absorbed dose rate	β-particle dosemeter	$^{90}Sr/^{90}Y$ source	1.1×10^{-5} Gy•s^{-1}	1)	2.8 %	
			^{85}Kr source	3.8×10^{-5} Gy•s^{-1}	1)	2.8 %	
			^{147}Pm source	2.0×10^{-6} Gy•s^{-1}	1)	4.8 %	
	β-particle dose equivalent	β-particle dosemeter β-particle detection device	$^{90}Sr/^{90}Y$ source	0.34×10^{-3} Sv to 12.0×10^{-3} Sv	2)	3.4 %	
	β-particle dose equivalent rate	β-particle dosemeter	$^{90}Sr/^{90}Y$ source	3.4×10^{-6} Sv•s^{-1}	2)	3.4 %	

1) This value was measured in February, 2006 and it is changed by decay or exchange of the radiation source.

2) This value was measured in February, 2022 and it is changed by decay or exchange of the radiation source.

Quantity	Calibration and Measurement Capabilities					Effective Date of Accreditation
	Instrument or Artifact		Measurand Level or Range	remarks	Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Radioactivity	Radioactivity concentration	Radioactive solution (γ-emitting radionuclide)	100 kBq/g to 2 MBq/g		0.2 % (^{60}Co solution)	2024-11-01
		Well-type RI calibrator	1 MBq/g to 400 MBq/g		0.8 % (^{60}Co solution source of AIST 5 mL standard ampoule)	
		γ-ray spectrometer	20 Bq/g to 400 kBq/g		0.8 % (HPGe detector)	
		Environmental-level activity (γ-emitting radionuclide)	2 Bq/kg to 10 Bq/kg		7 % (^{137}Cs U8 container)	
			10 Bq/kg to 20 Bq/kg		5 % (^{137}Cs U8 container)	
			20 Bq/kg to 20 Bq/g		4 % (^{137}Cs U8 container)	
			20 Bq/g to100 kBq/g		4 % (^{137}Cs Volumetric source)	
		Radioactive solution (pure α, β or X-ray emitting radionuclide)	20 Bq/g to 400 MBq/g		0.8 % (^{14}C solution)	
		Liquid scintillation counter	400 Bq/g to 400 MBq/g		1.2 % (^{14}Co solution)	
		Radioactive gaseous (Noble gas or CH_4)	1 Bq/cm^3 to 2 kBq/cm^3		1.0 % (^{85}Kr)	
		Radioactive gas monitor	30 Bq/cm^3 to 2 kBq/cm^3		1.4 % (^{85}Kr)	
	Radioactivity and γ-ray emission rate	Sealed γ sources for calibration of γ-ray spectrometer (30 keV to 2 MeV)	2 kBq to 4 MBq		0.8 % (^{60}Co point source)	
		γ-ray spectrometer (30 keV to 2 MeV)	2 kBq to 4 MBq		0.8 % (^{60}Co point source)	
	Radioactivity	Environmental-level activity (γ-emitting radionuclide)	0.2 Bq to 1 Bq		7 % (^{137}Cs U8 container)	
			1 Bq to 2 Bq		5 % (^{137}Cs U8 container)	
			2 Bq to 2 kBq		4 % (^{137}Cs U8 container)	
			2 kBq to 200 kBq		4 % (^{137}Cs Volumetric source)	
	Charged particle emission rate	Area source	200 s^{-1} to 2 × 10^4 s^{-1}		1.0 % (^{241}Am electroplated source)	
		Surface barrier detector	20 s^{-1} to 2 × 10^5 s^{-1}		1.2 % (^{241}Am electroplated source)	
		Large area surface monitoring devices	200 s^{-1} to 2 × 10^4 s^{-1}		2.0 % (^{36}Cl area source)	
	Surface density of radioactivity	Surface density source	3 Bq/cm^2 to 4 kBq/cm^2		1.0 % (^{241}Am electroplated source)	
		Surface monitoring devices	0.3 Bq/cm^2 to 1 MBq/cm^2		2.0 % (^{241}Am electroplated source)	
Radioactivity (remote calibration)	Radioactivity concentration	Well-type RI calibrator	1 MBq/g to 400 MBq/g	1)	0.8 % (^{60}Co solution source of AIST 5 mL standard ampoule)	
		γ-ray spectrometer	20 Bq/g to 400 kBq/g		0.8 % (HPGe detector)	
		Liquid scintillation counter	400 Bq/g to 400 MBq/g		1.2 % (^{14}C solution)	
	Radioactivity and γ-ray emission rate	γ-ray spectrometer (30 keV to 2 MeV)	2 kBq to 4 MBq	1)	0.8 % (^{60}Co point source)	
	Charged particle emission rate	Large area surface monitoring devices	200 s^{-1} to 2×10^4 s^{-1}	1)	2.0 % (^{36}Cl area source)	

Note 1) Nuclide and actitivty of source used in the remote calibration as a transfer instrument are limited to those the government permits the client to use.

Quantity	Calibration and Measurement Capabilities					Effective Date of Accreditation
	Instrument or Artifact		Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Relative Expanded Uncertainty (Level of Confidence Approximately 95 %)	
Neutron	Neutron emission rate	Neutron source (Am-Be)	1.0×10^3 s^{-1} to 2.0×10^7 s^{-1}		3.0 %	2024-11-01
		Neutron source (^{252}Cf)	1.0×10^3 s^{-1} to 3.0×10^7 s^{-1}		3.2 %	
		Neutron sensitive device (Am-Be)	1.0×10^3 s^{-1} to 1.0×10^7 s^{-1}		3.0 %	
		Neutron sensitive device (^{252}Cf)	1.0×10^3 s^{-1} to 1.0×10^7 s^{-1}		3.3 %	
	Thermal neutron fluence rate	Neutron sensitive device	5.0×10 $cm^{-2}s^{-1}$ to 1.0×10^4 $cm^{-2}s^{-1}$		2.8 %	
	Fast neutron fluence rate	Neutron sensitive device (24 keV)	1.0×10^{-1} $cm^{-2}s^{-1}$ to 1.6×10^2 $cm^{-2}s^{-1}$		8.7 %	
		Neutron sensitive device (144 keV)	2.3 $cm^{-2}s^{-1}$ to 1.8×10^3 $cm^{-2}s^{-1}$		4.4 %	
		Neutron sensitive device (250 keV)	1.2 $cm^{-2}s^{-1}$ to 9.0×10^2 $cm^{-2}s^{-1}$		5.5 %	
		Neutron sensitive device (565 keV)	6.3 $cm^{-2}s^{-1}$ to 5.1×10^3 $cm^{-2}s^{-1}$		4.4 %	
		Neutron sensitive device (1.2 MeV)	1.6 $cm^{-2}s^{-1}$ to 1.4×10^3 $cm^{-2}s^{-1}$		7.0 %	
		Neutron sensitive device (5.0 MeV)	2.5 $cm^{-2}s^{-1}$ to 2.0×10^3 $cm^{-2}s^{-1}$		6.2 %	
		Neutron sensitive device (14.8 MeV)	3.8 $cm^{-2}s^{-1}$ to 6.1×10^3 $cm^{-2}s^{-1}$		3.2 %	
		Neutron sensitive device (Am-Be)	4.1×10^{-1} $cm^{-2}s^{-1}$ to 1.7×10^2 $cm^{-2}s^{-1}$		2.8 %	
		Neutron sensitive device (^{252}Cf)	2.0×10^{-2} $cm^{-2}s^{-1}$to 4.9×10^2 $cm^{-2}s^{-1}$		3.6 %	
		Neutron sensitive device (D_2O-^{252}Cf)	1.7×10^1 $cm^{-2}s^{-1}$ to 4.4×10^2 $cm^{-2}s^{-1}$		8.9 %	
	Personal dose equivalent rate	Neutron personal dosimeter (Am-Be)	6.0×10^{-7} Svh^{-1} to 2.5×10^{-4} Svh^{-1}		8.5 %	
		Neutron personal dosimeter (^{252}Cf)	2.9×10^{-8} Svh^{-1} to 7.1×10^{-4} Svh^{-1}		4.1 %	
		Neutron dosemeter (D_2O-^{252}Cf)	7.0×10^{-6} Svh^{-1} to 1.8×10^{-4} Svh^{-1}		12 %	
	Ambient dose equivalent rate	Neutron dosemeter (Am-Be)	5.7×10^{-7} Svh^{-1} to 2.4×10^{-4} Svh^{-1}		8.5 %	
		Neutron dosemeter (^{252}Cf)	2.8×10^{-8} Svh^{-1} to 6.8×10^{-4} Svh^{-1}		4.1 %	
		Neutron dosemeter (D_2O-^{252}Cf)	6.6×10^{-6} Svh^{-1} to 1.7×10^{-4} Svh^{-1}		12 %	
	Thermal neutron fluence	Neutron sensitive device	1.0×10^3 cm^{-2} to 1.0×10^8 cm^{-2}		2.8 %	
	Fast neutron fluence	Neutron sensitive device (24 keV)	1.0×10^3 cm^{-2} to 1.0×10^8 cm^{-2}		8.7 %	
		Neutron sensitive device (144 keV)	1.0×10^3 cm^{-2} to 1.0×10^8 cm^{-2}		4.4 %	
		Neutron sensitive device (250 keV)	1.0×10^3 cm^{-2} to 1.0×10^8 cm^{-2}		5.5 %	
		Neutron sensitive device (565 keV)	1.0×10^3 cm^{-2} to 1.0×10^8 cm^{-2}		4.4 %	
		Neutron sensitive device (1.2 MeV)	1.0×10^3 cm^{-2} to 1.0×10^8 cm^{-2}		7.0 %	
		Neutron sensitive device (2.5 MeV)	1.0×10^3 cm^{-2} to 1.0×10^7 cm^{-2}		6.4 %	
		Neutron sensitive device (5.0 MeV)	1.0×10^3 cm^{-2} to 1.0×10^8 cm^{-2}		6.2 %	
		Neutron sensitive device (8.0 MeV)	1.0×10^3 cm^{-2} to 1.0×10^8 cm^{-2}		5.5 %	
		Neutron sensitive device (14.8 MeV)	1.0×10^3 cm^{-2} to 1.0×10^8 cm^{-2}		3.2 %	
		Neutron sensitive device (Am-Be)	1.0×10^3 cm^{-2} to 1.0×10^8 cm^{-2}		2.8 %	
		Neutron sensitive device (^{252}Cf)	1.0×10^3 cm^{-2} to 1.0×10^8 cm^{-2}		3.6 %	
		Neutron sensitive device (D_2O-^{252}Cf)	8.8×10^2 cm^{-2} to 8.9×10^7 cm^{-2}		8.9 %	
	Personal dose equivalent	Neutron personal dosimeter (Am-Be)	4.1×10^{-4} mSv to 4.1×10^1 mSv		8.5 %	
		Neutron personal dosimeter (^{252}Cf)	4.0×10^{-4} mSv to 4.0×10^1 mSv		4.1 %	
		Neutron personal dosimeter (D_2O-^{252}Cf)	9.7×10^{-5} mSv to 9.8 mSv		12 %	
	Ambient dose equivalent	Neutron dosemeter (Am-Be)	3.9×10^{-4} mSv to 3.9×10^1 mSv		8.5 %	
		Neutron dosemeter (^{252}Cf)	3.9×10^{-4} mSv to 3.9×10^1 mSv		4.1 %	
		Neutron dosemeter (D_2O-^{252}Cf)	9.2×10^{-5} mSv to 9.3 mSv		12 %	

Quantity	Calibration and Measurement Capabilities: Quantity (Instrument or Artefact)		Measurand Level or Range	Measurement Conditions / Independent Variable (Optional)	Expanded Uncertainty (Level of Confidence Approximately 95 %)	Effective Date of Accreditation
Properties of particles and powders	Particle size (electro-gravitational aerosol balance)		100 nm to 1 μm		0.33 nm to 0.88 nm	2022-03-09
	Particle mass (electro-gravitational aerosol balance)		500 ag to 500 fg		5.5 ag to 1.3 fg	
	Particle size (differential mobility analyzer)		20 nm to 300 nm		1.2 nm to 6.6 nm	
	Particle size distribution width (differential mobility analyzer)		1 nm to 10 nm	Particle size: 20 nm to 300 nm	Relative expanded uncertainty 6.8%	
	Airborne particle number concentration and its detection efficiency (calibration with Faraday-cup aerosol electrometer)	Condensation particle counter	1×10^3 cm^{-3} to 4×10^3 cm^{-3} (particle size: 10 nm to 300 nm) 4×10^3 cm^{-3} to 1×10^4 cm^{-3} (particle size: 10 nm to 200 nm) 1×10^0 cm^{-3} to 1×10^5 cm^{-3} (particle size: 30 nm to 60 nm)	Flow rate: 1 L/min to 1.5 L/min	Relative expanded uncertainty in concentration range from 1×10^3 cm^{-3} to 1×10^5 cm^{-3}: $U_{\mathrm{r}} = 2\sqrt{0.00369^2 + (\frac{10.5}{C_{\mathrm{N}}})^2}$ where C_{N} is particle number concentration in unit of cm^{-3} Relative expanded uncertainty in concentration range from 1×10^0 cm^{-3} to 1×10^3 cm^{-3} by dilution method: 0.011 (1×10^3 cm^{-3}) 0.016 (1×10^2 cm^{-3}) 0.022 (1×10^1 cm^{-3}) 0.031 (1×10^0 cm^{-3})	
	Airborne particle charge concentration and its detection efficiency (calibration with Faraday-cup aerosol electrometer)	Faraday-cup aerosol electrometer	0.16 fC cm^{-3} to 0.64 fC cm^{-3} (particle size: 10 nm to 300 nm) 0.64 fC cm^{-3} to 1.6 fC cm^{-3} (particle size: 10 nm to 200 nm) 1.6 fC cm^{-3} to 16 fC cm^{-3} (particle size: 30 nm to 60 nm) Note: For calibration items that indicate particle number concentration by converting particle charge concentration assuming the particle charge of +1: 1×10^3 cm^{-3} to 4×10^3 cm^{-3} (particle size: 10 nm to 300 nm) 4×10^3 cm^{-3} to 1×10^4 cm^{-3} (particle size: 10 nm to 200 nm) 1×10^4 cm^{-3} to 1×10^5 cm^{-3} (particle size: 30 nm to 60 nm)	Flow rate: 1 L/min to 1.5 L/min	Relative expanded uncertainty $U_{\mathrm{r}} = 2\sqrt{0.00369^2 + (\frac{0.00168}{C_{\mathrm{Q}}})^2}$ where C_{Q} is particle charge concentration in unit of fC cm^{-3}	
	Airborne particle number and its counting efficiency (calibration with inkjet aerosol generator)	Airborne optical particle counter	Particle count rate 10 s^{-1} to 100 s^{-1}	Particle size: 0.5 μm to 10 μm Nominal flow rate: 0.3 L/min to 30 L/min Corresponding particle number concentration: 0.02 cm^{-3} to 0.2 cm^{-3} at 30 L/min 2 cm^{-3} to 20 cm^{-3} at 0.3 L/min	Relative expanded uncertainty 0.0036	
	Airborne particle number concentration and its counting efficiency (calibration with inkjet aerosol generator)		Particle number concentration 0.02 cm^{-3} to 20 cm^{-3}	Particle size: 0.5 μm to 10 μm Particle count rate: 10 s^{-1} to 100 s^{-1} Nominal flow rate: 0.3 L/min to 30 L/min Corresponding particle number concentration: 0.02 cm^{-3} to 0.2 cm^{-3} at 30 L/min 2 cm^{-3} to 20 cm^{-3} at 0.3 L/min	Relative expanded uncertainty 0.0052	

(End of Attachment)