財團法人全國認證基金會
Taiwan Accreditation Foundation

Certificate of Accreditation

(Certificate No：LN0688-250924)

This is to certify that

National Measurement Laboratory, R. O. C.

National Measurement Laboratory R. O. C.

(Electricity, Magnetism, Photometry and Radiometry, Dimension)

No.321, Kuang Fu Rd., Sec. 2, Hsinchu City, Taiwan (R.O.C.)

is accredited in respect of laboratory

Accreditation Criteria	：	ISO/IEC 17025:2017；CNS 17025:2018
Accreditation Number	：	N0688
Originally Accredited	：	October 15, 2000
Effective Period	：	October 15, 2024 to October 14, 2029
Accredited Scope	：	Calibration Field, see described in the Appendix
Specific Accreditation Program	：	Accreditation Program for National Metrology Institutes

Scan to verify

Yi-Ling Chen

Yi-Ling Chen
President, Taiwan Accreditation Foundation
September 24, 2025

The Appendix forms an integral part of this Certificate, which shall be invalid when use without the Appendix

Accreditation Number ：N0688
Laboratory Head ：LAN, Yu-Ping

Length

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA1001 Long Gauge Blocks (ISO 3650) (Steel)	Long Gauge Blocks /KOBA /26088	In house method: Instrument Calibration Technique for Long Gauge Block Standard-Using Precision Long Gauge Block Measurement Machine (Document No.: 07-3-95-0033)	100	mm	1000	mm		$[74^2+ (365L)^2]^{1/2}$ nominal length L in m	nm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA1001 Long Gauge Blocks (ISO 3650) (Steel)	Long Gauge Blocks /P.T.W., KOBA	In house method: Instrument Calibration Technique for Long Gauge Blocks-Using Universal Measuring Machine (Document No.: 07-3-84-0105)	100	mm	600	mm		$1.98\times[53.2^2+ (324L)^2]^{1/2}$ nominal length L in m	nm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA1001 Gauge Blocks (ISO 3650/122 pieces) (Steel, Ceramic, Chromium carbide, Tungsten carbide)	Gauge Blocks /Mitutoyo /516-937-30	In house method: Instrument Calibration Technique for Gauge Blocks-Federal Gauge Block Comparator (Document No.: 07-3-86-0034)	0.5	mm	100	mm	Steel	$[39^2 + (0.6L)^2]^{1/2}$ nominal length L in mm	nm
			0.5	mm	100	mm	Ceramic	$[38^2 + (0.7L)^2]^{1/2}$ nominal length L in mm	nm
			0.5	mm	100	mm	Chromium carbide	$[39^2 + (0.9L)^2]^{1/2}$ nominal length L in mm	nm
			0.5	mm	100	mm	Tungsten carbide	$[39^2 + (1.9L)^2]^{1/2}$ nominal length L in mm	nm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA1001 Gauge Blocks (ISO 3650/122 pieces) (Steel, Ceramic)	Red stabilized laser /Mitutoyo /LIS-633	In house method: Instrument Calibration Technique for Gauge Blocks-Gauge Block Interferometer (Document No.: 07-3-93-0141)	0.5	mm	100	mm	Steel	$[22^2 + (0.43L)^2]^{1/2}$ nominal length L in mm	nm
			0.5	mm	100	mm	Ceramic	$[22^2 + (0.42L)^2]^{1/2}$ nominal length L in mm	nm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA1002 Pin Gauges	Pin Gauge /GSG	In house method: Instrument Calibration Technique for Pin Gague (Document No.: 07-3-95-0050)	1	mm	20	mm		$[0.42^2 + (0.012D)^2]^{1/2}$ external diameter D in mm	μm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA1002 Plug gauge	Plug gauge /ETALON/50	In house method: Instrument Calibration Technique for Plug Gauge-Use of Labmaster 1000M Universal Measuring System (Document No.: 07-3-B2-0192)	20	mm	100	mm		$1.98\times[0.113^2 + (1.37L)^2]^{1/2}$ external diameter L in m	μm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA1002 Plug Gauges	Plug Gauge /GSG/20 & ETALON/50	In house method: Instrument Calibration Technique for Plug Gauge-Use of Labmaster Universal Measuring System (Document No.: 07-3-95-0132)	20	mm	100	mm		$1.98\times[0.130^2 + (0.00137L)^2]^{1/2}$ external diameter L in mm	μm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA1003 Ring gauge	ring gauge /Cary/12 & VK/50 & VK/100 & VK/200	In house method: Instrument Calibration Technique for Ring Gauge-Use of Labmaster 1000M Universal Measuring System (Document No.: 07-3-B2-0181)	4	mm	200	mm		$1.99\times[0.144^2 + (1.37L)^2]^{1/2}$ internal diameter L in m	μm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA1003 Ring Gauges	Ring Gauge /Cary/12 & VK/50 & VK/100 & VK/200	In house method: Instrument Calibration Technique for Setting Ring Gauge-Use of Labmaster Universal Measuring System (Document No.: 07-3-90-0138)	4	mm	200	mm		$1.99\times[0.130^2 + (0.00137L)^2]^{1/2}$ internal diameter L in mm	μm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA1004 Step Gauge, Caliper Checker	Laser Interferometer /KEYSIGHT /5517C	In house method: Instrument Calibration Technique for Step Gauge (Document No.: 07-3-A5-0193)	10	mm	1010	mm		$1.97\times[0.21^2 + (4.03\times10\text{-}4L)^2]^{1/2}$, L in mm	μm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA1011 Step Height Standards	Frequency stabilized He-Ne lasers /Melles Griot /05-STP-901	In house method: Instrument Calibration Technique for Step Height Standard-Optical Method (Document No.: 07-3-93-0010)	0.01	μm	3	μm		$[3^2+ (1.2D)^2]^{1/2}$ step height D in μm	nm
			>3	μm	100	μm		$[9.6^2+ (3.6D)^2]^{1/2}$ step height D in μm	nm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA1011 Step Height Standards	Step Height Standards /Taylor Hobson /112-557	In house method: Instrument Calibration Technique for Step Height Standard-Stylus Method (Document No.: 07-3-92-0097)	0.01	μm	50	μm		$[5.0^2+ (3.2D)^2]^{1/2}$ step height D in μm	nm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA1012 Electronic Distance Meters, Total Stations	Rubidium clock /Datum/8040A	In house method: Instrument Calibration Technique for Electronic Distance Measurement Instruments (Document No.: 07-3-81-0007)	0.000	km	0.432	km	resolution: 0.1 mm	$[0.8^2 + (0.4L)^2]^{1/2}$ L in km	mm
			0.000	km	0.432	km	resolution: 1.0 mm	$[1.0^2 + (0.4L)^2]^{1/2}$ L in km	mm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
Calibration Site: Hsinchu National Standard Baseline									
KA1018 Stabilized laser	rubidium clock /Stanford Research Systems /FS 725	In house method: Instrument Calibration Technique of Iodine Stabilized He-Ne Lasers (Document No.: 07-3-A1-0124)	633	nm	633	nm	474 THz	0.002	fm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA1018 Stabilized Lasers	Iodine stabilized He-Ne lasers /Winters/100	In house method: Instrument Calibration Technique for Frequency Stabilized Lasers (Document No.: 07-3-85- 0051)	633	nm	633	nm	474 THz	0.02	fm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA1020 Laser Interferometers	Laser Interferometers /HP/5519A	In house method: Instrument Calibration Technique for Laser Interferometer (Document No.: 07-3-90-0056)	0.01	m	10	m	With environmental sensors	$1.98\times[6^2+(8.8\times10^{-8}L)^2+S_T^2]^{1/2}$ displacement L in nm, standard deviation s_T of repeated measurement in nm	nm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA1021 Global Navigation Satellite System Receivers	Rubidium clock /Stanford Research Systems/FS 725	In house method: Instrument Calibration Technique for GNSS Static and Kinematic Positioning Calibration System (Document No.: 07-3-91-0086)	≦ 55	m	≦ 55	m	(1) Static Relative Positioning: (a) super short distance (plane direction)	4.2	mm
			≦ 55	m	≦ 55	m	(1) Static Relative Positioning: (b) super short distance (elevation direction)	5.3	mm
			25	km	25	km	(1) Static Relative Positioning: (a) mid-distance (plane direction)	13	mm
			25	km	25	km	(1) Static Relative Positioning: (b) mid-distance (elevation direction)	21	mm
			≦ 55	m	≦ 55	m	(2) Dynamic Relative Positioning: super short distance (plane direction)	4.2	mm
			≦ 55	m	≦ 55	m	(2) Dynamic Relative Positioning: super short distance (elevation direction)	5.3	mm
							(3) Absolute positioning (plane direction)	39	mm
							(3) Absolute positioning (elevation direction)	53	mm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA1022 Standard Particle	Polystyrene Sphere Standard Particle NMIJ/5721-a, Thermo/3500A	In house method: Instrument Calibration Technique for Nanoparticale Size-Differential Mobility Analysis (Document No.: 07-3-97-1826)	20	nm	<350	nm	Particle Size /Polystyrene Sphere, D is particle diameter	0.065D + 0.351, D in nm	nm
			350	nm	500	nm	Particle Size /Polystyrene Sphere, D is particle diameter	0.065D + 0.985, D in nm	nm
Approval Signatory: LIN, Fang-Hsin; CHANG, Ching-Hsuan; FU, Wei-En									
KA1022 Standard Particle	Pitch Standard Ted Pella /70-1DUTC	In house method: Instrument Calibration Technique for Scanning Electron Misroscope Measurement System Standard Particle Size (Document No.: 07-3-A0-2415)	10	nm	<30	nm	Particle Size	1.5	nm
			30	nm	60	nm	Particle Size	5.4	nm
Approval Signatory: LIN, Fang-Hsin; CHANG, Ching-Hsuan; FU, Wei-En									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA1022 Standard Particle	Dynamic light scattering Malvern /Zetasizer Nano ZS (Scattering angle at 173°)	In house method: Instrument Calibration Technique for Nanoparticale Size-Dynamic Light Scattering (Document No.: 07-3-94-0104)	20	nm	20	nm	Particle Size (Hydrodynamic Diameter) /Polystyrene Sphere	0.8	nm
			>20	nm	50	nm	Particle Size (Hydrodynamic Diameter) /Polystyrene Sphere	1.8	nm
			>50	nm	100	nm	Particle Size (Hydrodynamic Diameter) /Polystyrene Sphere	3.3	nm
			>100	nm	200	nm	Particle Size (Hydrodynamic Diameter) /Polystyrene Sphere	6.4	nm
			>200	nm	300	nm	Particle Size (Hydrodynamic Diameter) /Polystyrene Sphere	9.9	nm
			>300	nm	500	nm	Particle Size (Hydrodynamic Diameter) /Polystyrene Sphere	17	nm
			>500	nm	800	nm	Particle Size (Hydrodynamic Diameter) /Polystyrene Sphere	26	nm
			>800	nm	1000	nm	Particle Size (Hydrodynamic Diameter) /Polystyrene Sphere	34	nm
Approval Signatory: LIN, Fang-Hsin; CHANG, Ching-Hsuan; FU, Wei-En									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA2001 Standard Rules	Laser Interferometers /KEYSIGHT /5517C	In house method: Instrument Calibration Technique for Line Scale Standards (Document No.: 07-3-84-0055)	0.01	mm	1000	mm		$[29.6^2 + (0.132L)^2]^{1/2}$ line spacing L in mm	nm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA2002 Standard Tapes, Steel Tapes	Laser Interferometers /Agilent/5519A	In house method: Instrument Calibration Technique for Scale Tapes (Document No.: 07-3-A5-0037)	0.001	m	10	m		$[10.16^2 + (2.67L)^2 + (1.17S_j)^2 + (2.02S_d)^2]^{1/2}$ line spacing L in m, standard deviation Sj of measured values, variation error Sd of scale alignment	μm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA2013 Invar Bar Code Staffs	Laser Interferometers /Agilent/5519A	In house method: Instrument Calibration Technique for Scale Tapes (Document No.: 07-3-A5-0037)	0.001	m	3	m		$[7.41^2 + (2.67L)^2 + (1.17S_j)^2 + (2.02S_d)^2]^{1/2}$ line spacing L in m, standard deviation S_j of measured values, variation error Sd of scale alignment	μm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA2014 1-D Grating: Pitch	Pitch Standard Ted Pella /70-1DUTC	In house method: Instrument Calibration Technique for Scanning Electron Misroscope Measurement System-Pitch Standard (Document No.: 07-3-A0-2414)	70	nm	<700	nm	Pitch	0.29	nm
			700	nm	1000	nm	Pitch	2.8	nm
Approval Signatory: LIN, Fang-Hsin; CHANG, Ching-Hsuan; FU, Wei-En									
KA2014 1-D Grating: Pitch	Laser Interferometer Renishaw /RLU10-A3-A3	In house method: Instrument Calibration Technique for Pitch Standard Calibration System by Metrological AFM (Document No.: 07-3-A3-0267)	50	nm	5	μm	Pitch	0.17	nm
Approval Signatory: LIN, Fang-Hsin; CHANG, Ching-Hsuan; FU, Wei-En									
KA2014 1-D Grating: Pitch	He-Ne laser Melles Griot /25LGR193-249	In house method: Instrument Calibration Technique for Pitch Standards by Laser Diffractometer (Document No.: 07-3-93-0067)	280	nm	300	nm	Pitch	0.008	nm
			>300	nm	700	nm	Pitch	0.030	nm
			>700	nm	10000	nm	Pitch	6.4	nm
Approval Signatory: LIN, Fang-Hsin; CHANG, Ching-Hsuan; FU, Wei-En									
KA3001 Angle Gauge Blocks	Angle Gauge Blocks/Starrett /AG16.LM	In house method: Instrument Calibration Technique for Angle Blocks (Document No.: 07-3-76-0068)	1	"	45	°		0.50	"
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA3004 Precision Indexing Tables	Precision Polygons /Starrett/OP-12 & OP-18 & Polygons/CSSC/-	In house method: Instrument Calibration Technique for Indexing Table (Document No.: 07-3-91-0026)	0.1	°	360	°		0.26	"
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA3005 Polygons	Circle closure	In house method: Instrument Calibration Technique for Polygons (Document No.: 07-3-86-0023)	3	face	72	face		0.22	"
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA3007 Optical Theodolites, Electronic Theodolites, Total Stations	Precision Indexing Tables /AA GAGE /2921487	In house method: Instrument Calibration Technique for Geodetic Angle Measuring Instruments (Document No.: 07-3-85-0085)	0	°	360	°		1.0	"
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA3016 Electronic Levels	Small angle generator /Hilger & Watts /TA48	In house method: Instrument Calibration Technique for Electronic Level (Document No.: 07-3-81-0006)	- 6	'	6	'	resolution: 0.2"	0.5	"
			-1	°	1	°	resolution: 1"	1	"
			-1	°	1	°	resolution: 2"	2	"
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA3099 Angular encorder	e-motionsystem /SCMS-127	In house method: Instrument Calibration Technique for Angular Encoder (Document No.: 07-3-A9-0226)	0	°	360	°		0.05	"
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA4001 Roughness Standards	Step Height Standards /Taylor Hobson /112-557	In house method: Instrument Calibration Technique for Surface Roughness Standard Specimen (Document No.: 07-3-76-0064)	0.01	μm	20	μm	Average parameters, Ra and Rq	$[5^2+(13R)^2]^{1/2}$ R in μm	nm
			0.01	μm	20	μm	Average parameters, Rmax, Rt and Rz	$[20^2+(13R)^2]^{1/2}$ R in μm	nm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA4004 Roundness Standards	Gauge blocks/Mahr/-	In house method: Instrument Calibration Technique for Roundness standard (Document No.: 07-3-76-0019)	0.01	μm	2	μm		21	nm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA4004 Roundness Standards	Flick Standard /Taylor Hobson	In house method: Instrument Calibration Technique for Roundness standard-Rotating Pick-up Type (Document No.: 07-3-98-3024)	0.001	μm	2	μm		$[4.13^2+(67R)^2]^{1/2}$ R in μm	nm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA4004 Roundness Standards	Gauge blocks /Mahr/-	In house method: Instrument Calibration Technique for Roundness Standard-Rotating Table Type (Document No.: 07-3-B0-0124)	0.001	μm	2	μm		$[3.14^2+(4.9R)^2]^{1/2}$ R in μm	nm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA4008 Coordinate Measuring Machine (On-site calibration included)	LaserTRACER /eTALON	In house method: Instrument Calibration Technique for Coordinate Measuring Machine (Document No.: 07-3-A4-0118)	200	mm	10000	mm		$1.97\times[0.21^2+(6.5\times10^{-4}L)^2]^{1/2}$, L in mm	μm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA4009 Film Thickness Standards	Grazing incidence X-ray Reflector PANalytical /X'PERT PRO MRD	In house method: Instrument Calibration Technique for Thin Film Calibration by X-Ray Reflector (Document No.: 07-3-95-0199)	1.5	nm	200	nm	Film Thickness	0.02	nm
Approval Signatory: LIN, Fang-Hsin; CHANG, Ching-Hsuan; FU, Wei-En									
Calibration Site: No.195, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 310, Taiwan (R.O.C.)									
KA4009 Film Thickness Standards	Spectroscopic Ellipsometer HORIBA Jobin Yvon/UVISEL	In house method: Instrument Calibration Technique for Thin Film Measurement System by Spectroscopic Ellipsometer (Document No.: 07-3-91-0007)	1.5	nm	1000	nm	Film Thickness	0.08	nm
Approval Signatory: LIN, Fang-Hsin; CHANG, Ching-Hsuan; FU, Wei-En									
Calibration Site: No.195, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 310, Taiwan (R.O.C.)									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KA4099 Grid Plate: Grid Point Coordinates and Pitch	Standard Rules /Mitutoyo /02ATL102	In house method: Instrument Calibration Technique for two-dimentional Optical Image-Based Standard (Document No.: 07-3-98-5558)	10×10	μm	1.0×1.0	mm	2-D (under Field of View)	0.19	μm
			1	mm	400	mm	1-D	$[0.32^2+(0.00184L)^2]^{1/2}$, L in mm	μm
			10×10	μm	400×400	mm	2-D (with Machine Motion)	$[0.32^2+(0.00214L)^2]^{1/2}$, L in mm	μm
Approval Signatory: CHANG, Ming-Wei; CHANG, Kuo-Ming; CHEN, Wen-Jen; TSAI, Chin-Lung									
KA4099 Specific Surface Area of Standard Particle	Specific Surface Area Analyzer Micrometrics /ASAP2020	In house method: Instrument Calibration Technique for Nano Particle Functional Property Measurement System-Calibration of Specific Surface Area by Gas Adsorption BET Method (Document No.: 07-3-A3-0184)	3	m^2/g	100	m^2/g	Specific Surface Area /Gas Adsorption-BET Method	1.6 (relative)	%
			>100	m^2/g	600	m^2/g	Specific Surface Area /Gas Adsorption-BET Method	2.1 (relative)	%
Approval Signatory: LIN, Fang-Hsin; CHANG, Ching-Hsuan; FU, Wei-En									

Electricity

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF1001 DC voltage source DC voltage meter	Datron 4910	In house method: Instrument Calibration Technique for DC Voltage System (Document No.: 07-3-76-0088)	1	mV	1	mV		0.7	mV/V
			10	mV	10	mV		0.07	mV/V
			100	mV	100	mV		7	μV/V
			1	V	1	V		0.8	μV/V
			10	V	10	V		0.4	μV/V
			100	V	100	V		0.7	μV/V
			1000	V	1000	V		6	μV/V
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF1001 DC voltage standard cell	Fluke 732A, 732B	In house method: Instrument Calibration Technique for DC 1V-10 V System (Document No.: 07-3-82-0001)	1	V	1	V		0.3	μV/V
			1.018	V	1.018	V		0.3	μV/V
			10	V	10	V		0.3	μV/V
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF1002 DC (low) current source DC (low) current meter	KEITHLEY 6517B, ESI SR1050, KEITHLEY 5156	In house method: Instrument calibration technique for DC Low Current System (Document No.: 07-3-84-0109)	10	pA	10	pA		0.81	mA/A
			100	pA	100	pA		0.42	mA/A
			1	nA	1	nA		0.33	mA/A
			10	nA	10	nA		0.31	mA/A
			100	nA	100	nA		0.30	mA/A
			1	μA	1	μA		0.30	mA/A
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF1002 DC current shunt DC current meter DC current source	Guildline 9211A	In house method: Instrument Calibration Technique for Direct Middle-Range Current system (Document No.: 07-3-86-0036)	10	μA	10	μA		28	μA/A
			100	μA	100	μA		20	μA/A
			1	mA	1	mA		20	μA/A
			10	mA	10	mA		20	μA/A

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF1002 DC current shunt DC current meter DC current source	Guildline 9211A	In house method: Instrument Calibration Technique for Direct Middle-Range Current system (Document No.: 07-3-86-0036)	100	mA	100	mA		20	μA/A
			1	A	1	A		24	μA/A
			2	A	2	A		32	μA/A
			5	A	5	A		27	μA/A
			10	A	10	A		27	μA/A
			20	A	20	A		61	μA/A
			50	A	50	A		58	μA/A
			100	A	100	A		58	μA/A
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF1003 DC high voltage source DC high voltage meter DC high voltage divider	CMS /EML-HV200	In house method: Instrument Calibration Technique for DC High Voltage System (Document No.: 07-3-76-0081)	1	kV	200	kV		0.1	mV/V
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF1004 DC current shunt DC current meter DC current source	H.TINSLEY 4638	In house method: Instrument Calibration Technique for DC High Current System (Document No.: 07-3-86-0056)	300	A	300	A		0.20	mA/A
			500	A	500	A		0.20	mA/A
			1000	A	1000	A		0.20	mA/A
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF1011 thermal voltage converter (TVC) , micropotentiometer (μ pot) , AC voltage source, AC voltage meter	NML TVC NML μpot	In house method: Instrument Calibration Technique for AC-DC Voltage Transfer (Document No.: 07-3-81-0014)	0.2	V	0.2	V	@ 20 Hz	19	μV/V
			0.2	V	0.2	V	(@ 40 Hz to 1 kHz)	14	μV/V
			0.2	V	0.2	V	@ 10 kHz	14	μV/V
			0.2	V	0.2	V	@ 30 kHz	14	μV/V
			0.2	V	0.2	V	@ 100 kHz	19	μV/V
			0.2	V	0.2	V	@ 300 kHz	34	μV/V
			0.2	V	0.2	V	@ 500 kHz	51	μV/V
			0.2	V	0.2	V	@ 800 kHz	65	μV/V
			0.2	V	0.2	V	@ 1 MHz	76	μV/V
			0.5	V	0.5	V	@ 20 Hz	16	μV/V
			0.5	V	0.5	V	@ 40 Hz to 1 kHz	11	μV/V
			0.5	V	0.5	V	@ 10 kHz	10	μV/V
			0.5	V	0.5	V	@ 30 kHz	11	μV/V
			0.5	V	0.5	V	@ 100 kHz	15	μV/V
			0.5	V	0.5	V	@ 300 kHz	27	μV/V
			0.5	V	0.5	V	@ 500 kHz	42	μV/V
			0.5	V	0.5	V	@ 800 kHz	53	μV/V
			0.5	V	0.5	V	@ 1 MHz	64	μV/V
			1	V	1	V	@ 20 Hz	13	μV/V
			1	V	1	V	(@ 40 Hz to 60 Hz)	9	μV/V
			1	V	1	V	(@ 1 kHz to 30 kHz)	8	μV/V
			1	V	1	V	@ 100 kHz	12	μV/V
			1	V	1	V	@ 300 kHz	23	μV/V
			1	V	1	V	@ 500 kHz	37	μV/V
			1	V	1	V	@ 800 kHz	47	μV/V
			1	V	1	V	@ 1 MHz	58	μV/V
			2	V	2	V	@ 20 Hz	11	μV/V
			2	V	2	V	@ 40 Hz to 60 Hz	5	μV/V
			2	V	2	V	@ 1 kHz to 30 kHz	4	μV/V
			2	V	2	V	@ 100 kHz	8	μV/V

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF1011 thermal voltage converter (TVC) , micropotentiometer (μ pot) , AC voltage source, AC voltage meter	NML TVC NML μpot	In house method: Instrument Calibration Technique for AC-DC Voltage Transfer (Document No.: 07-3-81-0014)	2	V	2	V	@ 300 kHz	18	μV/V
			2	V	2	V	@ 500 kHz	30	μV/V
			2	V	2	V	@ 800 kHz	40	μV/V
			2	V	2	V	@ 1 MHz	50	μV/V
			4	V	4	V	@ 20 Hz	13	μV/V
			4	V	4	V	@ 40 Hz to 60 Hz	9	μV/V
			4	V	4	V	@ 1 kHz to 30 kHz	8	μV/V
			4	V	4	V	@ 100 kHz	12	μV/V
			4	V	4	V	@ 300 kHz	23	μV/V
			4	V	4	V	@ 500 kHz	37	μV/V
			4	V	4	V	@ 800 kHz	47	μV/V
			4	V	4	V	@ 1 MHz	58	μV/V
			10	V	10	V	@ 20 Hz	19	μV/V
			10	V	10	V	@ 40 Hz to 30 kHz	12	μV/V
			10	V	10	V	@ 100 kHz	17	μV/V
			10	V	10	V	@ 300 kHz	31	μV/V
			10	V	10	V	@ 500 kHz	46	μV/V
			10	V	10	V	@ 800 kHz	58	μV/V
			10	V	10	V	@ 1 MHz	70	μV/V
			20	V	20	V	@ 20 Hz	21	μV/V
			20	V	20	V	(@ 40 Hz to 30 kHz)	15	μV/V
			20	V	20	V	@ 100 kHz	19	μV/V
			20	V	20	V	@ 300 kHz	34	μV/V
			20	V	20	V	@ 500 kHz	51	μV/V
			20	V	20	V	@ 800 kHz	63	μV/V
			20	V	20	V	@ 1 MHz	76	μV/V
			40	V	40	V	@ 20 Hz	24	μV/V
			40	V	40	V	@ 40 Hz to 30 kHz	17	μV/V
			40	V	40	V	@ 100 kHz	20	μV/V
			40	V	40	V	@ 300 kHz	37	μV/V

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF1011 thermal voltage converter (TVC) , micropotentiometer (μ pot) , AC voltage source, AC voltage meter	NML TVC NML μpot	In house method: Instrument Calibration Technique for AC-DC Voltage Transfer (Document No.: 07-3-81-0014)	100	V	100	V	@ 20 Hz	34	μV/V
			100	V	100	V	@ 40 Hz to 30 kHz	22	μV/V
			100	V	100	V	@ 100 kHz	29	μV/V
			200	V	400	V	@ 20 Hz	46	μV/V
			200	V	400	V	@ 40 Hz to 30 kHz	36	μV/V
			200	V	400	V	@ 100 kHz	52	μV/V
			500	V	1000	V	@ 20 Hz	61	μV/V
			500	V	1000	V	@40 Hz to 10 kHz	52	μV/V
			500	V	1000	V	@ 30 kHz	60	μV/V
			100	mV	100	mV	@ 20 Hz	34	μV/V
			100	mV	100	mV	(@ 40 Hz to 30 kHz)	32	μV/V
			100	mV	100	mV	@ 100 kHz	47	μV/V
			100	mV	100	mV	@ 300 kHz	55	μV/V
			100	mV	100	mV	@ 500 kHz	76	μV/V
			100	mV	100	mV	@ 800 kHz to 1 MHz	0.12	mV/V
			50	mV	50	mV	@ 20 Hz	45	μV/V
			50	mV	50	mV	(@ 40 Hz to 30 kHz)	43	μV/V
			50	mV	50	mV	@ 100 kHz	63	μV/V
			50	mV	50	mV	@ 300 kHz	69	μV/V
			50	mV	50	mV	@ 500 kHz	95	μV/V
			50	mV	50	mV	@ 800 kHz	0.14	mV/V
			50	mV	50	mV	@ 1 MHz	0.15	mV/V
			20	mV	20	mV	@ 20 Hz	73	μV/V
			20	mV	20	mV	(@ 40 Hz to 30 kHz)	71	μV/V
			20	mV	20	mV	@ 100 kHz	95	μV/V
			20	mV	20	mV	@ 300 kHz	0.11	mV/V
			20	mV	20	mV	@ 500 kHz	0.15	mV/V
			20	mV	20	mV	@ 800 kHz	0.20	mV/V
			20	mV	20	mV	@ 1 MHz	0.25	mV/V
			10	mV	10	mV	@ 20 Hz	92	μV/V

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF1011 thermal voltage converter (TVC) , micropotentiometer (μ pot) , AC voltage source, AC voltage meter	NML TVC NML μpot	In house method: Instrument Calibration Technique for AC-DC Voltage Transfer (Document No.: 07-3-81-0014)	10	mV	10	mV	(@ 40 Hz to 30 kHz)	91	μV/V
			10	mV	10	mV	@ 100 kHz	0.12	mV/V
			10	mV	10	mV	@ 300 kHz	0.14	mV/V
			10	mV	10	mV	@ 500 kHz	0.19	mV/V
			10	mV	10	mV	@ 800 kHz	0.25	mV/V
			10	mV	10	mV	@ 1 MHz	0.32	mV/V
			5	mV	5	mV	@ 20 Hz	0.11	mV/V
			5	mV	5	mV	(@ 40 Hz to 30 kHz)	0.11	mV/V
			5	mV	5	mV	@ 100 kHz	0.14	mV/V
			5	mV	5	mV	@ 300 kHz	0.17	mV/V
			5	mV	5	mV	@ 500 kHz	0.22	mV/V
			5	mV	5	mV	@ 800 kHz	0.28	mV/V
			5	mV	5	mV	@ 1 MHz	0.40	mV/V
			2	mV	2	mV	@ 20 Hz	0.13	mV/V
			2	mV	2	mV	(@ 40 Hz to 30 kHz)	0.13	mV/V
			2	mV	2	mV	@ 100 kHz	0.16	mV/V
			2	mV	2	mV	@ 300 kHz	0.19	mV/V
			2	mV	2	mV	@ 500 kHz	0.25	mV/V
			2	mV	2	mV	@ 800 kHz	0.32	mV/V
			2	mV	2	mV	@ 1 MHz	0.45	mV/V
			1	mV	1	mV	@ 20 Hz	0.17	mV/V
			1	mV	1	mV	(@ 40 Hz to 60 Hz)	0.17	mV/V
			1	mV	1	mV	@ 1 kHz to 30 kHz	0.15	mV/V
			1	mV	1	mV	@ 100 kHz	0.20	mV/V
			1	mV	1	mV	@ 300 kHz	0.23	mV/V
			1	mV	1	mV	@ 500 kHz	0.29	mV/V
			1	mV	1	mV	@ 800 kHz	0.36	mV/V
			1	mV	1	mV	@ 1 MHz	0.50	mV/V
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF1012 AC current source AC transconductance amplifier AC current meter AC current shunt	Fluke A40B /Fluke 5790B	In house method: Instrument Calibration Technique for AC Current Measurement System (Document No.: 07-3-A6-0095)	100	μA	< 300	μA	@ 20 Hz to 10 kHz	0.12	mA/A
			300	μA	100	A	@ 20 Hz to 10 kHz	0.07	mA/A
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF1012 thermal current converter, AC current shunt, AC current source, AC current meter	NML 101, 115, 129, PTB /IPHT 227	In house method: Instrument Calibration Technique for AC-DC Current Transfer System (Document No.: 07-3-78-0026)	1	mA	1	mA	@ 20 Hz to 10 kHz	18	μA/A
			1	mA	1	mA	@ 20 kHz	24	μA/A
			1	mA	1	mA	@ 50 kHz	40	μA/A
			1	mA	1	mA	@ 100 kHz	50	μA/A
			5	mA	5	mA	@ 20 Hz to 10 kHz	15	μA/A
			5	mA	5	mA	@ 20 kHz	20	μA/A
			5	mA	5	mA	@ 50 kHz	26	μA/A
			5	mA	5	mA	@ 100 kHz	40	μA/A
			10	mA	10	mA	@ 20 Hz to 10 kHz	11	μA/A
			10	mA	10	mA	@ 20 kHz	15	μA/A
			10	mA	10	mA	@ 50 kHz	19	μA/A
			10	mA	10	mA	@ 100 kHz	24	μA/A
			20	mA	20	mA	@ 20 Hz to 10 kHz	15	μA/A
			20	mA	20	mA	@ 20 kHz	20	μA/A
			20	mA	20	mA	@ 50 kHz	26	μA/A
			20	mA	20	mA	@ 100 kHz	40	μA/A
			30	mA	30	mA	@ 20 Hz to 10 kHz	18	μA/A
			30	mA	30	mA	@ 20 kHz	24	μA/A
			30	mA	30	mA	@ 50 kHz	40	μA/A
			30	mA	30	mA	@ 100 kHz	50	μA/A
			50	mA	50	mA	@ 20 Hz to 10 kHz	22	μA/A
			50	mA	50	mA	@ 20 kHz	28	μA/A

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF1012 thermal current converter, AC current shunt, AC current source, AC current meter	NML 101, 115, 129, PTB /IPHT 227	In house method: Instrument Calibration Technique for AC-DC Current Transfer System (Document No.: 07-3-78-0026)	50	mA	50	mA	@ 50 kHz	40	μA/A
			50	mA	50	mA	@ 100 kHz	50	μA/A
			100	mA	100	mA	@ 20 Hz to 10 kHz	24	μA/A
			100	mA	100	mA	@ 20 kHz	40	μA/A
			100	mA	100	mA	@ 50 kHz	50	μA/A
			100	mA	100	mA	@ 100 kHz	60	μA/A
			200	mA	200	mA	@ 20 Hz to 10 kHz	26	μA/A
			200	mA	200	mA	@ 20 kHz	40	μA/A
			200	mA	200	mA	@ 50 kHz	50	μA/A
			200	mA	200	mA	@ 100 kHz	60	μA/A
			300	mA	300	mA	@ 20 Hz to 10 kHz	28	μA/A
			300	mA	300	mA	@ 20 kHz	40	μA/A
			300	mA	300	mA	@ 50 kHz	50	μA/A
			300	mA	300	mA	@ 100 kHz	70	μA/A
			500	mA	500	mA	@ 20 Hz to 10 kHz	30	μA/A
			500	mA	500	mA	@ 20 kHz	50	μA/A
			500	mA	500	mA	@ 50 kHz	60	μA/A
			500	mA	500	mA	@ 100 kHz	70	μA/A
			1	A	1	A	@ 20 Hz to 10 kHz	40	μA/A
			1	A	1	A	@ 20 kHz	50	μA/A
			1	A	1	A	@ 50 kHz	60	μA/A
			1	A	1	A	@ 100 kHz	80	μA/A
			2	A	2	A	@ 20 Hz to 10 kHz	40	μA/A
			2	A	2	A	@ 20 kHz	50	μA/A
			2	A	2	A	@ 50 kHz	70	μA/A
			2	A	2	A	@ 100 kHz	80	μA/A
			3	A	3	A	@ 20 Hz to 10 kHz	40	μA/A
			3	A	3	A	@ 20 kHz	60	μA/A
			3	A	3	A	@ 50 kHz	70	μA/A
			3	A	3	A	@ 100 kHz	90	μA/A

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF1012 thermal current converter, AC current shunt, AC current source, AC current meter	NML 101, 115, 129, PTB /IPHT 227	In house method: Instrument Calibration Technique for AC-DC Current Transfer System (Document No.: 07-3-78-0026)	5	A	5	A	@ 20 Hz to 10 kHz	50	μA/A
			5	A	5	A	@ 20 kHz	60	μA/A
			5	A	5	A	@ 50 kHz	80	μA/A
			5	A	5	A	@ 100 kHz	0.10	mA/A
			10	A	10	A	@ 20 Hz to 10 kHz	50	μA/A
			10	A	10	A	@ 20 kHz	70	μA/A
			10	A	10	A	@ 50 kHz	80	μA/A
			10	A	10	A	@ 100 kHz	0.11	mA/A
			20	A	20	A	@ 20 Hz to 10 kHz	60	μA/A
			20	A	20	A	@ 20 kHz	70	μA/A
			20	A	20	A	@ 50 kHz	90	μA/A
			20	A	20	A	@ 100 kHz	0.12	mA/A
			500	μA	500	μA	@ 20 Hz to 1 kHz	40	μA/A
			500	μA	500	μA	@ 5 kHz	40	μA/A
			500	μA	500	μA	@ 10 kHz	50	μA/A
			200	μA	200	μA	@ 20 Hz to 1 kHz	40	μA/A
			200	μA	200	μA	@ 5 kHz	40	μA/A
			200	μA	200	μA	@ 10 kHz	60	μA/A
			100	μA	100	μA	@ 20 Hz to 1 kHz	40	μA/A
			100	μA	100	μA	@ 5 kHz	50	μA/A
			100	μA	100	μA	@ 10 kHz	60	μA/A
			50	μA	50	μA	@ 20 Hz to 1 kHz	40	μA/A
			50	μA	50	μA	@ 5 kHz	50	μA/A
			50	μA	50	μA	@ 10 kHz	70	μA/A
			20	μA	20	μA	@ 20 Hz	60	μA/A
			20	μA	20	μA	@ 40 Hz to 1 kHz	50	μA/A
			20	μA	20	μA	@ 5 kHz	70	μA/A
			20	μA	20	μA	@ 10 kHz	90	μA/A

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF1012 thermal current converter, AC current shunt, AC current source, AC current meter	NML 101, 115, 129, PTB /IPHT 227	In house method: Instrument Calibration Technique for AC-DC Current Transfer System (Document No.: 07-3-78-0026)	10	μA	10	μA	@ 20 Hz	70	μA/A
			10	μA	10	μA	@ 40 Hz to 1 kHz	60	μA/A
			10	μA	10	μA	@ 5 kHz	0.11	mA/A
			10	μA	10	μA	@ 10 kHz	0.25	mA/A
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF1015 DC voltage standard digital voltage meter	Josephson chip	In house method: Instrument CalibrationTechnique for Programmable Josephson Voltage Measurement System (Document No.: 07-3-A1-0079)	10	V	10	V		98	nV
			1.018	V	1.018	V		50	nV
			1	V	1	V		50	nV
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF1016 current transformer AC current coil integrator current shunt	Tettex-4764	In house method: Instrument Calibration Technique for Current Transformer Measurement System (Document No.: 07-3-76-0083)	5	A	5000	A	primary current 5 A to 5000 A, secondary current 1 A, 5 A (@ frequency 60 Hz)-ratio error	7.0E-05	
			5	A	5000	A	primary current 5 A to 5000 A, secondary current 1 A, 5 A (@ frequency 60 Hz)-phase angle error	24	μrad
			5	A	5000	A	primary current 5 A to 5000 A, secondary current 1 A, 5 A (@ frequency 60 Hz)-voltage	0.29	mV/V
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF1017 potential transformer AC high voltage source AC high voltage meter AC high voltage attenuator voltage instrument transformer test system	Tettex 4829	In house method: Instrument Calibration Technique for Potential Transformer Measurement System (Document No.: 07-3-76-0084)	1	kV	100	kV	primary voltage 1 kV to 100 kV, secondary voltage 10 V to 240 V (@ frequency 60 Hz) -ratio error	8.2E-05	
			1	kV	100	kV	primary voltage 1 kV to 100 kV, secondary voltage 10 V to 240 V (@ frequency 60 Hz) -phase angle error	60	μrad
			1	kV	100	kV	primary voltage 1 kV to 100 kV, secondary voltage 10 V to 240 V (@ frequency 60 Hz)-voltage	0.16	mV/V
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF2001 single-phase ac power source, single-phase ac power meter, single-phase ac watt converter, three-phase ac power source, three-phase ac power meter	Radian RD-33-373	In house method: Instrument Calibration Technique for Single-phase AC Electrical Power Measurement System (Document No.: 07-3-A3-0312) , Instrument Calibration Technique for Three-Phase AC Electrical Power Measurement System (Document No.: 07-3-A4-0146)	1.1	W	4.8	W	(1) single-phase active power: voltage (110, 120, 220, 240, 480) V; current 0.01 A; power factor 1; frequency (50, 60) Hz	0.21	mW/W
			0.55	W	2.4	W	(1) single-phase active power: voltage (110, 120, 220, 240, 480) V; current 0.01 A; power factor 0.5 Lead/Lag; frequency (50, 60) Hz	0.41	mW/W
			11	W	38.4	kW	(1) single-phase active power: voltage (110, 120, 220, 240, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 1; frequency (50, 60) Hz	70	μW/W
			5.5	W	19.2	kW	(1) single-phase active power: voltage (110, 120, 220, 240, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 0.5 Lead/Lag; frequency (50, 60) Hz	0.14	mW/W
			1.1	var	4.8	var	(2) single-phase reactive power: voltage (110, 120, 220, 240, 480) V; current 0.01 A; power factor 0 Lead/Lag; frequency (50, 60) Hz	0.21	mvar/var
			0.55	var	2.4	var	(2) single-phase reactive power: voltage (110, 120, 220, 240, 480) V; current 0.01 A; power factor 0.866 Lead/Lag; frequency (50, 60) Hz	0.41	mvar/var

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF2001 single-phase ac power source, single-phase ac power meter, single-phase ac watt converter, three-phase ac power source, three-phase ac power meter	Radian RD-33-373	In house method: Instrument Calibration Technique for Single-phase AC Electrical Power Measurement System (Document No.: 07-3-A3-0312) , Instrument Calibration Technique for Three-Phase AC Electrical Power Measurement System (Document No.: 07-3-A4-0146)	11	var	38.4	kvar	(2) single-phase reactive power: voltage (110, 120, 220, 240, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 0 Lead/Lag; frequency (50, 60) Hz	70	μvar/var
			5.5	var	19.2	kvar	(2) single-phase reactive power: voltage (110, 120, 220, 240, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 0.866 Lead/Lag; frequency (50, 60) Hz	0.14	mvar/var
			2.2	V	22	V	(3) voltage harmonic: foundamental voltage (110, 220) V; hamonic-to-fundamental ratio (2, 10) %; fundamental frequency (50, 60) Hz; harmonic number 2, 3, 5, 10	0.31	mV/V
			2.2	V	22	V	(3) voltage harmonic: foundamental voltage (110, 220) V; hamonic-to-fundamental ratio (2, 10) %; fundamental frequency (50, 60) Hz; harmonic number 20, 30, 40, 50, 64	0.63	mV/V

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF2001 single-phase ac power source, single-phase ac power meter, single-phase ac watt converter, three-phase ac power source, three-phase ac power meter	Radian RD-33-373	In house method: Instrument Calibration Technique for Single-phase AC Electrical Power Measurement System (Document No.: 07-3-A3-0312) , Instrument Calibration Technique for Three-Phase AC Electrical Power Measurement System (Document No.: 07-3-A4-0146)	0.02	A	1	A	(4) current harmonic: foundamental current (1, 2, 5, 10) A; hamonic-to-fundamental ratio (2, 10) %; fundamental frequency (50, 60) Hz; harmonic number 2, 3, 5, 10	0.24	mA/A
			0.02	A	1	A	(4) current harmonic: foundamental current (1, 2, 5, 10) A; hamonic-to-fundamental ratio (2, 10) %; fundamental frequency (50, 60) Hz; harmonic number 20, 30, 40, 50, 64	0.48	mA/A
			3.3	W	14.4	W	(1) three-phase active power: voltage (110, 220, 480) V; current 0.01 A; power factor 1; frequency (50, 60) Hz	0.21	mW/W
			1.65	W	7.2	W	(1) three-phase active power: voltage (110, 220, 480) V; current 0.01 A; power factor 0.5 Lead/Lag; frequency (50, 60) Hz	0.41	mW/W
			33	W	115.2	kW	(1) three-phase active power: voltage (110, 220, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 1; frequency (50, 60) Hz	70	μW/W

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF2001 single-phase ac power source, single-phase ac power meter, single-phase ac watt converter, three-phase ac power source, three-phase ac power meter	Radian RD-33-373	In house method: Instrument Calibration Technique for Single-phase AC Electrical Power Measurement System (Document No.: 07-3-A3-0312) , Instrument Calibration Technique for Three-Phase AC Electrical Power Measurement System (Document No.: 07-3-A4-0146)	16.5	W	57.6	kW	(1) three-phase active power: voltage (110, 220, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 0.5 Lead/Lag; frequency (50, 60) Hz	0.14	mW/W
			3.3	var	14.4	var	(2) three-phase reactive power: voltage (110, 220, 480) V; current 0.01 A; power factor 0 Lead/Lag; frequency (50, 60) Hz	0.21	mvar/var
			1.65	var	7.2	var	(2) three-phase reactive power: voltage (110, 220, 480) V; current 0.01 A; power factor 0.866 Lead/Lag; frequency (50, 60) Hz	0.41	mvar/var
			33	var	115.2	kvar	(2) three-phase reactive power: voltage (110, 220, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 0 Lead/Lag; frequency (50, 60) Hz	70	μvar/var
			16.5	var	57.6	kvar	(2) three-phase reactive power: voltage (110, 220, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 0.866 Lead/Lag; frequency (50, 60) Hz	0.14	mvar/var
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF2002 single-phase ac energy meter, single-phase ac watthour converter, three-phase ac energy meter	Radian RD-33-373	In house method: Instrument Calibration Technique for Single-Phase AC Electrical Energy Measurement System (Document No.: 07-3-A3-0313) , Instrument Calibration Technique for Three-Phase AC Electrical Energy Measurement System (Document No.: 07-3-A4-0148)	0.037	Wh	0.16	Wh	(1) single-phase active energy: voltage (110, 120, 220, 240, 480) V; current 0.01 A; power factor 1; frequency (50, 60) Hz; time 2 min	0.24	mWh/Wh
			0.018	Wh	0.08	Wh	(1) single-phase active energy: voltage (110, 120, 220, 240, 480) V; current 0.01 A; power factor 0.5 Lead/Lag; frequency (50, 60) Hz; time 2 min	0.47	mWh/Wh
			0.367	Wh	1.28	kWh	(1) single-phase active energy: voltage (110, 120, 220, 240, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 1; frequency (50, 60) Hz; time 2 min	0.10	mWh/Wh
			0.183	Wh	640	Wh	(1) single-phase active energy: voltage (110, 120, 220, 240, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 0.5 Lead/Lag; frequency (50, 60) Hz; time 2 min	0.19	mWh/Wh
			0.037	varh	0.16	varh	(2) single-phase reactive energy: voltage (110, 120, 220, 240, 480) V; current 0.01 A; power factor 0 Lead/Lag; frequency (50, 60) Hz; time 2 min	0.24	mvarh/varh

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF2002 single-phase ac energy meter, single-phase ac watthour converter, three-phase ac energy meter	Radian RD-33-373	In house method: Instrument Calibration Technique for Single-Phase AC Electrical Energy Measurement System (Document No.: 07-3-A3-0313) , Instrument Calibration Technique for Three-Phase AC Electrical Energy Measurement System (Document No.: 07-3-A4-0148)	0.018	varh	0.08	varh	(2) single-phase reactive energy: voltage (110, 120, 220, 240, 480) V; current 0.01 A; power factor 0.866 Lead/Lag; frequency (50, 60) Hz; time 2 min	0.47	mvarh/varh
			0.367	varh	1.28	kvarh	(2) single-phase reactive energy: voltage (110, 120, 220, 240, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 0 Lead/Lag; frequency (50, 60) Hz; time 2 min	0.10	mvarh/varh
			0.183	varh	640	varh	(2) single-phase reactive energy: voltage (110, 120, 220, 240, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 0.866 Lead/Lag; frequency (50, 60) Hz; time 2 min	0.19	mvarh/varh
			0.11	Wh	0.48	Wh	(1) three-phase active energy: voltage (110, 220, 480) V; current 0.01 A; power factor 1; frequency (50, 60) Hz; time 2 min	0.24	mWh/Wh
			0.055	Wh	0.24	Wh	(1) three-phase active energy: voltage (110, 220, 480) V; current 0.01 A; power factor 0.5 Lead/Lag; frequency (50, 60) Hz; time 2 min	0.47	mWh/Wh

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF2002 single-phase ac energy meter, single-phase ac watthour converter, three-phase ac energy meter	Radian RD-33-373	In house method: Instrument Calibration Technique for Single-Phase AC Electrical Energy Measurement System (Document No.: 07-3-A3-0313) , Instrument Calibration Technique for Three-Phase AC Electrical Energy Measurement System (Document No.: 07-3-A4-0148)	1.1	Wh	3.84	kWh	(1) three-phase active energy: voltage (110, 220, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 1; frequency (50, 60) Hz; time 2 min	0.10	mWh/Wh
			0.55	Wh	1.92	kWh	(1) three-phase active energy: voltage (110, 220, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 0.5 Lead/Lag; frequency (50, 60) Hz; time 2 min	0.19	mWh/Wh
			0.11	varh	0.48	varh	(2) three-phase reactive energy: voltage (110, 220, 480) V; current 0.01 A; power factor 0 Lead/Lag; frequency (50, 60) Hz; time 2 min	0.24	mvarh/varh
			0.055	varh	0.24	varh	(2) three-phase reactive energy: voltage (110, 220, 480) V; current 0.01 A; power factor 0.866 Lead/Lag; frequency (50, 60) Hz; time 2 min	0.47	mvarh/varh
			1.1	varh	3.84	kvarh	(2) three-phase reactive energy: voltage (110, 220, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 0 Lead/Lag; frequency (50, 60) Hz; time 2 min	0.10	mvarh/varh
			0.55	varh	1.92	kvarh	(2) three-phase reactive energy: voltage (110, 220, 480) V; current (0.1, 1, 5, 10, 50, 80) A; power factor 0.866 Lead/Lag; frequency (50, 60) Hz; time 2 min	0.19	mvarh/varh
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF2003 phase meter phase generator	Clarke Hess /5500	In house method: Instrument Calibration Technique for Phase Angle Measurement System (Document No.: 07-3-76-0085)	90	°	90	°	@ voltage 5 V (@ 60 Hz, 400 Hz, 1 kHz, 10 kHz, 50 kHz)	0.02	°
			180	°	180	°	@ voltage 5 V (@ 60 Hz, 400 Hz, 1 kHz, 10 kHz, 50 kHz)	0.02	°
			180	°	180	°	@ voltage 50 V (60 Hz, 400 Hz)	0.02	°
			180	°	180	°	@ voltage 100 V (60 Hz, 400 Hz)	0.02	°
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF2006 single-phase AC power meter single-phase AC power calibrator	NI/PXIe-1082, ITRI CMS-IVD-01, FLUKE A40B	In house method: Instrument Calibration Technique of Single-Phase AC Power Primary Measurement System (Document No.: 07-3-84-0094)	0.55	W	38.4	kW	(1) single-phase active power: voltage (110, 120, 220, 240, 480) V; current (0.01, 0.1, 1, 5, 10, 50, 80) A; power factor (1, 0.5 Lead/Lag; frequency (50, 60) Hz	80	μW/VA
			0.55	var	38.4	kvar	(2) single-phase reactive power: voltage (110, 120, 220, 240, 480) V; current (0.01, 0.1, 1, 5, 10, 50, 80) A; power factor (0 Lead/Lag, 0.866 Lead/Lag; frequency (50, 60) Hz	80	μvar/VA
			2.2	V	22	V	(3) voltage harmonic: foundamental voltage (110, 220) V; hamonic-to-fundamental ratio (2, 10) %; fundamental frequency (50, 60) Hz; fundamental number 2nd to 64th	0.22	mV/V
			0.02	A	1	A	(4) current harmonic: foundamental current (1, 2, 5 10) A; hamonic-to-fundamental ratio (2, 10) %; fundamental frequency (50, 60) Hz; fundamental number 2nd to 64th	0.20	mA/A
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF3001 DC high resistor DC high resistance meter multimeter calibrator decade resistor	Guildline 9330, MI 4310HR, Guildline 9334A	In house method: Instrument Calibration Technique for DC High Resistance System (Document No.: 07-3-76-0086)	1	MΩ	1	MΩ		9	μΩ/Ω
			10	MΩ	10	MΩ		11	μΩ/Ω
			100	MΩ	100	MΩ		15	μΩ/Ω
			1	GΩ	1	GΩ		17	μΩ/Ω
			10	GΩ	10	GΩ		31	μΩ/Ω
			100	GΩ	100	GΩ		33	μΩ/Ω
			1	TΩ	1	TΩ		73	μΩ/Ω
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF3001 DC standard resistor	Quantized Hall Resistance	In house method: Instrument Calibration Technique for Quantum Hall Resistance System (Document No.: 07-3-89-0053)	1	kΩ	1	kΩ		0.06	μΩ/Ω
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF3001 DC standard resistor multimeter calibrator decade resistor	LN4221, LN4222, LN4223, TETTEX 3220KD, LN4210, LN4214, Tinsley 5685A, Tinsley 5685B, Guildline 9330	In house method: Instrument Calibration Technique for Direct Resistance System (Document No.: 07-3-84-0042)	0.1	mΩ	0.1	mΩ	@ <100 A	0.7	μΩ/Ω
			0.1	mΩ	0.1	mΩ	@ 100 A to 1000 A	35	μΩ/Ω
			0.001	Ω	0.001	Ω		2.7	μΩ/Ω
			0.01	Ω	0.01	Ω		0.7	μΩ/Ω
			0.1	Ω	0.1	Ω		0.7	μΩ/Ω
			1	Ω	1	Ω		0.16	μΩ/Ω
			10	Ω	10	Ω		0.16	μΩ/Ω
			100	Ω	100	Ω		0.16	μΩ/Ω
			1	kΩ	1	kΩ		0.15	μΩ/Ω
			10	kΩ	10	kΩ		0.15	μΩ/Ω
			100	kΩ	100	kΩ		0.18	μΩ/Ω
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF3002 LCR meter	GR 1482-B, GR 1482-E, GR 1482-H, GR 1482-L, GR 1482-P, GR 1482-T	In house method: Instrument Calibration Technique for Standard Inductance Measurement System (Document No.: 07-3-76-0090)	100	μH	100	μH	@ frequency 100 Hz	1.2	mH/H
			1	mH	1	mH	@ frequency 100 Hz	0.24	mH/H
			10	mH	10	mH	@ frequency 100 Hz	0.24	mH/H
			100	mH	100	mH	@ frequency 100 Hz	0.24	mH/H
			1	H	1	H	@ frequency 100 Hz	0.24	mH/H
			10	H	10	H	@ frequency 100 Hz	0.24	mH/H
			100	μH	100	μH	@ frequency 1 kHz	1.2	mH/H
			1	mH	1	mH	@ frequency 1 kHz	0.24	mH/H
			10	mH	10	mH	@ frequency 1 kHz	0.24	mH/H
			100	mH	100	mH	@ frequency 1 kHz	0.24	mH/H
			1	H	1	H	@ frequency 1 kHz	0.54	mH/H
			10	H	10	H	@ frequency 1 kHz	2.2	mH/H
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF3002 standard inductor	GR 1482-B, GR 1482-E, GR 1482-H, GR 1482-L, GR 1482-P, GR 1482-T	In house method: Instrument Calibration Technique for Standard Inductance Measurement System (Document No.: 07-3-76-0090)	100	μH	100	μH	@ frequency 100 Hz	1.2	mH/H
			1	mH	1	mH	@ frequency 100 Hz	0.22	mH/H
			10	mH	10	mH	@ frequency 100 Hz	0.22	mH/H
			100	mH	100	mH	@ frequency 100 Hz	0.22	mH/H
			1	H	1	H	@ frequency 100 Hz	0.22	mH/H
			10	H	10	H	@ frequency 100 Hz	0.22	mH/H
			100	μH	100	μH	@ frequency 1 kHz	1.2	mH/H
			1	mH	1	mH	@ frequency 1 kHz	0.22	mH/H
			10	mH	10	mH	@ frequency 1 kHz	0.22	mH/H
			100	mH	100	mH	@ frequency 1 kHz	0.22	mH/H
			1	H	1	H	@ frequency 1 kHz	0.52	mH/H
			10	H	10	H	@ frequency 1 kHz	2.0	mH/H
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF3003 low-loss standard capacitor	GR 1404-A	In house method: Instrument Calibration Technique for Standard Capacitance-Traced to Resistance Standard (Document No.: 07-3-93-0054)	1	pF	1	pF	@ frequency 1000 Hz	0.58	μF/F
			10	pF	10	pF	@ frequency 1000 Hz	0.55	μF/F
			100	pF	100	pF	@ frequency 1000 Hz	0.56	μF/F
			1000	pF	1000	pF	@ frequency 1000 Hz	0.56	μF/F
			1	pF	1	pF	@ frequency 1592 Hz	0.25	μF/F
			10	pF	10	pF	@ frequency 1592 Hz	0.22	μF/F
			100	pF	100	pF	@ frequency 1592 Hz	0.21	μF/F
			1000	pF	1000	pF	@ frequency 1592 Hz	0.20	μF/F
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KF3003 standard capacitor, capacitance bridge, LCR meter	AH 11A, GR 1404A	In house method: Instrument Calibration Technique for Standard Capacitance-1 kHz Capacitance Standard (Document No.: 07-3-84-0076)	0.001	μF	0.001	μF	@ frequency 1 kHz two-terminal	0.56	mF/F
			0.01	μF	0.01	μF	@ frequency 1 kHz two-terminal	60	μF/F
			0.1	μF	0.1	μF	@ frequency 1 kHz two-terminal	30	μF/F
			1	μF	1	μF	@ frequency 1 kHz two-terminal	70	μF/F
			1	pF	1	pF	@ frequency 1 kHz three-terminal	2.0	μF/F
			10	pF	10	pF	@ frequency 1 kHz three-terminal	0.9	μF/F
			100	pF	100	pF	@ frequency 1 kHz three-terminal	0.7	μF/F
			1000	pF	1000	pF	@ frequency 1 kHz three-terminal	1.1	μF/F
			1	pF	1	pF	@ frequency 1 kHz four-terminal-pair	30	μF/F
			10	pF	10	pF	@ frequency 1 kHz four-terminal-pair	30	μF/F
			100	pF	100	pF	@ frequency 1 kHz four-terminal-pair	30	μF/F
			1000	pF	1000	pF	@ frequency 1 kHz four-terminal-pair	30	μF/F
			0.01	μF	0.01	μF	@ frequency 1 kHz four-terminal-pair	30	μF/F
			0.1	μF	0.1	μF	@ frequency 1 kHz four-terminal-pair	30	μF/F
			1	μF	1	μF	@ frequency 1 kHz four-terminal-pair	70	μF/F
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KF3006 silicon sheet resistance standards	Guildline 9330, HP 34420A	In house method: Instrument Calibration Technique for Sheet Resistance System (Document No.: 07-3-90-0055)	0.15	Ω	4000	Ω		0.46	%
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
Calibration Site: No.195, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 310, Taiwan (R.O.C.)									

Electromagnetics

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG1001 microwave power meter	Keysight 8478B	In house method: Instrument Calibration Technique for Microwave Power Meter (Document No.: 07-3-80-0009)	1	mW	1	mW	Power Reference: Frequency 50 MHz	0.27	%
			-25	dBm	20	dBm	Power Range	0.29	%
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG1001 microwave power sensor	Keysight 8478B	In house method: Instrument Calibration Technique for Microwave Power Sensor (Document No.: 07-3-82-0093)	0.7		1.1		Thermistor Mount: Power 1 mW Frequency 10 MHz	1.4	%
			0.7		1.1		Thermistor Mount: Power 1 mW Frequency 50 MHz	1.0	%
			0.7		1.1		Thermistor Mount: Power 1 mW Frequency 51 MHz to 4 GHz	1.0	%
			0.7		1.1		Thermistor Mount: Power 1 mW Frequency 4001 MHz to 8 GHz	1.2	%
			0.7		1.1		Thermistor Mount: Power 1 mW Frequency 8001 MHz to 18 GHz	2.0	%
			0.7		1.1		Power Sensor: Power 1 mW Frequency 10 MHz	1.4	%
			0.7		1.1		Power Sensor: Power 1 mW Frequency 50 MHz	1.0	%
			0.7		1.1		Power Sensor: Power 1 mW Frequency 51 MHz to 4 GHz	1.0	%
			0.7		1.1		Power Sensor: Power 1 mW Frequency 4001 MHz to 8 GHz	1.4	%
			0.7		1.1		Power Sensor: Power 1 mW Frequency 8001 MHz to 18 GHz	2.0	%
			0.7		1.1		Power Sensor with 30 dB Pad: Power 1 µW Frequency 10 MHz	1.8	%
			0.7		1.1		Power Sensor with 30 dB Pad: Power 1 µW Frequency 50 MHz	1.6	%

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG1001 microwave power sensor	Keysight 8478B	In house method: Instrument Calibration Technique for Microwave Power Sensor (Document No.: 07-3-82-0093)	0.7		1.1		Power Sensor with 30 dB Pad: Power 1 μW Frequency 51 MHz to 4 GHz	1.6	%
			0.7		1.1		Power Sensor with 30 dB Pad: Power 1 μW Frequency 4001 MHz to 8 GHz	1.8	%
			0.7		1.1		Power Sensor with 30 dB Pad: Power 1 μW Frequency 8001 MHz to 18 GHz	2.4	%
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KG1002 short circuit, open circuit, load, mismatch, air line, attenuator, component	Keysight /85052B	In house method: Instrument Calibration Technique for Network Devices with Microwave S-parameters and Impedance System (Document No.: 07-3-80-0076)	0		1		Reflection Coefficient 3.5 mm: @ 10 MHz to 45 MHz	0.0051 (linear)	
			0	°	180	°	Reflection Coefficient 3.5 mm: @ 10 MHz to 45 MHz	1.7	°
			0		1		Reflection Coefficient 3.5 mm: @ >45 MHz to 2 GHz	0.0051 (linear)	
			0	°	180	°	Reflection Coefficient 3.5 mm: @ >45 MHz to 2 GHz	1.7	°
			0		1		Reflection Coefficient 3.5 mm: @ >2 GHz to 20 GHz	0.0051 (linear)	
			0	°	180	°	Reflection Coefficient 3.5 mm: @ >2 GHz to 20 GHz	2	°
			0		1		Reflection Coefficient 3.5 mm: @ >20 GHz to 26.5 GHz	0.0067 (linear)	
			0	°	180	°	Reflection Coefficient 3.5 mm: @ >20 GHz to 26.5 GHz	2.5	°
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG1002 short circuit, open circuit, load, mismatch, air line, attenuator, component	Rohde & Schwarz /ZV-Z229	In house method: Instrument Calibration Technique for Network Devices with Microwave S-parameters and Impedance System (Document No.: 07-3-80-0076)	0		1		Reflection Coefficient 2.92 mm: @ 45 MHz to 2 GHz	0.0052 (linear)	
			0	°	180	°	Reflection Coefficient 2.92 mm: @ 45 MHz to 2 GHz	1.8	°
			0		1		Reflection Coefficient 2.92 mm: @ >2 GHz to 26.5 GHz	0.0053 (linear)	
			0	°	180	°	Reflection Coefficient 2.92 mm: @ >2 GHz to 26.5 GHz	2.3	°
			0		1		Reflection Coefficient 2.92 mm: @ >26.5 GHz to 40 GHz	0.012 (linear)	
			0	°	180	°	Reflection Coefficient 2.92 mm: @ >26.5 GHz to 40 GHz	3.1	°
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KG1002 short circuit, open circuit, load, mismatch, air line, attenuator, component	Rohde & Schwarz /ZV-Z224	In house method: Instrument Calibration Technique for Network Devices with Microwave S-parameters and Impedance System (Document No.: 07-3-80-0076)	0		1		Reflection Coefficient 2.4 mm: @ >45 MHz to 2 GHz	0.0051 (linear)	
			0	°	180	°	Reflection Coefficient 2.4 mm: @ >45 MHz to 2 GHz	1.2	°
			0		1		Reflection Coefficient 2.4 mm: @ >2 GHz to 26.5 GHz	0.0051 (linear)	
			0	°	180	°	Reflection Coefficient 2.4 mm: @ >2 GHz to 26.5 GHz	1.8	°
			0		1		Reflection Coefficient 2.4 mm: @ >26.5 GHz to 50 GHz	0.014 (linear)	
			0	°	180	°	Reflection Coefficient 2.4 mm: @ >26.5 GHz to 50 GHz	2.2	°
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG1002 short circuit, open circuit, load, mismatch, air line, attenuator, component	Rohde & Schwarz /ZV-WR15	In house method: Instrument Calibration Technique for Network Devices with Microwave S-parameters and Impedance System (Document No.: 07-3-80-0076)	0		1		Reflection Coefficient WR15: @ >50 GHz to 75 GHz	0.005 (linear)	
			0	°	180	°	Reflection Coefficient WR15: @ >50 GHz to 75 GHz	11	°
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KG1002 short circuit, open circuit, load, mismatch, air line, attenuator, component	Rohde & Schwarz /ZV-WR10, Keysight/85052B, Rohde & Schwarz /ZV-Z229, Rohde & Schwarz /ZV-Z224, Rohde & Schwarz /ZV-WR15, Rohde & Schwarz /ZV-Z270	In house method: Instrument Calibration Technique for Network Devices with Microwave S-parameters and Impedance System (Document No.: 07-3-80-0076)	0		1		Reflection Coefficient WR10: @ >75 GHz to 110 GHz	0.005 (linear)	
			0	°	180	°	Reflection Coefficient WR10: @ >75 GHz to 110 GHz	12	°
			>-20	dB	0	dB	Transmission Coefficient Type N: @ 10 MHz to 500 MHz	0.029	dB
			0	°	180	°	Transmission Coefficient Type N: @ 10 MHz to 500 MHz	0.2	°
			>-40	dB	-20	dB	Transmission Coefficient Type N: @ 10 MHz to 500 MHz	0.032	dB
			0	°	180	°	Transmission Coefficient Type N: @ 10 MHz to 500 MHz	0.2	°
			-60	dB	-40	dB	Transmission Coefficient Type N: @ 10 MHz to 500 MHz	0.15	dB
			0	°	180	°	Transmission Coefficient Type N: @ 10 MHz to 500 MHz	3.8	°
			>-20	dB	0	dB	Transmission Coefficient Type N: @ >500 MHz to 2 GHz	0.025	dB
			0	°	180	°	Transmission Coefficient Type N: @ >500 MHz to 2 GHz	0.2	°

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG1002 short circuit, open circuit, load, mismatch, air line, attenuator, component	Rohde & Schwarz/ZV-WR10, Keysight/85052B, Rohde & Schwarz/ZV-Z229, Rohde & Schwarz/ZV-Z224, Rohde & Schwarz/ZV-WR15, Rohde & Schwarz/ZV-Z270	In house method: Instrument Calibration Technique for Network Devices with Microwave S-parameters and Impedance System (Document No.: 07-3-80-0076)	>-40	dB	-20	dB	Transmission Coefficient Type N: @ >500 MHz to 2 GHz	0.029	dB
			0	°	180	°	Transmission Coefficient Type N: @ >500 MHz to 2 GHz	0.2	°
			-60	dB	-40	dB	Transmission Coefficient Type N: @ >500 MHz to 2 GHz	0.14	dB
			0	°	180	°	Transmission Coefficient Type N: @ >500 MHz to 2 GHz	4.1	°
			>-20	dB	0	dB	Transmission Coefficient Type N: @ >2 GHz to 18 GHz	0.022	dB
			0	°	180	°	Transmission Coefficient Type N: @ >2 GHz to 18 GHz	0.2	°
			>-40	dB	-20	dB	Transmission Coefficient Type N: @ >2 GHz to 18 GHz	0.027	dB
			0	°	180	°	Transmission Coefficient Type N: @ >2 GHz to 18 GHz	0.2	°
			-60	dB	-40	dB	Transmission Coefficient Type N: @ >2 GHz to 18 GHz	0.14	dB
			0	°	180	°	Transmission Coefficient Type N: @ >2 GHz to 18 GHz	5.4	°
			>-20	dB	0	dB	Transmission Coefficient 3.5 mm: @ 10 MHz to 45 MHz	0.032	dB
			0	°	180	°	Transmission Coefficient 3.5 mm: @ 10 MHz to 45 MHz	0.2	°
			>-40	dB	-20	dB	Transmission Coefficient 3.5 mm: @ 10 MHz to 45 MHz	0.043	dB
			0	°	180	°	Transmission Coefficient 3.5 mm: @ 10 MHz to 45 MHz	0.3	°
			-60	dB	-40	dB	Transmission Coefficient 3.5 mm: @ 10 MHz to 45 MHz	0.28	dB

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG1002 short circuit, open circuit, load, mismatch, air line, attenuator, component	Rohde & Schwarz/ZV-WR10, Keysight/85052B, Rohde & Schwarz/ZV-Z229, Rohde & Schwarz/ZV-Z224, Rohde & Schwarz/ZV-WR15, Rohde & Schwarz/ZV-Z270	In house method: Instrument Calibration Technique for Network Devices with Microwave S-parameters and Impedance System (Document No.: 07-3-80-0076)	0	°	180	°	Transmission Coefficient 3.5 mm: @ 10 MHz to 45 MHz	1.5	°
			>-20	dB	0	dB	Transmission Coefficient 3.5 mm: @ >45 MHz to 2 GHz	0.031	dB
			0	°	180	°	Transmission Coefficient 3.5 mm: @ >45 MHz to 2 GHz	0.2	°
			>-40	dB	-20	dB	Transmission Coefficient 3.5 mm: @ >45 MHz to 2 GHz	0.035	dB
			0	°	180	°	Transmission Coefficient 3.5 mm: @ >45 MHz to 2 GHz	0.2	°
			-60	dB	-40	dB	Transmission Coefficient 3.5 mm: @ >45 MHz to 2 GHz	0.11	dB
			0	°	180	°	Transmission Coefficient 3.5 mm: @ >45 MHz to 2 GHz	2.6	°
			>-20	dB	0	dB	Transmission Coefficient 3.5 mm: @ >2 GHz to 20 GHz	0.031	dB
			0	°	180	°	Transmission Coefficient 3.5 mm: @ >2 GHz to 20 GHz	0.3	°
			>-40	dB	-20	dB	Transmission Coefficient 3.5 mm: @ >2 GHz to 20 GHz	0.035	dB
			0	°	180	°	Transmission Coefficient 3.5 mm: @ >2 GHz to 20 GHz	0.3	°
			-60	dB	-40	dB	Transmission Coefficient 3.5 mm: @ >2 GHz to 20 GHz	0.11	dB
			0	°	180	°	Transmission Coefficient 3.5 mm: @ >2 GHz to 20 GHz	3.7	°
			>-20	dB	0	dB	Transmission Coefficient 3.5 mm: @ >20 GHz to 26.5 GHz	0.063	dB
			0	°	180	°	Transmission Coefficient 3.5 mm: @ >20 GHz to 26.5 GHz	0.4	°

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG1002 short circuit, open circuit, load, mismatch, air line, attenuator, component	Rohde & Schwarz/ZV-WR10, Keysight/85052B, Rohde & Schwarz/ZV-Z229, Rohde & Schwarz/ZV-Z224, Rohde & Schwarz/ZV-WR15, Rohde & Schwarz/ZV-Z270	In house method: Instrument Calibration Technique for Network Devices with Microwave S-parameters and Impedance System (Document No.: 07-3-80-0076)	>-40	dB	-20	dB	Transmission Coefficient 3.5 mm: @ >20 GHz to 26.5 GHz	0.064	dB
			0	°	180	°	Transmission Coefficient 3.5 mm: @ >20 GHz to 26.5 GHz	0.4	°
			-60	dB	-40	dB	Transmission Coefficient 3.5 mm: @ >20 GHz to 26.5 GHz	0.16	dB
			0	°	180	°	Transmission Coefficient 3.5 mm: @ >20 GHz to 26.5 GHz	14	°
			>-20	dB	0	dB	Transmission Coefficient 2.92 mm: @ 45 MHz to 2 GHz	0.061	dB
			0	°	180	°	Transmission Coefficient 2.92 mm: @ 45 MHz to 2 GHz	0.4	°
			>-40	dB	-20	dB	Transmission Coefficient 2.92 mm: @ 45 MHz to 2 GHz	0.12	dB
			0	°	180	°	Transmission Coefficient 2.92 mm: @ 45 MHz to 2 GHz	0.5	°
			-60	dB	-40	dB	Transmission Coefficient 2.92 mm: @ 45 MHz to 2 GHz	0.15	dB
			0	°	180	°	Transmission Coefficient 2.92 mm: @45 MHz to 2 GHz	2.7	°
			>-20	dB	0	dB	Transmission Coefficient 2.92 mm: @ >2 GHz to 26.5 GHz	0.062	dB
			0	°	180	°	Transmission Coefficient 2.92 mm: @ >2 GHz to 26.5 GHz	0.4	°
			> -40	dB	-20	dB	Transmission Coefficient 2.92 mm: @ >2 GHz to 26.5 GHz	0.071	dB
			0	°	180	°	Transmission Coefficient 2.92 mm: @ >2 GHz to 26.5 GHz	0.5	°
			-60	dB	-40	dB	Transmission Coefficient 2.92 mm: @ >2 GHz to 26.5 GHz	0.15	dB

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG1002 short circuit, open circuit, load, mismatch, air line, attenuator, component	Rohde & Schwarz/ZV-WR10, Keysight/85052B, Rohde & Schwarz/ZV-Z229, Rohde & Schwarz/ZV-Z224, Rohde & Schwarz/ZV-WR15, Rohde & Schwarz/ZV-Z270	In house method: Instrument Calibration Technique for Network Devices with Microwave S-parameters and Impedance System (Document No.: 07-3-80-0076)	0	°	180	°	Transmission Coefficient 2.92 mm: @ >2 GHz to 26.5 GHz	3.7	°
			>-20	dB	0	dB	Transmission Coefficient 2.92 mm: @ >26.5 GHz to 40 GHz	0.093	dB
			0	°	180	°	Transmission Coefficient 2.92 mm: @ >26.5 GHz to 40 GHz	0.6	°
			>-40	dB	-20	dB	Transmission Coefficient 2.92 mm: @ >26.5 GHz to 40 GHz	0.12	dB
			0	°	180	°	Transmission Coefficient 2.92 mm: @ >26.5 GHz to 40 GHz	0.7	°
			-60	dB	-40	dB	Transmission Coefficient 2.92 mm: @ >26.5 GHz to 40 GHz	0.21	dB
			0	°	180	°	Transmission Coefficient 2.92 mm: @ >26.5 GHz to 40 GHz	18	°
			>-20	dB	0	dB	Transmission Coefficient 2.4 mm: @ >45 MHz to 2 GHz	0.087	dB
			0	°	180	°	Transmission Coefficient 2.4 mm: @ >45 MHz to 2 GHz	0.7	°
			>-40	dB	-20	dB	Transmission Coefficient 2.4 mm: @ >45 MHz to 2 GHz	0.092	dB
			0	°	180	°	Transmission Coefficient 2.4 mm: @ >45 MHz to 2 GHz	0.6	°
			-60	dB	-40	dB	Transmission Coefficient 2.4 mm: @ >45 MHz to 2 GHz	0.25	dB
			0	°	180	°	Transmission Coefficient 2.4 mm: @ >45 MHz to 2 GHz	1.7	°
			>-20	dB	0	dB	Transmission Coefficient 2.4 mm: @ >2 GHz to 26.5 GHz	0.087	dB
			0	°	180	°	Transmission Coefficient 2.4 mm: @ >2 GHz to 26.5 GHz	0.7	°

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG1002 short circuit, open circuit, load, mismatch, air line, attenuator, component	Rohde & Schwarz/ZV-WR10, Keysight/85052B, Rohde & Schwarz/ZV-Z229, Rohde & Schwarz/ZV-Z224, Rohde & Schwarz/ZV-WR15, Rohde & Schwarz/ZV-Z270	In house method: Instrument Calibration Technique for Network Devices with Microwave S-parameters and Impedance System (Document No.: 07-3-80-0076)	>-40	dB	-20	dB	Transmission Coefficient 2.4 mm: @ >2 GHz to 26.5 GHz	0.093	dB
			0	°	180	°	Transmission Coefficient 2.4 mm: @ >2 GHz to 26.5 GHz	0.6	°
			-60	dB	-40	dB	Transmission Coefficient 2.4 mm: @ >2 GHz to 26.5 GHz	0.25	dB
			0	°	180	°	Transmission Coefficient 2.4 mm: @ >2 GHz to 26.5 GHz	2.8	°
			>-20	dB	0	dB	Transmission Coefficient 2.4 mm: @ >26.5 GHz to 50 GHz	0.14	dB
			0	°	180	°	Transmission Coefficient 2.4 mm: @ >26.5 GHz to 50 GHz	0.9	°
			> 40	dB	-20	dB	Transmission Coefficient 2.4 mm: @ >26.5 GHz to 50 GHz	0.099	dB
			0	°	180	°	Transmission Coefficient 2.4 mm: @ >26.5 GHz to 50 GHz	0.6	°
			-60	dB	-40	dB	Transmission Coefficient 2.4 mm: @ >26.5 GHz to 50 GHz	0.25	dB
			0	°	180	°	Transmission Coefficient 2.4 mm: @ >26.5 GHz to 50 GHz	16	°
			>-20	dB	0	dB	Transmission Coefficient WR15: @ >50 GHz to 75 GHz	0.043	dB
			0	°	180	°	Transmission Coefficient WR15: @ >50 GHz to 75 GHz	7.3	°
			> 40	dB	-20	dB	Transmission Coefficient WR15: @ >50 GHz to 75 GHz	0.044	dB
			0	°	180	°	Transmission Coefficient WR15: @ >50 GHz to 75 GHz	7.3	°
			-60	dB	-40	dB	Transmission Coefficient WR15: @ >50 GHz to 75 GHz	0.076	dB

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG1002 short circuit, open circuit, load, mismatch, air line, attenuator, component	Rohde & Schwarz/ZV-WR10, Keysight/85052B, Rohde & Schwarz/ZV-Z229, Rohde & Schwarz/ZV-Z224, Rohde & Schwarz/ZV-WR15, Rohde & Schwarz/ZV-Z270	In house method: Instrument Calibration Technique for Network Devices with Microwave S-parameters and Impedance System (Document No.: 07-3-80-0076)	0	°	180	°	Transmission Coefficient WR15: @ >50 GHz to 75 GHz	11	°
			>-20	dB	0	dB	Transmission Coefficient WR10: @ >75 GHz to 110 GHz	0.043	dB
			0	°	180	°	Transmission Coefficient WR10: @ >75 GHz to 110 GHz	7.6	°
			>-40	dB	-20	dB	Transmission Coefficient WR10: @ >75 GHz to 110 GHz	0.047	dB
			0	°	180	°	Transmission Coefficient WR10: @ >75 GHz to 110 GHz	7.6	°
			-60	dB	-40	dB	Transmission Coefficient WR10: @ >75 GHz to 110 GHz	0.075	dB
			0	°	180	°	Transmission Coefficient WR10: @ >75 GHz to 110 GHz	13	°
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KG1002 short circuit, open circuit, load, mismatch, air line, attenuator, component	Rohde & Schwarz /ZV-Z270	In house method: Instrument Calibration Technique for Network Devices with Microwave S-parameters and Impedance System (Document No.: 07-3-80-0076)	0		1		Reflection Coefficient Type N: @ 10 MHz to 500 MHz	0.0026 (linear)	
			0	°	180	°	Reflection Coefficient Type N: @ 10 MHz to 500 MHz	1.2	°
			0		1		Reflection Coefficient Type N: @ >500 MHz to 2 GHz	0.0028 (linear)	
			0	°	180	°	Reflection Coefficient Type N: @ >500 MHz to 2 GHz	1.2	°
			0		1		Reflection Coefficient Type N: @ >2 GHz to 18 GHz	0.0034 (linear)	
			0	°	180	°	Reflection Coefficient Type N: @ >2 GHz to 18 GHz	1.5	°
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG1005 elctromagnetic field strength meter	AR TC 3020A /AR TC 1510A	In house method: Instrument Calibration Technique for Electromagnetic Field Strength Meter by Using TEM Cell Field Strength Measurement System (Document No.: 07-3-84-0121)	1	V/m	200	V/m	electric field @ 100 kHz to 500 MHz	0.70	dB
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KG1005 elctromagnetic field strength meter, microwave leakage meter	Narda EF1891 /NBM-550, SchwarzBeck BBHA9120E /BBHA9120B	In house method: Instrument Calibration Technique for Anechoic Chamber Electromagnetic Field Strength Measurement System (Document No.: 07-3-84-0125)	1	V/m	200	V/m	electric field @ >0.5 GHz to 1 GHz	0.84	dB
			1	V/m	200	V/m	electric field @ >1 GHz to 8 GHz	0.95	dB
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KG2001 search coils	Agilent /34970A, SRS/SR620	In house method: Instrument Calibration Technique for Search Coils (Document No.: 07-3-83-0049)	0.001	m^2	1	m^2	area-turns:	0.45	%
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KG2001 fluxmeter	Agilent /34970A, SRS/SR620	In house method: Instrument Calibration Technique for Magnetic Fluxmeter (Document No.: 07-3-81-0017)	0.0001	Wb	0.001	Wb		0.22	%
			>0.001	Wb	1	Wb		0.09	%
			>1	Wb	2	Wb		0.08	%
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG2002 gaussmeter, magnetometer, std. reference magnet	HP 3457A	In house method: Instrument Calibration Technique for AC Magnetic Field (50 Hz to 1000 Hz) Calibration System (Document No.: 07-3-97-1288)	0.5	μT	1	μT	magnetic flux density @ 50 Hz	0.62	%
			>1	μT	3	μT	magnetic flux density @ 50 Hz	0.44	%
			>3	μT	5	μT	magnetic flux density @ 50 Hz	0.42	%
			>5	μT	10	μT	magnetic flux density @ 50 Hz	0.18	%
			>10	μT	30	μT	magnetic flux density @ 50 Hz	0.50	%
			>30	μT	50	μT	magnetic flux density @ 50 Hz	0.44	%
			0.5	μT	1	μT	magnetic flux density @ 51 Hz to 100 Hz	0.53	%
			>1	μT	3	μT	magnetic flux density @ 51 Hz to 100 Hz	0.19	%
			>3	μT	5	μT	magnetic flux density @ 51 Hz to 100 Hz	0.32	%
			>5	μT	10	μT	magnetic flux density @ 51 Hz to 100 Hz	0.27	%
			>10	μT	30	μT	magnetic flux density @ 51 Hz to 100 Hz	0.27	%
			>30	μT	50	μT	magnetic flux density @ 51 Hz to 100 Hz	0.28	%
			0.5	μT	1	μT	magnetic flux density @ 101 Hz to 300 Hz	0.34	%
			>1	μT	3	μT	magnetic flux density @ 101 Hz to 300 Hz	0.27	%
			>3	μT	5	μT	magnetic flux density @ 101 Hz to 300 Hz	0.32	%
			0.5	μT	1	μT	magnetic flux density @ 301 Hz to 1000 Hz	0.26	%
			>1	μT	3	μT	magnetic flux density @ 301 Hz to 1000 Hz	0.44	%
			>3	μT	5	μT	magnetic flux density @ 301 Hz to 1000 Hz	0.30	%
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KG2002 gaussmeter, magnetometer, std. reference magnet	HP 34970A	In house method: Instrument Calibration Technique for Low Magnetic (1 μT to 1 mT) Field System (Document No.: 07-3-84-0081)	1	μT	5	μT	magnetic flux density	0.66	%
			>5	μT	10	μT	magnetic flux density	0.42	%
			>10	μT	50	μT	magnetic flux density	0.40	%
			>50	μT	100	μT	magnetic flux density	0.46	%
			>100	μT	500	μT	magnetic flux density	0.56	%
			>500	μT	1000	μT	magnetic flux density	0.33	%
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG2002 gaussmeter, magnetometer, std. reference magnet	HP 34970A	In house method: Instrument Calibration Technique for Low Magnetic Field (1 mT to 50 mT) Calibration System (Document No.: 07-3-81-0011)	1	mT	50	mT	magnetic flux density	0.27	%
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KG2002 gaussmeter, magnetometer, std. reference magnet	SRS/SR620	In house method: Instrument Calibration Technique for Gaussmeter (Document No.: 07-3-86-0071)	0.05	T	1.5	T	magnetic flux density	0.01	%
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KG2002 gaussmeter, magnetometer, std. reference magnet	SRS/SR620	In house method: Instrument Calibration Technique for Standard Reference Magnet (Document No.: 07-3-81-0021)	0.05	T	1.5	T	magnetic flux density	0.01	%
Approval Signatory: HSU, Jimmy Chun-Ming; CHEN, Shih-Fang; LAO, Ray-Rong									
KG3001 illuminance meter illuminance colorimeter	CMS /V (λ) W02	In house method: Instrument Calibration Technique for Illuminance Meter of Absolute Radiometer System (Document No.: 07-3-80-0086)	25	lx	100	lx		1.1	%
			>100	lx	1500	lx		1.2	%
			>1500	lx	90000	lx		1.5	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3002 luminance meter luminance colorimeter	Optronic Laboratories /455-6KSA-2	In house method: Instrument Calibration Technique for Luminance Meter/Luminance Colorimeter of Spectroradiometric System (Document No.: 07-3-80-0085)	1	cd/m²	250	cd/m²		2.9	%
			>250	cd/m²	7000	cd/m²		1.5	%
			>7000	cd/m²	50000	cd/m²		1.7	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3003 tungsten lamp	CSIR AR-1100	In house method: Instrument Calibration Technique for Absolute Radiometer System (Document No.: 07-3-83-0023)	70	cd	10000	cd		1.8	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3003 tungsten lamp	CMS/V (λ) W02	In house method: Instrument Calibration Technique for Illuminance Meter of Absolute Radiometer System (Document No.: 07-3-80-0086)	25	cd	1500	cd		1.1	%
			>1500	cd	90000	cd		1.5	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3005 filter	Cary 5000	In house method: Instrument Calibration Technique for Transmittance of Spectral Spectrophotometric System (Document No.: 07-3-95-0053)	1	%	<5	%	Spectral Transmittance, wavelength: 380 nm to 800 nm	0.06	%
			5	%	<15	%	Spectral Transmittance, wavelength: 380 nm to 800 nm	0.12	%
			15	%	100	%	Spectral Transmittance, wavelength: 380 nm to 800 nm	0.21	%
			1	%	< 10	%	Luminous Transmittance	0.04	%
			10	%	100	%	Luminous Transmittance	0.12	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3006 Spectrally-neutral material	Cary 5000	In house method: Instrument Calibration Technique in the Specular Reflectance of Spectrophotometric System (Document No.: 07-3-93-0232)	1	%	100	%	wavelength: 250 nm to 2500 nm	0.37	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3006 Reflecting material	BRDF	In house method: Instrument Calibration Technique for Spectral Scattering Measurement System (Document No.: 07-3-96-0191)	>0.1				Spectral radiance factor, wavelength: 380 nm to 780 nm	0.006	
			>10				Luminance Factor θi: 0°~60°, θd: 0°~60°, ϕi: 0°, ϕd: 0°, 180°	0.16	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3008 silicon photodiode	CMS/Si/R01	In house method: Instrument Calibration Technique for Photodetector Spectral Responsivity of Spectroradiometric System (Document No.: 07-3-91-0088)	250	nm	< 380	nm		1.8	%
			380	nm	< 420	nm		0.90	%
			420	nm	< 540	nm		0.53	%
			540	nm	< 930	nm		0.40	%
			930	nm	1100	nm		0.81	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3008 V (λ) photodiode	CMS/Si/R01	In house method: Instrument Calibration Technique for Photodetector Spectral Responsivity of Spectroradiometric System (Document No.: 07-3-91-0088)	380	nm	< 460	nm	Relative Spectral Responsivity	0.00064	
			460	nm	< 500	nm	Relative Spectral Responsivity	0.0025	
			500	nm	< 620	nm	Relative Spectral Responsivity	0.0059	
			620	nm	< 670	nm	Relative Spectral Responsivity	0.0027	
			670	nm	< 730	nm	Relative Spectral Responsivity	0.00064	
			730	nm	780	nm	Relative Spectral Responsivity	0.000022	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3008 germanium photodiode, InGaAs detector	CMS/GE /ITEG1	In house method: Instrument Calibration Technique for Photodetector Spectral Responsivity of Spectroradiometric System (Document No.: 07-3-91-0088)	800	nm	<920	nm		0.68	%
			920	nm	<1600	nm		0.79	%
			1600	nm	1650	nm		0.95	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3009 optical fiber power meter	ILXLightwave /FPM-8210 /82103608 /821A030F	In house method: Instrument Calibration Technique for Optical Fiber Power Meter of Absolute Radiometer System (Document No.: 07-3-95-0051)	1	μW	1	mW	wavelength: 1310 nm	1.7	%
			1	μW	1	mW	wavelength: 1550 nm	1.7	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3014 white plate		In house method: Instrument Calibration Technique for Spectral Scattering Measurement System (Document No.: 07-3-96-0191)	(0, 0)		(1, 1)		(x, y) θi: 0°~60°, θd: 0°~60°, ϕi: 0°, ϕd: 0°, 180°	(0.0003, 0.0003)	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3014 white plate, color plate	OPAL GLASS GA90, FZ90, AE95 /Spectralon 7A11E-4258 /Sphere-Optics SG3049 /CCSII Series II AB95	In house method: Instrument Calibration Technique in the 0°: 45°a Geometry of Spectrophotometric System (Document No.: 07-3-93-0202)	(0, 0)		(1, 1)		(x, y) white plate 0°: 45°a	(0.004, 0.004)	
			(0, 0)		(1, 1)		(x, y) color plate 0°: 45°a, red	(0.004, 0.004)	
			(0, 0)		(1, 1)		(x, y) color plate 0°: 45°a, green	(0.004, 0.004)	
			(0, 0)		(1, 1)		(x, y) color plate 0°: 45°a, blue	(0.004, 0.004)	
			>1				CIELAB L* white plate 0°: 45°a	0.16	
			>1				CIELAB L* color plate 0°: 45°a, red	0.32	
			>1				CIELAB L* color plate 0°: 45°a, green	0.27	

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3014 white plate, color plate	OPAL GLASS GA90, FZ90, AE95 /Spectralon 7A11E-4258 /Sphere-Optics SG3049 /CCSII Series II AB95	In house method: Instrument Calibration Technique in the 0°: 45°a Geometry of Spectrophotometric System (Document No.: 07-3-93-0202)	>1				CIELAB L* color plate 0°: 45°a, blue	0.57	
			(-500, -200)		(500, 200)		(a*, b*) white plate 0°: 45°a	(0.30, 0.26)	
			(-500, -200)		(500, 200)		(a*, b*) color plate 0°: 45°a, red	(0.91, 1.0)	
			(-500, -200)		(500, 200)		(a*, b*) color plate 0°: 45°a, green	(0.79, 0.64)	
			(-500, -200)		(500, 200)		(a*, b*) color plate 0°: 45°a, blue	(1.6, 1.2)	
			>1				luminance factor (Y) , white plate 0°: 45°a	0.26	
			>0.01				spectral radiance factor, white plate 0°: 45°a, wavelength: 380 nm to 780 nm	0.013	
			>1				luminance factor (Y) , color plate 0°: 45°a, red	0.25	
			>1				luminance factor (Y) , color plate 0°: 45°a, green	0.28	
			>1				luminance factor (Y) , color plate 0°: 45°a, blue	0.26	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3014 white plate, color plate	OPAL GLASS GA90, FZ90, AE95 /Spectralon 7A11E-4258 /Sphere-Optics SG3049 /CCSII Series II AB95	In house method: Instrument Calibration Technique for Color Standard in the de: 8° Geometry of Spectrophotometric System (Document No.: 07-3-84-0150)	(0, 0)		(1, 1)		(x, y) white plate (de: 8°) , (di: 8°)	(0.004, 0.004)	
			(0, 0)		(1, 1)		(x, y) color plate (de: 8°) , (di: 8°) , red	(0.004, 0.004)	
			(0, 0)		(1, 1)		(x, y) color plate (de: 8°) , (di: 8°) , green	(0.004, 0.004)	
			(0, 0)		(1, 1)		(x, y) color plate (de: 8°) , (di: 8°) , blue	(0.004, 0.004)	
			1		100		CIELAB L* white plate (de: 8°) , (di: 8°)	0.13	
			1		100		CIELAB L* color plate de: 8°, red	0.36	
			1		100		CIELAB L* color plate de: 8°, green	0.17	
			1		100		CIELAB L* color plate de: 8°, blue	0.32	
			(-500, -200)		(500, 200)		(a*, b*) white plate (de: 8°) , (di: 8°)	(0.14, 0.13)	
			(-500, -200)		(500, 200)		(a*, b*) color plate de: 8°, red	(1.0, 1.2)	
			(-500, -200)		(500, 200)		(a*, b*) color plate de: 8°, green	(0.40, 0.32)	
			(-500, -200)		(500, 200)		(a*, b*) color plate de: 8°, blue	(0.83, 0.64)	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3014 white plate	OPAL GLASS GA90, FZ90, AE95 /Spectralon 7A11E-4258 /Sphere-Optics SG3049	In house method: Instrument Calibration Technique for White Standard in the 0°: de Geometry of Spectrophotometric System (Document No.: 07-3-82-0064)	(0, 0)		(1, 1)		(x, y) white plate (0°: de) , (0°: di)	(0.0004, 0.0004)	
			1		100		CIELAB L* white plate (0°: de) , (0°: di)	0.12	
			(-500, -200)		(500, 200)		(a*, b*) white plate (0°: de) , (0°: di)	(0.08, 0.06)	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3015 Spectral radiant flux lamp	NPL FEL /BN-9101-482	In house method: Instrument Calibration Technique for Standard Lamp of Total Spectral Radiant Flux System (Document No.: 07-3-A1-0073)	(0, 0)		(0.9, 0.9)		(x, y)	(0.0009, 0.0006)	
			(0, 0)		(0.62, 0.39)		(u, v)	(0.0006, 0.0003)	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3015 spectroradiometer	Sphere Optics /LR-6-Z	In house method: Instrument Calibration Technique for Spectroradiometer of Spectroradiometric System (Document No.: 07-3-91-0087)	(0, 0)		(0.9, 0.9)		(x, y) 1 cd/m² to 250 cd/m²	(0.0011, 0.0011)	
			(0, 0)		(0.9, 0.9)		(x, y) >250 cd/m² to 50000 cd/m²	(0.0008, 0.0008)	
			(0, 0)		(0.62, 0.39)		(u, v) 1 cd/m² to 250 cd/m²	(0.0009, 0.0003)	
			(0, 0)		(0.62, 0.39)		(u, v) >250 cd/m² to 50000 cd/m²	(0.0006, 0.0003)	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3015 Integrating sphere light source for spectral radiance, approximate CIE Illuminant A spectrum	KONICA MINOLTA /CS-2000	In house method: Instrument Calibration Technique for Spectral Radiance Standard Light Source of Spectroradiometric System (Document No.: 07-3-89-0074)	(0, 0)		(0.9, 0.9)		(x, y) 1 cd/m² to 250 cd/m²	(0.0011, 0.0011)	
			(0, 0)		(0.9, 0.9)		(x, y) >250 cd/m² to 50000 cd/m²	(0.0008, 0.0008)	
			(0, 0)		(0.62, 0.39)		(u, v) 1 cd/m² to 250 cd/m²	(0.0009, 0.0003)	
			(0, 0)		(0.62, 0.39)		(u, v) >250 cd/m² to 50000 cd/m²	(0.0006, 0.0003)	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3015 luminance colorimeter	Optronic Laboratories /455-6KSA-2	In house method: Instrument Calibration Technique for Luminance Meter/Luminance Colorimeter of Spectroradiometric System (Document No.: 07-3-80-0085)	(0, 0)		(0.9, 0.9)		(x, y) 1 cd/m² to 250 cd/m²	(0.0011, 0.0011)	
			(0, 0)		(0.9, 0.9)		(x, y) >250 cd/m² to 50000 cd/m²	(0.0008, 0.0008)	
			(0, 0)		(0.62, 0.39)		(u, v) 1 cd/m² to 250 cd/m²	(0.0009, 0.0003)	
			(0, 0)		(0.62, 0.39)		(u, v) >250 cd/m² to 50000 cd/m²	(0.0006, 0.0003)	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3015 LEDs	OSRAM /64743 1000W /IW08	In house method: Instrument Calibration Technique for LED Spectroradiometric Spectrum (Document No.: 07-3-95-0130)	(0, 0)		(0.9, 0.9)		(x, y) white light	(0.0082, 0.0078)	
			(0, 0)		(0.9, 0.9)		(x, y) red light	(0.0075, 0.0063)	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
Calibration Site: No.30, Daxue Rd., East Dist., Hsinchu City 300, Taiwan (R.O.C.)									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3015 illuminance meter, tungsten lamp	CMS /V (λ) W02	In house method: Instrument Calibration Technique for Illuminance Meter of Absolute Radiometer System (Document No.: 07-3-80-0086)	(0, 0)		(0.9, 0.9)		(x, y)	(0.0012, 0.0008)	
			(0, 0)		(0.9, 0.9)		(u, v)	(0.0008, 0.0003)	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3017 white plate, color plate	OPAL GLASS GA90, FZ90, AE95 /Spectralon 7A11E-4258 /Sphere-Optics SG3049 /CCSII Series II AB95	In house method: Instrument Calibration Technique for Color Standard in the de: 8° Geometry of Spectrophotometric System (Document No.: 07-3-84-0150)	1		100		luminance factor (Y) , white plate (de: 8°) , (di: 8°)	0.16	
			0.01		1		spectral reflectance factor, white plate (de: 8°) , (di: 8°) , wavelength: 400 nm to 750 nm	0.0042	
			1		100		luminance factor (Y) , color plate de: 8°, red	0.29	
			1		100		luminance factor (Y) , color plate de: 8°, green	0.17	
			1		100		luminance factor (Y) , color plate de: 8°, blue	0.17	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3017 white plate	OPAL GLASS GA90, FZ90, AE95 /Spectralon 7A11E-4258 /Sphere-Optics SG3049	In house method: Instrument Calibration Technique for White Standard in the 0°: de Geometry of Spectrophotometric System (Document No.: 07-3-82-0064)	1		100		luminance factor (Y) , white plate (0°: de) , (0°: di)	0.13	
			0.01		1		spectral reflectance factor, white plate (0°: de) , (0°: di) , wavelength: 380 nm to 780 nm	0.0034	
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3018 Spectral radiant flux lamp	NPL FEL /BN-9101-482	In house method: Instrument Calibration Technique for Standard Lamp of Total Spectral Radiant Flux System (Document No.: 07-3-A1-0073)	2800	K	3400	K		16	K
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3018 spectroradiometer	Sphere Optics /LR-6-Z	In house method: Instrument Calibration Technique for Spectroradiometer of Spectroradiometric System (Document No.: 07-3-91-0087)	2500	K	3200	K	1 cd/m² to 250 cd/m²	20	K
			2500	K	3200	K	>250 cd/m² to 50000 cd/m²	14	K
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3018 Integrating sphere light source for spectral radiance, approximate CIE Illuminant A spectrum	KONICA MINOLTA /CS-2000	In house method: Instrument Calibration Technique for Spectral Radiance Standard Light Source of Spectroradiometric System (Document No.: 07-3-89-0074)	2500	K	3200	K	1 cd/m² to 250 cd/m²	20	K
			2500	K	3200	K	>250 cd/m² to 50000 cd/m²	14	K
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3018 luminance colorimeter	Optronic Laboratories /455-6KSA-2	In house method: Instrument Calibration Technique for Luminance Meter/Luminance Colorimeter of Spectroradiometric System (Document No.: 07-3-80-0085)	2500	K	3200	K	1 cd/m² to 250 cd/m²	20	K
			2500	K	3200	K	>250 cd/m² to 50000 cd/m²	14	K
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3018 illuminance meter, tungsten lamp	CMS/V (λ) W02	In house method: Instrument Calibration Technique for Illuminance Meter of Absolute Radiometer System (Document No.: 07-3-80-0086)	2500	K	3200	K		29	K
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3020 optical power meters	CSIR AR-1100	In house method: Instrument Calibration Technique for Absolute Radiometer System (Document No.: 07-3-83-0023)	6	μW	100	mW	wavelength: 300 nm to 9000 nm, radiant power responsivity, visible range	0.32	%
			6	μW	100	mW	wavelength: 300 nm to 9000 nm, radiant power responsivity, other range	0.54	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3021 general detector	CSIR AR-1100	In house method: Instrument Calibration Technique for Absolute Radiometer System (Document No.: 07-3-83-0023)	70	lx	10000	lx	illuminance absolute responsivity	1.8	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3021 power meter or irradiance meter	LaserProbe /Rk-5700 Series	In house method: Instrument Calibration Technique for Radiant Power of Absolute Radiometer System (Document No.: 07-3-85-0069)	50	μW/cm²	150	mW/cm²	250 nm ≦ wavelength < 300 nm, irradiance meter, wide band light source	5.5	%
			50	μW/cm²	150	mW/cm²	300 nm ≦ wavelength ≦ 3000 nm, irradiance meter, wide band light source	3.0	%
			50	μW/cm²	150	mW/cm²	250 nm ≦ wavelength < 350 nm, irradiance meter, narrow band light source	6.2	%
			50	μW/cm²	150	mW/cm²	350 nm ≦ wavelength ≦ 500 nm, irradiance meter, narrow band light source	4.2	%
			50	μW/cm²	150	mW/cm²	500 nm < wavelength ≦ 3000 nm, irradiance meter, narrow band light source	3.3	%

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3021 power meter or irradiance meter	LaserProbe /Rk-5700 Series	In house method: Instrument Calibration Technique for Radiant Power of Absolute Radiometer System (Document No.: 07-3-85-0069)	50	μW/cm²	150	mW/cm²	250 nm ≦ wavelength < 300 nm, irradiance of light source, wide band light source	5.5	%
			50	μW/cm²	150	mW/cm²	300 nm ≦ wavelength ≦ 3000 nm, irradiance of light source, wide band light source	3.0	%
			50	μW/cm²	150	mW/cm²	250 nm ≦ wavelength < 350 nm, irradiance of light source, narrow band light source	6.2	%
			50	μW/cm²	150	mW/cm²	350 nm ≦ wavelength ≦ 500 nm, irradiance of light source, narrow band light source	4.2	%
			50	μW/cm²	150	mW/cm²	500 nm < wavelength ≦ 3000 nn, irradiance of light source, narrow band light source	3.3	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3022 spectroradiometer	Sphere Optics /LR-6-Z	In house method: Instrument Calibration Technique for Spectroradiometer of Spectroradiometric System (Document No.: 07-3-91-0087)	2	μW/ (nm·sr·m²)	2	W/ (nm·sr·m²)	1 cd/m² to 250 cd/m²; 380 nm ≦ wavelength < 420 nm	3.3	%
			2	μW/ (nm·sr·m²)	2	W/ (nm·sr·m²)	1 cd/m² to 250 cd/m²; 420 nm ≦ wavelength ≦ 780 nm	2.8	%
			2	μW/ (nm·sr·m²)	2	W/ (nm·sr·m²)	>250 cd/m² to 7000 cd/m²; 380 nm ≦ wavelength < 395 nm	2.3	%
			2	μW/ (nm·sr·m²)	2	W/ (nm·sr·m²)	>250 cd/m² to 7000 cd/m²; 395 nm ≦ wavelength < 430 nm	2.1	%
			2	μW/ (nm·sr·m²)	2	W/ (nm·sr·m²)	>250 cd/m² to 7000 cd/m²; 430 nm ≦ wavelength < 675 nm	1.3	%
			2	μW/ (nm·sr·m²)	2	W/ (nm·sr·m²)	>250 cd/m² to 7000 cd/m²; 675 nm ≦ wavelength ≦ 780 nm	1.1	%

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3022 spectroradiometer	Sphere Optics /LR-6-Z	In house method: Instrument Calibration Technique for Spectroradiometer of Spectroradiometric System (Document No.: 07-3-91-0087)	2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	>7000 cd/m² to 50000 cd/m²; 380 nm ≦ wavelength < 395 nm	3.3	%
			2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	>7000 cd/m² to 50000 cd/m²; 395 nm ≦ wavelength < 430 nm	2.3	%
			2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	>7000 cd/m² to 50000 cd/m²; 430 nm ≦ wavelength < 675 nm	1.6	%
			2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	>7000 cd/m² to 50000 cd/m²; 675 nm ≦ wavelength ≦780 nm	1.4	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3022 Integrating sphere light source for spectral radiance, approximate CIE Illuminant A spectrum	KONICA MINOLTA /CS-2000	In house method: Instrument Calibration Technique for Spectral Radiance Standard Light Source of Spectroradiometric System (Document No.: 07-3-89-0074)	2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	1 cd/m² to 250 cd/m²; 380 nm ≦ wavelength < 420 nm	4.0	%
			2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	1 cd/m² to 250 cd/m²; 420 nm ≦ wavelength ≦ 780 nm	2.9	%
			2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	>250 cd/m² to 7000 cd/m²; 380 nm ≦ wavelength < 395 nm	2.7	%
			2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	>250 cd/m² to 7000 cd/m²; 395 nm ≦ wavelength < 430 nm	2.3	%
			2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	>250 cd/m² to 7000 cd/m²; 430 nm ≦ wavelength < 675 nm	1.5	%
			2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	>250 cd/m² to 7000 cd/m²; 675 nm ≦ wavelength ≦ 780 nm	1.2	%
			2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	>7000 cd/m² to 50000 cd/m²; 380 nm ≦ wavelength < 395 nm	3.7	%
			2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	>7000 cd/m² to 50000 cd/m²; 395 nm ≦ wavelength < 430 nm	2.5	%
			2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	>7000 cd/m² to 50000 cd/m²; 430 nm ≦ wavelength < 675 nm	1.7	%
			2	μW/(nm·sr·m²)	2	W/(nm·sr·m²)	>7000 cd/m² to 50000 cd/m²; 675 nm ≦ wavelength ≦ 780 nm	1.5	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3023 tungsten lamp	Gooch & Housego /OL-FEL-U, OSRAM /FEL 1000W /SIR-R03	In house method: Instrument Calibration Technique for Spetral Irradiance Standard Lamp of Spectroradiometric System (Document No.: 07-3-80-0004)	0.01	mW/ (m²·nm)	240	mW/ (m²·nm)	250 nm ≦ wavelength ≦ 270 nm	2.3	%
			0.01	mW/ (m²·nm)	240	mW/ (m²·nm)	270 nm < wavelength ≦ 370 nm	1.8	%
			0.01	mW/ (m²·nm)	240	mW/ (m²·nm)	370 nm < wavelength ≦ 770 nm	1.6	%
			0.01	mW/ (m²·nm)	240	mW/ (m²·nm)	770 nm < wavelength ≦ 1100 nm	1.9	%
			0.01	mW/ (m²·nm)	240	mW/ (m²·nm)	1100 nm < wavelength ≦ 1520 nm	2.5	%
			0.01	mW/ (m²·nm)	240	mW/ (m²·nm)	1520 nm < wavelength ≦ 1800 nm	2.8	%
			0.01	mW/ (m²·nm)	240	mW/ (m²·nm)	1800 nm < wavelength ≦ 2020 nm	3.2	%
			0.01	mW/ (m²·nm)	240	mW/ (m²·nm)	2020 nm < wavelength ≦ 2170 nm	4.0	%
			0.01	mW/ (m²·nm)	240	mW/ (m²·nm)	2170 nm < wavelength ≦ 2260 nm	4.6	%
			0.01	mW/ (m²·nm)	240	mW/ (m²·nm)	2260 nm < wavelength ≦ 2400 nm	5.6	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3024 spectroradiometer	Sphere Optics /LR-6-Z	In house method: Instrument Calibration Technique for Spectroradiometer of Spectroradiometric System (Document No.: 07-3-91-0087)	1	cd/m²	50000	cd/m²	1 cd/m² to 250 cd/m²	2.6	%
			1	cd/m²	50000	cd/m²	>250 cd/m² to 7000 cd/m²	1.1	%
			1	cd/m²	50000	cd/m²	>7000 cd/m² to 50000 cd/m²	1.3	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3024 Integrating sphere light source for spectral radiance, approximate CIE Illuminant A spectrum	KONICA MINOLTA /CS-2000	In house method: Instrument Calibration Technique for Spectralradiance Standard Light Source of Spectroradiometric System (Document No.: 07-3-89-0074)	1	cd/m²	50000	cd/m²	1 cd/m² to 250 cd/m²	2.9	%
			1	cd/m²	50000	cd/m²	>250 cd/m² to 7000 cd/m²	1.5	%
			1	cd/m²	50000	cd/m²	>7000 cd/m² to 50000 cd/m²	1.7	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3025 Spectral radiant flux lamp	NPL FEL /BN-9101-482	In house method: Instrument Calibration Technique for Standard Lamp of Total Spectral Radiant Flux System (Document No.: 07-3-A1-0073)	700	lm	7000	lm	total luminous flux	1.3	%
			0.5	mW/nm	150	mW/nm	350 nm ≦ wavelength < 370 nm, spectral radiant flux	2.7	%
			0.5	mW/nm	150	mW/nm	370 nm ≦ wavelength ≦ 830 nm, spectral radiant flux	1.6	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3025 luminous flux standard lamp	OSRAM /50W/NLR01	In house method: Instrument Calibration Technique for Luminous Flux Standard Lamp of Luminous Flux System – 3 m Integrating Sphere (Document No.: 07-3-A5-0128)	1	lm	20000	lm		1.1	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
Calibration Site: No.30, Daxue Rd., East Dist., Hsinchu City 300, Taiwan (R.O.C.)									
KG3025 LEDs	OSRAM /50W/NLR01	In house method: Instrument Calibration Technique for LED Total Luminous Flux (Document No.: 07-3-95-0107)	40	mlm	800	lm	red light	3.4	%
			40	mlm	800	lm	green light	3.4	%
			40	mlm	800	lm	blue light	3.5	%
			40	mlm	800	lm	white light	3.4	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
Calibration Site: No.30, Daxue Rd., East Dist., Hsinchu City 300, Taiwan (R.O.C.)									
KG3026 optical power meter, light source	LaserProbe /Rk-5700 Series	In house method: Instrument Calibration Technique for Radiant Power of Absolute Radiometer System (Document No.: 07-3-85-0069)	50	µW	150	mW	optical power meter	4.1	%
			50	µW	150	mW	light source	4.1	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3026 light source	CSIR AR-1100	In house method: Instrument Calibration Technique for Absolute Radiometer System (Document No.: 07-3-83-0023)	6	µW	100	mW	wavelength: 300 nm to 9000 nm, radiant power, visible range	0.30	%
			6	µW	100	mW	wavelength: 300 nm to 9000 nm, radiant power, other range	0.52	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3027 gloss standard plate	BYK GARDNER (20, 60, 85)	In house method: Instrument Calibration Technique for Gloss Standard Plate of Luminous Flux System (Document No.: 07-3-84-0185)	10	GU	100	GU	High-gloss (20°)	1.4	GU
			10	GU	100	GU	High-gloss (60°)	1.1	GU
			10	GU	100	GU	High-gloss (85°)	0.5	GU
			10	GU	100	GU	Semi-gloss (20°)	2.4	GU
			10	GU	100	GU	Semi-gloss (60°)	1.2	GU
			10	GU	100	GU	Semi-gloss (85°)	1.7	GU
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3099 transmittance haze plate	Haze system	In house method: Instrument Calibration Technique for Transmittance Haze Standard (Document No.: 07-3-96-0035)	0	%	< 2	%	ISO 14782, JIS K 7136	0.039	%
			2	%	< 7	%	ISO 14782, JIS K 7136	0.12	%
			7	%	< 15	%	ISO 14782, JIS K 7136	0.19	%
			15	%	< 25	%	ISO 14782, JIS K 7136	0.36	%
			25	%	< 35	%	ISO 14782, JIS K 7136	0.51	%
			35	%	< 40	%	ISO 14782, JIS K 7136	0.62	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
KG3099 LEDs	OSRAM /64743 1000W /IW08	In house method: Instrument Calibration Technique for LED Spectroradiometric Spectrum (Document No.: 07-3-95-0130)	380	nm	780	nm	dominant wavelength	2.6	nm
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
Calibration Site: No.30, Daxue Rd., East Dist., Hsinchu City 300, Taiwan (R.O.C.)									
KG3099 LEDs	OSRAM /64743 1000W /IW08	In house method: Instrument Calibration Technique for LED Spectroradiometric Spectrum (Document No.: 07-3-95-0130)	410	nm	<422	nm	spectroradiometric spectrum, white light	23	%
			422	nm	<445	nm	spectroradiometric spectrum, white light	6.6	%
			445	nm	<472	nm	spectroradiometric spectrum, white light	5.0	%
			472	nm	<489	nm	spectroradiometric spectrum, white light	5.1	%

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3099 LEDs	OSRAM /64743 1000W /IW08	In house method: Instrument Calibration Technique for LED Spectroradiometric Spectrum (Document No.: 07-3-95-0130)	489	nm	<606	nm	spectroradiometric spectrum, white light	5.0	%
			606	nm	<649	nm	spectroradiometric spectrum, white light	5.1	%
			649	nm	<663	nm	spectroradiometric spectrum, white light	5.6	%
			663	nm	<714	nm	spectroradiometric spectrum, white light	8.0	%
			714	nm	<772	nm	spectroradiometric spectrum, white light	22	%
			772	nm	780	nm	spectroradiometric spectrum, white light	36	%
			565	nm	<593	nm	spectroradiometric spectrum, red light	27	%
			593	nm	<608	nm	spectroradiometric spectrum, red light	8.6	%
			608	nm	<635	nm	spectroradiometric spectrum, red light	8.3	%
			635	nm	<651	nm	spectroradiometric spectrum, red light	8.9	%
			651	nm	<671	nm	spectroradiometric spectrum, red light	11	%
			671	nm	675	nm	spectroradiometric spectrum, red light	15	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
Calibration Site: No.30, Daxue Rd., East Dist., Hsinchu City 300, Taiwan (R.O.C.)									

calibration items	working standard	calibration method	measurand level or range				measurement conditions /independent variable	smallest uncertainty	
	brand /model	document name /no.	minimum value	units	maximum value	units	explanation	value	units
KG3099 LEDs	CSIR AR-1100	In house method: Instrument Calibration Technique for LED Averaged Luminous Intensity (Document No.: 07-3-95-0108)	10	mcd	10000	mcd	averaged luminous intensity, red light, peak wavelength (633 ± 30) nm	1.9	%
			10	mcd	10000	mcd	averaged luminous intensity, green light, peak wavelength (520 ± 30) nm	1.8	%
			10	mcd	10000	mcd	averaged luminous intensity, blue light, peak wavelength (460 ± 30) nm	1.9	%
			10	mcd	10000	mcd	averaged luminous intensity, white light	1.8	%
Approval Signatory: WU, Kuei-Neng; CHUANG, Yi-Chen; CHEN, Cheng-Hsien									
Calibration Site: No.30, Daxue Rd., East Dist., Hsinchu City 300, Taiwan (R.O.C.)									

Note: Smallest uncertainty represents an expanded uncertainty using a coverage factor approximately 95 % level of confidence.
(Null Below)