Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC voltage sources: single values	Solid state voltage standard	Comparison	1.018	1.018	V			0.09	µV	2.2	95%	No		1	Approved on 18 October 2004
DC voltage sources: single values	Solid state voltage standard	Comparison	10	10	V			0.24	µV	2.2	95%	No		2	Approved on 18 October 2004
DC voltage sources: single values	Solid state voltage standard	Difference measurement	1	1	V			0.3	µV/V	2.13	95%	Yes		3	Approved on 18 October 2004
DC voltage sources: single values	Standard cell, solid state voltage standard	Difference measurement	1.018	1.018	V			0.3	µV/V	2.13	95%	Yes		4	Approved on 18 October 2004
DC voltage sources: single values	Solid state voltage standard	Difference measurement	10	10	V			0.3	µV/V	2.13	95%	Yes		5	Approved on 18 October 2004
DC voltage sources: low value ranges <= 10 V	DC voltage source, multifunction calibrator	Comparison with standard via resistive divider	1	1	mV			0.6	mV/V	2	95%	Yes		6	Approved on 18 October 2004
DC voltage sources: low value ranges <= 10 V	DC voltage source, multifunction calibrator	Comparison with standard via resistive divider	10	10	mV			0.06	mV/V	2	95%	Yes		7	Approved on 18 October 2004
DC voltage sources: low value ranges <= 10 V	DC voltage source, multifunction calibrator	Comparison with standard via resistive divider	100	100	mV			6	µV/V	2	95%	Yes		8	Approved on 18 October 2004
DC voltage sources: low value ranges <= 10 V	DC voltage source, multifunction calibrator	Comparison with standard via resistive divider	1	1	V			0.8	µV/V	2	95%	Yes		9	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC voltage sources: low value ranges <= 10 V	DC voltage source, multifunction calibrator	Comparison with standard via resistive divider	10	10	V			0.4	µV/V	2	95%	Yes		10	Approved on 18 October 2004
DC voltage sources: intermediate value ranges > 10 V to 1100 V	DC voltage source, multifunction calibrator	Comparison with standard via resistive divider	100	100	V			0.8	µV/V	2	95%	Yes		11	Approved on 18 October 2004
DC voltage sources: intermediate value ranges > 10 V to 1100 V	DC voltage source, multifunction calibrator	Comparison with standard via resistive divider	1000	1000	V			6	µV/V	2	95%	Yes		12	Approved on 18 October 2004
DC voltage meters: very low values <= 1 mV	DC voltmeter, multimeter	Direct measurement	1	1	mV			0.6	mV/V	2	95%	Yes		13	Approved on 18 October 2004
DC voltage meters: intermediate values > 1 mV to 1100 V	DC voltmeter, multimeter	Direct measurement	10	10	mV			0.06	mV/V	2	95%	Yes		14	Approved on 18 October 2004
DC voltage meters: intermediate values > 1 mV to 1100 V	DC voltmeter, multimeter	Direct measurement	100	100	mV			6	µV/V	2	95%	Yes		15	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC voltage meters: intermediate values > 1 mV to 1100 V	DC voltmeter, multimeter	Direct measurement	1	1	V			0.8	µV/V	2	95%	Yes		16	Approved on 18 October 2004
DC voltage meters: intermediate values > 1 mV to 1100 V	DC voltmeter, multimeter	Direct measurement	10	10	V			0.4	µV/V	2	95%	Yes		17	Approved on 18 October 2004
DC voltage meters: intermediate values > 1 mV to 1100 V	DC voltmeter, multimeter	Direct measurement	100	100	V			0.8	µV/V	2	95%	Yes		18	Approved on 18 October 2004
DC voltage meters: intermediate values > 1 mV to 1100 V	DC voltmeter, multimeter	Direct measurement	1000	1000	V			6	µV/V	2	95%	Yes		19	Approved on 18 October 2004
DC resistance standards and sources: low values (<= 1 Ω)	Fixed resistor	DCC bridge	0.0001	0.0001	Ω			31	µΩ/Ω	2	95%	Yes		20	Approved on 18 October 2004
DC resistance standards and sources: low values (<= 1 Ω)	Fixed resistor	DCC bridge	0.001	0.001	Ω	Oil bath temperature	(25 ± 0.005) °C	3.3	µΩ/Ω	2	95%	Yes		21	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC resistance standards and sources: low values (<= 1 Ω)	Fixed resistor	DCC bridge	0.01	0.01	Ω	Oil bath temperature	(25 ± 0.005) °C	2.7	μΩ/Ω	2	95%	Yes		22	Approved on 18 October 2004
DC resistance standards and sources: low values (<= 1 Ω)	Fixed resistor	DCC bridge	0.1	0.1	Ω	Oil bath temperature	(25 ± 0.005) °C	1.9	μΩ/Ω	2	95%	Yes		23	Approved on 18 October 2004
DC resistance standards and sources: low values (<= 1 Ω)	Fixed resistor	CCC bridge	1	1	Ω	Oil bath temperature	(25 ± 0.005) °C	0.02	μΩ/Ω	2	95%	Yes		24	Approved on 18 October 2004
DC resistance standards and sources: low values (<= 1 Ω)	Fixed resistor	DCC bridge	1	1	Ω	Oil bath temperature	(25 ± 0.005) °C	0.18	μΩ/Ω	2	95%	Yes		25	Approved on 18 October 2004
DC resistance standards and sources: low values (<= 1 Ω)	Resistance box	Difference measurement	1	1	Ω			0.06	mΩ/Ω	2	95%	Yes		25a	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
DC resistance standards and sources: intermediate values (> 1 Ω to 1 MΩ)	Fixed resistor	DCC bridge	10	10	Ω	Oil bath temperature	(25 ± 0.005) °C	0.18	μΩ/Ω	2	95%	Yes		26	Approved on 18 October 2004
DC resistance standards and sources: intermediate values (> 1 Ω to 1 MΩ)	Resistance box	Difference measurement	10	10	Ω			6	μΩ/Ω	2	95%	Yes		26a	Approved on 18 October 2004
DC resistance standards and sources: intermediate values (> 1 Ω to 1 MΩ)	Fixed resistor	DCC bridge	100	100	Ω	Oil bath temperature	(25 ± 0.005) °C	0.18	μΩ/Ω	2	95%	Yes		27	Approved on 18 October 2004
DC resistance standards and sources: intermediate values (> 1 Ω to 1 MΩ)	Resistance box	Difference measurement	100	100	Ω			2	μΩ/Ω	2	95%	Yes		27a	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
DC resistance standards and sources: intermediate values (> 1 Ω to 1 MΩ)	Fixed resistor	DCC bridge	1	1	kΩ	Oil bath temperature	(25 ± 0.005) °C	0.19	μΩ/Ω	2	95%	Yes		28	Approved on 18 October 2004
DC resistance standards and sources: intermediate values (> 1 Ω to 1 MΩ)	Resistance box	Difference measurement	1	1	kΩ			1	μΩ/Ω	2	95%	Yes		28a	Approved on 18 October 2004
DC resistance standards and sources: intermediate values (> 1 Ω to 1 MΩ)	Fixed resistor	DCC bridge	10	10	kΩ	Oil bath temperature	(25 ± 0.005) °C	0.2	μΩ/Ω	2	95%	Yes		29	Approved on 18 October 2004
DC resistance standards and sources: intermediate values (> 1 Ω to 1 MΩ)	Resistance box	Difference measurement	10	10	kΩ			1	μΩ/Ω	2	95%	Yes		29a	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC resistance standards and sources: intermediate values (> 1 Ω to 1 MΩ)	Fixed resistor	Difference measurement	100	100	kΩ	Oil bath temperature	(25 ± 0.005) °C	5	μΩ/Ω	2	95%	Yes		30	Approved on 18 October 2004
DC resistance standards and sources: intermediate values (> 1 Ω to 1 MΩ)	Fixed resistor	Difference measurement	1	1	MΩ	Oil bath temperature	(25 ± 0.005) °C	8	μΩ/Ω	2	95%	Yes		31	Approved on 18 October 2004
DC resistance standards and sources: high values (> 1 MΩ)	Fixed resistor	Difference measurement	10	10	MΩ	Oil bath temperature	(25 ± 0.005) °C	12	μΩ/Ω	2	95%	Yes		32	Approved on 18 October 2004
DC resistance standards and sources: high values (> 1 MΩ)	Fixed resistor	Difference measurement	100	100	MΩ	Air bath temperature	(23 ± 0.03) °C	0.09	mΩ/Ω	2.4	95%	Yes		33	Approved on 18 October 2004
DC resistance standards and sources: high values (> 1 MΩ)	Fixed resistor	Difference measurement	1	1	GΩ	Air bath temperature	(23 ± 0.03) °C	0.07	mΩ/Ω	2	95%	Yes		34	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
DC resistance standards and sources: high values (> 1 MΩ)	Fixed resistor	Difference measurement	10	10	GΩ	Air bath temperature	(23 ± 0.03) °C	0.22	mΩ/Ω	2	95%	Yes		35	Approved on 18 October 2004
DC resistance standards and sources: high values (> 1 MΩ)	Fixed resistor	Difference measurement	100	100	GΩ	Air bath temperature	(23 ± 0.03) °C	0.28	mΩ/Ω	2	95%	Yes		36	Approved on 18 October 2004
DC resistance standards and sources: high values (> 1 MΩ)	Fixed resistor	Difference measurement	1	1	TΩ	Air bath temperature	(23 ± 0.03) °C	0.4	mΩ/Ω	2	95%	Yes		37	Approved on 18 October 2004
DC resistance standards and sources: standards for high current	DC shunt	Voltage drop across shunt	100	1000	A			0.4	mA/A	2	95%	Yes		38	Approved on 18 October 2004
DC resistance meters: low values (<= 1 Ω)	Microohmmeter	Direct measurement	0.0001	0.0001	Ω			10	mΩ/Ω	2	95%	Yes		39	Approved on 18 October 2004
DC resistance meters: low values (<= 1 Ω)	Multimeter	Direct measurement	0.001	0.001	Ω			10	mΩ/Ω	2	95%	Yes		40	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC resistance meters: low values (<= 1 Ω)	Multimeter	Direct measurement	0.01	0.01	Ω			3	mΩ/Ω	2	95%	Yes		41	Approved on 18 October 2004
DC resistance meters: low values (<= 1 Ω)	Multimeter	Direct measurement	0.1	0.1	Ω			0.2	mΩ/Ω	2	95%	Yes		42	Approved on 18 October 2004
DC resistance meters: low values (<= 1 Ω)	Multimeter	Direct measurement	1	1	Ω			6	μΩ/Ω	2	95%	Yes		43	Approved on 18 October 2004
DC resistance meters: intermediate values (> 1 Ω to 1 GΩ)	Multimeter	Direct measurement	10	10	Ω			1	μΩ/Ω	2	95%	Yes		44	Approved on 18 October 2004
DC resistance meters: intermediate values (> 1 Ω to 1 GΩ)	Multimeter	Direct measurement	100	100	Ω			0.2	μΩ/Ω	2	95%	Yes		45	Approved on 18 October 2004
DC resistance meters: intermediate values (> 1 Ω to 1 GΩ)	Multimeter	Direct measurement	1	1	kΩ			0.2	μΩ/Ω	2	95%	Yes		46	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC resistance meters: intermediate values (> 1 Ω to 1 GΩ)	Multimeter	Direct measurement	10	10	kΩ			0.2	μΩ/Ω	2	95%	Yes		47	Approved on 18 October 2004
DC resistance meters: intermediate values (> 1 Ω to 1 GΩ)	Multimeter	Direct measurement	100	100	kΩ			5	μΩ/Ω	2	95%	Yes		48	Approved on 18 October 2004
DC resistance meters: intermediate values (> 1 Ω to 1 GΩ)	Multimeter	Direct measurement	1	1	MΩ			8	μΩ/Ω	2	95%	Yes		49	Approved on 18 October 2004
DC resistance meters: intermediate values (> 1 Ω to 1 GΩ)	Multimeter	Direct measurement	10	10	MΩ			12	μΩ/Ω	2	95%	Yes		50	Approved on 18 October 2004
DC resistance meters: intermediate values (> 1 Ω to 1 GΩ)	Multimeter, teraohmmeter	Direct measurement	100	100	MΩ			0.09	mΩ/Ω	2.4	95%	Yes		51	Approved on 18 October 2004
DC resistance meters: intermediate values (> 1 Ω to 1 GΩ)	Multimeter, teraohmmeter	Direct measurement	1	1	GΩ			0.07	mΩ/Ω	2	95%	Yes		52	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC resistance meters: high values (> 1 GΩ)	Teraohmmeter	Direct measurement	10	10	GΩ			0.22	mΩ/Ω	2	95%	Yes		53	Approved on 18 October 2004
DC resistance meters: high values (> 1 GΩ)	Teraohmmeter	Direct measurement	100	100	GΩ			0.28	mΩ/Ω	2	95%	Yes		54	Approved on 18 October 2004
DC resistance meters: high values (> 1 GΩ)	Teraohmmeter	Direct measurement	1	1	TΩ			0.4	mΩ/Ω	2	95%	Yes		55	Approved on 18 October 2004
DC current sources: low values (<= 0.1 mA)	Current generator	Comparison	10	10	pA			29	mA/A	1.96	95%	Yes		56	Approved on 18 October 2004
DC current sources: low values (<= 0.1 mA)	Current generator	Comparison	100	100	pA			2.2	mA/A	1.96	95%	Yes		57	Approved on 18 October 2004
DC current sources: low values (<= 0.1 mA)	Current generator	Comparison	1	1	nA			0.3	mA/A	1.96	95%	Yes		58	Approved on 18 October 2004
DC current sources: low values (<= 0.1 mA)	Current generator	Comparison	10	10	nA			0.3	mA/A	1.96	95%	Yes		59	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC current sources: low values (<= 0.1 mA)	Current generator	Comparison	100	100	nA			0.3	mA/A	1.96	95%	Yes		60	Approved on 18 October 2004
DC current sources: low values (<= 0.1 mA)	Current generator	Comparison	1	1	µA			0.04	mA/A	1.96	95%	Yes		61	Approved on 18 October 2004
DC current sources: low values (<= 0.1 mA)	Current generator, multifunction calibrator	Voltage drop across standard resistor	10	10	µA			11	µA/A	2	95%	Yes		62	Approved on 18 October 2004
DC current sources: low values (<= 0.1 mA)	Current generator, multifunction calibrator	Voltage drop across standard resistor	100	100	µA			10	µA/A	2	95%	Yes		63	Approved on 18 October 2004
DC current sources: intermediate values (> 0.1 mA to 20 A)	Current generator, multifunction calibrator	Voltage drop across standard resistor	1	1	mA			13	µA/A	2	95%	Yes		64	Approved on 18 October 2004
DC current sources: intermediate values (> 0.1 mA to 20 A)	Current generator, multifunction calibrator	Voltage drop across standard resistor	10	10	mA			10	µA/A	2	95%	Yes		65	Approved on 18 October 2004
DC current sources: intermediate values (> 0.1 mA to 20 A)	Current generator, multifunction calibrator	Voltage drop across standard resistor	100	100	mA			10	µA/A	2	95%	Yes		66	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC current sources: intermediate values (> 0.1 mA to 20 A)	Current generator, multifunction calibrator	Voltage drop across standard resistor	1	1	A			14	µA/A	2	95%	Yes		67	Approved on 18 October 2004
DC current sources: intermediate values (> 0.1 mA to 20 A)	Current generator, multifunction calibrator	Voltage drop across standard resistor	2	2	A			18	µA/A	2	95%	Yes		68	Approved on 18 October 2004
DC current sources: intermediate values (> 0.1 mA to 20 A)	Current generator, multifunction calibrator	Voltage drop across standard resistor	5	5	A			15	µA/A	2	95%	Yes		69	Approved on 18 October 2004
DC current sources: intermediate values (> 0.1 mA to 20 A)	Current generator, multifunction calibrator	Voltage drop across standard resistor	10	10	A			15	µA/A	2	95%	Yes		70	Approved on 18 October 2004
DC current sources: high values (> 20 A to 100 A)	Current generator	Voltage drop across standard resistor	100	100	A			47	µA/A	2	95%	Yes		71	Approved on 18 October 2004
DC current meters: low values (<= 0.1 mA)	Picoammeter	Direct measurement	10	10	pA			29	mA/A	1.96	95%	Yes		72	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC current meters: low values (<= 0.1 mA)	Picoammeter	Direct measurement	100	100	pA			2.2	mA/A	1.96	95%	Yes		73	Approved on 18 October 2004
DC current meters: low values (<= 0.1 mA)	Nanoammeter	Direct measurement	1	1	nA			0.4	mA/A	1.96	95%	Yes		74	Approved on 18 October 2004
DC current meters: low values (<= 0.1 mA)	Nanoammeter	Direct measurement	10	10	nA			0.3	mA/A	1.96	95%	Yes		75	Approved on 18 October 2004
DC current meters: low values (<= 0.1 mA)	Nanoammeter	Direct measurement	100	100	nA			0.3	mA/A	1.96	95%	Yes		76	Approved on 18 October 2004
DC current meters: low values (<= 0.1 mA)	Multimeter	Direct measurement	1	1	µA			0.05	mA/A	1.96	95%	Yes		77	Approved on 18 October 2004
DC current meters: low values (<= 0.1 mA)	Multimeter, multifunction transfer standard	Direct measurement	10	10	µA			11	µA/A	2	95%	Yes		78	Approved on 18 October 2004
DC current meters: low values (<= 0.1 mA)	Multimeter, multifunction transfer standard	Direct measurement	100	100	µA			10	µA/A	2	95%	Yes		79	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC current meters: intermediate values (> 0.1 mA to 20 A)	Multimeter, multifunction transfer standard	Direct measurement	1	1	mA			13	µA/A	2	95%	Yes		80	Approved on 18 October 2004
DC current meters: intermediate values (> 0.1 mA to 20 A)	Multimeter, multifunction transfer standard	Direct measurement	10	10	mA			10	µA/A	2	95%	Yes		81	Approved on 18 October 2004
DC current meters: intermediate values (> 0.1 mA to 20 A)	Multimeter, multifunction transfer standard	Direct measurement	100	100	mA			10	µA/A	2	95%	Yes		82	Approved on 18 October 2004
DC current meters: intermediate values (> 0.1 mA to 20 A)	Multimeter, multifunction transfer standard	Direct measurement	1	1	A			14	µA/A	2	95%	Yes		83	Approved on 18 October 2004
DC current meters: intermediate values (> 0.1 mA to 20 A)	Current transducer	Direct measurement	2	2	A			18	µA/A	2	95%	Yes		84	Approved on 18 October 2004
DC current meters: intermediate values (> 0.1 mA to 20 A)	Current transducer	Direct measurement	5	5	A			15	µA/A	2	95%	Yes		85	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
DC current meters: intermediate values (> 0.1 mA to 20 A)	Current transducer	Direct measurement	10	10	A			15	µA/A	2	95%	Yes		86	Approved on 18 October 2004
DC current meters: high values (> 20 A to 100 A)	Current transducer	Direct measurement	100	100	A			47	µA/A	2	95%	Yes		87	Approved on 18 October 2004
Capacitance: capacitance for low loss capacitors	Standard capacitor	Difference measurement	1	1	pF	Frequency	1 kHz	40	µF/F	2	95%	Yes		88a	Approved on 18 October 2004
Capacitance: capacitance for low loss capacitors	Standard capacitor	Difference measurement	10	10	pF	Frequency	1 kHz	2.5	µF/F	2	95%	Yes		88	Approved on 18 October 2004
Capacitance: capacitance for low loss capacitors	Standard capacitor	Difference measurement	100	100	pF	Frequency	1 kHz	2.9	µF/F	2	95%	Yes		89	Approved on 18 October 2004
Capacitance: capacitance for low loss capacitors	Standard capacitor	Difference measurement	1000	1000	pF	Frequency	1 kHz	6.1	µF/F	2	95%	Yes		90	Approved on 18 October 2004
Capacitance: capacitance for dielectric capacitors	Fixed capacitor	Difference measurement	0.01	0.01	µF	Frequency	1 kHz	40	µF/F	2	95%	Yes		90a	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
Capacitance: capacitance for dielectric capacitors	Fixed capacitor	Difference measurement	0.1	0.1	µF	Frequency	1 kHz	40	µF/F	2	95%	Yes		90b	Approved on 18 October 2004
Capacitance: capacitance for dielectric capacitors	Fixed capacitor	Difference measurement	1	1	µF	Frequency	1 kHz	80	µF/F	2	95%	Yes		90c	Approved on 18 October 2004
Capacitance: meters	Capacitance bridge	Direct measurement	1	1	pF	Frequency	1 kHz	40	µF/F	2	95%	Yes		91a	Approved on 18 October 2004
Capacitance: meters	Capacitance bridge	Direct measurement	10	10	pF	Frequency	1 kHz	2.5	µF/F	2	95%	Yes		91	Approved on 18 October 2004
Capacitance: meters	Capacitance bridge	Direct measurement	100	100	pF	Frequency	1 kHz	2.9	µF/F	2	95%	Yes		92	Approved on 18 October 2004
Capacitance: meters	Capacitance bridge	Direct measurement	1000	1000	pF	Frequency	1 kHz	6.1	µF/F	2	95%	Yes		93	Approved on 18 October 2004
Capacitance: meters	Capacitance bridge	Direct measurement	0.01	0.01	µF	Frequency	1 kHz	40	µF/F	2	95%	Yes		93a	Approved on 18 October 2004
Capacitance: meters	Capacitance bridge	Direct measurement	0.1	0.1	µF	Frequency	1 kHz	40	µF/F	2	95%	Yes		93b	Approved on 18 October 2004
Capacitance: meters	Capacitance bridge	Direct measurement	1	1	µF	Frequency	1 kHz	80	µF/F	2	95%	Yes		93c	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
Inductance: self inductance, low values (< 1 mH)	Fixed inductor	Difference measurement	100	100	µH	Frequency	1 kHz	1.2	mH/H	2	95%	Yes		94	Approved on 18 October 2004
Inductance: self inductance, intermediate values (>= 1 mH to 1 H)	Fixed inductor	Difference measurement	1	1	mH	Frequency	100 Hz , 1 kHz	0.22	mH/H	2	95%	Yes		95	Approved on 18 October 2004
Inductance: self inductance, intermediate values (>= 1 mH to 1 H)	Fixed inductor	Difference measurement	10	10	mH	Frequency	100 Hz , 1 kHz	0.22	mH/H	2	95%	Yes		96	Approved on 18 October 2004
Inductance: self inductance, intermediate values (>= 1 mH to 1 H)	Fixed inductor	Difference measurement	100	100	mH	Frequency	100 Hz , 1 kHz	0.22	mH/H	2	95%	Yes		97	Approved on 18 October 2004
Inductance: self inductance, intermediate values (>= 1 mH to 1 H)	Fixed inductor	Difference measurement	1	1	H	Frequency	100 Hz	0.22	mH/H	2	95%	Yes		98	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	NMI Service Identifier	Comments
Inductance: self inductance, intermediate values (>= 1 mH to 1 H)	Fixed inductor	Difference measurement	1	1	H	Frequency	1 kHz	0.52	mH/H	2	95%	Yes		98a	Approved on 18 October 2004
Inductance: self inductance, high values (> 1 H)	Fixed inductor	Difference measurement	10	10	H	Frequency	100 Hz	0.22	mH/H	2	95%	Yes		99	Approved on 18 October 2004
Inductance: self inductance, high values (> 1 H)	Fixed inductor	Difference measurement	10	10	H	Frequency	1 kHz	2	mH/H	2	95%	Yes		99a	Approved on 18 October 2004
Inductance: meters	LCR meter	Direct measurement	100	100	µH	Frequency	100 Hz , 1 kHz	1.2	mH/H	2	95%	Yes		100	Approved on 18 October 2004
Inductance: meters	LCR meter	Direct measurement	1	1	mH	Frequency	100 Hz , 1 kHz	0.22	mH/H	2	95%	Yes		101	Approved on 18 October 2004
Inductance: meters	LCR meter	Direct measurement	10	10	mH	Frequency	100 Hz , 1 kHz	0.22	mH/H	2	95%	Yes		102	Approved on 18 October 2004
Inductance: meters	LCR meter	Direct measurement	100	100	mH	Frequency	100 Hz , 1 kHz	0.22	mH/H	2	95%	Yes		103	Approved on 18 October 2004
Inductance: meters	LCR meter	Direct measurement	1	1	H	Frequency	100 Hz	0.22	mH/H	2	95%	Yes		104	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
Inductance: meters	LCR meter	Direct measurement	1	1	H	Frequency	1 kHz	0.52	mH/H	2	95%	Yes		104a	Approved on 18 October 2004
Inductance: meters	LCR meter	Direct measurement	10	10	H	Frequency	100 Hz	0.22	mH/H	2	95%	Yes		105	Approved on 18 October 2004
Inductance: meters	LCR meter	Direct measurement	10	10	H	Frequency	1 kHz	2	mH/H	2	95%	Yes		105a	Approved on 18 October 2004
AC/DC voltage transfer: AC/DC transfer difference at low voltages	Micropotentiometer and LVTVC	Difference measurement	0.001	0.1	V	Frequency	20 Hz to 1 MHz	29 to 2000	µV/V	2	95%	Yes	Matrix 1	106	Approved on 18 October 2004
AC/DC voltage transfer: AC/DC transfer difference at medium voltages	Thermal voltage converter	Difference measurement	0.2	5	V	Frequency	20 Hz to 1 MHz	4 to 60	µV/V	2	95%	Yes	Matrix 1	107	Approved on 18 October 2004
AC/DC voltage transfer: AC/DC transfer difference at higher voltages	Thermal voltage converter	Difference measurement	5	1000	V	Frequency	20 Hz to 1 MHz	7 to 60	µV/V	2	95%	Yes	Matrix 1	108	Approved on 18 October 2004

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
AC voltage up to 1000 V: sources	Multifunction calibrator, ACV source	AC/DC comparison	0.001	1000	V	Frequency	20 Hz to 1 MHz	10 to 1000	µV/V	2	95%	Yes	Matrix 3	109	Approved on 18 October 2004
AC voltage up to 1000 V: meters	Multimeter, AC voltmeter	AC/DC comparison	0.001	1000	V	Frequency	20 Hz to 1 MHz	10 to 1000	µV/V	2	95%	Yes	Matrix 3	110	Approved on 18 October 2004
AC/DC current transfer: AC/DC transfer difference	Thermal current converter	Difference measurement	0.001	20	A	Frequency	20 Hz to 10 kHz	15 to 110	µA/A	2	95%	Yes	Matrix 2	111	Approved on 18 October 2004
AC/DC current transfer: AC/DC transfer difference	Shunt	Difference measurement	5	20	A	Frequency	60 Hz, 1 kHz	160 to 400	µA/A	2	95%	Yes		112	Approved on 18 October 2004
AC current up to 100 A: sources	Multfunction calibrator, transconductance amplifier	AC/DC comparison	0.001	20	A	Frequency	20 Hz to 10 kHz	50 to 150	µA/A	2	95%	Yes	Matrix 4	113	Approved on 18 October 2004
AC current up to 100 A: meters	AC ammeter, multimeter	AC/DC comparison	0.001	20	A	Frequency	20 Hz to 10 kHz	50 to 150	µA/A	2	95%	Yes	Matrix 4	114	Approved on 18 October 2004
AC power and energy: single phase power at *f* <= 400 Hz	Wattmeter, power converter	Power comparator	120	1200	VA	Voltage	120 V, 240 V	45	µW/VA	2	95%	Yes		115	Approved on 18 October 2004
						Current	1 A, 5 A								
						Frequency	50 Hz, 60 Hz								
						Power factor	any								

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
AC power and energy: single phase power at *f* <= 400 Hz	Power calibrator, wattmeter, watt converter, watthour meter	Difference measurement	110	2400	VA	Voltage	110 V, 120 V, 220 V, 240 V	120	µW(h)/ VA(h)	2	95%	Yes		118	Approved on 18 October 2004
						Current	1 A, 5 A, 10 A								
						Frequency	60 Hz								
						Power factor	0.5 lead / lag, 1								
AC energy: three phase	Watthour meter	Difference measurement pulse output	110	550	VA	Voltage	110 V	120	µWh/V Ah	2	95%	Yes		119	Approved on 18 October 2004
						Current	1 A, 2.5 A, 5 A								
						Frequency	60 Hz								
						Power factor	0.5 lead / lag, 1								
High DC voltage: high voltage sources	DC kilovolt source	Comparison	1	100	kV			0.1	mV/V	2	95%	Yes		120	Approved on 18 October 2004
High DC voltage: high voltage meters	DC kilovolt meter	Direct measurement	1	100	kV			0.1	mV/V	2	95%	Yes		121	Approved on 18 October 2004
High DC voltage: ratios	Resistive divider	Comparison	1000:1	100000:1	V/V			0.1	mV/V	2	95%	Yes		122	Approved on 18 October 2004
AC high voltage: ratio error	Potential transformer	Difference measurement	0	0.02		Voltage	1 kV to 100 kV	8E-05		2	95%	No		123	Approved on 18 October 2004
						Frequency	60 Hz								

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
AC high voltage: phase displacement	Potential transformer	Difference measurement	0	30	mrad	Voltage	1 kV to 100 kV	60	µrad	2	95%	No		123a	Approved on 18 October 2004
						Frequency	60 Hz								
High AC current: ratio error	Current transformer	Difference measurement	0	0.02		Current	5 A to 5 kA	6.5E-05		2	95%	No		124	Approved on 18 October 2004
						Frequency	60 Hz								
High AC current: phase displacement	Current transformer	Difference measurement	0	30	mrad	Current	5 A to 5 kA	30	µrad	2	95%	No		124a	Approved on 18 October 2004
						Frequency	60 Hz								
High DC current: sources	Current source	Voltage drop across shunt	100	1000	A			0.4	mA/A	2	95%	Yes		125	Approved on 18 October 2004
High DC current: meters	Current meter	Direct measurement	100	1000	A			0.4	mA/A	2	95%	Yes		126	Approved on 18 October 2004
Phase angle: sources	Phase source	Difference measurement	0	360	°	Voltage	5 V to 100 V with equal input levels	0.02	°	2	95%	No		127	Approved on 18 October 2004
						Frequency	60 Hz to 50 kHz								
Phase angle: meters	Phase meter	Direct measurement	0	360	°	Voltage	5 V to 100 V with equal input levels	0.02	°	2	95%	No		128	Approved on 18 October 2004
						Frequency	60 Hz to 50 kHz								

Electricity and Magnetism, Chinese TAIPEI, CMS (Center for Measurement Standards)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage Factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Uncertainty matrix**	**NMI Service Identifier**	**Comments**
RF power: calibration factor on coaxial lines	Power sensor, thermistor (50 Ω, N)	DC substitution, reflection measurement	0.8	1		Power	0.1 mW to 10 mW	1.8 to 2.2	%	2	95%	Yes		129	Approved on 18 October 2004
						Frequency	10 MHz to 18 GHz								
Lumped impedance: resistance (*R*)	Termination resistor, on APC-7 coaxial, one-port	RF impedance analyzer	33	100	Ω	Frequency	10 MHz to 60 MHz	0.15	Ω	2	95%	No		130	Approved on 18 October 2004
Lumped impedance: capacitance (*C*)	Termination resistor, on APC-7 coaxial, one-port	RF impedance analyzer	1	100	pF	Frequency	10 MHz to 60 MHz	0.019	pF	2	95%	No		131	Approved on 18 October 2004

Chinese TAIPEI, CMS (Center for Measurement Standards)

AC/DC Voltage transfer uncertainty matrix: Matrix 1

Internal NMI service identifier: 106, 107 and 108

	20 Hz	40 Hz	60 Hz	1 kHz	10 kHz	30 kHz	100 kHz	300 kHz	500 kHz	800 kHz	1 MHz
1 mV	200	200	200	200	200	300	700	1000	1300	1600	2000
2 mV	150	150	150	130	130	150	200	300	500	700	1000
5 mV	110	110	110	100	100	100	140	160	220	270	400
10 mV	90	90	90	80	80	80	120	140	180	230	300
20 mV	70	70	70	70	70	70	90	110	140	180	240
50 mV	40	40	40	40	40	40	60	70	90	110	130
100 mV	29	29	29	29	29	29	40	50	70	90	120
200 mV	13	13	13	13	13	13	15	28	40	50	60
0.5 V	10	10	10	10	10	10	13	24	40	50	60
1 V	7	7	7	7	7	7	10	20	30	40	50
2 V	5	5	5	4	4	4	8	18	30	40	50
4 V	7	7	7	7	7	7	10	20	30	40	50
10 V	10	10	10	10	10	10	13	24	40	50	60
20 V	13	13	13	13	13	13	15	28	40	50	60
40 V	15	15	15	15	15	15	17	30	-	-	-
100 V	18	18	18	18	18	18	23	-	-	-	-
200 V	27	27	27	27	27	27	40	-	-	-	-
400 V	40	40	40	40	40	40	50	-	-	-	-
1000 V	50	50	50	50	50	60	-	-	-	-	-

The expanded uncertainties given in this table are expressed in µV/V.

Chinese TAIPEI, CMS (Center for Measurement Standards)

AC/DC Current transfer uncertainty matrix: Matrix 2

Internal NMI service identifier: 111

	20 Hz	40 Hz	60 Hz	1 kHz	5 kHz	10 kHz
1 mA	23	23	23	23	40	70
2.5 mA	23	23	23	23	40	70
5 mA	20	20	20	20	40	60
10 mA	18	18	18	18	30	50
20 mA	15	15	15	15	28	40
30 mA	18	18	18	18	30	50
50 mA	20	20	20	20	40	60
100 mA	23	23	23	23	40	70
200 mA	25	25	25	25	50	70
300 mA	27	27	27	27	50	80
500 mA	29	29	29	29	60	80
1 A	30	30	30	40	60	80
2 A	30	30	30	40	60	90
3 A	40	40	40	50	70	90
5 A	50	50	50	60	80	100
10 A	50	50	50	60	80	110
20 A	50	50	50	70	90	110

The expanded uncertainties given in this table are expressed in µA/A.

Chinese TAIPEI, CMS (Center for Measurement Standards)

AC Voltage uncertainty matrix: Matrix 3

Internal NMI service identifier: 109 and 110

	20 Hz	60 Hz	10 kHz	30 kHz	100 kHz	500 kHz	1 MHz
1 mV	-	1000	1000	1000	-	-	-
2 mV	-	800	800	800	-	-	-
5 mV	-	500	500	500	-	-	-
10 mV	-	300	300	300	-	-	-
20 mV	-	100	100	200	-	-	-
50 mV	-	70	70	100	-	-	-
100 mV	70	40	40	40	100	300	500
200 mV	40	30	30	40	60	300	400
0.5 V	30	20	20	30	40	200	300
1 V	20	10	10	20	30	200	300
2 V	30	20	20	30	40	200	300
4 V	40	30	30	40	50	200	300
10 V	40	30	30	50	60	200	300
20 V	50	40	40	60	70	-	-
40 V	60	50	50	70	-	-	-
100 V	70	60	60	80	-	-	-
200 V	70	60	60	80	-	-	-
400 V	80	70	70	90	-	-	-
1000 V	100	80	80	100	-	-	-

The expanded uncertainties given in this table are expressed in µV/V.

Chinese TAIPEI, CMS (Center for Measurement Standards)

AC Current uncertainty matrix: Matrix 4

Internal NMI service identifier: 113 and 114

	20 Hz	60 Hz	1 kHz	5 kHz	10 kHz
1 mA	50	50	50	70	120
10 mA	50	50	50	70	100
20 mA	60	60	60	80	110
50 mA	70	70	70	90	120
100 mA	80	80	80	100	140
300 mA	90	90	90	-	-
1 A	100	100	100	-	-
2 A	-	100	100	-	-
5 A	-	120	120	-	-
10 A	-	150	150	-	-
20 A	-	150	150	-	-

The expanded uncertainties given in this table are expressed in µA/A.