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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
DC voltage sources: single values	Standard cell, solid state voltage standard	Comparison	0.1	1.018	V			0.02	µV/V	2	95%	Yes		Approved on 18 October 2004	EM-1
DC voltage sources: single values	Standard cell, solid state voltage standard	Comparison	1	10	V			0.01	µV/V	2	95%	Yes		Approved on 18 October 2004	EM-2
DC voltage sources: single values	Standard cell	Comparison	1.018	1.018	V			0.1	µV/V	3	99%	Yes		Approved on 18 October 2004	EM-3
DC voltage sources: low values (<= 10 V)	DC voltage source, multifuction calibrator	DC voltmeter	0.1	10	V			5.1 to 1.8	µV/V	3	99%	Yes		Approved on 18 October 2004 Oil bath temperature	EM-4
DC voltage sources: intermediate values (> 10 V to 1100 V)	DC voltage source, multifuction calibrator	DC voltmeter	10	1000	V			2.0 to 3.9	µV/V	3	99%	Yes		Approved on 18 October 2004	EM-5
DC voltage meters: intermediate values(>1 mV to 1100 V)	DC voltmeter, multimeter, multifunction transfer standard	Comparison with DC voltage source	0.01	10	V			10 to 2.0	µV/V	3	99%	Yes		Approved on 18 October 2004	EM-6
DC voltage meters: intermediate values (>1 mV to 1100 V)	DC voltmeter, multimeter, multifunction transfer standard	Comparison with DC voltage source	10	1000	V			2.0 to 4.5	µV/V	3	99%	Yes		Approved on 18 October 2004	EM-7
DC voltage ratios: up to 1100 V	Resistive divider, ratio meter		10	1000	V			0.3 to 0.5	µV/V	3	99%	Yes		Approved on 18 October 2004	EM-8

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
DC current sources: intermediate values (> 0.1 mA to 20 A)	Current generator, multifunction calibrator	Resistance standards	0.0001	10	A			10 to 50	μA/A	3	99%	Yes		Approved on 18 October 2004	EM-9
DC current meters: intermediate values (> 0.1 mA to 20 A)	Multimeter, multifunction transfer standard	Comparison with multifunction calibrator	0.0001	10	A			15 to 60	μA/A	3	99%	Yes		Approved on 18 October 2004	EM-10
DC resistance standards and sources: multiple ranges	Multifunction calibrator	Comparison with resistance standards	10	1E+07	Ω	Resistance	10 Ω, 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ, 1 MΩ, 10 MΩ	5 to 10	μΩ/Ω	3	99%	Yes		Approved on 18 October 2004 Correction for temperature	EM-11
						Temperature	20 °C								
DC resistance meters: intermediate values (> 1 Ω to 1 GΩ)	Ohmmeter, multimeter, multifunction transfer standard	Comparison with resistance standards	10	1E+07	Ω	Resistance	10 Ω, 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ, 1 MΩ, 10 MΩ	5 to 10	μΩ/Ω	3	99%	Yes		Approved on 18 October 2004 Correction for temperature	EM-12
						Temperature	20 °C								
DC resistance standards and sources: lower values (<= 1 Ω)	Fixed resistor	DCC bridge	0.0001	0.1	Ω	Resistance	0.0001 Ω, 0.001 Ω, 0.01 Ω, 0.1 Ω	5 to 1.5	μΩ/Ω	2	95%	Yes		Approved on 18 October 2004	EM-13
						Temperature of oil or air bath	20 °C								

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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?	Matrix uncertainty	Comments	NMI Service Identifier
DC resistance standards and sources: lower values (<= 1 Ω)	Fixed resistor	QHR and DCC bridge	1	1	Ω	Temperature of oil or air bath	20 °C	0.02	μΩ/Ω	2	95%	Yes		Approved on 18 October 2004	EM-14.a
DC resistance standards and sources: intermediate values (>=1 Ω to 1 MΩ)	Fixed resistor	DCC bridge and Hamon resistors	10	10	Ω	Temperature of oil or air bath	20 °C	0.2	μΩ/Ω	2	95%	Yes		Approved on 18 October 2004	EM-15
DC resistance standards and sources: intermediate values (>=1 Ω to 1 MΩ)	Fixed resistor	QHR and CCC bridge	100	100	Ω	Temperature of oil or air bath	20 °C	0.02	μΩ/Ω	2	95%	Yes		Approved on 18 October 2004	EM-16.a
DC resistance standards and sources: intermediate values (>=1 Ω to 1 MΩ)	Fixed resistor	DCC bridge and Harmon resistors	1000	1000	Ω	Temperature of oil or air bath	20 °C	0.2	μΩ/Ω	2	95%	Yes		Approved on 18 October 2004	EM-17
DC resistance standards and sources: intermediate values (>= 1 Ω to 1 MΩ)	Fixed resistor	QHR and CCC bridge	10	10	kΩ	Temperature of oil or air bath	20 °C	0.02	μΩ/Ω	2	95%	Yes		Approved on 18 October 2004	EM-18.a
DC resistance standards and sources: intermediate values (>= 1 Ω to 1 MΩ)	Fixed resistor	High resistance bridge and Harmon resistors	100	1000	kΩ	Resistance	100 kΩ, 1000 kΩ	0.5	μΩ/Ω	2	95%	Yes		Approved on 18 October 2004	EM-19

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
						Temperature of air bath	20 °C								
DC resistance standards and sources: high values (> 1 MΩ)	Fixed resistor, three terminal resistor	High resistance bridge and Harmon resistors	10	1000	MΩ	Resistance	10 MΩ, 100 MΩ, 1000 MΩ	2 to 7	μΩ/Ω	2	95%	Yes		Approved on 18 October 2004	EM-20
						Temperature of air bath	20 °C								
DC resistance standards and sources: multiple ranges	Multifunction calibrator	DCC bridge and high resistance bridge	1	1E+08	Ω	Temperature of oil or air bath	20 °C	5 to 30	μΩ/Ω	2	95%	Yes		Approved on 18 October 2004	EM-21
Inductance: self inductance and equivalent series resistance, low values (< 1 mH)	Fixed inductor, variable inductor, inductance box	Modified Maxwell bridge	1	100	μH	Inductance	1 μH, 2 μH, 3 μH, 5 μH, 10 μH, 20 μH, 30 μH, 50 μH, 100 μH	3	nH	2	95%	No		Approved on 18 October 2004	EM-22
						Frequency	50 Hz to 2.5 kHz								
Inductance: self inductance and equivalent series resistance, low values (< 1 mH)	Fixed inductor, variable inductor, inductance box	Modified Maxwell bridge	0.2	1	mH	Inductance	0.2 mH, 0.3 mH, 0.5 mH, 1 mH	30	μH/H	2	95%	Yes		Approved on 18 October 2004	EM-23
						Frequency	50 Hz to 2.5 kHz								
Inductance: self inductance and equivalent series resistance, intermediate values (>= 1 mH to 1 H)	Fixed inductor, variable inductor, inductance box	Modified Maxwell bridge	0.002	1	H	Inductance	0.002 H, 0.003 H, 0.005 H, 0.01 H, 0.02 H, 0.03 H, 0.05 H, 0.1 H, 0.2 H, 0.3 H, 0.4 H, 0.5 H, 1 H	30	μH/H	2	95%	Yes		Approved on 18 October 2004	EM-24
						Frequency	50 Hz to 2.5 kHz								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Inductance: meters	LCR meter	Comparison	0.0001	1	H	Inductance	0.0001 H, 0.001 H, 0.01 H, 0.1 H, 1 H	50	µH/H	2	95%	Yes		Approved on 18 October 2004	EM-25
Capacitance: capacitance for low loss capacitors	Standard capacitor (sealed, dry nitrogen or silica dielectric)	Comparison	1	1E+04	pF	Capacitance	1 pF, 10 pF, 100 pF, 1000 pF, 10000 pF	10	µF/F	2	95%	Yes		Approved on 18 October 2004	EM-26
Capacitance: capacitance for low loss capacitors	Standard capacitor (sealed, dry nitrogen or silica dielectric)	Capacitance bridge	0.5	1000	pF	Capacitance	0.5 pF, 1 pF, 10 pF, 100 pF, 1000 pF	1	µF/F	2	95%	Yes		Approved on 18 October 2004	EM-27
Capacitance: capacitance for dielectric capacitors	Fixed capacitor, capacitance box	Direct comparison	1	1E+06	pF			100	µF/F	2	95%	Yes		Approved on 18 October 2004	EM-28
Capacitance: dissipation factor for low loss capacitors	Standard capacitor (air, fused silica)	Comparison	1E-06	1E-04		Capacitance	10 pF, 100 pF, 1000 pF, 10000 pF (relative expanded uncertainty on capacitance: 10E-06)	1	1E-06	2	95%	No		Approved on 18 October 2004	EM-29
						Frequency	40 Hz to 1000 Hz								
Capacitance: dissipation factor for dielectric capacitors	Capacitor: dielectric capacitor	Direct comparison	1E-04	0.1		Capacitance	1 pF to 1E+06 pF (relative expanded uncertainty on capacitance: 100E-06)	1 to 100	1E-06	2	95%	No		Approved on 18 October 2004	EM-30
						Frequency	40 Hz to 1000 Hz								
Capacitance: dissipation factor for dielectric capacitors	Fixed dissipation factor standard, dissipation factor standard box	Direct	1E-06	1		Capacitance	1 pF to 10 mF (relative expanded uncertainty on capacitance: 100E-06)	1 to 1000	1E-06	2	95%	No		Approved on 18 October 2004	EM-31
						Frequency	40 Hz to 1000 Hz								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
High voltage impedance: capacitance and dissipation factor	Compressed gas capacitor, capacitor for high voltage	Direct comparison	10	1E+04	pF	Voltage	10 kV to 1 kV	10	μF/F	2	95%	Yes		Approved on 18 October 2004	EM-32
						Frequency	40 Hz to 60 Hz								
High voltage impedance: capacitance and dissipation factor	Compressed gas capacitor, capacitor for high voltage	Direct comparison	1E-06	0.1		Voltage	10 kV to 1 kV	1 to 500	1E-06	2	95%	No		Approved on 18 October 2004	EM-33
						Frequency	40 Hz to 60 Hz								
Capacitance: meter	Capacitance bridge, LCR meter	Comparison	1E-04	1	μF	Capacitance	0.0001 μF, 0.001 μF, 0.01 μF, 0.1 μF, 1 μF	50	μF/F	2	95%	Yes		Approved on 18 October 2004	EM-34
Dielectric properties: relative permittivity, real part	Solid materials, liquid materials	Direct	1	100				1	1E-02	2	95%	Yes		Approved on 18 October 2004	EM-35
Dielectric properties: dielectric loss tangent, tanδ	Solid materials, liquid materials	Direct	0.0001	10				1	1E-02	2	95%	Yes		Approved on 18 October 2004	EM-36
AC resistance: real component	Fixed resistor	Quadrature bridge	1	10	kΩ	Resistance	10 kΩ, 1 kΩ	1	μΩ/Ω	2	95%	Yes		Approved on 18 October 2004	EM-37
						Frequency	1592 Hz								
AC resistance: meter	LCR meter	Comparison	1	1E+04	Ω	Resistance	1 Ω, 10 Ω, 100 Ω, 1000 Ω, 10000 Ω	50	μΩ/Ω	2	95%	Yes		Approved on 18 October 2004	EM-38
						Frequency	60 Hz to 10 kHz								
AC resistance: meter	LCR meter	Comparison	1E+05	1E+06	Ω	Resistance	100 kΩ, 1 MΩ	100	μΩ/Ω	2	95%	Yes		Approved on 18 October 2004	EM-39
						Frequency	60 Hz to 10 kHz								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
AC voltage ratio, attenuation and gain: real component	Inductive voltage divider, voltage transformer, AC bridge standard, attenuator box	Reference potential and direct comparison	1E-08	1	V/V	Frequency	1 kHz	0.02	µV/V	2	95%	No		Approved on 18 October 2004	EM-40
						Voltage	10 V								
AC voltage ratio, attenuation and gain: imaginary component	Inductive voltage divider, voltage transformer, AC bridge standard, attenuator box	Reference potential and direct comparison	1E-08	1	V/V	Frequency	1 kHz	0.5	µrad	2	95%	No		Approved on 18 October 2004	EM-41
						Voltage	10 V								
AC voltage ratio,attenuation and gain: real component	Inductive voltage divider, voltage transformer, AC bridge standard, attenuator box	Reference potential and direct comparison	1E-08	1	V/V	Frequency	10 kHz	1	µV/V	2	95%	No		Approved on 18 October 2004	EM-42
						Voltage	10 V								
AC voltage ratio, attenuation and gain: imaginary component	Inductive voltage divider, voltage transformer, AC bridge standard, attenuator box	Reference potential and direct comparison	1E-08	1	V/V	Frequency	10 kHz	1	µrad	2	95%	No		Approved on 18 October 2004	EM-43
						Voltage	10 V								
AC voltage ratio, attenuation and gain: real component	Inductive voltage divider, voltage transformer, AC bridge standard, attenuator box	Reference potential and direct comparison	1E-08	1	V/V	Frequency	50 Hz	0.1	µV/V	2	95%	No		Approved on 18 October 2004	EM-44
						Voltage	600 V								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
AC voltage ratio, attenuation and gain: imaginary component	Inductive voltage divider, voltage transformer, AC bridge standard, attenuator box	Reference potential and direct comparison	1E-08	1	V/V	Frequency	50 Hz	0.1	µrad	2	95%	No		Approved on 18 October 2004	EM-45
						Voltage	600 V								
AC/DC voltage transfer: AC/DC transfer difference at medium voltages	Thermal voltage converters	Comparison	0.5	1	V	Frequency	10 Hz to 1 MHz	2 to 40	µV/V	2	95%	Yes	Matrix 1	Approved on 18 October 2004	EM-46
AC/DC voltage transfer: AC/DC transfer difference at higher voltages	Thermal voltage converters plus range extenders	Comparison	1	1000	V	Frequency	10 Hz to 1 MHz	2 to 66	µV/V	2	95%	Yes	Matrix 1	Approved on 18 October 2004	EM-47
AC voltage up to 1000 V: sources	Multifunction calibrator	Comparison	0.5	1	V	Frequency	10 Hz to 1 MHz	6 to 120	µV/V	2	95%	Yes	Matrix 2	Approved on 18 October 2004	EM-48
AC voltage up to 1000 V: sources	Multifunction calibrator	Comparison	1	1000	V	Frequency	10 Hz to 1 MHz	6 to 144	µV/V	2	95%	Yes	Matrix 2	Approved on 18 October 2004	EM-49
AC voltage up to 1000 V: meters	AC voltmeter, multimeter, multifunction transfer standard	Comparison	0.5	1	V	Frequency	10 Hz to 1 MHz	6 to 120	µV/V	2	95%	Yes	Matrix 2	Approved on 18 October 2004	EM-50
AC voltage up to 1000 V: meters	AC voltmeter, multimeter, multifunction transfer standard	Comparison	1	1000	V	Frequency	10 Hz to 1 MHz	6 to 144	µV/V	2	95%	Yes	Matrix 2	Approved on 18 October 2004	EM-51
AC/DC current transfer: AC/DC transfer difference	Thermal current converter plus shunt, AC/DC transfer standard plus shunt	Direct comparison	0.01	20	A	Frequency	25 Hz to 100 kHz	10 to 80	µA/A	2	95%	Yes	Matrix 3	Approved on 18 October 2004	EM-52

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
AC current up to 100A: sources	Multifunction calibrator, transconductance amplifier	Direct comparison	0.01	20	A	Frequency	25 Hz to 100 kHz	40 to 240	μA/A	2	95%	Yes	Matrix 4	Approved on 18 October 2004	EM-53
AC current up to 100A: meters	AC ammeter, multimeter, multifunction transfer standard	Direct comparison	0.01	20	A	Frequency	25 Hz to 100 kHz	40 to 240	μA/A	2	95%	Yes	Matrix 4	Approved on 18 October 2004	EM-54
AC power and energy: single phase power (*f* <= 400Hz)	Power meter, energy meter, power converter, wattmeter	AC/DC power/energy comparison	0	40000	W	Frequency	45 Hz to 65 Hz	15	μW/W or μJ/J	3	99%	Yes		Approved on 18 October 2004	EM-55
						Voltage	60 V to 400 V								
						Current	0.5 A to 100 A								
						Power factor: cos ϕ	0.0 lead and lag, 0.5 lead and lag, 0.866 lead and lag, 1.0								
AC power and energy: three phase	Power meter, energy meter, power comparator	Comparison	15	40000	W	Frequency	45 Hz to 65 Hz	33	μW/W or μJ/J	3	99%	Yes		Approved on 18 October 2004 This is the smallest possible uncertainty value achievable for a nearly ideal DUT no more than 24 hours after the calibration of the working standards	EM-56

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
						Voltage	60 V to 400 V								
						Current	0.5 A to 100 A								
						Power factor: cos ϕ	0.5 lead and lag, 0.866 lead and lag, 1.0								
Magnetic fields below 50 kHz: DC magnetic flux density and applied magnetic field strength	Magnetic flux density meter, magnetic field strength meter	Hall effect, NMR	0.03	0.1	mT	Stability of magnetic field	0.1 nT	0.6	nT	2	95%	No		Approved on 18 October 2004	EM-57
Magnetic fields below 50 kHz: DC magnetic flux density and applied magnetic field strength	Magnetic flux density meter, magnetic field strength meter	Fluxgate, NMR, AMR	100	1E+05	nT	Stability of magnetic field	0.1 nT	3	nT	2	95%	No		Approved on 18 October 2004	EM-58
Magnetic fields below 50 kHz: DC magnetic flux density and applied magnetic field strength	Magnetic flux density meter, magnetic field strength meter	Hall effect, NMR	0.1	50	mT	Stability of magnetic field	5 µT	6	µT	2	95%	No		Approved on 18 October 2004	EM-59
Magnetic fields below 50 kHz: DC magnetic flux density and applied magnetic field strength	Magnetic flux density meter, magnetic field strength meter	Hall effect and NMR	0.05	1.5	T	Stability of magnetic field	15 µT	30	µT/T	2	95%	Yes		Approved on 18 October 2004	EM-60

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Magnetic fields below 50 kHz: AC magnetic flux density and applied magnetic field strength	Magnetic flux density meter, magnetic field strength meter	Electromagnetic induction	0.01	1	mT	Stability of magnetic field	10 nT	4	mT/T	2	95%	Yes		Approved on 18 October 2004	EM-61
						Frequency	10 Hz to 50 Hz								
Magnetic field below 50 kHz: magnetic flux	Flux meter, flux etalon	Integration	10	1000	mWb	Stability of current	0.0001	2 to 5	mWb/Wb	3	99%	Yes		Approved on 18 October 2004	EM-62
Inductance: mutual inductance	Fixed mutual inductance	Bridge comparison	0.1	100	mH	Stability of current	0.0001	0.1 to 5	mH/H	3	99%	Yes		Approved on 18 October 2004	EM-63
Magnetic field below 50 kHz: turn area	Pick-up coil	Standard coil calculation	100	1E+05	cm^2	Stability of current	0.0001	2 to 5	1E-03	3	99%	Yes		Approved on 18 October 2004	EM-64
Soft magnetic sheet and powder material: specific total power loss	Epstein, ring and single sheet sample	Epstein frame	0.1	30	W/kg	Peak magnetic polarisation	0 T to 2 T	15	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-65
Soft magnetic sheet and powder material: peak value of DC magnetic polarisation	Epstein, ring	Epstein frame	0.1	2	T	Peak magnetic field strength	0 A/m to 10000 A/m	10	mT/T	2	95%	Yes		Approved on 18 October 2004	EM-66
Soft magnetic sheet and powder material: peak value of AC magnetic polarisation	Epstein, ring and single sheet sample	Epstein frame	0.1	2	T	Peak magnetic field strength	0 A/m to 10000 A/m	10	mT/T	2	95%	Yes		Approved on 18 October 2004	EM-67

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Soft magnetic sheet and powder material: peak value of magnetic strength	Epstein, ring and single sheet sample	Epstein frame	1	10000	A/m	Peak magnetic polarisation	0 T to 2 T	20	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-68
Soft magnetic sheet and powder material: RMS value of magnetic field strength	Epstein	Epstein frame	1	10000	A/m	Peak magnetic polarisation	0 T to 2 T	20	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-69
Soft magnetic sheet and powder material: specific apparent power	Epstein, ring and single sheet sample	Epstein frame	0.1	200	VA/kg	Peak magnetic polarisation	0 T to 2 T	50	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-70
Soft magnetic sheet and powder material: peak permeability	Ring	Epstein frame	0.0001	2	H/m	Peak magnetic field strength	0 A/m to 10000 A/m	20	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-71
Soft magnetic sheet material: density	Epstein and single sheet sample	Balance	6500	7800	kg/m^3			10	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-72
Soft magnetic bulk material: magnetic polarisation	Rod, cylinder	Solenoid, electromagnet	0.01	2.5	T	Magnetic field strength	0 A/m to 100000 A/m	10	mT/T	2	95%	Yes		Approved on 18 October 2004	EM-73
Soft magnetic bulk material: magnetic field strength	Rod, cylinder	Solenoid, electromagnet	100	3000	A/m	Magnetic polarisation	0 T to 2.5 T	10	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-74
Soft magnetic bulk material: remanent magnetic flux density	Rod, cylinder	Solenoid, electromagnet	0.01	2	T	Magnetic field strength	0 A/m	10	mT/T	2	95%	Yes		Approved on 18 October 2004	EM-75

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Soft magnetic bulk material: coercive magnetic field strength	Rod, cylinder	Solenoid, electromagnet	0.1	1000	A/m	Magnetic flux density	0 T	10	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-76
Soft magnetic bulk material: magnetic saturation polarisation	Rod, cylinder	Solenoid, electromagnet	0.01	2.5	T	Magnetic field strength	up to 100000 A/m	10	mT/T	2	95%	Yes		Approved on 18 October 2004	EM-77
Soft magnetic bulk material: permeability	Rod, cylinder	Solenoid, electromagnet	0.0001	2	H/m	Inductance	0 A/m to 100000 A/m	20	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-78
Feebly magnetic, paramagnetic and diamagnetic material: DC magnetic susceptibility or relative permeability	Rod, cylinder	Electromagnet	0.99	1.01				5	1E-03	2	95%	No		Approved on 18 October 2004	EM-79
Hard magnetic material: remanent magnetic flux density	Cylinder, rectangular parallelepiped	Electromagnet	0.1	1.6	T	Magnetic field strength	0 A/m	10	mT/T	2	95%	Yes		Approved on 18 October 2004	EM-80
Hard magnetic material: coercive field strength (H_{CB}, H_{CJ})	Cylinder, rectangular parallelepiped	Electromagnet	500	2E+06	A/m	Magnetic flux density	0 T	10	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-81
Hard magnetic material: maximum energy product $(B{\cdot}H)_{max}$	Cylinder, rectangular parallelepiped	Electromagnet	50	500	kJ/m^3			25	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-82

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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?	Matrix uncertainty	Comments	NMI Service Identifier
Hard magnetic material: magnetic flux density	Cylinder, rectangular parallelepiped	Electromagnet	0.1	2.5	T	Maximum magnetic field strength of applied field	3000000 A/m	10	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-83
Hard magnetic material: magnetic polarisation	Cylinder, rectangular parallelepiped	Electromagnet	0.1	1.6	T	Maximum magnetic field strength of applied field	3000000 A/m	10	1E-03	2	95%	Yes		Approved on 18 October 2004	EM-84
Magnetic data storage media: reference field of diskette	Diskette		50	200	% (reference: master standard)			5	%	2	95%	No		Approved on 18 October 2004	EM-85
Magnetic data storage media: signal amplitude of diskette	Diskette		50	200	% (reference: master standard)			5	%	2	95%	No		Approved on 18 October 2004	EM-86
Magnetic data storage media: resolution of diskette	Diskette		50	200	% (reference: master standard)			10	%	2	95%	No		Approved on 18 October 2004	EM-87
Magnetic data storage media: peak shift of diskette	Diskette		50	200	% (reference: master standard)			4 for side (0), 8 for side (1)	%	2	95%	No		Approved on 18 October 2004	EM-88
Magnetic data storage media: overwrite of diskette	Diskette		50	200	% (reference: master standard)			15	%	2	95%	No		Approved on 18 October 2004	EM-89
Magnetic video storage media: RF recording current	VHS video cassette tape		0.35	0.7	Vp-p			5	%	2	95%	Yes		Approved on 18 October 2004	EM-90

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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?	Matrix uncertainty	Comments	NMI Service Identifier
Magnetic video storage media: RF playback output	VHS video cassette tape		-60	50	dB			0.5	dB (reference: standard tape)	2	95%	No		Approved on 18 October 2004	EM-91
Magnetic video storage media: video S/N	VHS video cassette tape		-60	-7	dB			0.5	dB (reference: standard tape)	2	95%	No		Approved on 18 October 2004	EM-92
Magnetic video storage media: drop-out	VHS video cassette tape		-24	-10	dB	Time width	0.5 µs to 50 µs	0.5	dB	2	95%	No		Approved on 18 October 2004	EM-93
Magnetic video storage media: audio sensitivity	VHS cassette tape		-10	10	dB			0.5	dB (reference: standard tape)	2	95%	No		Approved on 18 October 2004	EM-94
Magnetic video storage media: audio frequency response	VHS cassette tape		20	20000	Hz			0.5	dB (reference: standard tape)	2	95%	No		Approved on 18 October 2004	EM-95
Magnetic video storage media: output uniformity	VHS cassette tape		0	10	dB			0.5	dB	2	95%	No		Approved on 18 October 2004	EM-96
Phase angle: sources	Phase source	Phase meter	0	360	°	Frequency	45 Hz to 55 Hz	0.03	°	2	95%	No		Approved on 18 October 2004	RF-1
						Voltage	5 V to 500 V								
						Current	0.1 A to 10 A								
Phase angle: meters	Phase meter	Comparison	0	360	°	Frequency	45 Hz to 55 Hz	0.03	°	2	95%	No		Approved on 18 October 2004	RF-2
						Voltage	5 V to 500 V								
						Current	0.1 A to 10 A								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Phase angle: sources	Phase source	Phase meter	0	360	°	Frequency	5 Hz to 10 kHz	0.07	°	2	95%	No		Approved on 18 October 2004	RF-3
						Magnitude	80 mV to 10 V								
Phase angle: sources	Phase source	Phase meter	0	360	°	Frequency: *f*	10 kHz to 100 kHz	(0.07 + 8E-04*f*), *f* in kHz	°	2	95%	No		Approved on 18 October 2004	RF-4
						Magnitude	80 mV to 10 V								
Phase angle: meters	Phase meter	Comparison	0	360	°	Frequency	5 Hz to 10 kHz	0.07	°	2	95%	No		Approved on 18 October 2004	RF-5
						Magnitude	80 mV to 10 V								
Phase angle: meters	Phase meter	Comparison	0	360	°	Frequency: *f*	10 kHz to 100 kHz	(0.07+ 8E-04*f*), *f* in kHz	°	2	95%	No		Approved on 18 October 2004	RF-6
						Magnitude	80 mV to 10 V								
RF power: calibration factor on coaxials	Power sensor	Substitution	0.9	1		Frequency	10 MHz to 18 GHz	0.01		2	95%	Yes		Approved on 18 October 2004	RF-7
						Power level	1 mW to 10 mW								
						Connector type	type-N								
RF power: calibration factor on coaxials	Power sensor	Substitution	0.9	1		Frequency	10 MHz to 8 GHz	0.01		2	95%	Yes		Approved on 18 October 2004	RF-8
						Power level	1 mW to 10 mW								
						Connector type	GR900								
RF power: calibration factor on waveguides	Power sensor	Substitution	0.9	1		Frequency	8.2 GHz, 8.6 GHz, 9.37 GHz, 10 GHz, 11 GHz, 12.4 GHz	0.01		2	95%	Yes		Approved on 18 October 2004	RF-9
						Power level	1 mW to 10 mW								
						Waveguide designation	R100								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
RF power: calibration factor on waveguides	Power sensor	Substitution	0.9	1		Frequency	26.5 GHz, 33 GHz, 35 GHz, 39 GHz	0.03		2	95%	Yes		Approved on 18 October 2004	RF-10
						Power level	10 mW								
						Waveguide designation	R320								
Scalar RF reflection coefficient and attenuation: attenuation on coaxials	Passive device: *a*	Voltage ratio	0.01	40	dB	Frequency	10 kHz	(2E-03 + 1E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-11
						Reflection coefficient	<= 0.005								
						Impedance	50 Ω, 75 Ω								
Scalar RF reflection coefficient and attenuation: attenuation on coaxials	Passive device: *a*	Voltage ratio	> 40	60	dB	Frequency	10 kHz	(2E-03 + 2E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-12
						Reflection coefficient	<= 0.005								
						Impedance	50 Ω, 75 Ω								
Scalar RF reflection coefficient and attenuation: attenuation on coaxials	Passive device: *a*	Voltage ratio	> 60	80	dB	Frequency	10 kHz	(2E-03 + 3E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-13
						Reflection coefficient	<= 0.005								
						Impedance	50 Ω, 75 Ω								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Scalar RF reflection coefficient and attenuation: attenuation on coaxials	Passive device: *a*	Voltage ratio	0.01	40	dB	Frequency	100 kHz to 18 GHz	(2E-03 + 1E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-14
						Reflection coefficient	<= 0.005								
						Impedance	50 Ω								
Scalar RF reflection coefficient and attenuation: attenuation on coaxials	Passive device: *a*	Voltage ratio	> 40	60	dB	Frequency	100 kHz to 18 GHz	(2E-03 + 2E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-15
						Reflection coefficient	<= 0.005								
						Impedance	50 Ω								
Scalar RF reflection coefficient and attenuation: attenuation on coaxials	Passive device: *a*	Voltage ratio	> 60	80	dB	Frequency	100 kHz to 18 GHz	(2E-03 + 3E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-16
						Reflection coefficient	<= 0.005								
						Impedance	50 Ω								
Scalar RF reflection coefficient and attenuation: attenuation on waveguides	Passive device: *a*	Voltage ratio	0.01	40	dB	Frequency	3.95 GHz to 5.85 GHz	(2E-03 + 1E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-17

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
						Reflection coefficient	<= 0.005								
						Waveguide designation	R48								
Scalar RF reflection coefficient and attenuation: attenuation on waveguides	Passive device: *a*	Voltage ratio	> 40	60	dB	Frequency	3.95 GHz to 5.85 GHz	(2E-03 + 2E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-18
						Reflection coefficient	<= 0.005								
						Waveguide designation	R48								
Scalar RF reflection coefficient and attenuation: attenuation on waveguides	Passive device: *a*	Voltage ratio	> 60	80	dB	Frequency	3.95 GHz to 5.85 GHz	(2E-03 + 3E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-19
						Reflection coefficient	<= 0.005								
						Waveguide designation	R48								
Scalar RF reflection coefficient and attenuation: attenuation on waveguides	Passive device: *a*	Voltage ratio	0.01	40	dB	Frequency	8.2 GHz to 12.4 GHz	(2E-03 + 1E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-20
						Reflection coefficient	<= 0.005								
						Waveguide designation	R100								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Scalar RF reflection coefficient and attenuation: attenuation on waveguides	Passive device: *a*	Voltage ratio	> 40	60	dB	Frequency	8.2 GHz to 12.4 GHz	(2E-03 + 2E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-21
						Reflection coefficient	<= 0.005								
						Waveguide designation	R100								
Scalar RF reflection coefficient and attenuation: attenuation on waveguides	Passive device: *a*	Voltage ratio	> 60	80	dB	Frequency	8.2 GHz to 12.4 GHz	(2E-03 + 3E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-22
						Reflection coefficient	<= 0.005								
						Waveguide designation	R100								
Scalar RF reflection coefficient and attenuation: attenuation on waveguides	Passive device: *a*	Voltage ratio	0.01	40	dB	Frequency	12.4 GHz to 18 GHz	(2E-03 + 1E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-23
						Reflection coefficient	<= 0.005								
						Waveguide designation	R140								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Scalar RF reflection coefficient and attenuation: attenuation on waveguides	Passive device: *a*	Voltage ratio	> 40	60	dB	Frequency	12.4 GHz to 18 GHz	(2E-03 + 2E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-24
						Reflection coefficient	<= 0.005								
						Waveguide designation	R140								
Scalar RF reflection coefficient and attenuation: attenuation on waveguides	Passive device: *a*	Voltage ratio	> 60	80	dB	Frequency	12.4 GHz to 18 GHz	(2E-03 + 3E-04*a*), *a* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-25
						Reflection coefficient	<= 0.005								
						Waveguide designation	R140								
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, magnitude	Passive device, one port and two port device	Network analyser	0	1		Frequency	50 MHz to 18 GHz	0.006		2	95%	No		Approved on 18 October 2004	RF-26
						Connector type	type-N, PC7								
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, phase	Passive device, one port and two port device	Network analyser	-180	180	°	Frequency	50 MHz to 18 GHz	arcsin(u(Γ) /Γ)	°	2	95%	No		Approved on 18 October 2004	RF-27

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
						Connector type	type-N, PC7								
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, magnitude	Passive device, one port and two port device	Network analyser	0	1		Frequency	50 MHz to 26.5 GHz	0.004		2	95%	No		Approved on 18 October 2004	RF-28
						Connector type	PC-3.5								
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, phase	Passive device, one port and two port device	Network analyser	-180	180	°	Frequency	50 MHz to 26.5 GHz	$\arcsin(u(\Gamma)/\Gamma)$	°	2	95%	No		Approved on 18 October 2004	RF-29
						Connector type	PC-3.5								
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, magnitude	Passive device, two port device: *A*	Network analyser	> 0	50	dB	Frequency	50 MHz to 18 GHz	(0.02 + 1.5E-03*A*), *A* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-30
						Connector type	type-N, PC7								
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, phase	Passive device, two port device	Network analyser	-180	180	°	Frequency	50 MHz to 18 GHz	(0.15 + 0.01*A*), *A* in dB	°	2	95%	No		Approved on 18 October 2004	RF-31
						Connector type	type-N, PC7								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, magnitude	Passive device, two port device: *A*	Network analyser	> 0	50	dB	Frequency	50 MHz to 26.5 GHz	(0.02 + 1.5E-03*A*), *A* in dB	dB	2	95%	No		Approved on 18 October 2004	RF-32
						Connector type	PC-3.5								
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, phase	Passive device, two port device	Network analyser	-180	180	°	Frequency	50 MHz to 26.5 GHz	(0.15 + 0.01*A*), *A* in dB	°	2	95%	No		Approved on 18 October 2004	RF-33
						Connector type	PC-3.5								
Scattering parameters: reflection coefficient (Sii) on waveguides, magnitude	Passive device, one port and two port device: *Γ*	Dual six-port	0.0005	1		Frequency	26.5 GHz to 40 GHz	(2 + *Γ*) * 1E-03		2	95%	No		Approved on 18 October 2004	RF-34
						Waveguide designation	R320								
Scattering parameters: reflection coefficient (Sii) on waveguides, phase	Passive device, one port and two port device	Dual six-port	0	360	°	Frequency	26.5 GHz to 40 GHz	(0.3 + 0.1/*Γ*)	°	2	95%	No		Approved on 18 October 2004	RF-35
						Waveguide designation	R320								
						Voltage reflection coefficient *Γ*	0.0005 to 1								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Scattering parameters: transmission coefficient (Sij) on waveguides, magnitude	Passive device, two port device	Dual six-port	> 0	60	dB	Frequency	26.5 GHz to 40 GHz	0.002		2	95%	Yes		Approved on 18 October 2004	RF-36
						Waveguide designation	R320								
Scattering parameters: transmission coefficient (Sij) on waveguides, phase	Passive device, two port device	Dual six-port	0	360	°	Frequency	26.5 GHz to 40 GHz	0.4	°	2	95%	No		Approved on 18 October 2004	RF-37
						Waveguide designation	R320								
Noise: excess ratio in coaxials	Noise source	Radiometer	1	20	dB	Frequency	500 MHz to 1000 MHz	0.1	dB	2	95%	No		Approved on 18 October 2004	RF-38
						Connector	PC7								
Noise: excess ratio in coaxials	Noise source	Radiometer	2	20	dB	Frequency	10 MHz to 500 MHz	0.2	dB	2	95%	No		Approved on 18 October 2004	RF-39
						Connector	PC7								
Noise: excess ratio in coaxials	Noise source	Radiometer	2	20	dB	Frequency	1 GHz to 18 GHz	0.2	dB	2	95%	No		Approved on 18 October 2004	RF-40
						Connector	PC7								
Noise: excess ratio in waveguides	Noise source	Radiometer	-5	30	dB	Frequency	3.2 GHz to 4.9 GHz	0.06	dB	2	95%	No		Approved on 18 October 2004	RF-41
						Waveguide designation	R40								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Noise: excess ratio in waveguides	Noise source	Radiometer	-5	30	dB	Frequency	3.9 GHz to 6.9 GHz	0.06	dB	2	95%	No		Approved on 18 October 2004	RF-42
						Waveguide designation	R48								
Noise: excess ratio in waveguides	Noise source	Radiometer	-5	30	dB	Frequency	8.2 GHz to 12.4 GHz	0.06	dB	2	95%	No		Approved on 18 October 2004	RF-43
						Waveguide designation	R100								
Noise: phase noise	High stability crystal oscillator, atomic frequency standard	Phase detector	-165	0	dBc/Hz	Frequency	5 MHz, 10 MHz	2	dB	2	95%	No		Approved on 18 October 2004	RF-45
						Offset frequency	10 kHz								
Noise: phase noise	Frequency synthesizer	Phase detector	-135	0	dBc/Hz	Frequency	50 kHz to 639.9 MHz	2	dB	2	95%	No		Approved on 18 October 2004	RF-46
						Offset frequency	10 kHz								
Noise: phase noise	Frequency synthesizer	Phase detector	-118	0	dBc/Hz	Frequency	640 MHz to 18 GHz	2	dB	2	95%	No		Approved on 18 October 2004	RF-50
						Offset frequency	10 kHz								
Signal and pulse characteristics: pulse amplitude *U*	Pulse generator	Time domain sampling	-0.5	0.5	V	Time	10 ps to 100 ns	(7E-03*U* + 2E-03), *U* in V	V	2	95%	No		Approved on 18 October 2004	RF-55
						Maximum input voltage	2 V								
						Impedance	50 Ω								

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Signal and pulse characteristics: pulse amplitude *U*	Pulse generator or function generator	DC/AC direct	10	200	V	Square wave frequency	10 Hz to 1 kHz	(5E-04*U* + 5E-03), *U* in V	V	2	95%	No		Approved on 18 October 2004	RF-57
						Impedance	1 MΩ								
Signal and pulse characteristics: pulse amplitude *U*	Pulse generator or function generator	DC/AC direct	0.01	10	V	Square wave frequency	10 Hz to 1 kHz	(5E-04*U* + 5E-04), *U* in V	V	2	95%	No		Approved on 18 October 2004	RF-58
						Impedance	1 MΩ								
Signal and pulse characteristics: pulse amplitude	Pulse generator or function generator	DC/AC direct	-10	-200	V	Square wave frequency	10 Hz to 1 kHz	(5E-04*U* + 5E-03), *U* absolute value of the pulse amplitude in V	V	2	95%	No		Approved on 18 October 2004	RF-59
						Impedance	1 MΩ								
Signal and pulse characteristics: pulse amplitude	Pulse generator or function generator	DC/AC direct	-0.01	-10	V	Square wave frequency	10 Hz to 1 kHz	(5E-04*U* + 5E-04), *U* absolute value of the pulse amplitude in V	V	2	95%	No		Approved on 18 October 2004	RF-60
						Impedance	1 MΩ								
RF voltage and current: RF voltage meters	RF voltmeter	Direct	0.2	2	V	Frequency	10 MHz to 1 GHz	2	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-62
RF voltage and current: RF voltage meters	RF voltmeter	Direct	0.2	2	V	Frequency	1 GHz to 2 GHz	4	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-63

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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?	Matrix uncertainty	Comments	NMI Service Identifier
RF voltage and current: RF voltage meters	RF meter	Direct	0.2	2	V	Frequency	2 GHz to 3 GHz	7	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-64
RF voltage and current: RF/DC difference	Thermal voltage converter: RF coaxial thermal voltage converter	Direct	0.1	3	V	Frequency	30 MHz to 1 GHz	5	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-65
RF voltage and current: RF/DC difference	Thermal voltage converter: RF coaxial thermal voltage converter	Direct	3	10	V	Frequency	30 MHz to 1 GHz	10	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-66
RF voltage and current: RF/DC difference	Thermal voltage converter: RF micropotentiometer	Direct	100	100	mV	Frequency	30 MHz to 1 GHz	5	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-67
RF voltage and current: RF/DC difference	Thermal voltage converter: RF micropotentiometer	Substitution	10	100	mV	Frequency	30 MHz to 1 GHz	10	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-68
RF voltage and current: RF/DC difference	Thermal voltage converter: RF micropotentiometer	Substitution	10	100	mV	Frequency	1 MHz to 30 MHz	2	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-69
RF voltage and current: RF/DC difference	Thermal voltage converter: RF micropotentiometer	Substitution	1	10	mV	Frequency	30 MHz to 1 GHz	12	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-70
RF voltage and current: RF/DC difference	Thermal voltage converter: RF micropotentiometer	Substitution	1	10	mV	Frequency	1 MHz to 30 MHz	3	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-71

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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?	Matrix uncertainty	Comments	NMI Service Identifier
RF voltage and current: RF/DC difference	Thermal voltage converter: RF micropotentiometer	Substitution	0.1	1	mV	Frequency	30 MHz to 1 GHz	15	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-72
RF voltage and current: RF/DC difference	Thermal voltage converter: RF micropotentiometer	Substitution	0.1	1	mV	Frequency	1 MHz to 30 MHz	5	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-73
RF voltage and current: RF/DC difference	Thermal voltage converter: RF micropotentiometer	Substitution	0.01	0.1	mV	Frequency	30 MHz to 1 GHz	20	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-74
RF voltage and current: RF/DC difference	Thermal voltage converter: RF micropotentiometer	Substitution	0.01	0.1	mV	Frequency	1 MHz to 30 MHz	10	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-75
RF voltage and current: RF/DC difference	Thermal voltage converter: RF micropotentiometer	Substitution	0.001	0.01	mV	Frequency	30 MHz to 1 GHz	30	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-76
RF voltage and current: RF/DC difference	Thermal voltage converter: RF micropotentiometer	Substitution	0.001	0.01	mV	Frequency	1 MHz to 30 MHz	20	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-77
RF voltage and current: RF voltage sources	RF source: RF voltage standard	Substitution	0.1	2	V	Frequency	10 MHz to 1 GHz	4	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-78
RF voltage and current: RF voltage sources	RF source: RF voltage standard	Substitution	0.1	2	V	Frequency	1 GHz to 2 GHz	8	mV/V	2	95%	Yes		Approved on 18 October 2004	RF-79

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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?**	**Matrix uncertainty**	**Comments**	**NMI Service Identifier**
Lumped impendance/admittance: resistance: real component	Fixed resistor	LCR meter	1	100000	Ω	Resistance	0.1 Ω, 1 Ω, 10 Ω, 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ	0.001 to 0.016		2	95%	Yes	HF-Impedance-Matrix1	Approved on 18 October 2004	RF-80
						Frequency	50 kHz to 30 MHz								
Lumped impendance/admittance: resistance: meters	LCR meter	Standard resistors	1	100000	Ω	Resistance	0.1 Ω, 1 Ω, 10 Ω, 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ	0.001 to 0.016		2	95%	Yes	HF-Impedance-Matrix1	Approved on 18 October 2004	RF-81
						Frequency	50 kHz to 30 MHz								
Lumped impendance/admittance: inductance	Fixed inductor	LCR meter	0.001	100	mH	Frequency	50 kHz to 1.5 MHz	0.001 to 0.016		2	95%	Yes	HF-Impedance-Matrix2	Approved on 18 October 2004	RF-82
Lumped impendance/admittance: inductance, meters	LCR meter	Standard inductors	0.001	100	mH	Frequency	50 kHz to 1.5 MHz	0.001 to 0.016		2	95%	Yes	HF-Impedance-Matrix2	Approved on 18 October 2004	RF-84
Lumped impendance/admittance: capacitance	Standard capacitor	LCR meter	1	1E+06	pF	Capacitance	1 pF, 10 pF, 100 pF, 1 nF, 10 nF, 100 nF, 1 μF	0.001 to 0.016		2	95%	Yes	HF-Impedance-Matrix3	Approved on 18 October 2004	RF-85
						Frequency	50 kHz to 30 MHz								
Lumped impendance/admittance: capacitance, meters	LCR meter	Standard capacitors	1	1E+06	pF	Capacitance	1 pF, 10 pF, 100 pF, 1 nF, 10 nF, 100 nF, 1 μF	0.001 to 0.016		2	95%	Yes	HF-Impedance-Matrix3	Approved on 18 October 2004	RF-86
						Frequency	50 kHz to 30 MHz								

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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?	Matrix uncertainty	Comments	NMI Service Identifier
Antenna properties: antenna factor	Dipole antenna	3-antenna method	-10	30	dB/m	Frequency	80 MHz to 1000 MHz	0.7	dB	2	95%	No		Approved on 18 October 2004	RF-90
						Polarization	horizontal								
Antenna properties: antenna factor	Biconical antenna	3-antenna method	5	30	dB/m	Frequency	20 MHz to 200 MHz	1.4	dB	2	95%	No		Approved on 18 October 2004	RF-91
						Polarization	horizontal								
Antenna properties: antenna factor	LOG Periodic antenna	3-antenna method	5	30	dB/m	Frequency	200 MHz to 1000 MHz	1.2	dB	2	95%	No		Approved on 18 October 2004	RF-92
						Polarization	horizontal								
Antenna properties: antenna gain	Dipole antenna	3-antenna method	0	5	dB	Frequency	80 MHz to 1000 MHz	1.4	dB	2	95%	No		Approved on 18 October 2004	RF-93
						Polarization	horizontal								
Antenna properties: antenna gain	Biconical antenna	3-antenna method	5	20	dB	Frequency	20 MHz to 200 MHz	2.8	dB	2	95%	No		Approved on 18 October 2004	RF-94
						Polarization	horizontal								
Antenna properties: antenna gain	LOG periodic antenna	3-antenna method	5	20	dB	Frequency	200 MHz to 1000 MHz	2.4	dB	2	95%	No		Approved on 18 October 2004	RF-95
						Polarization	horizontal								

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Uncertainty matrix: Matrix 1

AC/DC voltage transfer. Internal identifier: 46 & 47

	10 Hz	60 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz	500 kHz	1 MHz
500 mV	10	5	5	5	6	7	8	20	40
1 V	8	3	2	2	3	5	5	15	35
2 V	13	4	2	2	3	5	6	17	37
3 V	15	5	2	2	3	6	8	20	40
5 V	17	7	3	3	5	8	10	25	43
10 V	19	9	5	5	6	8	11	28	46
20 V	22	11	7	7	8	9	13	31	48
30 V	23	13	9	9	9	10	14	-	-
50 V	26	16	10	10	10	11	15	-	-
100 V	28	17	12	12	12	12	16	-	-
200 V	30	19	14	14	14	22	24	-	-
300 V	32	22	17	17	17	28	30	-	-
500 V	-	26	21	21	23	32	44	-	-
1000 V	-	30	27	27	32	50	66	-	-

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

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Uncertainty matrix: Matrix 2

AC voltage up to 1000 V. Internal identifier: 48, 49, 50 & 51

	10 Hz	60 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz	500 kHz	1 MHz
500 mV	20	15	15	15	18	21	24	60	120
1 V	16	9	6	6	9	10	10	45	105
2 V	26	12	6	6	9	10	12	51	111
3 V	30	15	6	6	9	12	16	60	120
5 V	34	16	9	9	12	14	18	75	129
10 V	38	17	10	10	13	16	20	84	138
20 V	44	18	11	11	13	18	22	93	144
30 V	43	20	14	14	14	20	25	-	-
50 V	52	24	15	15	15	24	28	-	-
100 V	56	26	18	18	18	28	32	-	-
200 V	60	29	21	21	21	33	36	-	-
300 V	64	33	26	26	26	42	45	-	-
500 V	-	39	32	32	35	48	66	-	-
1000 V	-	45	41	41	48	75	99	-	-

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

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Uncertainty matrix: Matrix 3

AC/DC current transfer. Internal identifier: 52

	25 Hz	60 Hz	1 kHz	5 kHz	10 kHz	20 kHz	50 kHz	100 kHz
10 mA	25	10	10	10	10	15	20	30
20 mA	30	20	20	20	20	30	40	60
30 mA	35	20	20	20	20	40	60	80
50 mA	40	20	20	20	20	-	-	-
100 mA	45	20	20	20	20	-	-	-
200 mA	50	20	20	20	20	-	-	-
300 mA	60	20	20	20	20	-	-	-
500 mA	-	20	20	20	20	-	-	-
1 A	-	20	20	20	20	-	-	-
2 A	-	20	20	20	20	-	-	-
3 A	-	20	20	20	20	-	-	-
5 A	-	20	20	20	20	-	-	-
10 A	-	20	20	20	20	-	-	-
20 A	-	40	40	40	50	-	-	-

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

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Uncertainty matrix: Matrix 4

AC current up to 100 A. Internal identifier: 53 & 54

	25 Hz	60 Hz	1 kHz	5 kHz	10 kHz	20 kHz	50 kHz	100 kHz
10 mA	100	40	40	40	40	60	80	120
20 mA	90	60	60	60	60	90	120	180
30 mA	105	60	60	60	60	120	180	240
50 mA	120	60	60	60	60	-	-	-
100 mA	135	60	60	60	60	-	-	-
200 mA	150	60	60	60	60	-	-	-
300 mA	180	60	60	60	60	-	-	-
500 mA	-	60	60	60	60	-	-	-
1 A	-	60	60	60	60	-	-	-
2 A	-	60	60	60	60	-	-	-
3 A	-	60	60	60	60	-	-	-
5 A	-	60	60	60	60	-	-	-
10 A	-	60	60	60	60	-	-	-
20 A	-	100	100	100	120	-	-	-

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

Electricity and Magnetism, China, NIM (National Institute of Metrology)

Uncertainty matrix: HF-Impedance-Matrix1

Lumped impedance/admittance: resistance. Internal identifier: 80 & 81

	0.1 Ω	1 Ω	10 Ω	100 Ω	1 kΩ	10 kΩ	100 kΩ
0.05 MHz	0.016	0.002	0.001	0.001	0.001	0.001	0.002
0.1 MHz	0.008	0.001	0.001	0.001	0.001	0.001	0.003
1 MHz	0.002	0.002	0.002	0.002	-	-	-
10 MHz	0.006	0.006	0.006	0.006	-	-	-
30 MHz	0.013	0.012	0.012	0.012	-	-	-

The expanded uncertainties given in this table are dimensionless.

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Uncertainty matrix: HF-Impedance-Matrix2

Lumped impedance/admittance: inductance. Internal identifier: 82 & 84

	0.000001 H	0.00001 H	0.0001 H	0.001 H	0.01 H	0.1 H
0.05 MHz	0.016	0.002	0.001	0.001	0.001	0.001
0.1 MHz	0.008	0.001	0.001	0.001	0.001	0.001
1 MHz	0.002	0.002	0.002	0.002	0.002	0.006
1.5 MHz	0.006	0.006	0.006	0.006	0.011	-

The expanded uncertainties given in this table are dimensionless.

Electricity and Magnetism, China, NIM (National Institute of Metrology)

Uncertainty matrix: HF-Impedance-Matrix3

Lumped impedance/admittance: capacitance. Internal identifier: 85 & 86

	1 pF	10 pF	100 pF	1000 pF	10000 pF	100000 pF	1000000 pF
0.05 MHz	0.016	0.002	0.001	0.001	0.001	0.001	0.002
0.1 MHz	0.008	0.001	0.001	0.001	0.001	0.001	0.003
1 MHz	0.002	0.002	0.002	0.002	-	-	-
10 MHz	0.006	0.006	0.006	0.006	-	-	-
30 MHz	0.013	0.012	0.012	0.012	-	-	-

The expanded uncertainties given in this table are dimensionless.