

eughausstrasse 43, 8004 Zuri	ch, Switzerland	HAC-MRA C S S	viss Calibration Service
Accredited by the Swiss Federal The Swiss Accreditation Servic	Office of Metrology and Act te is one of the signatorie	creditation Accreditation No as to the EA	.: 303 108
Client Sporton (Aude	en)	Certificate No: E	01900V2-5d041_Mar08
	CERTIFICATE	E	
Object	D1900V2 - SN: 5	5d041	
Calibration procedure(s)	QA CAL-05.v7 Calibration proce	edure for dipole validation kits	
Calibration date:	March 18, 2008		
Condition of the calibrated item	In Tolerance		
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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



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Schweizerischer Kalibrierdienst Service suisse d'étalonnage

Servizio svizzero di taratura Swiss Calibration Service

Swiss Galibration Service

Accreditation No.: SCS 108

Accredited by the Swiss Federal Office of Metrology and Accreditation The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end
 of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed
 point exactly below the center marking of the flat phantom section, with the arms oriented
 parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole
 positioned under the liquid filled phantom. The impedance stated is transformed from the
 measurement at the SMA connector to the feed point. The Return Loss ensures low
 reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

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Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.2 ± 6 %	1.47 mho/m ± 6 %
Head TSL temperature during test	(21.1 ± 0.2) °C		

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	10.1 mW/g
SAR normalized	normalized to 1W	40.4 mW / g
SAR for nominal Head TSL parameters 1	normalized to 1W	39.5 mW / g ± 17.0 % (k=2)

SAR measured	250 mW input power	5.20 mW / g
SAR normalized	normalized to 1W	20.8 mW / g
SAR for nominal Head TSL parameters 1	·normalized to 1W	20.6 mW / g ± 16.5 % (k=2)

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¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

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Body TSL parameters

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.6 ± 6 %	1.57 mho/m ± 6 %
Body TSL temperature during test	(21.4 ± 0.2) °C		

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SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.4 mW / g
SAR normalized	normalized to 1W	41.6 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	40.1 mW / g ± 17.0 % (k=2)
	condition	
SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Body TSL SAR measured	condition 250 mW input power	5.44 mW / g
SAR averaged over 10 cm ³ (10 g) of Body TSL SAR measured SAR normalized	condition 250 mW input power normalized to 1W	5.44 mW / g 21.8 mW / g

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² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.0 Ω + 5.1 jΩ	
Return Loss	- 24.2 dB	

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.0 Ω + 6.1 jΩ	
Return Loss	- 23.6 dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns	
		_

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 04, 2003

Certificate No: D1900V2-5d041_Mar08

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DASY4 Validation Report for Head TSL

Date/Time: 18.03.2008 12:05:10

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d041

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1 Medium: HSL U10 BB; Medium parameters used: f = 1900 MHz; σ = 1.47 mho/m; ϵ_r = 40.2; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 SN3025; ConvF(4.9, 4.9, 4.9); Calibrated: 01.03.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 03.09.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 91.7 V/m; Power Drift = 0.013 dB Peak SAR (extrapolated) = 19.1 W/kg SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.2 mW/g Maximum value of SAR (measured) = 11.8 mW/g





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Impedance Measurement Plot for Head TSL

DASY4 Validation Report for Body TSL

Date/Time: 14.03.2008 13:22:24

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d041

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1 Medium: MSL U10 BB; Medium parameters used: f = 1900 MHz; σ = 1.57 mho/m; ϵ_r = 51.7; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 SN3025; ConvF(4.5, 4.5, 4.5); Calibrated: 01.03.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 03.09.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 89.7 V/m; Power Drift = 0.004 dB Peak SAR (extrapolated) = 18.6 W/kg SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.44 mW/g Maximum value of SAR (measured) = 12.0 mW/g



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DASY4 Validation Report for Body TSL

Date/Time: 14.03.2008 13:22:24

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d041

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1 Medium: MSL U10 BB; Medium parameters used: f = 1900 MHz; σ = 1.57 mho/m; ϵ_r = 51.7; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 SN3025; ConvF(4.5, 4.5, 4.5); Calibrated: 01.03.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 03.09.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 89.7 V/m; Power Drift = 0.004 dB Peak SAR (extrapolated) = 18.6 W/kg SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.44 mW/g Maximum value of SAR (measured) = 12.0 mW/g



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S Schweizerischer Kalibrierdienst Service suisse d'étalonnage С Servizio svizzero di taratura S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates Accreditation No.: SCS 108

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CALIBRATION CI	ERTIFICATE	and the second second	
Object	DAE3 - SD 000 D	03 AA - SN: 577	
Calibration procedure(s)	QA CAL-06.v12 Calibration proceed	lure for the data acquisition	electronics (DAE)
Calibration date:	November 12, 200	08	
Condition of the calibrated item	In Tolerance		
The measurements and the uncerta All calibrations have been conducte Calibration Equipment used (M&TE	ainties with confidence pro of in the closed laboratory critical for calibration)	obability are given on the following pag	es and are part of the certificate. ± 3)°C and humidity < 70%.
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
luke Process Calibrator Type 702 (eithley Multimeter Type 2001	SN: 6295803 SN: 0810278	30-Sep-08 (No: 7673) 30-Sep-08 (No: 7670)	Sep-09 Sep-09
Secondary Standards	ID#	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	06-Jun-08 (in house check)	In house check: Jun-09
	Name	Function	Signature
Calibrated by:	Andrea Guntli	Technician	ASHUM
Calibrated by: Approved by:	Andrea Guntli Fin Bomholt	Technician R&D Director	iv. Roume
Calibrated by: Approved by:	Andrea Guntli Fin Bomholt	Technician R&D Director	Issued: November 12, 2008

Calibration Laboratory of Schmid & Partner **Engineering AG** Zeughausstrasse 43, 8004 Zurich, Switzerland



SWISS

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Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary

DAE

data acquisition electronics information used in DASY system to align probe sensor X to the robot Connector angle coordinate system.

Methods Applied and Interpretation of Parameters

- DC Voltage Measurement: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- Connector angle: The angle of the connector is assessed measuring the angle . mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a . result from the performance test and require no uncertainty.
 - DC Voltage Measurement Linearity: Verification of the Linearity at +10% and -10% of . the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - Common mode sensitivity: Influence of a positive or negative common mode voltage on the differential measurement.
 - Channel separation: Influence of a voltage on the neighbor channels not subject to an . input voltage.
 - AD Converter Values with inputs shorted: Values on the internal AD converter corresponding to zero input voltage
 - Input Offset Measurement: Output voltage and statistical results over a large number of . zero voltage measurements.
 - Input Offset Current: Typical value for information; Maximum channel input offset . current, not considering the input resistance.
 - Input resistance: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - Low Battery Alarm Voltage: Typical value for information. Below this voltage, a battery alarm signal is generated.
 - Power consumption: Typical value for information. Supply currents in various operating modes.

Certificate No: DAE3-577_Nov08

DC Voltage Measurement

A/D - Converter Resolution nominal

 High Range:
 1LSB =
 6.1μ V,
 full range =
 -100...+300 mV

 Low Range:
 1LSB =
 61nV,
 full range =
 -10...+3mV

 DASY measurement parameters: Auto Zero Time:
 3 sec; Measuring time:
 3 sec

Calibration Factors	x	Y	Z
High Range	404.437 ± 0.1% (k=2)	403.882 ± 0.1% (k=2)	404.321 ± 0.1% (k=2)
Low Range	3.93985 ± 0.7% (k=2)	3.94699 ± 0.7% (k=2)	3.94542 ± 0.7% (k=2)

. .

Connector Angle

Connector Angle to be used in DASY system	268 ° ± 1 °
---	-------------

Certificate No: DAE3-577_Nov08

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Appendix

1. DC Voltage Linearity

High Range	Input (µV)	Reading (µV)	Error (%)
Channel X + Input	200000	200000.5	. 0.00
Channel X + Input	20000	20006.28	0.03
Channel X - Input	20000	-19997.96	-0.01
Channel Y + Input	200000	199999.8	0.00
Channel Y + Input	20000	20003.35	0.02
Channel Y - Input	20000	-20003.31	0.02
Channel Z + Input	200000	200000.3	0.00
Channel Z + Input	20000	20006.28	0.03
Channel Z - Input	20000	-19999.42	0.00

Low Range	Input (μV)	Reading (µV)	Error (%)
Channel X + Inp	ut 2000	2000	0.00
Channel X + Inp	ut 200	200.64	0.32
Channel X - Inpu	it 200	-199.61	-0.19
Channel Y + Inp	ut 2000	2000	0.00
Channel Y + Inp	ut 200	199.39	-0.31
Channel Y - Inpu	it 200	-201.03	0.52
Channel Z + Inp	ut 2000	2000	0.00
Channel Z + Inp	ut 200	199.42	-0.29
Channel Z - Inpu	it 200	-200.73	0.36

2. Common mode sensitivity DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (µV)
Channel X	200	13.38	13.83
	- 200	-13.53	-13.82
Channel Y	200	-5.55	-6.09
	- 200	5.06	5.66
Channel Z	200	-1.00	-0.72
	- 200	-0.80	-0.52

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-	1.66	0.50
Channel Y	200	1.90	-	3.95
Channel Z	200	-0.95	0.48	

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4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15967	16080
Channel Y	15851	16385
Channel Z	16197	16100

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec Input $10 M \Omega$

	Average (µV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (µV)
Channel X	1.13	-1.22	2.29	0.58
Channel Y	-1.51	-2.99	0.83	0.52
Channel Z	0.02	-0.89	0.92	0.38

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2000	198.6
Channel Y	0.2001	199.4
Channel Z	0.2000	198.8

8. Low Battery Alarm Voltage (verified during pre test)

Typical values	Alarm Level (VDC)		
Supply (+ Vcc)		+7.9	
Supply (- Vcc)		-7.6	

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	-0.01	-8	-9

Certificate No: DAE3-577_Nov08



ccredited by the Swiss Accredit he Swiss Accreditation Servic ultilateral Agreement for the	ation Service (SAS) ce is one of the signatori recognition of calibration	Accreditation es to the EA n certificates	on No.: SCS 108
lient Sporton (Aud	en)	Certificate 1	No: ET3-1788_Sep08
CALIBRATION	CERTIFICAT	E	
Dbject	ET3DV6 - SN:1	788	
Calibration procedure(s)	QA CAL-01.v6 a Calibration proc	and QA CAL-23.v3 edure for dosimetric E-field prob	es
Calibration date:	September 23, 2	2008	
		the second s	
Condition of the calibrated item This calibration certificate docum The measurements and the unc All calibrations have been condu	In I olerance	tional standards, which realize the physical u probability are given on the following pages a ory facility: environment temperature (22 ± 3)	nits of measurements (SI). and are part of the certificate. °C and humidity < 70%.
Condition of the calibrated item This calibration certificate docun The measurements and the unc All calibrations have been condu Calibration Equipment used (M8	In I olerance nents the traceability to na ertainties with confidence ucted in the closed laborat	tional standards, which realize the physical u probability are given on the following pages a ory facility: environment temperature (22 ± 3)	nits of measurements (SI). and are part of the certificate. °C and humidity < 70%.
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Condition of the calibrated item This calibration certificate docum The measurements and the unc All calibrations have been condu Calibration Equipment used (M8 Primary Standards Power meter E44198 Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator	In Tolerance	tional standards, which realize the physical u probability are given on the following pages a ory facility: environment temperature (22 ± 3) Cal Date (Certificate No.) 1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Jul-08 (No. 217-00788) 1-Jul-08 (No. 217-00785)	nits of measurements (SI). and are part of the certificate. °C and humidity < 70%. Scheduled Calibration Apr-09 Apr-09 Apr-09 Jul-09 Ar-09
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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





S Schweizerischer Kalibrierdienst

- C Service suisse d'étalonnage
- Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
Polarization ϕ	φ rotation around probe axis
Polarization 9	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- NORMx,y,z: Assessed for E-field polarization 9 = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)x,y,z = NORMx,y,z * frequency_response (see Frequency Response Chart). This
 linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of
 the frequency response is included in the stated uncertainty of ConvF.
- DCPx,y,z: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy): in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Certificate No: ET3-1788_Sep08



September 23, 2008

Probe ET3DV6

SN:1788

Manufactured: Last calibrated: Recalibrated: May 28, 2003 September 26, 2007 September 23, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

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DASY - Parameters of Probe: ET3DV6 SN:1788

e Space ^A		Diode C	ompression ^B
1.73 ± 10.1%	$\mu V/(V/m)^2$	DCP X	95 mV
1.59 ± 10.1%	$\mu V/(V/m)^2$	DCP Y	98 mV
1.72 ± 10.1%	$\mu V/(V/m)^2$	DCP Z	91 mV
	e Space ^A 1.73 ± 10.1% 1.59 ± 10.1% 1.72 ± 10.1%	e Space ^A 1.73 ± 10.1% μV/(V/m) ² 1.59 ± 10.1% μV/(V/m) ² 1.72 ± 10.1% μV/(V/m) ²	e Space ^A Diode C 1.73 ± 10.1% μ V/(V/m) ² DCP X 1.59 ± 10.1% μ V/(V/m) ² DCP Y 1.72 ± 10.1% μ V/(V/m) ² DCP Z

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL

5	900 MHz	Typical SAR gradient: 5	% per mm	
Sensor Cente	er to Phanto	om Surface Distance	3.7 mm	4.7 mm
SAR _{be} [%]	Withou	t Correction Algorithm	10.6	6.8
SAR _{be} [%]	With Co	orrection Algorithm	0.8	0.3

TSL 1750 MHz Typical SAR gradient: 10 % per mm

Sensor Cente	r to Phantom Surface Distance	3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	8.8	4.9
SAR _{be} [%]	With Correction Algorithm	0.7	0.6

Sensor Offset

Probe Tip to Sensor Center

2.7 mm

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

⁸ Numerical linearization parameter: uncertainty not required.

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Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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Receiving Pattern (ϕ), $\vartheta = 0^{\circ}$



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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Conversion Factor Assessment

f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.44	2.65	6.55 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.68	1.98	5.59 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.75	1.75	5.13 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.80	1.45	4.68 ± 11.0% (k=2)
				÷			
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.50	, 2.48	6.34 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	$1.49 \pm 5\%$	0.63	2.33	4.87 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.74	1.99	4.73 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.94	1.75	3.98 ± 11.0% (k=2)

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

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September 23, 2008





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: ET3-1788_Sep08

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Appendix D - Simultaneous SAR Evaluation

- 1. The display size is 9.6 inches, so KDB447498 is implemented for the simultaneous SAR evaluation.
- 2. The antenna location is 18.8 cm from the human body, so 3) b) ii) 2) is implemented.
- 3. The evaluation results are as below:



device, mode, f	P, mW	n, cm	r, cm	R, cm	Single SAR, W/kg	Remarks
m1, GPRS850	405.45	4.65	18.8	7	0.040	r ₁ > 5 cm
class 10						r ₁ > R ₁
m2, 802.11b	123.31	4.01	18.8	7	0.040	r ₂ > 5 cm
						r ₂ > R ₂
all SAR _{1g}					0.080	_{all} SAR _{1g} < 1.6 W/kg

(x, y)	d _{xy} , cm	L _{xy} , cm	SPLSR _{xy}	Sim-Tx SAR	Remark
(1, 2)	0.7	1.5	0.053	Ν	$_{all}$ SAR $_{1g}$ < 1.6 W/kg and
					SPLSR _{xy} < 0.3

From the evaluation above, Σ_{all} SAR_{1g} < 1.6 W/kg and SPLSR_{xy} < 0.3, we judge simultaneous SAR is not required.



Appendix E - Product Photos









Appendix F - Test Setup Photos



Bottom with 0cm Gap



Appendix G - FCC 3G SAR Measurement Procedures

Conducted Output Power:

The PBA is fulfilled. The EUT was tested according to the requirements of the FCC 3G procedures and the TS 34.121. The EUT's WCDMA and HSPA function is Release 6 version supporting HSDPA Category 8, and HSUPA Category 5. A detailed analysis of the output power for all WCDMA, HSPDA, and HSPA (HSUPA&HSDPA) modes is provided in the tables below. According to the FCC 3G procedures, handsets with both HSDPA and HSUPA should be tested according to Release 6 HSPA test procedures, and the EUT does not support VOIP function over the HSPA function. Device was tested according to procedure KDB941225 - section Release 6 HSPA Data Devices as documented/evaluated in the following table. Power values for HSPA are less than ¼ dB higher than the basic 12.2 kbps RMC configurations in WCDMA.

	WCDMA SAR Te	est mode ·	- Conduct	ed Power			
		Ce	ll band (8	50)	PC	S band (19	900)
Mode	Sotup	CH4132	CH4182	CH4233	CH9262	CH9400	CH9538
WOUE	Setup	826.4	836.4	846.6	1852.4	1880.0	1907.6
		(MHz)	(MHz)	(MHz)	(MHz)	(MHz)	(MHz)
R99- WCDMA	RMC 12.2Kbps	24.51	24.30	24.25	24.32	24.31	24.25
	HSDPA - subtest 1	24.40	24.27	24.26	24.11	24.14	24.03
	HSDPA - subtest 2	23.70	23.58	23.22	23.42	23.43	23.51
KJ-NJDFA	HSDPA - subtest 3	23.51	23.25	22.91	23.09	23.15	23.05
	HSDPA - subtest 4	23.03	22.74	22.44	22.73	22.68	22.62
	HSUPA - subtest 1	24.40	24.12	24.20	24.37	24.36	24.22
	HSUPA - subtest 2	22.05	22.04	21.91	22.18	22.42	22.25
R6- HSPA (HSUPA&HSDPA)	HSUPA - subtest 3	23.15	22.98	22.98	23.13	23.24	23.07
	HSUPA - subtest 4	22.65	22.35	22.50	22.48	22.38	22.51
	HSUPA - subtest 5	24.68	24.25	24.10	24.45	24.31	24.19



WCDMA Setup Configuration:

- a. The EUT was connected to Base Station referred to the drawing of Setup Configuration.
- b. The RF path losses were compensated into the measurements.
- c. A call was established between EUT and Base Station with following setting
 - i. Data rates: Varied from RMC 12.2Kbps.
 - ii. RMC Test Loop=Loop Mode 1
 - iii. Power Ctrl Mode= All Up bits.
- d. The transmitted maximum output power was recorded.

Wireless Communication Test Set		_	
	0	Q	EUT
RF IN		0.4	

Setup Configuration

HSDPA Setup Configuration:

- a. The EUT was connected to Base Station referred to the drawing of Setup Configuration.
- b. The RF path losses were compensated into the measurements.
- c. A call was established between EUT and Base Station with following setting:
 i. Set Gain Factors(βc,and βd) and parameters were set according to each

ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121.

- iii. Set RMC12.2Kbps + HSDPA mode.
- iv. Set Cell Power = -86 dBm
- v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
- vi. Select HSDPA Uplink Parameters.
- vii. Set DeltaACK , DeltaNACK and DeltaCQI =8.
- viii. Set Ack-Nack Repetition Factor to 3
- ix. Set CQI Feedback Cycle (k) to 4 ms
- x. Set CQI Repetition Factor to 2.
- xi. Power Ctrl Mode= All Up bits.
- d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	βο	βd	βd	β₀/β₀	β _{Hs}	CM (dB)	MPR (dB)
			(5F)		Note 2)	(Note 3)	(NOLE 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15	15/15	64	12/15	24/15	1.0	0.0
	(Note 4)	(Note 4)		(Note 4)			
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5
Note 1:	$\Delta_{ACK}, \Delta_{NACK}$	and $\Delta_{CQI} = 3$	0/15 with $eta_{\scriptscriptstyle h}$	$s = 30/15 * \beta_c$.			
Note 2:	For the HS-[Magnitude (I	OPCCH pow EVM) with H	er mask requ S-DPCCH te	iirement test in cla st in clause 5.13.1	use 5.2C, 5.1 A, and HSD	7A, and the Erro PA EVM with pha	r Vector ase
	discontinuity	in clause 5.	13.1AA, Δ _{ACF}	and $\Delta_{NACK} = 30/1$	5 with β_{hs} =	30/15 * eta_c , and	1 Δ _{CQI} = 24/15
	with β_{hs} = 2	4/15 * β_c .					
Note 3:	CM = 1 for β DPCCH the support HSE	₀/β _d =12/15, MPR is base)PA in releas	β _{hs} /β _c =24/15 ed on the rela se 6 and late	. For all other com ative CM difference r releases.	binations of I e. This is app	DPDCH, DPCCH licable for only U	I and HS- JEs that
Note 4:	For subtest 2 achieved by = 15/15.	2 the β₀/β₀ ra setting the s	atio of 12/15 1 signalled gain	for the TFC during a factors for the ref	the measure erence TFC	ment period (TF (TF1, TF1) to βε	1, TF0) is = 11/15 and β _d

Setup Configuration



HSPA (HSUPA & HSPDA) Setup Configuration:

- a. The EUT was connected to Base Station referred to the drawing of Setup Configuration.b. The RF path losses were compensated into the measurements.
- c. A call was established between EUT and Base Station with following setting *:
 - i.Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
 - Set the Gain Factors (\u03b3c, and \u03b3d) and parameters (AG Index) were set according to each ii. specific sub-test in the following table, C11.1.3, quoted from the TS 34.121.
 - iii. Set Cell Power = -86 dBm
 - iv. Set Channel Type = 12.2k + HSPA
 - v. Set UE Target Power
 - vi. Power Ctrl Mode= Alternating bits.
 - vii. Set and observe the E-TFCI
 - viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtests' E-TFCI.
- The transmitted maximum output power was recorded. d.

Sub-	Sub- Bo Bd Bd Bd/Bd BHS Beo Bed Bed CM MPR AG E-												
test	Pc	Pd	Pa (SF)	Pc/Pd	рнs (Note1)	Pec	Note 5) (Note 6)	Ped (SF)	Ped (Codes)	(dB) (Note 2)	(dB) (Note 2)	Index (Note 6)	TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/2 25	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β _{ed} 1: 47/15 β _{ed} 2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81
Note 1 Note 2	: Δ _{АСК} , . : СМ =	Δ _{NACK} and 1 for β₀/β	d ∆cqi = la =12/1	= 30/15 v 15, β _{hs} /β _c	/ith β_{hs} = =24/15. F	= 30/15 * For all ot	eta_c . her combinatio	ons of	DPDCH, I	DPCCH,	HS- DPO	CCH, E-D	PDCH
Note 3	E For su	-DPCCH ibtest 1 ti the sign	the MH he β ₀ /β	PR is bas d ratio of lain facto	ed on the 11/15 foi rs for the	e relative the TFC	CM difference during the m	e. easure TE1) te	ement per	iod (TF1	, TF0) is	achieveo	l by
Note 4	: For su setting	btest 5 ti the sign	he β _o /β alled g	_d ratio of ain facto	15/15 for rs for the	the TFC	during the m	easure TF1) to	ement per $\beta_{\alpha} = 14/2$	iod (TF1 15 and β	a = 15/15 , TF0) is a = 15/15	achieveo	l by
Note 5	In cas TS25.	e of testi 306 Tabl	ng by l e 5.1g.	JE using	E-DPDC	H Physic	cal Layer cate	gory 1	Sub-test	3 is omi	tted acco	rding to	
Note 6	: Bed ca	n not be	set dire	ectly, it is	set by A	bsolute (Grant Value.						

Setup Configuration

Note: For details settings in the Agilent 8960 test equipment, please refer to the user guide "HSUPA Measurement Guide with 8960 V7.5.0 Release 7 (2007-06) Ver.: v.02.18"



			Cal	ll Set	up Scr	reen					
Call Control		F	lctive	Cell	Operat	ing M	lode				Call Parms
Channel (UARFCN) Info	Insi	[:		UE Inf	ormatio	۱			-	Ce	11 Ронег -86.00
Cell	Iner Iner Pom	i: er Class:								Ch	annel Type 12.2k + HSPA
Conceptor	Init	ue ial prach t	Expecte X Pouer:	d Open	Loop Tr -11.70	ansmit dBm	Pouer			Pa	ging Service
Info	Initi	ial DPCCH T	X Pouer:		-0.56	dBm				┡	RB Test Node
		Upli	.nk Par	amete	rs			Value			
Uplink	PRACH	Preambles						64			HSPA
Parameters _V	PRACH Ramping Cycles(111AX)					2			Parameters		
	Availat	ble Subchar	nnels (B	it Nask)		000	00000000	01		
UE Rep	Uplink	DPCH Scran	nbling Co	ode				0			34.121 Preset
lleas	Uplink DPCH Bc/Bd Control					Manual			Call Configs 🛛		
	Hanual	Uplink DPC	H BC					11			
Close	Manual	Uplink DPC	:H Bd					15			Channel
Henu	Haximu	m Uplink Tr	ansmit P	ouer L	evel			21 dBm		a	JARFCN) Parms
			Active (Idle	Cell			Sys T <u>ı</u>	jpe: UTRA	i FDD		
2 of 4				IntRef	Offset						1 of 3

Example for HSPA Subtest 1, and other subtests following table, C11.1.3 (Gain Factors ($\beta c = 11$ and $\beta d = 15$))







	Call Setu	p Screen	
Screen Ctrl	Recorded E-TFC	I Information	E-TFCI Record
			E-TFCI Rec Count
Channel (UABECN) Info	E-TFCI Recor	rding State	15
	Idl	e	
HSPA			Start Recording
Information	Recorded E-T	FCI Values	E-TFCI Values
	1: 75 11: 75 21: -	31: 41:	
	2: 75 12: 75 22: -	32: 42:	
E-IFCI Recording Information	3: 75 13: 75 23: -	33: 43:	
	4: 75 14: 75 24: -	34: 44:	
	5: 75 15: 75 25: -	35: 45:	
		36: 46:	Send Step Up
	/: /5 1/: 2/:	3/: 4/:	TPC Bit Pattern
		38: 48:	
		33 43	
Clear UF Info	10. 75 20 30	40 50	Send Step Doun
	45/	4 5	TFO DIV FUXCITI
	15/	15	
Return			Return
Ī	Background Active Cell	Sus Tupe: IITRA FDI	n
	IntBef Of	fset	
[L			
Example: Co	firm that E-TFCI is equal t	o the target E-TFCI of 75	5 for sub-test 1

Reference:

- [1] 941225 D01 SAR test for 3G devices v02, SAR Measurement Procedures for 3G Devices CDMA 2000/Ev-Do/WCDMA/HSDPA/HSPA Oct. 2007 Laboratory Division Office of Engineering and Technology Federal Communications Commission
- [2.] TS 34.121 Universal Mobile Telecommunications System (UMTS); Terminal Conformance Specification, Radio Transmission and Reception (FDD)
- [3.] HSUPA Measurement Guide with 8960 V7.5.0 Release 7 (2007-06) Ver.: v.02.18



Appendix H - Analysis of Effective Frequency Interval of Probe

The test frequencies are properly matched as this is a cellular band. The probe calibration for permittivity and conductivity is within \pm 5%, were the probe calibrated centre frequency at 900 MHz has permittivity and conductivity of 55.0 and 1.05 respectively. At the probe extreme frequencies the following are true: at 800 MHz the permittivity and conductivity are 52.3 and 0.92 respectively. At 1000 MHz the permittivity and conductivity are 57.8 and 1.1 respectively. The probe was calibrated at these parameters in order to cover the frequency range 800 MHz to 1000 MHz.

Conversion			
Name: 900 (Body)			ОК
X: Conversion factor: 5.91	Y:	Z:	Cancel
Alpha: 0.31	0.31	0.31	
Delta: 2.98	2.98	2.98	
Frequency range: 800	to 1000	MHz C	alibrated for: 900 MHz
Permittivity range: 52.3	to 57.8	c	alibrated for: 55
Conductivity range: 0.92	to 1.1	S/m C	alibrated for: 1.05 S/m

The target permittivity and conductivity at 835 MHz is 55.2 and 0.97 respectively which is within the calibrated range of the probe parameter.



T [MHZ]	Validity [MHz] ^C	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	±50/±100	Head	41.5±5%	0.97±5%	0.30	2.80	6.06	± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.53	2.11	5.36	± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.59	1.96	5.01	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1,80 ± 5%	0.77	1.57	4.49	± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.31	2.98	5.91	± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.60	2.20	4.73	± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.68	1.95	4.49	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.90	1.51	3.79	± 11.0% (k=2)
		lu anellier l	IN DARY IN A IN	d binbar (and Dam	a 21. The su	a contributu	the DES	
E The val	1000 AT \$ 100 MM > AA			La contraction of the second of the second		Inclusion substances a second	8 UNE (100	

The following parameters are declared in the probe calibration certificate on pare 8:

The system manufacturer has carried out addition steps as detailed on page 4 of KDB 450824. This is detailed in the calibration certificates. The measured SAR values in the report are all below 10% of the SAR limit.

The measured fluid dielectric parameters for 835 MHz, performed during test values were all within \pm 5% of the 835 MHz target value.

At 900 MHz, the probe was calibrated and validation performed, the tissue dielectric parameter measured for routine measurements at 900 MHz was less than the target parameter for 835 MHz ϵ_r and higher than the target parameter for 835 MHz σ .



	Measurd Paramet 2/20/	ed Fluid ter Date: 2009	Nomina Paramete System ma in calibrate	al Fluid er used by unufacturer e certificate
Frequency (MHz)	εr	σ	εr	σ
820	53.57	0.962	53.96	0.95
825	53.51	0.967	54.37	0.96
830	53.46	0.973	54.79	0.96
835	53.39	0.978	55.20	0.97
840	53.32	0.983	55.18	0.98
845	53.27	0.988	55.17	0.98
850	53.22	0.994	55.15	0.99
900	52.68	1.051	55.00	1.05



SPORTON INTERNATIONAL INC. TEL : 886-3-327-3456 FAX : 886-3-328-4978 FCC ID : HLZUNDP-1C

Report Issued Date : Mar. 31, 2009 Report Version : Rev. 01





The probe conversion factor and its frequency response, with respect to the tissue dielectric media used during the probe calibration and routine measurements was examined to determine if the effective frequency interval is adequate for the intended measurements to satisfy protocol requirements. The frequency range at which the probe was calibrated for 900 MHz covered 800 MHz to 1000 MHz and the dielectric parameters required for 824 to 840 MHz were all within the calibrated range of the probe dielectric parameters.



Conversion			
Name: 900 (Body)			ОК
X: Conversion factor: 5.91	Y:	Z:	Cancel
Alpha: 0.31	0.31	0.31	
Delta: 2.98	2.98	2.98]
Frequency range: 800	to 1000	MHz C	alibrated for: 900 MHz
Permittivity range: 52.3	to 57.8	C C	alibrated for: 55
Conductivity range: 0.92	to 1.1	S/m C	alibrated for: 1.05 S/m

The measurement within the required frequency interval satisfy an expanded probe calibration uncertainty $(k=2) \le 15\%$ for all measurement conditions. Please refer to SAR report for probe and dipole calibration certificates produce by the system manufacturer.



Boundary	Effect			
SL	900 MH	z Typical SAR gradier	nt: 5 % per mm	
Sense	or Center to Ph	antom Surface Distance	3.7 mm	4.7 mm
SAR	[%] Wit	hout Correction Algorithm	11.3	7.5
SAR	。[%] Wit	h Correction Algorithm	0,8	0.5
SL	1750 MH	z Typical SAR gradier	nt: 10 % per mm	
Senso	or Center to Ph	antom Surface Distance	3.7 mm	4.7 mm
SAR	. [%] Wit	hout Correction Algorithm	10.1	6.5
SAR	.[%] Wit	h Correction Algorithm	0.B	0.6
Sensor Of	fset			
Probe	Tip to Sensor	Center	2.7 mm	
The reported measureme	d uncertainty nt multiplied	of measurement is stat by the coverage factor	ted as the standard k=2, which for a nor	uncertainty of mal distribution
correspond	s to a covera	ge probability of approx	cimately 95%.	
The uncertainties	of NormX, Y,Z do	not affect the E ² -field uncertainty in	ede TSL (see Page 5).	
Numerical linear	zation parameter.	incertainty not required.		