TEST REPORT

TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: LT25i

To: OET Bulletin 65 Supplement C: (2001-01)
IEEE1528:2003

FCC ID: PY7PM-0060

Test Report Serial No:
RFI-SAR-RP89439JD02A V5.0

Version 5.0 supersedes all previous versions

This Test Report Is Issued Under The Authority Of Richelieu Quoi, SAR Technology Consultant:	 (APPROVED SIGNATORY)
Checked By: Naseer Mirza	 (APPROVED SIGNATORY)
Issue Date:	**15 November 2012**
Test Dates:	**06 September 2012 to 14 November 2012**

RFI Global Services Ltd,
Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG, UK
Tel. +44 (0) 1256 312000 Fax +44 (0) 1256 312001
web: www.rfi-global.com email: contactus@rfi-global.com

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TABLE OF CONTENTS

1. Customer Information

Company Name:	Sony Mobile Communications AB
Address:	Nya Vattentornet 22188 Lund Sweden

2. Equipment Under Test (EUT)

2.1. Identification of Equipment Under Test (EUT)

Description:	Mobile Handset
Brand Name:	Sony
Model Name or Number:	LT25i
Serial Number:	CB5A1KT671
Type Number:	PM-0060-BV
IMEI Number:	00440245-042441-5
Hardware Version Number:	AP1.1
Software Version Number:	9.0.D.0.164
Hardware Revision of GSM Module:	Not Applicable
Software Revision of GSM Module:	Not Applicable
FCC ID Number:	PY7PM-0060
Country of Manufacture:	China
Date of Receipt:	28 August 2012

Note(s):

This sample was used to perform WWAN SAR testing on bands PCS1900 only. The sample supports simultaneous transmission with the WWAN and WLAN antenna > 5 cm apart. Wireless Personal Hotspot is also supported and was evaluated as per KDB 941225 D06 "Hot Spot SAR v01"

Description:	Mobile Handset
Brand Name:	Sony
Model Name or Number:	LT25i
Serial Number:	CB5A1KTGY5
Type Number:	PM-0060-BV
IMEI Number:	00440245-042420-9
Hardware Version Number:	AP1.1
Software Version Number:	9.0.D.0.164
Hardware Revision of GSM Module:	Not Applicable
Software Revision of GSM Module:	Not Applicable
FCC ID Number:	PY7PM-0060
Country of Manufacture:	China
Date of Receipt:	28 August 2012

Note(s):

This sample was used to perform WWAN SAR testing on bands GSM850, UMTS FDD 5 and LTE Band 5 only. The sample supports simultaneous transmission with the WWAN and WLAN antenna > 5 cm apart. Wireless Personal Hotspot is also supported and was evaluated as per KDB 941225 D06 "Hot Spot SAR v01"

Identification of Equipment Under Test (EUT) (Continued):	
Description:	Mobile Handset
Brand Name:	Sony
Model Name or Number:	LT25i
Serial Number:	CB5A1KT6AD
Type Number:	PM-0060-BV
IMEI Number:	00440245-042446-4
Hardware Version Number:	AP1.1
Software Version Number:	s_atp_tsubasa_2_0_8_0
Hardware Revision of GSM Module:	Not Applicable
Software Revision of GSM Module:	Not Applicable
FCC ID Number:	PY7PM-0060
Country of Manufacture:	China
Date of Receipt:	28 August 2012

Note(s):

This sample was used to perform WLAN SAR testing only. The sample supports simultaneous transmission with the WWAN and WLAN antenna > 5 cm apart. Wireless Personal Hotspot is also supported and was evaluated as per KDB 941225 D06 "Hot Spot SAR v01"

Description:	Mobile Handset
Brand Name:	Sony
Model Name or Number:	LT25i
Serial Number:	CB5A1KTGY9
Type Number:	PM-0060-BV
IMEI Number:	00440245-042436-5
Hardware Version Number:	AP1.1
Software Version Number:	9.0.D.0.164
Hardware Revision of GSM Module:	Not Applicable
Software Revision of GSM Module:	Not Applicable
FCC ID Number:	PY7PM-0060
Country of Manufacture:	China
Date of Receipt:	28 August 2012

Note(s):

This sample was used to perform WWAN conducted power measurements only. The sample supports simultaneous transmission with the WWAN and WLAN antenna > 5 cm apart. Wireless Personal Hotspot is also supported and was evaluated as per KDB 941225 D06 "Hot Spot SAR v01"

Identification of Equipment Under Test (EUT) (Continued):

Description:	Mobile Handset
Brand Name:	Sony
Model Name or Number:	LT25i
Serial Number:	CB5A1KTGY8
Type Number:	PM-0060-BV
IMEI Number:	00440245-042431-6
Hardware Version Number:	AP1.1
Software Version Number:	s_atp_tsubasa_2_0_8_0
Hardware Revision of GSM Module:	Not Applicable
Software Revision of GSM Module:	Not Applicable
FCC ID Number:	PY7PM-0060
Country of Manufacture:	China
Date of Receipt:	28 August 2012

Note(s):

This sample was used to perform WLAN conducted power measurements only. The sample supports simultaneous transmission with the WWAN and WLAN antenna > 5 cm apart. Wireless Personal Hotspot is also supported and was evaluated as per KDB 941225 D06 "Hot Spot SAR v01"

2.2. Description of EUT

The Equipment Under Test is a Smart Phone with GSM 2G Quad Band, 3G Tri band, LTE Penta Band and Wi-Fi bands. The EUT has GPRS Class 12 / EDGE Class 12, UMTS FDD 1, 5, 8 With HSPA (with HSDPA Category 14 and HSUPA Category 6) , LTE Band 1, 3, 5, 7, 20, WLAN 802.11 a/b/g/n, *Bluetooth Class 1*, Personal hotspot mode and RFID.

2.3. Modifications Incorporated in the EUT

EUT (IMEI: 00440245-042441-5) is used to perform PCS 1900 SAR measurements only.

EUT (IMEI: 00440245-042420-9) is used to perform GSM850, UMTS FDD 5 and LTE Band 5 SAR measurements only.

EUT (IMEI: 00440245-042446-4) is used to perform WLAN SAR measurements only.

EUT (IMEI: 00440245-042436-5) is used to perform WWAN conducted power measurements only.

EUT (IMEI: 00440245-042431-6) is used to perform WLAN conducted power measurements only.

2.4. Accessories

Description:	Personal Hands-Free Kit (PHF)
Brand Name:	Sony
Model Name or Number:	MH750
Serial Number:	12250C1A000A8274
Cable Length and Type:	~1.2 m
Country of Manufacture:	None Stated
Connected to Port	3.5mm Audio jack and custom type

Description:	Memory Card
Brand Name:	None Stated (Generic)
Model Name or Number:	None Stated
Serial Number:	None Stated
Cable Length and Type:	Not Applicable
Country of Manufacture:	China
Connected to Port	Dedicated Micro SD Slot

Description:	Battery
Brand Name:	Sony
Model Name or Number:	BA800
Serial Number:	001610SWSGNS
Cable Length and Type:	Not Applicable
Country of Manufacture:	China
Connected to Port	5-pin contact

2.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Wireless Communication Test Set
Brand Name:	Agilent
Model Name or Number:	8960 Series 10
Serial Number:	GB46311280
Cable Length and Type:	~4.0m Utiflex Cable
Connected to Port:	RF (Input / Output) Air Link

Description:	Wireless Communication Test Set
Brand Name:	Agilent
Model Name or Number:	8960 Series 10
Serial Number:	GB462000666
Cable Length and Type:	~4.0m Utiflex Cable
Connected to Port:	RF (Input / Output) Air Link

Description:	Radio Communication Analyzer
Brand Name:	Anritsu
Model Name or Number:	MT8820C
Serial Number:	6200938937
Cable Length and Type:	~4.0m Utiflex Cable
Connected to Port:	RF (Input / Output) Air Link

2.6. Additional Information Related to Testing		
Equipment Category	GSM/GPRS850 PCS/GPRS1900 UMTS FDD 5 LTE Band 5 WiFi802.11 a/b/g/n	
Type of Unit	Portable Transceiver	
Intended Operating Environment:	Within GSM, UMTS, LTE , WiFi and *Bluetooth* Coverage	
Transmitter Maximum Output Power Characteristics:	GSM850	Communication Test Set was configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 5.
	PCS1900	Communication Test Set was configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 0.
	UMTS FDD 5	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
	LTE Band 5	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D05.
	WiFi802.11b/g/n	Test Software was used to configure the EUT to transmit at a maximum power of up to 13.8dBm.
	5.0 GHz Wi-Fi 802.11a/n (HT20 / HT40)	:= 9.5 dBm
	Bluetooth	:=9.5 dBm#
Transmitter Frequency Range:	GSM850	824 to 849 MHz
	PCS1900	1850 to 1910 MHz
	UMTS FDD 5	826 to 847 MHz
	LTE Band 5	824 to 849 MHz
	WiFi802.11b/g/n	2412 to 2462 MHz
	5.0 GHz Wi-Fi 802.11a/n (HT20 / HT40)	5180 to 5825 MHz
Note(s):		

The *Bluetooth* ***Rated Power (6.5 dBm) + Upper Tolerance (3.0 dBm)*** were provided by the customer.

Additional Information Related to Testing (Continued):

Transmitter Frequency Allocation of EUT When Under Test:	Channel Number	Channel Description	Frequency (MHz)
	128	Low	824.2
	190	Middle	836.6
	251	High	848.8
	512	Low	1850.2
	661	Middle	1880.0
	810	High	1909.8
	4132	Low	826.4
	4183	Middle	836.6
	4233	High	846.6
	20450(10MHz)	Low	829.0
	20525(10MHz)	Middle	836.5
	20600(10MHz)	High	844.0
	20407(1.4MHz)	Low	824.7
	20525(1.4MHz)	Middle	836.5
	20643(1.4MHz)	High	848.3
	1	Low	2412.0
	6	Middle	2437.0
	11	High	2462.0

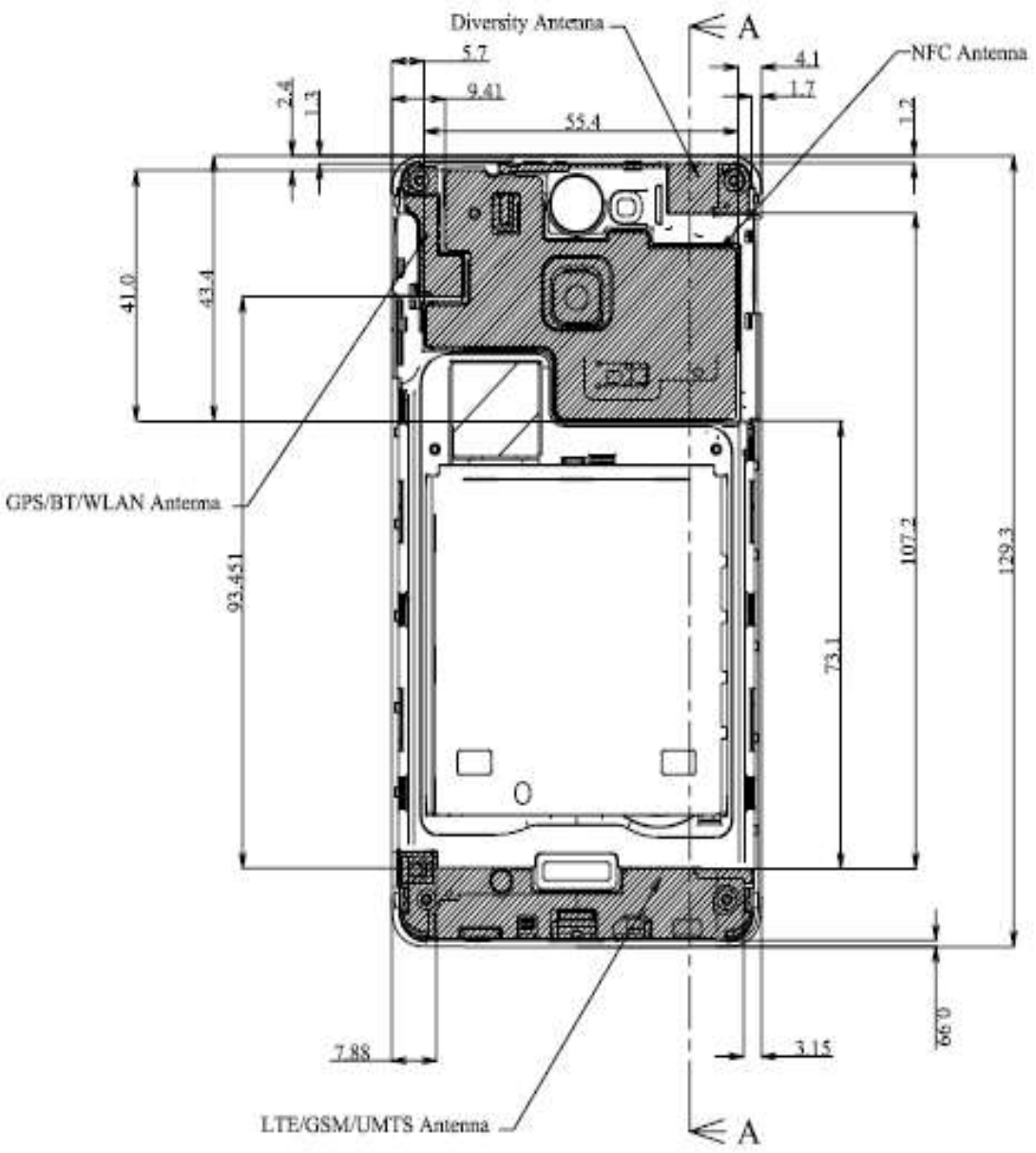
Additional Information Related to Testing (Continued)

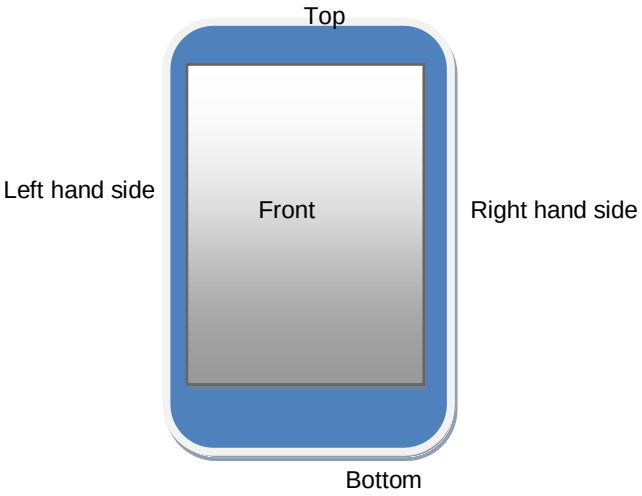
Transmitter Frequency Allocation of EUT When Under Test:	Channel Number	Frequency (MHz)
	36	5180.0
	38	5190.0
	40	5200.0
	44	5220.0
	46	5230.0
	48	5240.0
	52	5260.0
	54	5270.0
	56	5280.0
	60	5300.0
	62	5310.0
	64	5320.0
	100	5500.0
	102	5510.0
	104	5520.0
	108	5540.0
	110	5550.0
	112	5560.0
	116	5580.0
	118	5590.0
	120	5600.0
	124	5620.0
	126	5630.0
	128	5640.0
	132	5660.0
	134	5670.0
	136	5680.0
	140	5700.0
	149	5745.0
	151	5755.0
	153	5765.0
	157	5785.0
	159	5795.0
	161	5805.0
	165	5825.0

Additional Information Related to Testing (Continued):	
Modulation(s):	GMSK (GSM/ GPRS): 217 Hz QPSK(UMTS / HSDPA/HSPA):0Hz DBPSK, CCK (Wi-Fi): 0 Hz FDD (QPSK/ 16QAM): 0 Hz
Modulation Scheme (Crest Factor):	GSMK (GSM): 8.3 GMSK (GPRS): 4 DBPSK, CCK (Wi-Fi): 1 QPSK(UMTS FDD / HSDPA): 1 FDD (QPSK/ 16QAM): 1
Antenna Type:	Internal integral
Antenna Length:	Unknown
Number of Antenna Positions:	1 fixed (WWAN) 1 fixed (GPS/WLAN/*Bluetooth*) 1 fixed (NFC) 1 fixed (Diversity)
Power Supply Requirement:	3.7V
Battery Type(s):	Li-ion

Additional Information Related to LTE Test parameter		
#	**Description**	**Parameter**
1	Identify the operating frequency range of each LTE transmission FCC band used by the device	Band5: frequency range – 824 MHz– 849 MHz
2	Identify the channel bandwidths used in each frequency band; e.g.: 1.4, 3, 5, 10, 15, 20 MHz etc.	Channel Bandwidths used are: B5 (1.4, 3, 5 , 10) MHz
3	Identify the high, middle and low (L, M, H) channel numbers and frequencies in each LTE frequency band	B5 -1.4 MHz (H,M,L)= (20643, 20525, 20407) (848.3, 836.5, 824.7) MHz B5 -3 MHz (H,M,L)= (20635, 20525, 20415) (847.5, 836.5, 825.5) MHz B5 -5 MHz (H,M,L)= (20625, 20525, 20425) (846.5, 836.5, 826.5) MHz B5 -10MHz (H,M,L)= (20600, 20525, 20450) (844.0, 836.5, 829.0) MHz
4	Specify the UE category and uplink modulations used	The UE Category is 3 and the Uplink modulations used are QPSK, 16QAM.

Additional Information Related to LTE Test parameter (Continued):		
#	**Description**	**Parameter**
5	Descriptions of the LTE transmitter and antenna implementation & identify whether it is a standalone transmitter operating independently of other wireless transmitters in the device or sharing hardware components and/or antenna(s) with other transmitters etc.	This model (LT25i) has only one main antenna for LTE/UMTS/GSM bands (as pictured below).



Additional Information Related to LTE Test parameter (Continued):		
#	**Description**	**Parameter**
6	Identify the LTE Band Voice/data requirements in each operating mode and exposure condition with respect to head and body test configurations, antenna locations, handset flip-cover or slide positions, antenna diversity conditions, etc.	The following exposure condition with respect to head and body test are required for both voice and data modes due to EUT functionality and antenna locations. 1) Body-worn SAR is required at 15 mm separation distance 2) Mobile Hot Spot Mode will be tested by positioning the smart phone with 10 mm separation distance. - Wireless Personal Hotspot mode with consideration for the Front Display of EUT, Back of EUT, Left Hand side of EUT, Right Hand side of EUT, Top Edge of EUT and Bottom Edge of EUT with respect to the antenna location. The test separation distance between the EUT edge and phantom flat surface for this mode will be 10mm as the dimensions of the device is > 9cm x 5cm. 3) Head SAR is required in LTE mode as this model supports SVLTE operation. 

Additional Information Related to LTE Test parameter (Continued):		
#	**Description**	**Parameter**
7	Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design: a) only mandatory MPR may be considered during SAR testing, when the maximum output power is permanently limited by the MPR implemented within the UE; and only for the applicable RB (resource block) configurations specified in LTE standards b) A-MPR (additional MPR) must be disabled.	The EUT incorporates MPR as per 36.101 as shown in the table below. MPR cannot be disabled after the phone is manufactured, MPR is mandatory. * Target MPR - QPSK 1RB 0offset: 0dB, QPSK 1RB 49offset: 0dB - 16QAM 1RB 0offset: 1dB, 16QAM 1RB 49offset: 1dB - QPSK 25RB 13offset: 1dB, 16QAM 25RB 13offset: 2dB - QPSK 50RB 0offset: 1dB, 16QAM 50RB 0offset: 2dB
8	Include the maximum average conducted output power measured on the required test channels for each channel bandwidth and UL modulation used in each frequency band: a) with 1 RB allocated at the upper edge of a channel b) with 1 RB allocated at the lower edge of a channel c) using 50% RB allocation centered within a channel d) using 100% RB allocation	This is included in the section 7.2.19 of this report.
9	Identify all other U.S. wireless operating modes (3G, Wi-Fi, WiMax, Bluetooth etc), device/exposure configurations (head and body, antenna and handset flip-cover or slide positions, antenna diversity conditions etc.) and frequency bands used for these modes	The following bands are supported for the exposure conditions 1) GSM (850/1900) and UMTS FDD (850) - Exposure conditions: Head/Body worn SAR required for GSM / UMTS FDD and wireless personal hotspot. DTM is not supported. 2) Bluetooth 2.4GHz (Basic Rate & EDR) - Exposure conditions: BT SAR is not required as maximum output power < 6.31mW or 2*Pref & antenna separation distance > 5cm. 3) WiFi 2.4GHz - Exposure conditions: Head/Body SAR required for wireless personal hotspot. No power reduction. 4) WiFi 5 GHz - Exposure conditions: SAR is not required as maximum output power 2*Pref -5.15 to 5.35 GHz maximum output power =7.2 mW < 12mW (2*Pref) -5.47 to 5.85 GHz maximum output power =9.5mW < 10mW (2*Pref) Stand Alone SAR evaluation is not required for 5.0 GHz WLAN802.11a/n modes.

Additional Information Related to LTE Test parameter (Continued):

<table>
<tr><th>#</th><th>Description</th><th>Parameter</th></tr>
<tr><td>10</td><td>Include the maximum average conducted output power measured for the other wireless mode and frequency bands</td><td>This is included in the section 7.2.16 to 7.2.21 of this report.</td></tr>
<tr><td>11</td><td>Identify the simultaneous transmission conditions for the voice and data configurations supported by all wireless modes, device configurations and frequency bands, for the head and body exposure conditions and device operating configurations (handset flip or cover positions, antenna diversity conditions etc.)</td><td>
<table>
<tr><td></td><td colspan="5">Simultaneous transmission conditions</td></tr>
<tr><td></td><td colspan="3">WWAN</td><td>WLAN</td><td>Sum of WWAN & WLAN</td></tr>
<tr><td>#</td><td>LTE BAND Voice/Data</td><td>GSM Voice/Data</td><td>UMTS Voice/Data</td><td>Wi-Fi 802.11a/b/g/n</td><td></td></tr>
<tr><td>1</td><td>X</td><td></td><td></td><td>X</td><td>X</td></tr>
<tr><td>2</td><td></td><td>X</td><td></td><td>X</td><td>X</td></tr>
<tr><td>3</td><td></td><td></td><td>X</td><td>X</td><td>X</td></tr>
</table>
</td></tr>
<tr><td>12</td><td>When power reduction is applied to certain wireless modes to satisfy SAR compliance for simultaneous transmission conditions, other equipment certification or operating requirements, include the maximum average conducted output power measured in each power reduction mode applicable to the simultaneous voice/data transmission configurations for such wireless configurations and frequency bands; and also include details of the power reduction implementation and measurement setup</td><td>Not applicable.</td></tr>
<tr><td>13</td><td>Include descriptions of the test equipment, test software, built-in test firmware etc. required to support testing the device when power reduction is applied to one or more transmitters/antennas for simultaneous voice/data transmission</td><td>An Anritsu MT8820C communication simulator which supports LTE modes (voice/data) was used for testing.</td></tr>
<tr><td>14</td><td>When appropriate, include a SAR test plan proposal with respect to the above.</td><td>Not Applicable</td></tr>
<tr><td>15</td><td>If applicable, include preliminary SAR test data and/or supporting information in laboratory testing inquiries to address specific issues and concerns or for requesting further test reduction considerations appropriate for the device; for example simultaneous transmission configurations.</td><td>Not Applicable</td></tr>
</table>

3. Test Specification, Methods and Procedures

3.1. Test Specification

Reference:	OET Bulletin 65 Supplement C: (2001-01)
Title:	Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
Purpose of Test:	To determine whether the equipment met the basic restrictions as defined in OET Bulletin 65 Supplement C: (2001-01) using the SAR averaging method as described in the test specification above.

3.2. Methods and Procedures Reference Documentation

The methods and procedures used were as detailed in:

Federal Communications Commission, “Evaluating compliance with FCC Guidelines for human exposure to radio frequency electromagnetic fields”, OET Bulletin 65 Supplement C, FCC, Washington, D.C, 20554, 2001.

Thomas Schmid, Oliver Egger and Neils Kuster, “Automated E-field scanning system for dosimetric assessments”, IEEE Transaction on microwave theory and techniques,
Vol. 44, pp. 105-113, January 1996.

Neils Kuster, Ralph Kastle and Thomas Schmid, “Dosimetric evaluation of mobile communications equipment with know precision”, IEICE Transactions of communications, Vol. E80-B, No.5, pp. 645-652, May 1997.

EN 62209-1: 2006
Title: Basic standard for the measurement of specific absorption rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz).

EN 62209-2:2010
Human exposure to radio frequency fields from handheld and body mounted wireless communication devices — Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz) (IEC 62209-2:2010)

KDB 248227 D01 "SAR measurements for 802.11a/b/g v01r02"

KDB 447498 D01 “Mobile Portable RF Exposure v04”

KDB 648474 D01 SAR Handsets Multi Xmiter and Ant v01r05”

KDB 648474 D02 SAR Polcy Handsts Multi Xmiter Ant v01r01

KDB 941225 D01 SAR test for 3G devices v02

KDB 941225 D03 ‘’ SAR Test Reduction GSM/GPRS/EDGE v01’’

KDB 941225 D05 SAR for LTE Devices v01

KDB 941225 D06 "Hot Spot SAR v01"

Methods and Procedures Reference Documentation (Continued)

The version of DASY system used by RFI for SAR measurements is v4.7.

The SAR probe for the DASY v4.4 and higher has a validity of +/- 100 MHz from the spot frequency at which the system is calibrated.

The system validation performed at 900 MHz is valid for 800 MHz to 1000 MHz which covers the 850 MHz band. The probe calibration for SN3814 was performed at the spot frequencies of 750 MHz and 900 MHz. The SAR software selects the conversion factor based on the following attributes; 1. The operating frequency 2. The measured permittivity imported to the software and 3. The measured conductivity imported to the software.

The 900 MHz system check is applicable for the 850 band as this is within 100 MHz of the of the 850 MHz spot frequency.

As per FCC KDB pub 450824 for SAR probe calibration; The following procedures are recommended for DUT measurements at 150 MHz to 3 GHz to minimize probe calibration and tissue dielectric parameter discrepancies. Measurements exceeding 50 % of these intervals, in this case +/- 50 MHz, EUT frequency greater than or equal to 300 MHz, shall apply method 1 of the steps.
1) When the actual tissue dielectric parameters used for probe calibration are available the differences for relative permittivity and conductivity between probe calibration and routine measurements should each be less than or equal to 5 % while also satisfying the required +/- 5 % tolerances in target dielectric parameters.

The simulation liquid used satisfies both 835 MHz and 900 MHz target values for all channels in the GSM850 band. The SAR probe coverage and conversion factor has been calibrated to ensure this condition is met and the appropriate conversion factor is used in the frequency range for up to +/- 100 MHz.

3.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations from the Test Specification

Test was performed as per KDB 648474 D01 “SAR Handsets Multi Xmiter and Ant v01r05”, KDB 941225 D01/D03 ‘’ SAR Test Reduction GSM/GPRS/EDGE v01’’, KDB 941225 D01 "SAR test for 3G v02", KDB 248227 D01 "SAR measurements for 802.11a/b/g v01r02" and KDB 941225 D06 "Hot Spot SAR v01" according to the handset procedures in IEEE Std 1528-2003 and OET Bulletin 65 Supplement C 01-01. The assessment for Personal Wireless Hotspot was also evaluated as per the FCC KDB 941225 D06 "Hot Spot SAR v01". Prior to testing the FCC was contacted for LTE evaluation under FCC Tracking Number 398090.

For technologies bands supporting personal hotspot mode, SAR was evaluated on all the sides and surfaces within 25mm of the transmitting antenna (WWAN or WLAN) as per FCC KDB 941225 D06 "Hot Spot SAR v01".

SAR test was performed in the middle channels for WWAN and WLAN. The worst case configuration for both Head and Body test was evaluated in the low and high channels.

The measured maximum conducted power for WLAN 2.45HGz 802.11b/n is 12.5dBm (equivalent to 18 mW) and for WLAN 5GHz is 9.8dBm (equivalent to 9.5mW).
As per FCC kdb pub. *SAR Handsets Multi Xmiter and Ant, v01r05;* when there is simultaneous transmission occuring, stand- alone SAR evaluation is not required when the output power measured is ≤ 2.P_{ref} for the particular band and antenna separation is ≥ 5.0 cm from other antenna.

Output power thresholds for Unlicensed Transmitters

P_{ref}	2.45	5.15 – 5.35	5 47	GHz
	12	6	5	mW

As per table 1 above, since output power measured for;
5.15 to 5.35 GHz maximum output power =7.2 mW < 12mW (2*Pref)
5.47 to 5.85 GHz maximum output power =9.5mW < 10mW (2*Pref)

Stand Alone SAR evaluation is not required for 5.0 GHz WLAN802.11a/n modes.

GPRS class12 / uplink setup of 1-uplink, 2-uplink, 3-uplink and 4-uplink were all evaluated to find the setting with the highest power reference point (unit v/m) as per the DASY4 system. 2-uplink was found to give the highest power reference point measurement on the DASY4 system (unit v/m). All settings were performed with the device in a fixed position Back facing phantom at 0mm separation to ensure there were no positioning errors. The following values were measured relative to the uplink settings:

GPRS Mode	GPRS850 Power reference (v/m)	GPRS1900 Power reference (v/m)
1 uplink	15.59	23.60
2 uplink	**17.97**	**26.12**
3 uplink	17.85	25.39
4 uplink	17.52	25.90

Note: Power reference point measurements are from the DASY4 system and used to check the device power drift although the units are v/m. For informational purpose to ensure the worst case uplink time slot is also verified by the DASY4 SAR system, this was use as per above comment at a fixed point.

5. Operation and Configuration of the EUT during Testing

5.1. Operating Modes

The EUT was tested in the following operating mode(s) unless otherwise stated:

- GSM850 – Voice allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 5.
- GPRS850 – Data allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 5. Tested using 2 Uplink time slots with CS1 for GPRS.
- PCS1900 – Voice allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 0.
- GPRS1900 – Data allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 0. Tested using 2 Uplink time slots with CS1 for GPRS.

GSM850: Power Table Settings used for Test Set	
Power Control Level PCL	Nominal Power (dBm)
0 … 2	39
3	37
4	35
5	**33**
6	31
7	29
8	27
9	25
10	23
11	21
12	19
13	17
14	15
15	13
16	11
17	9
18	7
19 ... 31	5

PCS1900: Power Table Settings used for Test Set	
Power Control Level PCL	Nominal Power (dBm)
22 … 29	Reserved
30	33
31	32
0	**30**
1	28
2	26
3	24
4	22
5	20
6	18
7	16
8	14
9	12
10	10
11	8
12	6
13	4
14	2
15	0
16 … 21	Reserved

- UMTS FDD 5 Call allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum as per KDB 941225 D01.
- UMTS FDD 5 - RMC 12.2kbps + HSUPA With Test loop mode 1 and TPC bits configured to all "1's", Sub-test 5, AG Index set to 21 and E-TFCI set to 81 with Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
- UMTS FDD 5 - RMC 12.2kbps + HSDPA With Test loop mode 1 and TPC bits configured to all "1's", Sub-test 1 with Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.

Operating Modes (Continued)

- LTE Band 5 data allocated mode at QPSK & 16 QAM on the 1.4MHz BW and 10MHz BW channels, using a Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D05.
- 2.4 GHz WiFi802.11b/g/n Data allocated mode using 'HyperTerminal' software to excise mode ‘b’, ‘g’ and ‘n’, with maximum power of up to 12.4 dBm for ‘b’ mode and 13.8 dBm for ‘g’ and 12.5 dBm for ‘n’ modes.
- 5.0 GHz WiFi802.11a/n Data allocated mode using 'HyperTerminal' software to excise mode ‘a’ and ‘n’, with maximum power of up to 9.5 dBm for ‘a’ mode and 9.8 dBm for ‘n’ modes

5.2. Configuration and Peripherals

The EUT was tested in the following configuration(s) unless otherwise stated:

- Standalone fully charged battery powered.
- Head and Body-worn configurations were evaluated.
- The applied FCC body-worn Personal Hotspot orientations where the corresponding edge(s) closest to the user with the most conservative exposure condition were all evaluated at 10 mm from the body. For configuration that did not overlap with Personal hotspot, SAR evaluation was performed at 15mm separation.
- GPRS class 12: setup for 1-uplink, 2-uplink, 3-uplink and 4-uplink were evaluated to find the setting with the highest power reference measurements. 2-uplink was found to give the highest power reference measurement on the DASY4 system. All settings were performed with the device in a fixed position 'Back facing phantom' at 0mm separation to ensure there were no positioning errors.
- GSM, GPRS and EDGE power measurement were all measured as per FCC pubs. 941225 D03 and 941225 D04. Although power reduction was allowed SAR test was performed on GPRS using GMSK. Test reduction was applied to EDGE using GMSK and 8PSK modulation scheme.

Head Configuration

a) The EUT was placed in a normal operating position with the centre of the ear-piece aligned with the ear canal on the phantom.

b) With the ear-piece touching the phantom the centre line of the EUT was aligned with an imaginary plane (X and Y axis) consisting of three lines connecting both ears and the mouth.

c) For the cheek position the EUT was gradually moved towards the cheek until any point of the mouth-piece or keypad touched the cheek.

d) For the tilted position the EUT was positioned as for the cheek position, and then the horizontal angle was increased by fifteen degrees (the phone keypad was moved away from the cheek by fifteen degrees).

e) SAR measurements were evaluated at maximum power and the unit was operated for an appropriate period prior to the evaluation in order to minimise the drift.

f) The device was keyed to operate continuously in the transmit mode for the duration of the test.

g) The location of the maximum spatial SAR distribution (hot spot) was determined relative to the EUT and its antenna.

h) The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

Body Configuration

a) The EUT was placed in a normal operating position where the centre of EUT was aligned with the centre reference point on the flat section of the 'SAM' phantom.

b) With the EUT touching the phantom at an imaginary centre line. The EUT was aligned with a marked plane (X and Y axis) consisting of two lines.

c) For the touch-safe position the EUT was gradually moved towards the flat section of the 'SAM' phantom until any point of the EUT touched the phantom.

d) For position(s) greater then 0mm separation the EUT was positioned as per the touch-safe position, and then the vertical height was decreased/adjusted as required.

e) SAR measurements were evaluated at maximum power and the unit was operated for an appropriate period prior to the evaluation in order to minimise the drift.

f) The device was keyed to operate continuously in the transmit mode for the duration of the test.

g) The location of the maximum spatial SAR distribution (hot spot) was determined relative to the EUT and its antenna.

h) The EUT was transmitting at full power throughout the duration of the test powered by a fully charged battery.

6. Summary of Test Results

Test Name	Specification Reference	Result
Specific Absorption Rate-GSM 850 Head Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-GPRS 850 Hotspot Mode Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-GSM 850 Body-Worn Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-PCS 1900 Head Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-GPRS 1900 Hotspot Mode Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-PCS 1900 Body-Worn Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-UMTS-FDD 5 Head Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-UMTS-FDD 5 Hotspot Mode Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-UMTS-FDD 5 Body-Worn Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-LTE Band 5 10MHz Channel BW Head Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-LTE Band 5 10MHz Channel BW Hotspot Mode Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-LTE Band 5 10MHz Channel BW Body-Worn Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-Wi-Fi 2450 Head Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-Wi-Fi 2450 Hotspot Mode Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied
Specific Absorption Rate-Wi-Fi 2450 Body-Worn Configuration 1g	OET Bulletin 65 Supplement C: (2001-01)	Complied

6.1. SAR Individual Transmitter Evaluation

device, mode	Frequency, (MHz)	Phantom Configuration	P_x (mW)	P_{REF} (mW)	single SAR, W/kg	Remarks
WWAN, GSM	850	Left Hand Side	372	60/f	1.210	Routine Evaluation
WWAN, GSM	1900	Front	174	60/f	0.885	Routine Evaluation
WWAN, UMTS	850	Left Hand Side	282	60/f	1.210	Routine Evaluation
WWAN, LTE	850	Back	258	60/f	0.926	Routine Evaluation
WLAN, WiFi802.11g	2450	Touch Left	24	60/f	0.240	Routine Evaluation
WLAN, WiFi802.11b	2450	Touch Left	17	60/f	0.114	Routine Evaluation
WLAN, WiFi802.11a/n	5150 -5350	N/A	~7.2	6	:=0	{PBT ≤ $2P_{REF}$} {$d_{WWAN, WLAN}$ > 5cm
WLAN, WiFi802.11a/n	5470 -5850	N/A	~9.5	5	:=0	{PBT ≤ $2P_{REF}$} {$d_{WWAN, WLAN}$ > 5cm
BT, *Bluetooth*	2400	N/A	~ 6.3	12	:=0	{PBT ≤ $2P_{REF}$} {$d_{WWAN, BT}$ > 5cm}

Note(s):

1. Simultaneous transmission was not evaluated as the sum of the individual SAR for WWAN and WLAN was < 1.6 W/kg.
2. *Bluetooth* transmitter thresholds output power "P_{Ref} = 12 mW as listed in KDB 648474.
3. Px: power level measured by RFI.
4. Single SAR value measured by RFI.
5. The "Antenna-to-Antenna distance and Antenna-to-User distance were provided by the customer.

SAR Simultaneous Transmitter Evaluation

(x,y)	D(x,y) cm	L(x,y) cm	$SPLSR_{xy}$	Sim-Tx SAR	Remarks
(WWAN, BT)	>5	N/A	N/A	N/A	{no stand-alone SAR for BT}
(WWAN, Wi-Fi)	>5	N/A	N/A	N/A	{D(x,y) > 5 } & {$\Sigma_{WWAN, WLAN}$ < 1.6 W/kg}

6.2.Summary of Test Results Measured and Scaled value to maximum tolerance

SAR Scale-Up Worst case Configuration Measurements per mode:

1g SAR

Technology Mode	Configuration	Channel Number	Mode	Meas. output power [1] [dBm]	Max Rated Power[2] [dBm]	Measured SAR(W/kg)[3]	Calculated SAR(W/kg)
						1g mass	1g mass
GSM850	Head	251	Voice	24.6	24.7	0.831	0.845
	Hotspot	128	Data	25.7	25.7	1.210	1.210
	Body-worn	128	Voice	24.7	24.7	0.732	0.732
PCS1900	Head	810	Voice	21.3	21.5	0.686	0.713
	Hotspot	512	Data	22.4	22.5	0.885	0.901
	Body-worn	512	Voice	21.2	21.5	0.414	0.441
UMTS FDD 5	Head	4132	Data(RMC)	24.5	24.6	0.858	0.878
	Hotspot	4132	Data(RMC)	24.5	24.6	1.210	1.238
	Body-worn	4132	Data(RMC)	24.5	24.6	0.844	0.864
LTE Band 5	Head	20525	Data	24.1	24.3	0.926	0.970
	Hotspot	20450	Data	24.3	24.3	0.860	0.860
	Body-worn	20450	Data	24.3	24.3	0.635	0.635
WiFi 802.11g	Head	11	Data	13.8	13.8	0.240	0.240
	Hotspot	11	Data	13.8	13.8	0.058	0.058
	Body-worn	11	Data	13.8	13.8	0.034	0.034
WiFi 802.11b	Head	1	Data	12.4	14.0	0.114	0.165
	Hotspot	1	Data	12.4	14.0	0.029	0.042
	Body-worn	1	Data	12.4	14.0	0.015	0.022

Note(s):

1. *Meas output power* (Source Base average power) level measured by RFI.
2. *Max Rated power* (Source Base average power) level supplied by manufacturer plus tolerance.
3. *Measured SAR value*, measured by RFI.

6.3. Simultaneous Transmission SAR Analysis

Head Configuration 1g – Worst cases measurements

	Measured SAR 1g (W/Kg)						
	WWAN					WLAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 5	LTE Band 5 (1.4MHz)	LTE Band 5 (10MHz)	Wi-Fi	
Touch Left	0.693					0.240	0.933
Touch Right	0.831					0.087	0.918
Touch Left		0.550				0.240	0.790
Touch Right		0.686				0.087	0.773
Touch Left			0.717			0.240	0.957
Touch Right			0.858			0.087	0.945
Touch Left				0.763		0.240	1.003
Touch Right				0.926		0.087	1.013
Touch Left					0.863	0.240	1.103
Touch Right					0.735	0.087	0.822

Note(s):

1. Simultaneous transmission was not evaluated as the sum of the individual SAR for WWAN and WLAN was < 1.6 W/kg.

Simultaneous Transmission SAR Analysis (Continued)

Hotspot Mode Configuration 1g – Worst cases measurements

	Measured SAR 1g (W/Kg)						
	WWAN					WLAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 5	LTE Band 5 (1.4MHz)	LTE Band 5 (10MHz)	Wi-Fi	
Front	0.789					0.058	0.847
Back	0.884					0.030	0.914
Left Hand Side	1.210					0.005	1.215
Right Hand Side	1.020					0.027	1.047
Bottom	0.180						0.180
Top						0.024	0.024
Front		0.885				0.058	0.943
Back		0.762				0.030	0.792
Left Hand Side		0.311				0.005	0.316
Right Hand Side		0.193				0.027	0.220
Bottom		0.437					0.437
Top						0.024	0.024
Front			0.976			0.058	1.034
Back			0.767			0.030	0.797
Left Hand Side			1.210			0.005	1.215
Right Hand Side			0.939			0.027	0.966
Bottom			0.232				0.232
Top						0.024	0.024
Front				0.853		0.058	0.911
Back				0.803		0.030	0.833
Left Hand Side				0.628		0.005	0.633
Right Hand Side				0.596		0.027	0.623
Bottom				0.177			0.177
Top						0.024	0.024
Front					0.860	0.058	0.918
Back					0.790	0.030	0.820
Left Hand Side					0.717	0.005	0.722
Right Hand Side					0.691	0.027	0.718
Bottom					0.179		0.179
Top						0.024	0.024

Note(s):

1. Simultaneous transmission was not evaluated as the sum of the individual SAR for WWAN and WLAN was < 1.6 W/kg.

6.4. Location of Tests

All the measurements described in this report were performed at the premises of
RFI Global Services Ltd, Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG United Kingdom

7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to section 8 for details of measurement uncertainties.

7.2. Test Results

For All SAR measurement in this report the SAR limit tested to is 1.6 W/kg

7.2.1.Specific Absorption Rate - GSM 850 Head Configuration 1g

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.831
Environmental Conditions:	
Temperature Variation in Lab (°C):	22.4 to 22.4
Temperature Variation in Liquid (°C):	22.3 to 22.3

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	190	24.7	N/A	0.693	1	GMSK
Tilt	Left	190	24.7	N/A	0.422	1	GMSK
Touch	Right	190	24.7	N/A	0.715	1	GMSK
Tilt	Right	190	24.7	N/A	0.489	1	GMSK
Touch	Right	128	24.7	N/A	0.697	1	GMSK
Touch	Right	251	24.6	N/A	0.831	1	GMSK

Note(s):

1. Voice mode

7.2.2.Specific Absorption Rate - GPRS 850 Hotspot Mode Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	1.210

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.7 to 23.7

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom	Flat (SAM)	190	25.5	N/A	0.789	1, 2	GMSK
Back of EUT Facing Phantom	Flat (SAM)	190	25.5	N/A	0.819	1, 2	GMSK
Back of EUT Facing Phantom	Flat (SAM)	128	25.7	N/A	0.884	1, 2	GMSK
Back of EUT Facing Phantom	Flat (SAM)	251	25.5	N/A	0.785	1, 2	GMSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	190	25.5	N/A	1.060	1, 2	GMSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	128	25.7	N/A	1.210	1, 2	GMSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	251	25.5	N/A	0.921	1, 2	GMSK

Specific Absorption Rate - GPRS 850 Hotspot Mode Configuration 1g (Continued):

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Right Hand Side of EUT Facing Phantom	Flat (SAM)	190	25.5	N/A	1.020	1, 2	GMSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	128	25.7	N/A	1.060	1, 2	GMSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	251	25.5	N/A	0.891	1, 2	GMSK
Bottom of EUT Facing Phantom	Flat (SAM)	190	25.5	N/A	0.180	1, 2	GMSK

Note(s):

1. Data - SAR measurements were performed using 2 uplink timeslots.
2. EUT supports Hotspot: As per FCC KDB procedure SAR measurements were performed with the EUT at a separation distance of 10mm from the 'SAM' phantom flat section.

*KDB 941225 - SAR is not required for EDGE technology when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding GPRS channels.

7.2.3.Specific Absorption Rate - GSM 850 Body-Worn Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.732

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.7 to 23.7

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Back of EUT Facing Phantom	Flat (SAM)	190	24.7	N/A	0.659	1, 2	GMSK
Back of EUT Facing Phantom	Flat (SAM)	128	24.7	N/A	0.732	1, 2	GMSK
Back of EUT Facing Phantom	Flat (SAM)	251	24.6	N/A	0.626	1, 2	GMSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	128	24.7	N/A	0.553	1, 2, 3	GMSK

Note(s):

1. Voice - Back of EUT is worst case and most conservative configuration of GPRS hotspot mode and is applied to GSM Body-worn.
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 15mm from the 'SAM' phantom flat section.
3. Personal Hands-Free Kit attached, using the worst-case configuration acquired.

7.2.4.Specific Absorption Rate - PCS 1900 Head Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.686

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.5 to 22.5

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	661	21.3	N/A	0.550	1	GMSK
Tilt	Left	661	21.3	N/A	0.488	1	GMSK
Touch	Right	661	21.3	N/A	0.635	1	GMSK
Tilt	Right	661	21.3	N/A	0.303	1	GMSK
Touch	Right	512	21.2	N/A	0.606	1	GMSK
Touch	Right	810	21.3	N/A	0.686	1	GMSK

Note(s):

1. Voice Mode

7.2.5.Specific Absorption Rate - GPRS 1900 Hotspot Mode Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.885

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.3 to 22.3

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom	Flat (SAM)	661	22.4	N/A	0.794	1, 2	GMSK
Back of EUT Facing Phantom	Flat (SAM)	661	22.4	N/A	0.762	1, 2	GMSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	661	22.4	N/A	0.311	1, 2	GMSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	661	22.4	N/A	0.193	1, 2	GMSK
Bottom of EUT Facing Phantom	Flat (SAM)	661	22.4	N/A	0.437	1, 2	GMSK
Front of EUT Facing Phantom	Flat (SAM)	512	22.4	N/A	0.885	1, 2	GMSK
Front of EUT Facing Phantom	Flat (SAM)	810	22.5	N/A	0.813	1, 2	GMSK

Note(s):

1. Data - SAR measurements were performed using 2 uplink timeslots.
2. EUT supports Hotspot: As per FCC KDB procedure SAR measurements were performed with the EUT at a separation distance of 10mm from the 'SAM' phantom flat section.

*KDB 941225 - SAR is not required for EDGE technology when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding GPRS channels.

7.2.6.Specific Absorption Rate - PCS 1900 Body-Worn Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.414
Environmental Conditions:	
Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	21.7 to 21.7

Results:

EUT Position	Phantom Configuration	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom	Flat (SAM)	512	21.2	N/A	0.414	1, 2	GMSK
Front of EUT Facing Phantom	Flat (SAM)	661	21.3	N/A	0.402	1, 2	GMSK
Front of EUT Facing Phantom	Flat (SAM)	810	21.3	N/A	0.374	1, 2	GMSK
Front of EUT Facing Phantom With PHF	Flat (SAM)	512	21.2	N/A	0.354	1, 2, 3	GMSK

Note(s):

1. Voice - Front of EUT is worst case and most conservative configuration of GPRS hotspot mode and is applied to GSM Body-worn.
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 15mm from the 'SAM' phantom flat section.
3. Personal Hands-Free Kit attached, using the worst-case configuration acquired.

7.2.7.Specific Absorption Rate - UMTS-FDD 5 Head Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.858

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.5 to 23.5

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	4183	24.6	N/A	0.717	1	QPSK
Tilt	Left	4183	24.6	N/A	0.573	1	QPSK
Touch	Right	4183	24.6	N/A	0.781	1	QPSK
Tilt	Right	4183	24.6	N/A	0.517	1	QPSK
Touch	Right	4132	24.5	N/A	0.858	1	QPSK
Touch	Right	4233	24.4	N/A	0.832	1	QPSK

Note(s):

1. Circuit Switch (CS) - RMC 12.2kbps with Test loop mode 1 and TPC bits configured to All "1's"

*KDB 941225 - SAR is not required for RMC+HSPA (HSDPA/HSUPA) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding RMC channels.

7.2.8.Specific Absorption Rate - UMTS-FDD 5 Hotspot Mode Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	1.210
Environmental Conditions:	
Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.7 to 23.7

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom	Flat (SAM)	4183	24.6	N/A	0.886	1, 2	QPSK
Front of EUT Facing Phantom	Flat (SAM)	4132	24.5	N/A	0.976	1, 2	QPSK
Front of EUT Facing Phantom	Flat (SAM)	4233	24.4	N/A	0.846	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	4183	24.6	N/A	0.767	1, 2	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	4183	24.6	N/A	1.150	1, 2	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	4132	24.5	N/A	1.210	1, 2	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	4233	24.4	N/A	0.974	1, 2	QPSK

Specific Absorption Rate - UMTS-FDD 5 Hotspot Mode Configuration 1g (Continued):

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Right Hand Side of EUT Facing Phantom	Flat (SAM)	4183	24.6	N/A	0.961	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	4132	24.5	N/A	0.939	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	4233	24.4	N/A	0.847	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	4183	24.6	N/A	0.232	1, 2	QPSK

Note(s):

1. Packet Switch (PS) - RMC 12.2kbps with Test loop mode 1 and TPC bits configured to All "1's"
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 10mm from the 'SAM' phantom flat section.

*KDB 941225 - SAR is not required for RMC+HSPA (HSDPA/HSUPA) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding RMC channels.

7.2.9.Specific Absorption Rate - UMTS-FDD 5 Body-Worn Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.844

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.7 to 23.7

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom	Flat (SAM)	4183	24.6	N/A	0.779	1, 2, 3, 5	QPSK
Front of EUT Facing Phantom	Flat (SAM)	4132	24.5	N/A	0.844	1, 2, 3, 5	QPSK
Front of EUT Facing Phantom	Flat (SAM)	4233	24.4	N/A	0.725	1, 2, 3, 5	QPSK
Front of EUT Facing Phantom With PHF	Flat (SAM)	4132	24.5	N/A	0.712	1, 2, 3, 4	QPSK

Note(s):

1. Circuit Switch (CS) - RMC 12.2kbps with Test loop mode 1 and TPC bits configured to All "1's"
2. Front of EUT, is worst case and most conservative configuration from Hotspot mode and used for Body-worn Configuration.
3. SAR measurements were performed with the closest edge of the EUT at a separation distance of 15mm from the 'SAM' phantom flat section.
4. Personal Hands-Free Kit attached, using the worst-case configuration acquired.
5. Although the above configuration for body-worn overlapped in hotspot mode at the customer request, assessment was performed at 15mm for body-worn configuration. This result can be considered as extra information.

*KDB 941225 - SAR is not required for RMC+HSPA (HSDPA/HSUPA) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding RMC channels.

7.2.10.Specific Absorption Rate - LTE Band 5 – 10MHz Channel BW Head Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.735

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.5 to 23.5

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch Left							
Touch	Left	20525	23.0	N/A	0.496	1	QPSK
Touch	Left	20525	24.2	N/A	0.821	2	QPSK
Touch	Left	20525	24.3	N/A	0.863	3	QPSK
Touch	Left	20525	21.8	N/A	0.487	1	16QAM
Touch	Left	20525	23.0	N/A	0.635	2	16QAM
Touch	Left	20525	23.2	N/A	0.661	3	16QAM
Tilt Left							
Tilt	Left	20525	23.0	N/A	0.278	1	QPSK
Tilt	Left	20525	24.2	N/A	0.489	2	QPSK
Tilt	Left	20525	24.3	N/A	0.480	3	QPSK
Tilt	Left	20525	21.8	N/A	0.277	1	16QAM
Tilt	Left	20525	23.0	N/A	0.374	2	16QAM
Tilt	Left	20525	23.2	N/A	0.373	3	16QAM
Touch Right							
Touch	Right	20525	23.0	N/A	0.496	1	QPSK
Touch	Right	20525	24.2	N/A	0.707	2	QPSK
Touch	Right	20525	24.3	N/A	0.735	3	QPSK
Touch	Right	20525	21.8	N/A	0.402	1	16QAM
Touch	Right	20525	23.0	N/A	0.357	2	16QAM
Touch	Right	20525	23.2	N/A	0.590	3	16QAM
Tilt Right							
Tilt	Right	20525	23.0	N/A	0.337	1	QPSK
Tilt	Right	20525	24.2	N/A	0.485	2	QPSK
Tilt	Right	20525	24.3	N/A	0.443	3	QPSK
Tilt	Right	20525	21.8	N/A	0.274	1	16QAM
Tilt	Right	20525	23.0	N/A	0.363	2	16QAM
Tilt	Right	20525	23.2	N/A	0.392	3	16QAM

Specific Absorption Rate - LTE Band 5 – 10MHz Channel BW Head Configuration 1g (Continued):

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Worst case configuration							
Touch	Left	20450	24.0	N/A	0.779	3	QPSK
Touch	Left	20600	24.2	N/A	0.824	3	QPSK

Note(s):

1. 50% RB Allocation cantered within the channel Bandwidth.
2. 1 RB Allocation Low End of the Channel Edge.
3. 1 RB Allocation High End of the Channel Edge.

According to 941225 D05 SAR for LTE Devices v01

A) Begin by measuring SAR on the high, middle and low (H, M, L) channels using the largest channel bandwidth3, in QPSK with 50% RB allocation centered within the channel bandwidth.
   I) When the SAR of a channel measured in A) is > 1.45 W/kg, also measure SAR for that channel using QPSK with 100% RB allocation.
      a) If the highest SAR measured in I) is > 1.45 W/kg, measure SAR on all channels (H, M, L).

B) Measure SAR in QPSK with 1 RB allocated at the high end of the channel edge using the highest SAR channel measured in A); and then repeat the measurement at the low end of the channel edge.
   II) If the SAR measured for a 1 RB configuration in B) is > 1.45 W/kg, test that 1 RB configuration on all channels (H, M, L).

7.2.11.Specific Absorption Rate - LTE Band 5 – 10MHz Channel BW Hotspot Mode Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.860

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.5 to 23.5

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom							
Front of EUT Facing Phantom	Flat (SAM)	20525	23.0	N/A	0.598	1, 2	QPSK
Front of EUT Facing Phantom	Flat (SAM)	20525	24.2	N/A	0.839	1, 3	QPSK
Front of EUT Facing Phantom	Flat (SAM)	20525	24.3	N/A	0.809	1, 4	QPSK
Front of EUT Facing Phantom	Flat (SAM)	20525	21.8	N/A	0.495	1, 2	16-QAM
Front of EUT Facing Phantom	Flat (SAM)	20525	23.0	N/A	0.649	1, 3	16-QAM
Front of EUT Facing Phantom	Flat (SAM)	20525	23.2	N/A	0.660	1, 4	16-QAM
Back of EUT Facing Phantom							
Back of EUT Facing Phantom	Flat (SAM)	20525	23.0	N/A	0.608	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20525	24.2	N/A	0.790	1, 3	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20525	24.3	N/A	0.759	1, 4	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20525	21.8	N/A	0.473	1, 2	16-QAM
Back of EUT Facing Phantom	Flat (SAM)	20525	23.0	N/A	0.646	1, 3	16-QAM
Back of EUT Facing Phantom	Flat (SAM)	20525	23.2	N/A	0.620	1, 4	16-QAM

Specific Absorption Rate - LTE Band 5 – 10MHz Channel BW Hotspot Mode Configuration 1g (Continued):

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Left Hand Side of EUT Facing Phantom							
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.0	N/A	0.494	1, 2	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	24.2	N/A	0.717	1, 3	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	24.3	N/A	0.591	1, 4	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	21.8	N/A	0.374	1, 2	16-QAM
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.0	N/A	0.573	1, 3	16-QAM
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.2	N/A	0.472	1, 4	16-QAM
Right Hand Side of EUT Facing Phantom							
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.0	N/A	0.486	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	24.2	N/A	0.691	1, 3	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	24.3	N/A	0.597	1, 4	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	21.8	N/A	0.375	1, 2	16-QAM
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.0	N/A	0.529	1, 3	16-QAM
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.2	N/A	0.478	1, 4	16-QAM

Specific Absorption Rate - LTE Band 5 – 10MHz Channel BW Hotspot Mode Configuration 1g (Continued):

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Bottom of EUT Facing Phantom							
Bottom of EUT Facing Phantom	Flat (SAM)	20525	23.0	N/A	0.133	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	20525	24.2	N/A	0.179	1, 3	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	20525	24.3	N/A	0.175	1, 4	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	20525	21.8	N/A	0.098	1, 2	16-QAM
Bottom of EUT Facing Phantom	Flat (SAM)	20525	23.0	N/A	0.135	1, 3	16-QAM
Bottom of EUT Facing Phantom	Flat (SAM)	20525	23.2	N/A	0.137	1, 4	16-QAM
Worst Case Configuration							
Front of EUT Facing Phantom	Flat (SAM)	20450	24.3	N/A	0.860	1, 3	QPSK
Front of EUT Facing Phantom	Flat (SAM)	20600	24.2	N/A	0.775	1, 3	QPSK

Note(s):

1. SAR measurements were performed with the closest edge of the EUT at a separation distance of 10mm from the 'SAM' phantom flat section.
2. 50% RB Allocation cantered within the channel Bandwidth.
3. 1 RB Allocation Low End of the Channel Edge.
4. 1 RB Allocation High End of the Channel Edge.

According to 941225 D05 SAR for LTE Devices v01

A) Begin by measuring SAR on the high, middle and low (H, M, L) channels using the largest channel bandwidth3, in QPSK with 50% RB allocation centered within the channel bandwidth.
   I) When the SAR of a channel measured in A) is > 1.45 W/kg, also measure SAR for that channel using QPSK with 100% RB allocation.
      a) If the highest SAR measured in I) is > 1.45 W/kg, measure SAR on all channels (H, M, L).

B) Measure SAR in QPSK with 1 RB allocated at the high end of the channel edge using the highest SAR channel measured in A); and then repeat the measurement at the low end of the channel edge.
   II) If the SAR measured for a 1 RB configuration in B) is > 1.45 W/kg, test that 1 RB configuration on all channels (H, M, L).

7.2.12.Specific Absorption Rate - LTE Band 5 – 10MHz Channel BW Body-Worn Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.532

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom with PHF	Flat (SAM)	20450	24.3	N/A	0.532	1, 2, 3, 4, 5	QPSK

Note(s):

1. Front of EUT (QPSK 50 % RB Allocation centred within the channel Bandwidth), is the worst case configuration from Hotspot Mode and used for Body-Worn Configuration.
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 15mm from the 'SAM' phantom flat section.
3. 1 RB Allocation Low End of the Channel Edge.
4. Personal Hands-Free Kit attached, using the worst-case configuration acquired.
5. Since the worst case configuration for body-worn overlaps hotspot mode, assessment was performed only with the Personal Hands-free connected.

7.2.13.Specific Absorption Rate - LTE Band 5 – 1.4MHz Channel BW Head Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.926

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.9 to 22.9

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch Left							
Touch	Left	20525	24.1	N/A	0.761	1	QPSK
Touch	Left	20525	24.1	N/A	0.763	2	QPSK
Touch	Left	20525	24.2	N/A	0.749	3	QPSK
Touch	Left	20525	23.1	N/A	0.592	1	16QAM
Touch	Left	20525	23.1	N/A	0.605	2	16QAM
Touch	Left	20525	23.1	N/A	0.591	3	16QAM
Tilt Left							
Tilt	Left	20525	24.1	N/A	0.388	1	QPSK
Tilt	Left	20525	24.1	N/A	0.381	2	QPSK
Tilt	Left	20525	24.2	N/A	0.377	3	QPSK
Tilt	Left	20525	23.1	N/A	0.315	1	16QAM
Tilt	Left	20525	23.1	N/A	0.308	2	16QAM
Tilt	Left	20525	23.1	N/A	0.309	3	16QAM
Touch Right							
Touch	Right	20525	24.1	N/A	0.850	1	QPSK
Touch	Right	20407	24.2	N/A	0.858	1	QPSK
Touch	Right	20643	24.1	N/A	0.881	1	QPSK
Touch	Right	20643	24.1	N/A	0.926	2	QPSK
Touch	Right	20643	24.1	N/A	0.818	3	QPSK
Touch	Right	20525	23.1	N/A	0.658	1	16QAM
Touch	Right	20525	23.1	N/A	0.627	2	16QAM
Touch	Right	20525	23.1	N/A	0.627	3	16QAM

Specific Absorption Rate - LTE Band 5 – 1.4MHz Channel BW Head Configuration 1g (Continued):

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Tilt Right							
Tilt	Right	20525	24.1	N/A	0.440	1	QPSK
Tilt	Right	20525	24.1	N/A	0.452	2	QPSK
Tilt	Right	20525	24.2	N/A	0.454	3	QPSK
Tilt	Right	20525	23.1	N/A	0.360	1	16QAM
Tilt	Right	20525	23.1	N/A	0.349	2	16QAM
Tilt	Right	20525	23.1	N/A	0.368	3	16QAM
Worst case configuration							
Touch	Right	20525	24.1	N/A	0.843	2	QPSK
Touch	Right	20407	24.3	N/A	0.869	2	QPSK

Note(s):

1. 50% RB Allocation cantered within the channel Bandwidth.
2. 1 RB Allocation Low End of the Channel Edge.
3. 1 RB Allocation High End of the Channel Edge.

According to 941225 D05 SAR for LTE Devices v01

A) Begin by measuring SAR on the high, middle and low (H, M, L) channels using the largest channel bandwidth3, in QPSK with 50% RB allocation centered within the channel bandwidth.
   I) When the SAR of a channel measured in A) is > 1.45 W/kg, also measure SAR for that channel using QPSK with 100% RB allocation.
      b) If the highest SAR measured in I) is > 1.45 W/kg, measure SAR on all channels (H, M, L).

B) Measure SAR in QPSK with 1 RB allocated at the high end of the channel edge using the highest SAR channel measured in A); and then repeat the measurement at the low end of the channel edge.
   II) If the SAR measured for a 1 RB configuration in B) is > 1.45 W/kg, test that 1 RB configuration on all channels (H, M, L).

7.2.14.Specific Absorption Rate - LTE Band 5 – 1.4MHz Channel BW Hotspot Mode Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.853

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom							
Front of EUT Facing Phantom	Flat (SAM)	20525	24.1	N/A	0.790	1, 2	QPSK
Front of EUT Facing Phantom	Flat (SAM)	20525	24.1	N/A	0.818	1, 3	QPSK
Front of EUT Facing Phantom	Flat (SAM)	20525	24.2	N/A	0.786	1, 4	QPSK
Front of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.644	1, 2	16-QAM
Front of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.638	1, 3	16-QAM
Front of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.630	1, 4	16-QAM
Back of EUT Facing Phantom							
Back of EUT Facing Phantom	Flat (SAM)	20525	24.1	N/A	0.797	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20525	24.1	N/A	0.803	1, 3	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20525	24.2	N/A	0.780	1, 4	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.649	1, 2	16-QAM
Back of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.640	1, 3	16-QAM
Back of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.635	1, 4	16-QAM

Specific Absorption Rate - LTE Band 5 – 1.4MHz Channel BW Hotspot Mode Configuration 1g (Continued):

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Left Hand Side of EUT Facing Phantom							
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	24.1	N/A	0.613	1, 2	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	24.1	N/A	0.628	1, 3	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	24.2	N/A	0.571	1, 4	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.485	1, 2	16-QAM
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.496	1, 3	16-QAM
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.475	1, 4	16-QAM
Right Hand Side of EUT Facing Phantom							
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	24.1	N/A	0.596	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	24.1	N/A	0.582	1, 3	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	24.2	N/A	0.591	1, 4	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.472	1, 2	16-QAM
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.475	1, 3	16-QAM
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.452	1, 4	16-QAM

Specific Absorption Rate - LTE Band 5 – 1.4MHz Channel BW Hotspot Mode Configuration 1g (Continued):

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Bottom of EUT Facing Phantom							
Bottom of EUT Facing Phantom	Flat (SAM)	20525	24.1	N/A	0.173	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	20525	24.1	N/A	0.177	1, 3	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	20525	24.2	N/A	0.167	1, 4	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.137	1, 2	16-QAM
Bottom of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.137	1, 3	16-QAM
Bottom of EUT Facing Phantom	Flat (SAM)	20525	23.1	N/A	0.134	1, 4	16-QAM
Worst case Configuration							
Front of EUT Facing Phantom	Flat (SAM)	20407	24.3	N/A	0.853	1, 3	QPSK
Front of EUT Facing Phantom	Flat (SAM)	20643	24.1	N/A	0.743	1, 3	QPSK

Note(s):

1. SAR measurements were performed with the closest edge of the EUT at a separation distance of 10mm from the 'SAM' phantom flat section.
2. 50% RB Allocation cantered within the channel Bandwidth.
3. 1 RB Allocation Low End of the Channel Edge.
4. 1 RB Allocation High End of the Channel Edge.

According to 941225 D05 SAR for LTE Devices v01

A) Begin by measuring SAR on the high, middle and low (H, M, L) channels using the largest channel bandwidth3, in QPSK with 50% RB allocation centered within the channel bandwidth.
   I) When the SAR of a channel measured in A) is > 1.45 W/kg, also measure SAR for that channel using QPSK with 100% RB allocation.
   a) If the highest SAR measured in I) is > 1.45 W/kg, measure SAR on all channels (H, M, L).

B) Measure SAR in QPSK with 1 RB allocated at the high end of the channel edge using the highest SAR channel measured in A); and then repeat the measurement at the low end of the channel edge.
   II) If the SAR measured for a 1 RB configuration in B) is > 1.45 W/kg, test that 1 RB configuration on all channels (H, M, L).

7.2.15.Specific Absorption Rate - LTE Band 5 – 1.4MHz Channel BW Body-Worn Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.635

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.0 to 23.0

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom with PHF	Flat (SAM)	20407	24.3	N/A	0.635	1, 2, 3, 4, 5	QPSK

Note(s):

1. Front of EUT (QPSK 50 % RB Allocation centred within the channel Bandwidth), is the worst case configuration from Hotspot Mode and used for Body-Worn Configuration.
2. SAR measurements were performed with the closest edge of the EUT at a separation distance of 15mm from the 'SAM' phantom flat section.
3. 1 RB Allocation Low End of the Channel Edge.
4. Personal Hands-Free Kit attached, using the worst-case configuration acquired.
5. Since the worst case configuration for body-worn overlaps hotspot mode, assessment was performed only with the Personal Hands-free connected.

7.2.16.Specific Absorption Rate - Wi-Fi 2450 Head Configuration 1g
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.240
Environmental Conditions:	
Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	24.0 to 24.0

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	6	12.7	N/A	0.174	1	BPSK
Tilt	Left	6	12.7	N/A	0.117	1	BPSK
Touch	Right	6	12.7	N/A	0.087	1	BPSK
Tilt	Right	6	12.7	N/A	0.070	1	BPSK
Touch	Left	1	12.6	N/A	0.162	1	BPSK
Touch	Left	11	13.8	N/A	0.240	1	BPSK
Touch	Left	1	12.4	N/A	0.114	2	DBPSK

Note(s):

1. WLAN 802.11g 6Mbps
2. WLAN 802.11b 1Mbps: Touch Left, worst case configuration on ‘g’ mode was used to evaluate ‘b’ mode on the highest output channel (channel 1).

*KDB 248227 - SAR is not required for 802.11n channels when the maximum average output power is less than ¼ dB higher than that measured on the corresponding 802.11g channels and ‘b’ mode highest output channel was also evaluated.

As per FCC kdb pub. *SAR Handsets Multi Xmiter and Ant, v01r05;* when there is simultaneous transmission occuring, stand- alone SAR evaluation is not required when the output power measured is ≤ 2.Pref for the particular band and antenna separation is ≥5.0cm from other antenna.

Output power thresholds for Unlicensed Transmitters

Pref	2.45	5.15 – .35	5.47	G z
	12	6	5	Mw

As per table 1 above, since output power measured for;
5.15 to 5.35 GHz maximum output power =7.2 mW < 12mW (2*Pref)
5.47 to 5.85 GHz maximum output power =9.5mW < 10mW (2*Pref)

Stand Alone SAR evaluation is not required for 5.0 GHz WLAN802.11a/n modes.

7.2.17.Specific Absorption Rate - Wi-Fi 2450 Hotspot Mode Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.058

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	24.0 to 24.0

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom	Flat (SAM)	6	12.7	N/A	0.037	1, 2	BPSK
Back of EUT Facing Phantom	Flat (SAM)	6	12.7	N/A	0.030	1, 2	BPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	6	12.7	N/A	0.005	1, 2	BPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	6	12.7	N/A	0.027	1, 2	BPSK
Top of EUT Facing Phantom	Flat (SAM)	6	12.7	N/A	0.024	1, 2	BPSK

Specific Absorption Rate - Wi-Fi 2450 Hotspot Mode Configuration 1g (Continued)							
EUT Position	**Phantom Configuration**	**Channel Number**	**Meas. Avg. Power (dBm)**	**Power Back-off (dB)**	**Meas. Level (W/Kg)**	**Note(s)**	**Mod.**
Front of EUT Facing Phantom	Flat (SAM)	1	12.6	N/A	0.032	1, 2	BPSK
Front of EUT Facing Phantom	Flat (SAM)	11	13.8	N/A	0.058	1, 2	BPSK
Front of EUT Facing Phantom	Flat (SAM)	1	12.4	N/A	0.029	1, 2, 3	DBPSK

Note(s):

1. WLAN 802.11g 6Mbps
2. EUT Supports Hotspot; SAR measurements were performed with the closest edge of the EUT at a separation distance of 10mm from the 'SAM' phantom flat section.
3. WLAN 802.11b 1Mbps: Front of EUT, worst case configuration on ‘g’ mode was used to evaluate ‘b’ mode on the highest output channel (channel 1).

*KDB 248227 - SAR is not required for 802.11n channels when the maximum average output power is less than ¼ dB higher than that measured on the corresponding 802.11g channels and ‘b’ mode highest output channel was also evaluated.

As per FCC kdb pub. *SAR Handsets Multi Xmiter and Ant, v01r05;* when there is simultaneous transmission occuring, stand- alone SAR evaluation is not required when the output power measured is ≤ 2.Pref for the particular band and antenna separation is ≥5.0cm from other antenna.

Output power thresholds for Unlicensed Transmitters

Pref	2.45	5.15 – 5.35	5.47	GHz
	12	6	5	Mw

As per table 1 above, since output power measured for;
5.15 to 5.35 GHz maximum output power =7.2 mW < 12mW (2*Pref)
5.47 to 5.85 GHz maximum output power =9.5mW < 10mW (2*Pref)

Stand Alone SAR evaluation is not required for 5.0 GHz WLAN802.11a/n modes.

7.2.18.Specific Absorption Rate - Wi-Fi 2450 Body-Worn Configuration 1g Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.034
Environmental Conditions:	
Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	24.0 to 24.0

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Front of EUT Facing Phantom	Flat (SAM)	11	13.8	N/A	0.034	1, 2, 3, 5	BPSK
Front of EUT Facing Phantom	Flat (SAM)	1	12.4	N/A	0.015	1, 3, 5, 6	DBPSK
Front of EUT Facing Phantom With PHF	Flat (SAM)	11	13.8	N/A	0.024	1, 2, 3, 4	BPSK

Note(s):

1. The Front of EUT, Worst case configuration of Wi-Fi Hotspot Mode is applied on Body-Worn configuration.
2. WLAN 802.11g 6Mbps
3. SAR measurements were performed with the closest edge of the EUT at a separation distance of 15mm from the 'SAM' phantom flat section.
4. Personal Hands-Free Kit attached, using the worst-case configuration acquired.
5. Although the above configuration for body-worn overlapped in hotspot mode at the customer request, assessment was performed at 15mm for body-worn configuration. This result can be considered as extra information.
6. WLAN 802.11b 1Mbps: Front of EUT, worst case configuration on ‘g’ mode was used to evaluate ‘b’ mode on the highest output channel (channel 1).

*KDB 248227 - SAR is not required for 802.11n channels when the maximum average output power is less than ¼ dB higher than that measured on the corresponding 802.11g channels and ‘b’ mode highest output channel was also evaluated.

As per FCC kdb pub. *SAR Handsets Multi Xmiter and Ant, v01r05;* when there is simultaneous transmission occuring, stand- alone SAR evaluation is not required when the output power measured is ≤ 2.Pref for the particular band and antenna separation is ≥5.0cm from other antenna.

Output power thresholds for Unlicensed Transmitters

Pref	2.45	5.15 – 5.35	5.47	GHz
	12	6	5	mW

As per table 1 above, since output power measured for;
5.15 to 5.35 GHz maximum output power =7.2 mW < 12mW (2*Pref)
5.47 to 5.85 GHz maximum output power =9.5mW < 10mW (2*Pref)

Stand Alone SAR evaluation is not required for 5.0 GHz WLAN802.11a/n modes.

7.2.19.Conducted Average Power Measurement 2G: GSM850

Channel Number	Frequency (MHZ)	Power (dBm)	Avg. Burst Power with consideration for uplink time slot (dBm)	Note
128	824.2	33.7	24.7	Conducted, GMSK
190	836.6	33.7	24.7	Conducted, GMSK
251	848.8	33.6	24.6	Conducted, GMSK

GPRS850 - Measured Average Power without consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	33.8	31.7	30.0	28.7	Conducted, GMSK
190	836.6	33.7	31.5	29.9	28.6	Conducted, GMSK
251	848.8	33.6	31.5	29.7	28.6	Conducted, GMSK

GPRS850 - Calculated Value with consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	24.8	25.7	25.7	25.7	Conducted, GMSK
190	836.6	24.7	25.5	25.6	25.6	Conducted, GMSK
251	848.8	24.6	25.5	25.4	25.6	Conducted, GMSK

EDGE (MCS4 ~ GMSK)
EDGE850 - Measured Average Power without consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	33.7	31.7	30.0	28.7	Conducted, GMSK
190	836.6	33.6	31.5	29.9	28.6	Conducted, GMSK
251	848.8	33.6	31.5	29.7	28.7	Conducted, GMSK

EDGE850 - Calculated Value with consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	24.7	25.7	25.7	25.7	Conducted, GMSK
190	836.6	24.6	25.5	25.6	25.6	Conducted, GMSK
251	848.8	24.6	25.5	25.4	25.7	Conducted, GMSK

Note:

Scale factor for uplink time slot:

1. 1 Uplink: time slot ratio = 8:1 => 10*log(8/1) = **9.03 dB**
2. 2 Uplink: time slot ratio = 8:2 => 10*log(8/2) = **6.02 dB**
3. 3 Uplink: time slot ratio = 8:3 => 10*log(8/3) = **4.26 dB**
4. 4 Uplink: time slot ratio = 8:4 => 10*log(8/4) = **3.01 dB**

EDGE (MCS9 ~ 8PSK)
EDGE850 - Measured Average Power without consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	28.1	26.7	25.6	23.4	Conducted, 8PSK
190	836.6	28.1	26.7	25.6	23.4	Conducted, 8PSK
251	848.8	28.1	26.7	25.5	23.4	Conducted, 8PSK

EDGE850 - Calculated Value with consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	19.1	20.7	21.3	20.4	Conducted, 8PSK
190	836.6	19.1	20.7	21.3	20.4	Conducted, 8PSK
251	848.8	19.1	20.7	21.2	20.4	Conducted, 8PSK

Note:

Scale factor for uplink time slot:

1. 1 Uplink: time slot ratio = 8:1 => 10*log(8/1) = **9.03 dB**
2. 2 Uplink: time slot ratio = 8:2 => 10*log(8/2) = **6.02 dB**
3. 3 Uplink: time slot ratio = 8:3 => 10*log(8/3) = **4.26 dB**
4. 4 Uplink: time slot ratio = 8:4 => 10*log(8/4) = **3.01 dB**

7.2.20.Conducted Average Power Measurement 2G: PCS1900

Channel Number	Frequency (MHZ)	Power (dBm)	Avg. Burst Power with consideration for uplink time slot (dBm)	Note
512	1850.2	30.2	21.2	Conducted, GMSK
661	1880.0	30.3	21.3	Conducted, GMSK
810	1909.8	30.3	21.3	Conducted, GMSK

GPRS1900 - Measured Average Power without consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	30.2	28.4	26.4	25.3	Conducted, GMSK
661	1880.0	30.3	28.4	26.4	25.2	Conducted, GMSK
810	1909.8	30.3	28.5	26.5	25.2	Conducted, GMSK

GPRS1900 - Calculated Value with consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	21.2	22.4	22.1	22.3	Conducted, GMSK
661	1880.0	21.3	22.4	22.1	22.2	Conducted, GMSK
810	1909.8	21.3	22.5	22.2	22.2	Conducted, GMSK

EDGE (MCS4 ~ GMSK)
EDGE1900 - Measured Average Power without consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	30.3	28.3	26.4	25.3	Conducted, GMSK
661	1880.0	30.3	28.3	26.5	25.3	Conducted, GMSK
810	1909.8	30.3	28.5	26.5	25.2	Conducted, GMSK

EDGE1900 - Calculated Value with consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	21.3	22.3	22.1	22.3	Conducted, GMSK
661	1880.0	21.3	22.3	22.2	22.3	Conducted, GMSK
810	1909.8	21.3	22.5	22.2	22.2	Conducted, GMSK

Note:

Scale factor for uplink time slot:

1. 1 Uplink: time slot ratio = 8:1 => 10*log(8/1) = **9.03 dB**
2. 2 Uplink: time slot ratio = 8:2 => 10*log(8/2) = **6.02 dB**
3. 3 Uplink: time slot ratio = 8:3 => 10*log(8/3) = **4.26 dB**
4. 4 Uplink: time slot ratio = 8:4 => 10*log(8/4) = **3.01 dB**

EDGE (MCS9 ~ 8PSK):
EDGE1900 - Measured Average Power without consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	26.8	25.3	24.2	23.3	Conducted, 8PSK
661	1880.0	26.8	25.3	24.2	23.3	Conducted, 8PSK
810	1909.8	26.8	25.3	24.3	23.3	Conducted, 8PSK

EDGE1900 - Calculated Value with consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	17.8	19.3	19.9	20.3	Conducted, 8PSK
661	1880.0	17.8	19.3	19.9	20.3	Conducted, 8PSK
810	1909.8	17.8	19.3	20.0	20.3	Conducted, 8PSK

Note:

Scale factor for uplink time slot:

1. 1 Uplink: time slot ratio = 8:1 => 10*log(8/1) = **9.03 dB**
2. 2 Uplink: time slot ratio = 8:2 => 10*log(8/2) = **6.02 dB**
3. 3 Uplink: time slot ratio = 8:3 => 10*log(8/3) = **4.26 dB**
4. 4 Uplink: time slot ratio = 8:4 => 10*log(8/4) = **3.01 dB**

7.2.21.Conducted Average Power Measurement 3G:

Modes		HSDPA				HSPA					WCDMA
Sets		1	2	3	4	1	2	3	4	5	Voice / RMC 12.2kbps
Band	Channel	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]
850 (Band 5)	4132 4357	24.5	24.0	23.5	23.5	24.1	24.3	23.5	24.5	23.6	24.5
	4183 4408	24.6	24.1	23.6	23.5	24.2	24.4	23.5	24.6	23.6	24.6
	4233 4458	24.4	24.0	23.5	23.5	24.1	24.2	23.4	24.4	23.4	24.4
ßc		2	12	15	15	11	6	15	2	15	
ßd		15	15	8	4	15	15	9	15	15	
ΔACK, ΔNACK, ΔCQI		8	8	8	8	8	8	8	8	8	
AGV		-	-	-	-	20	12	15	17	21	

The module power levels were measured in both HSPA and 3G RMC 12.2kbps modes and compared to ensure the correct mode of operation had been established.

The following tables taken from FCC 3G SAR procedures (KDB 941225 D01 SAR test for 3G devices v02) below were applied using an Agilent 8960 series 10 wireless communications test set which supports 3G / HSDPA release 5 / HSPA release 6.

Sub-test Setup for Release 5 HSDPA

Sub-test	β_c	β_d	B_d *(SF)*	β_c/β_d	β_{hs} (1)	SM (dB) (2)
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 (3)	15/15 (3)	64	12/15 (3)	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $B_{hs}/\beta_c = 24/15$

Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$

Sub-test Setup for Release 6 HSPA

Sub-test	β_c	β_d	B_d *(SF)*	β_c/β_d	β_{hs} (1)	B_{oc}	B_{od}	B_{od} *(SF)*	B_{od} *(codes)*	CM (2) (dB)	MPR (dB)	AG (4) Index	E-TFCI
1	11/15 (3)	15/15 (3)	64	11/15 (3)	22/15	209/225	1039/225	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	31/15	B_{al1}: 47/15 B_{al2}: 47/15	4	1	2.0	1.0	15	92
4	2/15	15/15	64	2/15	2/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (4)	15/15 (4)	64	15/15 (4)	24/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $B_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH AND E-DPCCH for the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Tavle 5.1g.

Note 6: B_{od} cannot be set directly; it is set by Absolute Grant Value.

7.2.22.Conducted Average Power Measurement: LTE Band 5 (850 MHz)

Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **829.0 MHz** (Low)	Frequency **836.5 MHz** (Middle)	Frequency **844.0 MHz** (High)
10 MHz	QPSK	1	Low	0	(0)	24.0	24.3	24.2	24.2
		1	High	49	(0)	24.0	24.0	24.3	24.2
		25	Mid	12	(1)	23.0	22.7	23.0	23.0
		50	-	0	(1)	23.0	22.6	22.8	22.8
	16QAM	1	Low	0	(1)	23.0	23.1	23.0	23.1
		1	High	49	(1)	23.0	23.0	23.2	23.1
		25	Mid	12	(2)	22.0	21.7	21.8	22.0
		50	-	0	(2)	22.0	21.7	21.8	21.8

Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **826.5 MHz** (Low)	Frequency **836.5 MHz** (Middle)	Frequency **846.5 MHz** (High)
5 MHz	QPSK	1	Low	0	(0)	24.0	24.1	24.1	24.1
		1	High	24	(0)	24.0	24.2	24.3	24,1
		12	Mid	6	(1)	23.0	23.2	23.2	23.1
		25	-	0	(1)	23.0	23.0	23.0	22.9
	16QAM	1	Low	0	(1)	23.0	23.2	23.0	23.1
		1	High	24	(1)	23.0	23.1	23.2	23.0
		12	Mid	6	(2)	22.0	22.1	22.2	22.0
		25	-	0	(2)	22.0	21.9	22.0	21.9

Conducted Average Power Measurement: LTE Band 5 (850 MHz) (Continued)

Ch. BW	Modulations	RB Config	Start RB Offset		Power Back-off	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **825.5 MHz** (Low)	Frequency **836.5 MHz** (Middle)	Frequency **847.5 MHz** (High)
3 MHz	QPSK	1	Low	0	(0)	24.0	24.3	24.0	24.1
		1	High	14	(0)	24.0	24.1	24.1	24.1
		8	Mid	4	(1)	23.0	23.1	23.1	23.1
		15	-	0	(1)	23.0	23.0	23.0	23.0
	16QAM	1	Low	0	(1)	23.0	23.2	23.0	23.1
		1	High	14	(1)	23.0	23.0	23.0	23.1
		8	Mid	4	(2)	22.0	22.0	22.1	22.1
		15	-	0	(2)	22.0	22.0	22.1	22.0
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**Power Back-off**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **824.7 MHz** (Low)	Frequency **836.5 MHz** (Middle)	Frequency **848.3 MHz** (High)
1.4 MHz	QPSK	1	Low	0	(0)	24.0	24.3	24.1	24.1
		1	High	5	(0)	24.0	24.2	24.2	24.1
		3	Mid	1	(0)	24.0	24.2	24.1	24.1
		6	-	0	(1)	23.0	23.2	23.2	23.2
	16QAM	1	Low	0	(1)	23.0	23.2	23.1	23.1
		1	High	5	(1)	23.0	23.2	23.1	23.1
		3	Mid	1	(1)	23.0	23.2	23.1	23.1
		6	-	0	(2)	22.0	22.2	22.2	22.2

7.2.23.Conducted Power Measurements Wi-Fi802.11b/g/n

802.11b/g

Channel Number	Frequency (MHZ)	TX Power (dBm)	Note
1	2412.0	12.4	**2.4GHz 802.11b** (1Mbps)
6	2437.0	11.5	
11	2462.0	11.5	
1	2412.0	11.6	**2.4GHz 802.11b** (11Mbps)
6	2437.0	10.9	
11	2462.0	11.1	
1	2412.0	12.6	**2.4GHz 802.11g** (6Mbps)
6	2437.0	12.7	
11	2462.0	13.8	
1	2412.0	12.2	**2.4GHz 802.11g** (54Mbps)
6	2437.0	12.5	
11	2462.0	13.1	

802.11n

Channel Number	Frequency (MHZ)	TX Power (dBm)	Note
1	2412.0	11.7	**2.4GHz 802.11n** (MCS0 6.5Mbps)
6	2437.0	12.0	
11	2462.0	12.5	
1	2412.0	11.4	**2.4GHz 802.11n** (MCS7 65Mbps)
6	2437.0	11.5	
11	2462.0	12.2	

7.2.24.Conducted Power Measurements Wi-Fi802.11a/n (5.0 GHz)
802.11a (5.0 GHz)

Channel Number	Frequency (MHZ)	TX Power (dBm) 6 Mbps	TX Power (dBm) 54 Mbps	Note
36*	**5180.0**	8.6	7.3	**5.2 GHz**
40	5200.0	7.8	7.4	
44	5220.0	7.9	7.4	
48*	**5240.0**	7.6	7.2	
52*	**5260.0**	7.5	7.4	**5.3 GHz**
56	5280.0	7.8	7.4	
60	5300.0	7.5	6.9	
64*	**5320.0**	7.5	7.0	
100	5500.0	7.5	7.4	**5.6 GHz**
104*	**5520.0**	7.8	7.4	
108	5540.0	7.9	7.6	
112	5560.0	8.1	7.4	
116*	**5580.0**	8.0	7.8	
120	5600.0	8.2	7.8	
124*	**5620.0**	8.5	8.2	
128	5640.0	8.4	8.2	
132	5660.0	8.7	8.5	
136*	**5680.0**	8.8	8.4	
140	5700.0	9.1	8.5	
149*	**5745.0**	9.4	8.6	**5.8 GHz**
153	5765.0	9.1	8.7	
157*	**5785.0**	9.5	9.2	
161	5805.0	8.6	7.8	
165*	**5825.0**	8.4	7.8	

Note:

*** Default test Channels**

802.11n (5.0 GHz) (HT20)				
Channel Number	**Frequency (MHZ)**	**TX Power (dBm) 6.5 Mbps**	**TX Power (dBm) 65 Mbps**	**Note**
36*	**5180.0**	7.9	7.7	**5.2 GHz**
40	5200.0	7.7	7.8	
44	5220.0	7.6	7.5	
48*	**5240.0**	7.8	7.4	
52*	**5260.0**	7.8	7.2	**5.3 GHz**
56	5280.0	7.8	7.5	
60	5300.0	7.6	7.4	
64*	**5320.0**	7.6	7.4	
100	5500.0	7.5	7.3	**5.6 GHz**
104*	**5520.0**	7.7	7.4	
108	5540.0	7.7	7.7	
112	5560.0	7.9	7.5	
116*	**5580.0**	8.2	7.9	
120	5600.0	8.2	7.8	
124*	**5620.0**	8.6	8.3	
128	5640.0	8.4	8.2	
132	5660.0	8.7	8.3	
136*	**5680.0**	8.8	8.3	
140	5700.0	9.2	9.0	
149*	**5745.0**	9.0	8.9	**5.8 GHz**
153	5765.0	9.2	9.2	
157*	**5785.0**	8.5	8.6	
161	5805.0	8.6	8.7	
165*	**5825.0**	8.5	9.0	

Note:

*** Default test Channels**

802.11n (5.0 GHz) (HT40)				
Channel Number	**Frequency (MHZ)**	**TX Power (dBm) 13.5 Mbps**	**TX Power (dBm) 135 Mbps**	**Note**
38	5190.0	7.4	7.3	**5.2 GHz**
46	5230.0	7.0	7.0	
54	5270.0	7.2	7.3	**5.3 GHz**
62	5310.0	7.6	7.2	
102	5510.0	7.9	7.7	**5.6 GHz**
110	5550.0	8.4	8.3	
118	5590.0	7.4	8.3	
126	5630.0	8.1	8.7	
134	5670.0	8.9	9.1	
151	5755.0	9.3	9.1	**5.8 GHz**
159	5795.0	9.8	9.6	

Note:

As per FCC kdb pub. *SAR Handsets Multi Xmiter and Ant, v01r05;* when there is simultaneous transmission occuring, stand- alone SAR evaluation is not required when the output power measured is ≤ 2.P_{ref} for the particular band and antenna separation is ≥5.0cm from other antenna.

Output power thresholds for Unlicensed Transmitters

P_{ref}	2.45	5.15 – 5.35	5.47	GHz
	12	6	5	mW

As per table 1 above, since output power measured for;
5.15 to 5.35 GHz maximum output power =7.2 mW < 12mW (2*P_{ref})
5.47 to 5.85 GHz maximum output power =9.5mW < 10mW (2*P_{ref})

Stand Alone SAR evaluation is not required for 5.0 GHz WLAN802.11a/n modes.

8. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Test Name	Confidence Level	Calculated Uncertainty
Specific Absorption Rate-GSM 850/ UMTS FDD 5 / LTE Band 5 Head Configuration 1g	95%	±19.94%
Specific Absorption Rate-GSM / GPRS / EDGE 850 / UMTS FDD 5 / LTE Band 5 Body Configurations 1g	95%	±20.07%
Specific Absorption Rate-PCS 1900 Head Configuration 1g	95%	±20.72%
Specific Absorption Rate-GSM / GPRS / EDGE 1900 Body Configuration 1g	95%	±20.00%
Specific Absorption Rate-Wi-Fi 2450 MHz Head Configuration 1g	95%	±19.47%
Specific Absorption Rate-Wi-Fi 2450 MHz Body Configuration 1g	95%	±19.90%

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

8.1. Specific Absorption Rate Uncertainty -GSM 850 / UMTS FDD 5 / LTE Band 5 Head Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (1g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.400	2.400	normal (k=1)	1.0000	1.0000	2.400	2.400	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.920	4.920	normal (k=1)	1.0000	0.6400	3.149	3.149	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.970	4.970	normal (k=1)	1.0000	0.6000	2.982	2.982	5
	Combined standard uncertainty			t-distribution			10.17	10.17	>250
	Expanded uncertainty			k = 1.96			19.94	19.94	>250

8.2. Specific Absorption Rate-GSM / GPRS / EDGE 850 / UMTS FDD 5 / LTE Band 5 Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (1g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration /Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.900	2.900	normal (k=1)	1.0000	1.0000	2.900	2.900	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.690	4.690	normal (k=1)	1.0000	0.6400	3.002	3.002	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.860	4.860	normal (k=1)	1.0000	0.6000	2.916	2.916	5
	Combined standard uncertainty			t-distribution			10.24	10.24	>250
	Expanded uncertainty			k = 1.96			20.07	20.07	>250

8.3. Specific Absorption Rate-PCS 1900 Head Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (1g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with Regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	3.800	3.800	normal (k=1)	1.0000	1.0000	3.800	3.800	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.900	4.900	normal (k=1)	1.0000	0.6400	3.136	3.136	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.880	4.880	normal (k=1)	1.0000	0.6000	2.928	2.928	5
	Combined standard uncertainty			t-distribution			10.57	10.57	>200
	Expanded uncertainty			k = 1.96			20.72	20.72	>200

8.4. Specific Absorption Rate-PCS / GPRS / EDGE 1900 Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (1g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	1.730	1.730	Rectangular	1.7321	1.0000	0.999	0.999	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.500	2.500	normal (k=1)	1.0000	1.0000	2.500	2.500	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.940	4.940	normal (k=1)	1.0000	0.6400	3.162	3.162	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.980	4.980	normal (k=1)	1.0000	0.6000	2.988	2.988	5
	Combined standard uncertainty			t-distribution			10.20	10.20	>250
	Expanded uncertainty			k = 1.96			20.00	20.00	>250

8.5. Specific Absorption Rate-Wi-Fi 2450 MHz Head Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (1g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.000	2.000	normal (k=1)	1.0000	1.0000	2.000	2.000	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.410	4.410	normal (k=1)	1.0000	0.6400	2.822	2.822	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.930	4.930	normal (k=1)	1.0000	0.6000	2.958	2.958	5
	Combined standard uncertainty			t-distribution			9.93	9.93	>300
	Expanded uncertainty			k = 1.96			19.47	19.47	>300

8.6. Specific Absorption Rate-Wi-Fi 2450 MHz Body Configuration 1g

Type	Source of uncertainty	+ Value	- Value	Probability Distribution	Divisor	$c_{i\ (1g)}$	Standard Uncertainty		υ_i or υ_{eff}
							+ u (%)	- u (%)	
B	Probe calibration	6.000	6.000	normal (k=1)	1.0000	1.0000	6.000	6.000	∞
B	Axial Isotropy	0.250	0.250	normal (k=1)	1.0000	1.0000	0.250	0.250	∞
B	Hemispherical Isotropy	1.300	1.300	normal (k=1)	1.0000	1.0000	1.300	1.300	∞
B	Spatial Resolution	0.500	0.500	Rectangular	1.7321	1.0000	0.289	0.289	∞
B	Boundary Effect	0.769	0.769	Rectangular	1.7321	1.0000	0.444	0.444	∞
B	Linearity	0.600	0.600	Rectangular	1.7321	1.0000	0.346	0.346	∞
B	Detection Limits	0.200	0.200	Rectangular	1.7321	1.0000	0.115	0.115	∞
B	Readout Electronics	0.160	0.160	normal (k=1)	1.0000	1.0000	0.160	0.160	∞
B	Response Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	Integration Time	0.000	0.000	Rectangular	1.7321	1.0000	0.000	0.000	∞
B	RF Ambient conditions	3.000	3.000	Rectangular	1.7321	1.0000	1.732	1.732	∞
B	Probe Positioner Mechanical Restrictions	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Probe Positioning with regard to Phantom Shell	2.850	2.850	Rectangular	1.7321	1.0000	1.645	1.645	∞
B	Extrapolation and integration / Maximum SAR evaluation	5.080	5.080	Rectangular	1.7321	1.0000	2.933	2.933	∞
A	Test Sample Positioning	2.570	2.570	normal (k=1)	1.0000	1.0000	2.570	2.570	10
A	Device Holder uncertainty	0.154	0.154	normal (k=1)	1.0000	1.0000	0.154	0.154	10
B	Phantom Uncertainty	4.000	4.000	Rectangular	1.7321	1.0000	2.309	2.309	∞
B	Drift of output power	5.000	5.000	Rectangular	1.7321	1.0000	2.887	2.887	∞
B	Liquid Conductivity (target value)	5.000	5.000	Rectangular	1.7321	0.6400	1.848	1.848	∞
A	Liquid Conductivity (measured value)	4.900	4.900	normal (k=1)	1.0000	0.6400	3.136	3.136	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.6000	1.732	1.732	∞
A	Liquid Permittivity (measured value)	4.920	4.920	normal (k=1)	1.0000	0.6000	2.952	2.952	5
	Combined standard uncertainty			t-distribution			10.15	10.15	>250
	Expanded uncertainty			k = 1.96			19.90	19.90	>250

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A034	Narda 20W Termination	Narda	374BNM	8706	Calibrated as part of system	-
A1097	SMA Directional Coupler	MiDISCO	MDC6223-30	None	Calibrated as part of system	-
A1137	3dB Attenuator	Narda	779	04690	Calibrated as part of system	-
A1174	Dielectric Probe Kit	Agilent Technologies	85070C	Us99360072	Calibrated before use	-
A1328	Handset Positioner	Schmid & Partner Engineering AG	Modification	SD 000 H01 DA	-	-
A1182	Handset Positioner	Schmid & Partner Engineering AG	V3.0	None	-	-
A1184	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	394	26 Jan 2012	12
A2111	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	432	02 May 2012	12
A2077	Probe	Schmid & Partner Engineering AG	EX3 DV4	3814	22 Sep 2011	12
A1185	Probe	Schmid & Partner Engineering AG	ET3 DV6	1528	26 Jul 2012	12
A1235	900 MHz Dipole Kit	Schmid & Partner Engineering AG	D900V2	124	09 Feb 2011	24
A2201	900 MHz Dipole Kit	Schmid & Partner Engineering AG	D900V2	035	16 Aug 2012	12
A1237	1900 MHz Dipole Kit	Schmid & Partner Engineering AG	D1900V2	540	08 Feb 2011	24
A1322	2450 MHz Dipole Kit	Schmid & Partner Engineering AG	D2450V2	725	08 Feb 2011	24
A1497	Amplifier	Mini-Circuits	zhl-42w (sma)	e020105	Calibrated as part of system	-
A1566	SAM Phantom	Schmid & Partner Engineering AG	SAM a (Site 56)	002	Calibrated before use	-
A1238	SAM Phantom	Schmid & Partner Engineering AG	SAM b (Site 56)	001	Calibrated before use	-
A2125	SAM Phantom	Schmid & Partner Engineering AG	SAM b (Site 57)	TP-1031	Calibrated before use	-

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A2124	SAM Phantom	Schmid & Partner Engineering AG	SAM a (Site 57)	TP-1030	Calibrated before use	-
A215	20 dB Attenuator	Narda	766-20	9402	Calibrated as part of system	-
A1531	Antenna	AARONIA AG	7025	02458	-	-
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	27 Sept 2011	12
C1145	Cable	Rosenberger MICRO-COAX	FA147A F003003030	41843-1	Calibrated as part of system	-
C1146	Cable	Rosenberger MICRO-COAX	FA147A F030003030	41752-1	Calibrated as part of system	-
G0528	Robot Power Supply	Schmid & Partner Engineering AG	DASY4	None	Calibrated before use	-
GO591	Robot Power Supply	Schmid & Partner Engineering AG	DASY4	None	Calibrated before use	-
G0592	Robot Power Supply	Schmid & Partner Engineering AG	DASY53	None	Calibrated before use	-
G087	PSU	Thurlby Thandar	CPX200	100701	Calibrated before use	-
M1047	Robot Arm	Staubli	RX908 L	F00/SD8 9A1/A/01	Calibrated before use	-
M1653	Robot Arm	Staubli	RX908 L	F01/5J8 6A1/C/01	Calibrated before use	-
M1680	Robot Arm	Staubli	TX60 L	F12/5MZ7 A1/A/01	Calibrated before use	-
M1159	Signal Generator	Agilent Technologies	E8241A	US42110332	Internal Checked 10 Aug 2012	4
M1071	Spectrum Analyzer	Agilent	HP8590E	3647U00514	(Monitoring use only)	-
M1270	Digital Thermometer	RS	N/A	N/A	Internal Checked 13 May 2012	12
M1023	Dual Channel Power Meter	R & S	NRVD	863715/030	18 July 2012	12
S256	SAR Lab	RFI	Site 56	N/A	Calibrated before use	-
S512	SAR Lab	RFI	Site 57	N/A	Calibrated before use	-
S513	SAR Lab	RFI	Site 58	N/A	Calibrated before use	-

Note:

All the assets were in calibration during the course of testing.

A.1.1. Calibration Certificates

This section contains the calibration certificates and data for the Probe(s) and Dipole(s) used, which are not included in the total number of pages for this report.

The following information is justification to why the listed dipoles calibration period has been extended. This address FCC KDB 450824 D02

Cal Date	Dipole Calibration History									
	Dipole SN: 124, Frequency 900 MHz									
	Head Parameters					Body Parameters				
	1g (W/Kg)	10g (W/Kg)	Return loss (dB)	Real (Ω)	Imaginary (Ω)	1g (W/Kg)	10g (W/Kg)	Return loss (dB)	Real (Ω)	Imaginary (Ω)
27-Jun-12	Lab Annual Check of dipole		-24.73	49.56	-7.40	Lab Annual Check of dipole		-21.92	48.18	-8.03
09-Feb-11	11.00	7.01	-21.60	48.90	-8.20	11.10	7.14	-20.20	46.10	-8.60
23-Aug-07	10.20	6.56	-21.20	48.60	-8.50	10.50	6.89	-20.20	45.40	-8.10
31-Aug-05	10.60	6.78	-24.70	49.10	-5.70	10.50	6.77	-18.90	44.90	-8.90
13-May-03	10.60	6.76	-24.00	50.30	-6.40	11.00	7.12	-20.60	46.20	-8.20
03-Aug-01	11.28	7.16	-25.40	50.80	-5.60	Dipole calibrated for Head only				
Standard Deviation	**0.42**	**0.23**	**1.77**	**0.85**	**1.25**	**0.32**	**0.18**	**1.08**	**1.25**	**0.37**
|Mean Value|	**10.74**	**6.85**	**23.61**			**10.78**	**6.98**	**20.36**		
Relative standard deviation %	**3.87%**	**3.41%**	**7.49%**			**2.97%**	**2.58%**	**5.31%**		

Calibration Certificates (Continued)

Cal Date	Dipole Calibration History									
	Dipole SN: 540, Frequency 1900 MHz									
	Head Parameters					Body Parameters				
	1g (W/Kg)	10g (W/Kg)	Return loss (dB)	Real (Ω)	Imaginary (Ω)	1g (W/Kg)	10g (W/Kg)	Return loss (dB)	Real (Ω)	Imaginary (Ω)
27-Jun-12	Lab Annual Check of dipole		-30.57	49.54	1.41	Lab Annual Check of dipole		-29.80	50.34	2.37
08-Feb-11	40.30	21.00	-27.60	50.50	4.20	40.70	21.60	-23.10	45.60	5.00
26-Jun-09	40.30	21.10	-30.00	48.50	2.70	40.90	21.50	-24.30	44.90	2.80
11-Jun-07	36.10	19.30	-25.40	51.90	5.10	38.00	20.70	-25.30	47.70	4.80
14-Jun-05	38.1	19.90	-25.40	51.90	5.20	39.10	20.70	-24.00	48.10	5.90
04-Jun-03	41.20	21.20	-28.50	50.30	3.80	Dipole calibrated for Head only				
Standard Deviation	**2.08**	**0.85**	**2.21**	**1.33**	**1.46**	**1.38**	**0.49**	**2.64**	**2.16**	**1.52**
|Mean Value|	**39.20**	**20.50**	**27.91**			**39.68**	**21.13**	**25.30**		
Relative standard deviation %	**5.30%**	**4.15%**	**7.93%**			**3.47%**	**2.33%**	**10.42%**		

Cal Date	Dipole Calibration History									
	Dipole SN: 725, Frequency 2450 MHz									
	Head Parameters					Body Parameters				
	1g (W/Kg)	10g (W/Kg)	Return loss (dB)	Real (Ω)	Imaginary (Ω)	1g (W/Kg)	10g (W/Kg)	Return loss (dB)	Real (Ω)	Imaginary (Ω)
02-July-12	Lab Annual Check of dipole		-20.37	47.27	8.65	Lab Annual Check of dipole		-21.04	48.52	8.72
08-Feb-11	52.90	24.70	-20.50	45.60	7.90	51.90	24.10	-20.20	49.50	9.70
08-Jan-09	52.10	24.30	-23.70	54.40	5.30	52.20	24.70	-23.40	49.00	6.70
17-Jan-07	53.30	24.80	-22.10	52.40	7.70	53.30	24.50	-21.80	47.80	7.70
04-Jan-05	54.5	24.70	-22.30	53.50	7.20	52.90	24.50	-22.20	48.50	7.50
17-Jan-03	54.70	24.50	-22.60	53.00	7.00	52.10	24.10	-21.70	49.00	8.10
Standard Deviation	**1.10**	**0.20**	**1.28**	**3.66**	**1.14**	**0.59**	**0.27**	**1.08**	**0.58**	**1.04**
|Mean Value|	**53.50**	**24.60**	**21.93**			**52.48**	**24.38**	**21.72**		
Relative standard deviation %	**2.05%**	**0.81%**	**5.85%**			**1.13%**	**1.10%**	**4.97%**		

Note:

1. SAR lab has more than one dipole, the 900 MHz calibration gap is 24 months from 2007 and a second dipole was use after this period.
2. The dipole history shows that the measured SAR relative standard deviation was all less than 10% for the calibration period. The return loss relative standard deviation was all less than 10 %. And the real and imaginary impedance standard deviation is within 5 **(Ω).**

Checked by [signature] DATE: 26-SEPT-2012

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

S Schweizerischer Kalibrierdienst
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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client **RFI** **Certificate No: EX3-3814_Sep12**

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3814

Calibration procedure(s) QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: September 24, 2012

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 24, 2012

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

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Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 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 ϑ = 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 affect the E^2-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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *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.

Probe EX3DV4

SN:3814

Manufactured: September 2, 2011
Calibrated: September 24, 2012

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3814

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.53	0.50	0.44	± 10.1 %
DCP (mV)[B]	99.9	93.7	98.7	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.00	0.00	1.00	172.6	±3.0 %
			Y	0.00	0.00	1.00	154.1	
			Z	0.00	0.00	1.00	144.1	

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 E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3814

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
1450	40.5	1.20	8.56	8.56	8.56	0.19	2.04	± 12.0 %
2450	39.2	1.80	6.89	6.89	6.89	0.33	0.97	± 12.0 %
2600	39.0	1.96	6.81	6.81	6.81	0.34	1.00	± 12.0 %
5200	36.0	4.66	5.06	5.06	5.06	0.42	1.80	± 13.1 %
5300	35.9	4.76	4.73	4.73	4.73	0.42	1.80	± 13.1 %
5500	35.6	4.96	4.54	4.54	4.54	0.45	1.80	± 13.1 %
5600	35.5	5.07	4.26	4.26	4.26	0.50	1.80	± 13.1 %
5800	35.3	5.27	4.50	4.50	4.50	0.45	1.80	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3814

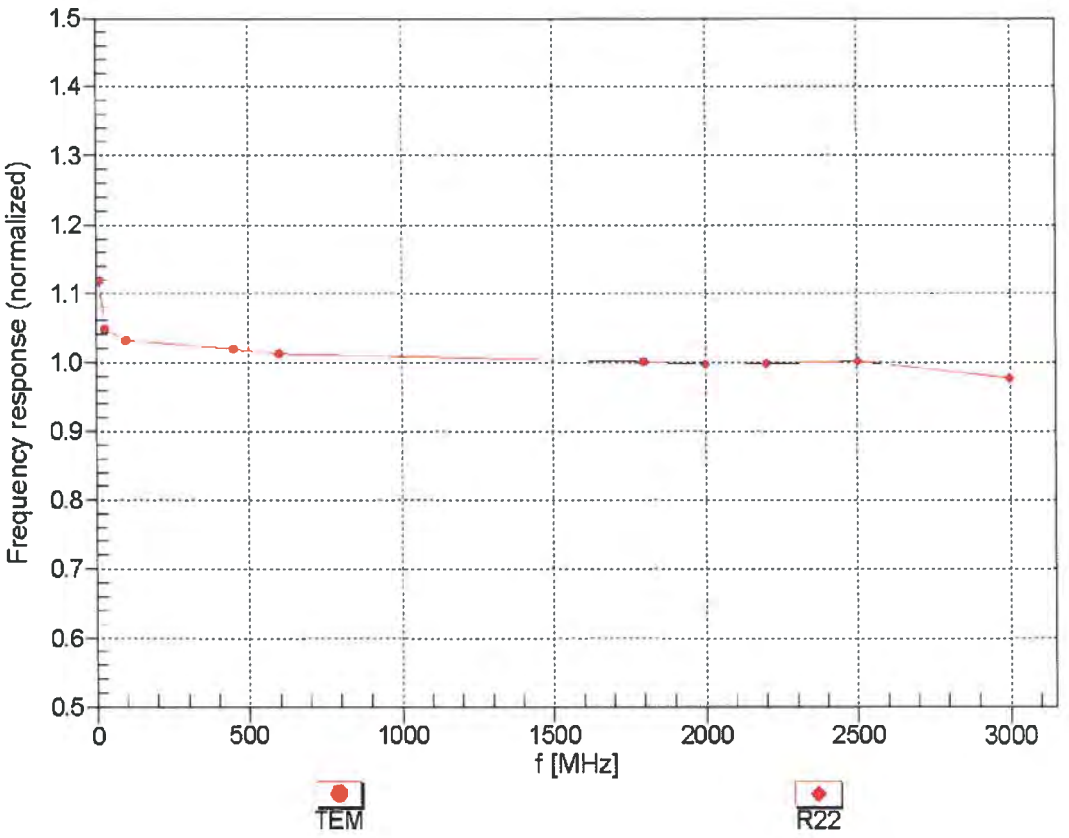
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
1450	54.0	1.30	8.26	8.26	8.26	0.23	1.40	± 12.0 %
2450	52.7	1.95	7.41	7.41	7.41	0.80	0.66	± 12.0 %
2600	52.5	2.16	7.08	7.08	7.08	0.79	0.61	± 12.0 %
3700	51.0	3.55	6.27	6.27	6.27	0.22	2.24	± 13.1 %
5200	49.0	5.30	4.39	4.39	4.39	0.52	1.90	± 13.1 %
5300	48.9	5.42	4.11	4.11	4.11	0.55	1.90	± 13.1 %
5500	48.6	5.65	4.02	4.02	4.02	0.52	1.90	± 13.1 %
5600	48.5	5.77	3.71	3.71	3.71	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.97	3.97	3.97	0.60	1.90	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Frequency Response of E-Field

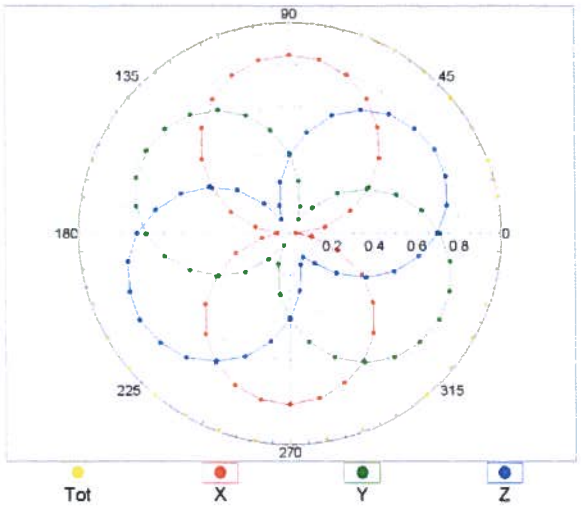
(TEM-Cell:ifi110 EXX, Waveguide: R22)



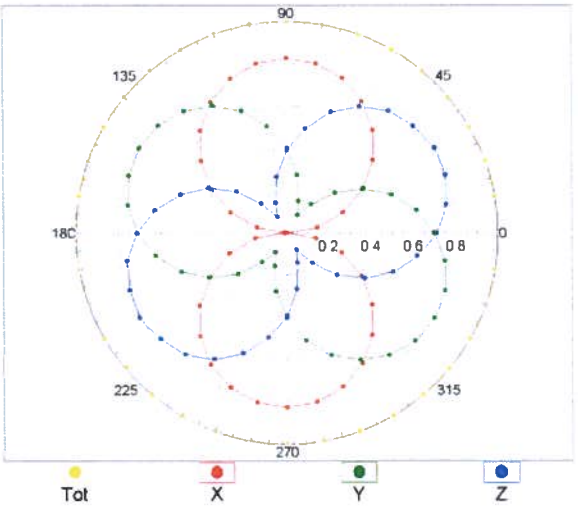
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

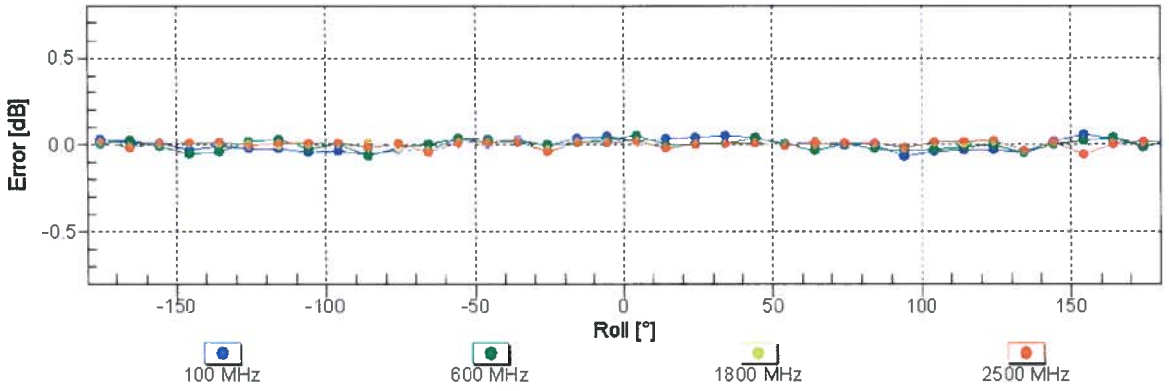
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



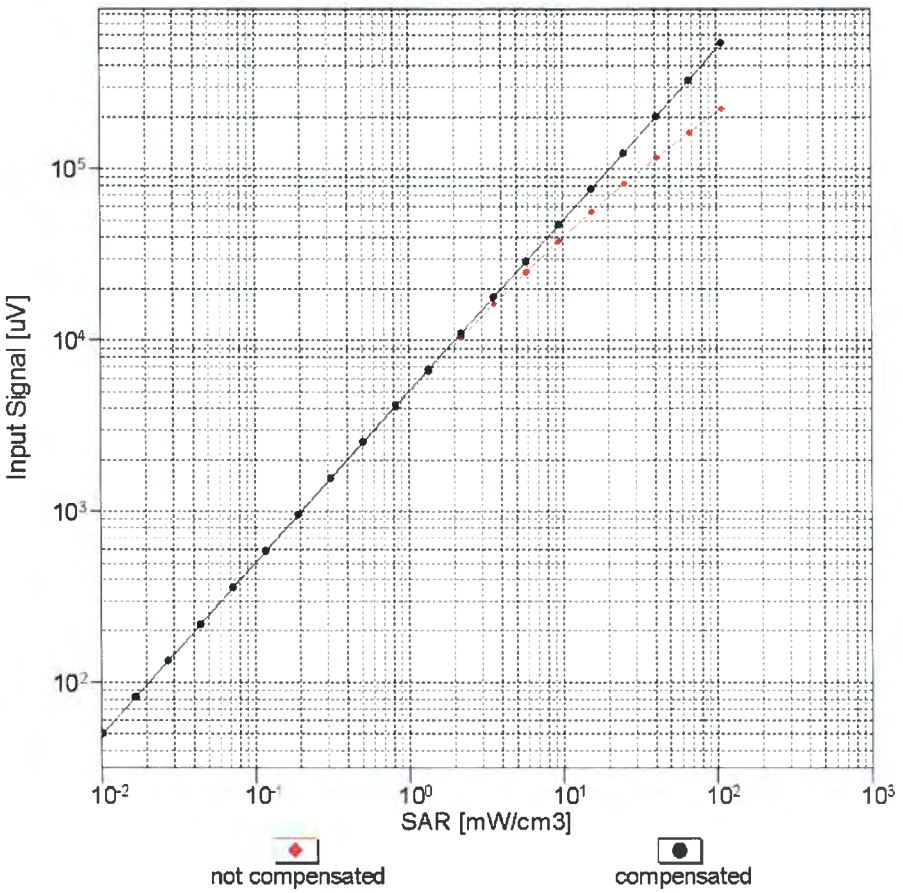
f=1800 MHz,R22

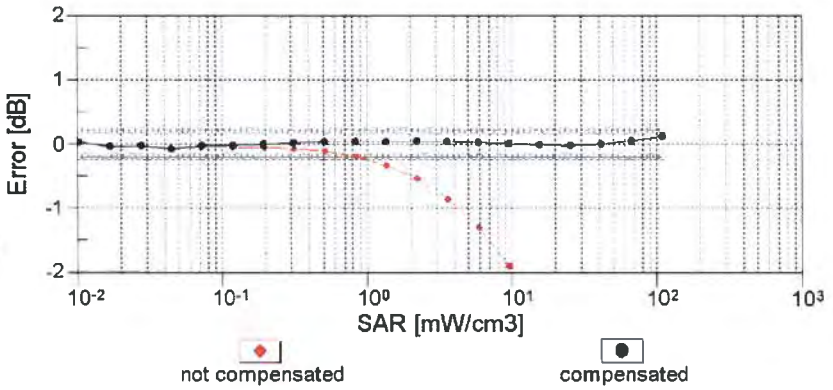




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

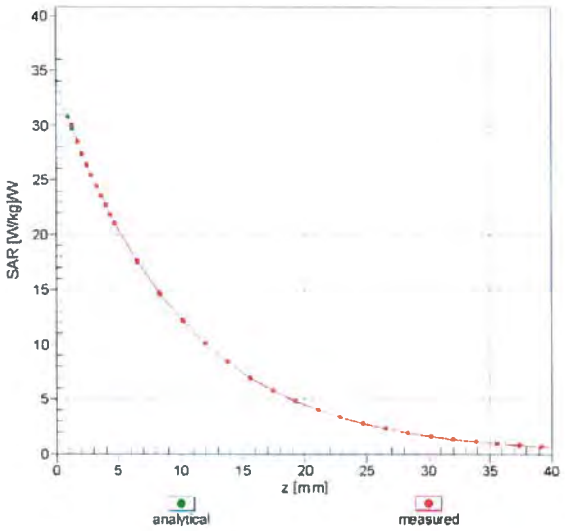




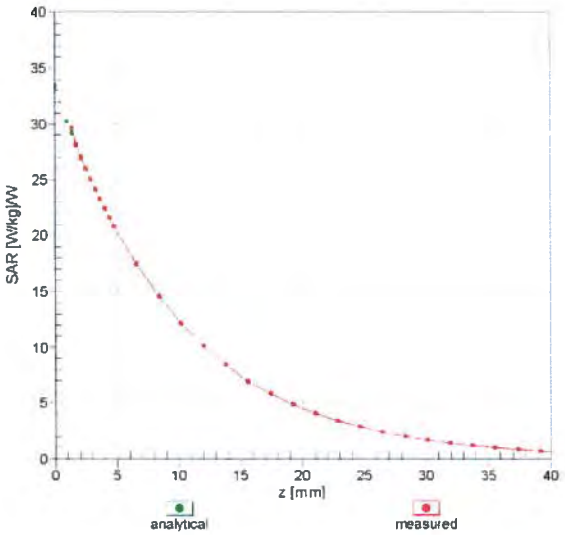
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 2450 MHz,WGLS R22 (H_convF)

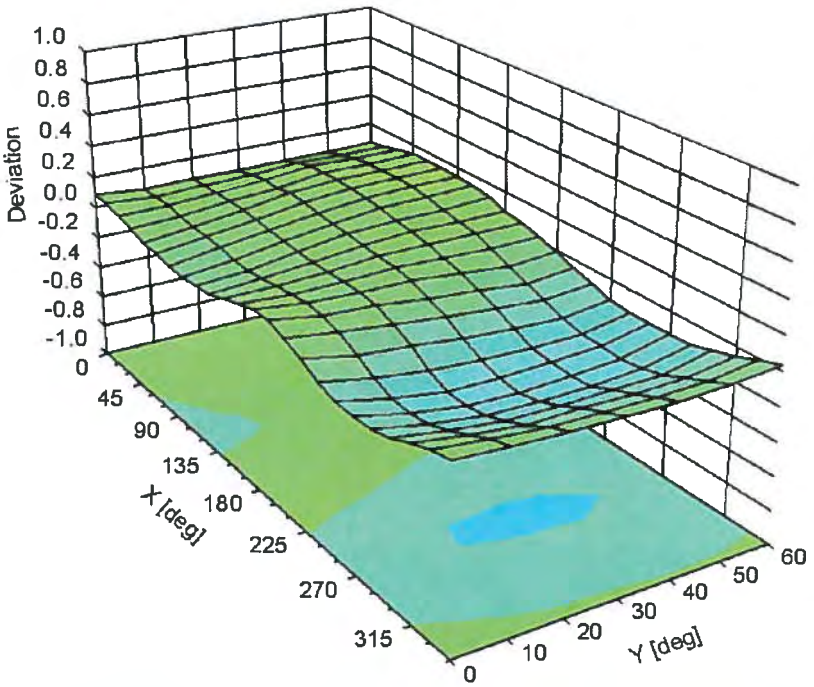


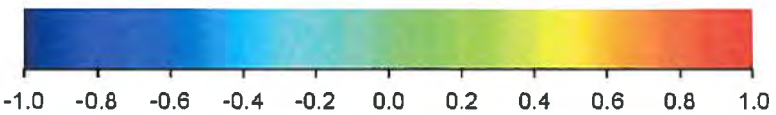
f = 2450 MHz,WGLS R22 (M_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3814

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-65.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

checked by KD 16 Aug 2012

ASSET: A1185

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

S Schweizerischer Kalibrierdienst
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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client RFI

Certificate No: ET3-1528_Jul12

CALIBRATION CERTIFICATE

Object: ET3DV6 - SN:1528

Calibration procedure(s): QA CAL-01.v8, QA CAL-12.v7, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: July 26, 2012

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 26, 2012

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

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Accreditation No.: SCS 108
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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 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 ϑ = 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 affect the E^2-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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *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.

Probe ET3DV6

SN:1528

Manufactured: March 21, 2000
Calibrated: July 26, 2012

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1528

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.45	1.86	1.61	± 10.1 %
DCP (mV)[B]	95.5	97.5	100.3	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.00	0.00	1.00	166.6	±1.9 %
			Y	0.00	0.00	1.00	160.4	
			Z	0.00	0.00	1.00	170.5	

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 E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1528

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	43.5	0.87	7.01	7.01	7.01	0.23	2.32	± 13.4 %
750	41.9	0.89	6.37	6.37	6.37	0.49	2.16	± 12.0 %
835	41.5	0.90	6.06	6.06	6.06	0.61	1.95	± 12.0 %
900	41.5	0.97	5.95	5.95	5.95	0.30	3.00	± 12.0 %
1450	40.5	1.20	5.22	5.22	5.22	0.49	2.80	± 12.0 %
1750	40.1	1.37	5.12	5.12	5.12	0.80	2.07	± 12.0 %
1900	40.0	1.40	4.92	4.92	4.92	0.80	2.10	± 12.0 %
2150	39.7	1.53	4.65	4.65	4.65	0.80	2.00	± 12.0 %
2450	39.2	1.80	4.31	4.31	4.31	0.80	1.74	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

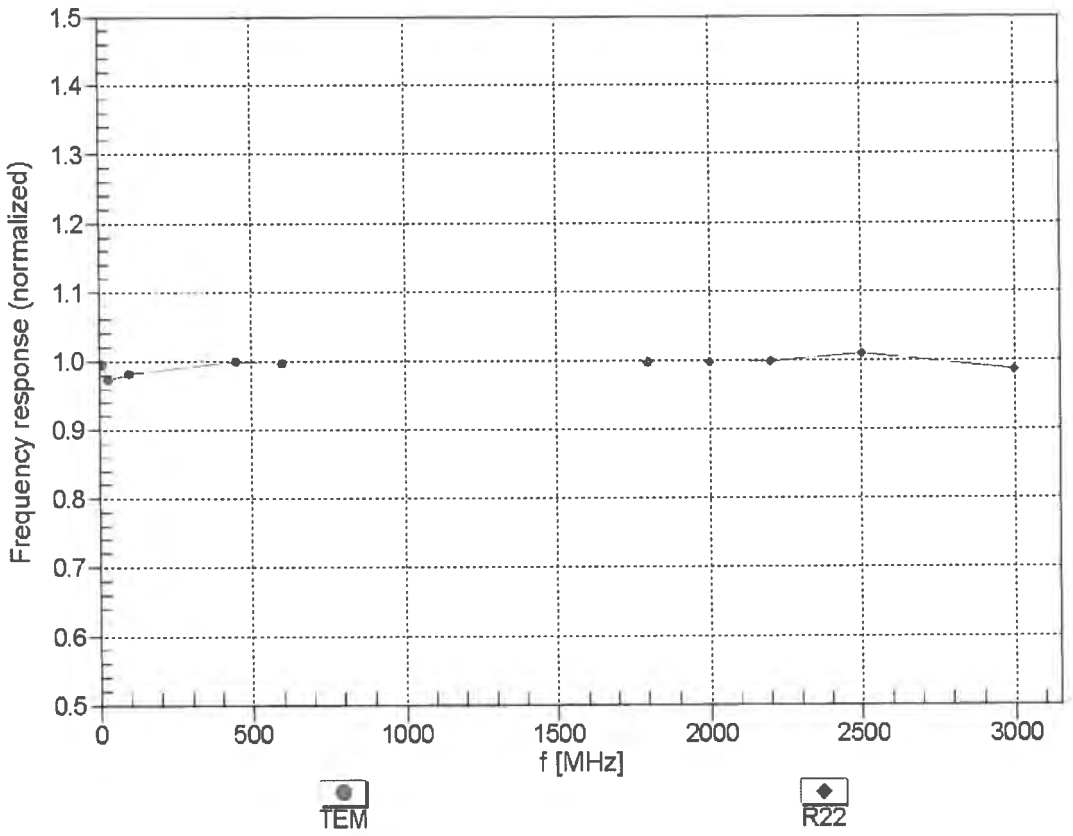
DASY/EASY - Parameters of Probe: ET3DV6 - SN:1528

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.47	7.47	7.47	0.16	2.32	± 13.4 %
750	55.5	0.96	6.17	6.17	6.17	0.33	2.75	± 12.0 %
835	55.2	0.97	5.99	5.99	5.99	0.33	3.00	± 12.0 %
900	55.0	1.05	5.92	5.92	5.92	0.55	2.18	± 12.0 %
1450	54.0	1.30	5.11	5.11	5.11	0.76	2.07	± 12.0 %
1750	53.4	1.49	4.64	4.64	4.64	0.80	2.45	± 12.0 %
1900	53.3	1.52	4.42	4.42	4.42	0.80	2.33	± 12.0 %
2150	53.1	1.66	4.37	4.37	4.37	0.80	1.93	± 12.0 %
2450	52.7	1.95	3.99	3.99	3.99	0.56	0.98	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

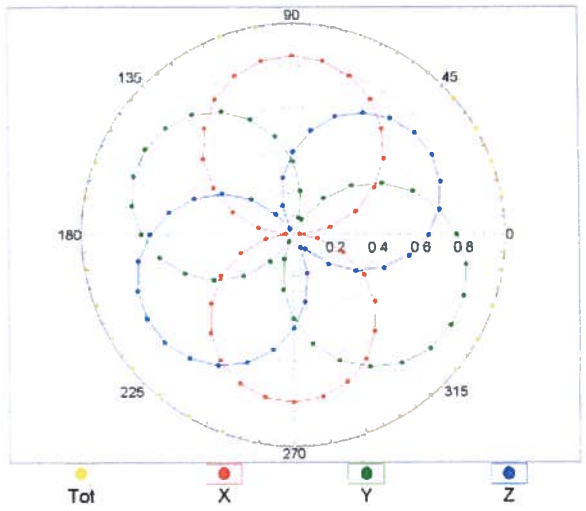
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



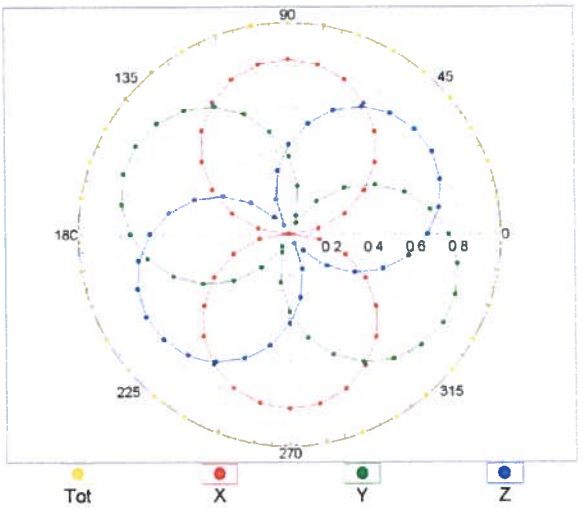
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

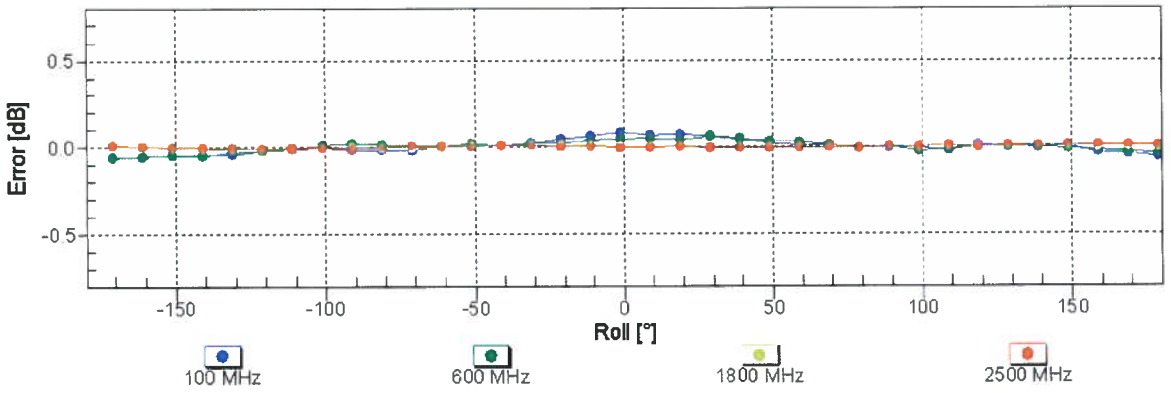
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



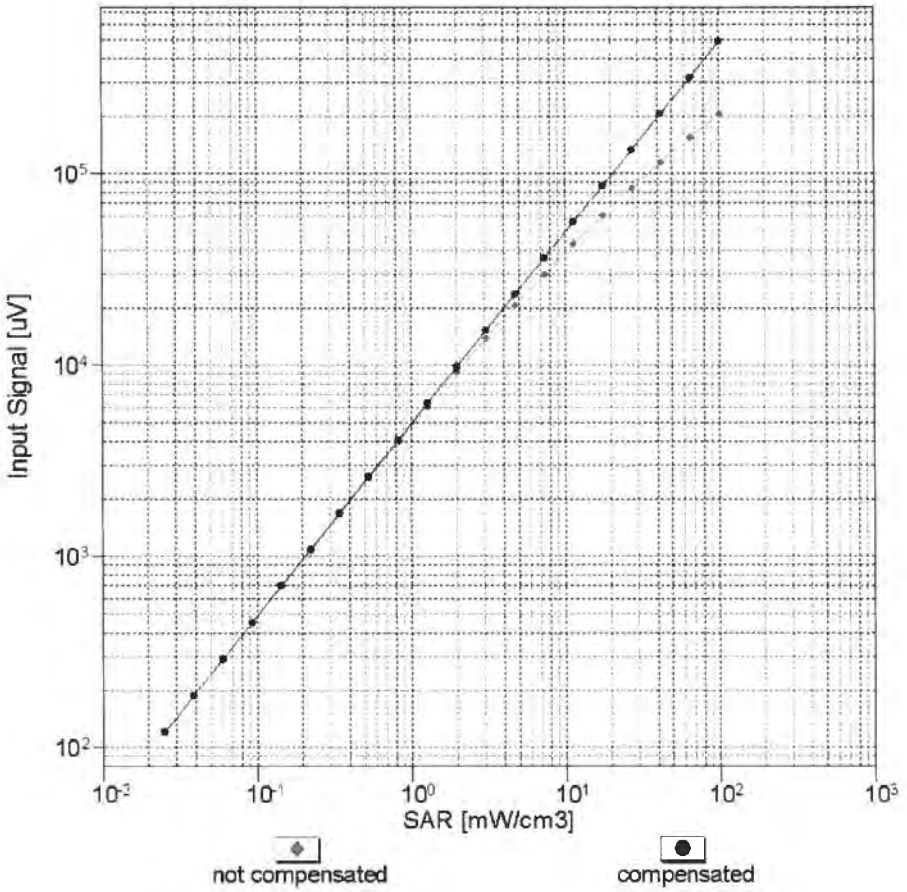
f=1800 MHz,R22

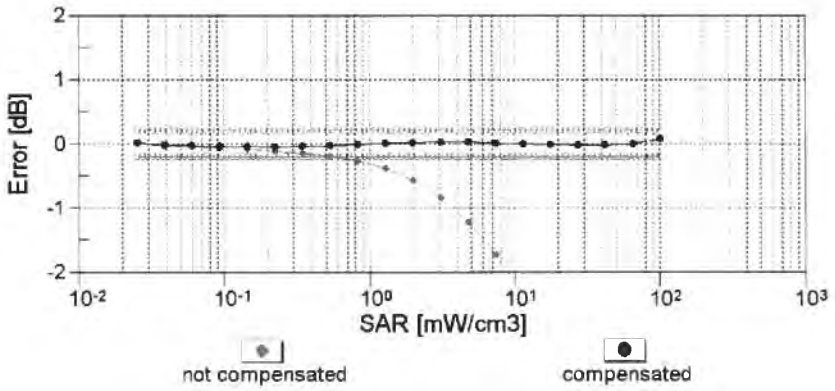




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

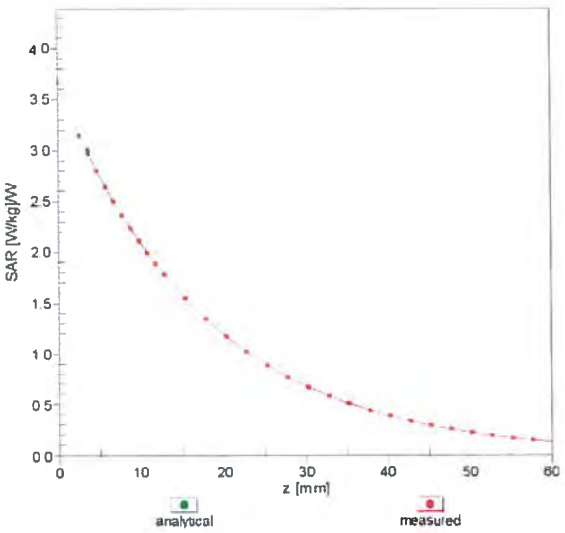




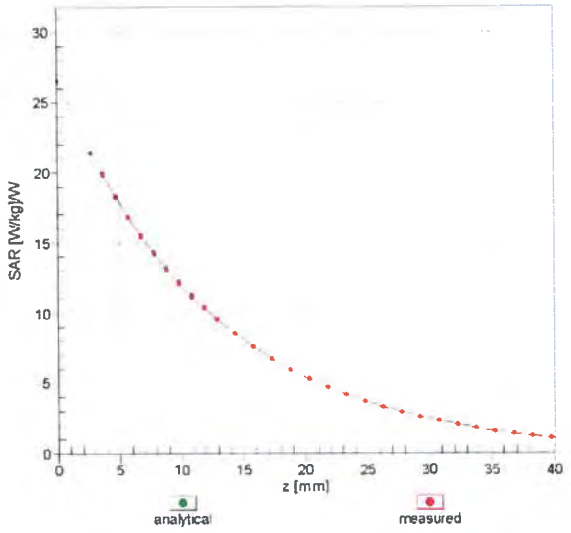
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

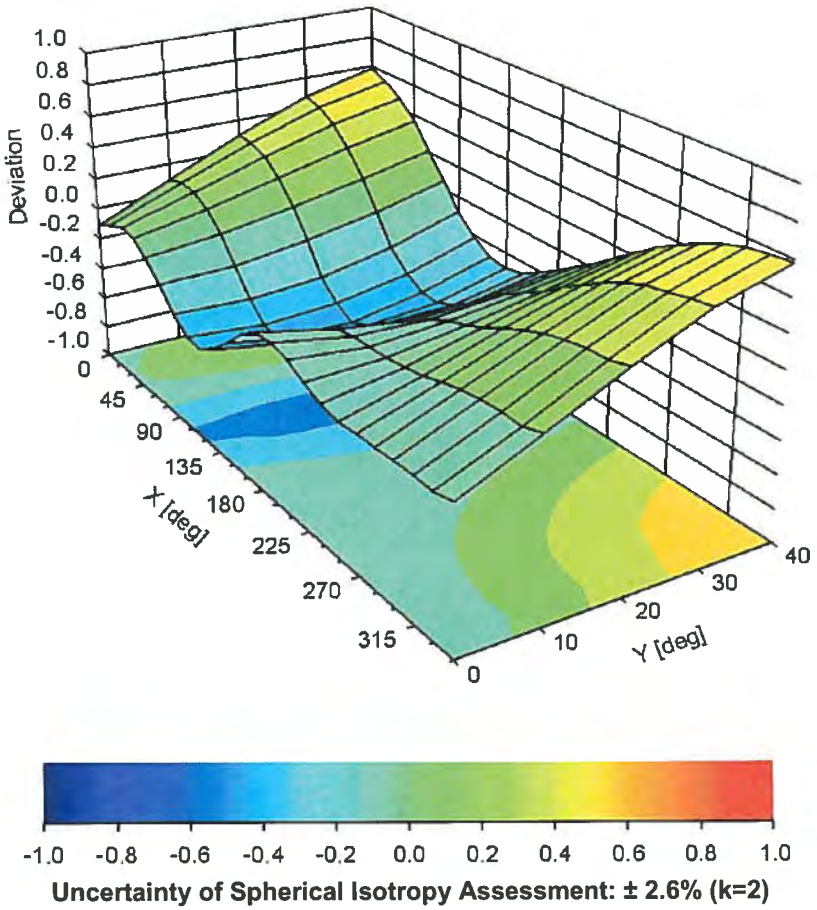


f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1528

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	18.9
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	enabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

ASSET: #1235 Checked by 21/02/2011

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

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Accreditation No.: SCS 108

Client RFI

Certificate No: D900V2-124_Feb11

CALIBRATION CERTIFICATE

Object	D900V2 - SN: 124
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits
Calibration date:	February 09, 2011

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	D. Iliev
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 9, 2011

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) 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
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) DASY4/5 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.

Measurement Conditions

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

DASY Version	DASY5	V52.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.2 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.3 ± 6 %	0.95 mho/m ± 6 %
Head TSL temperature during test	(21.5 ± 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	2.72 mW / g
SAR normalized	normalized to 1W	10.9 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**11.0 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.74 mW / g
SAR normalized	normalized to 1W	6.96 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**7.01 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.0	1.05 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.6 ± 6 %	1.05 mho/m ± 6 %
Body TSL temperature during test	(21.8 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.79 mW / g
SAR normalized	normalized to 1W	11.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**11.1 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.79 mW / g
SAR normalized	normalized to 1W	7.16 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**7.14 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.9 Ω - 8.2 jΩ
Return Loss	- 21.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.1 Ω - 8.6 jΩ
Return Loss	- 20.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.409 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, 2001

DASY5 Validation Report for Head TSL

Date/Time: 09.02.2011 11:44:15

Test Laboratory: SPEAG, Zurich, Switzerland

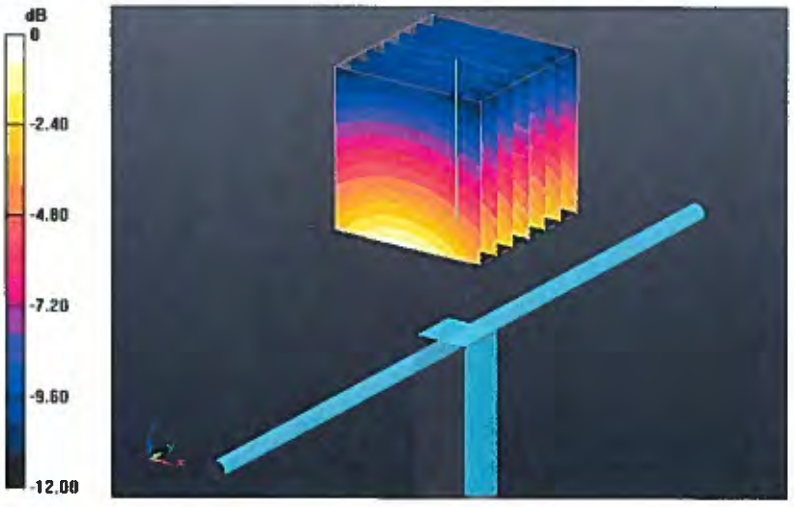
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:124

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL900
Medium parameters used: f = 900 MHz; σ = 0.95 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

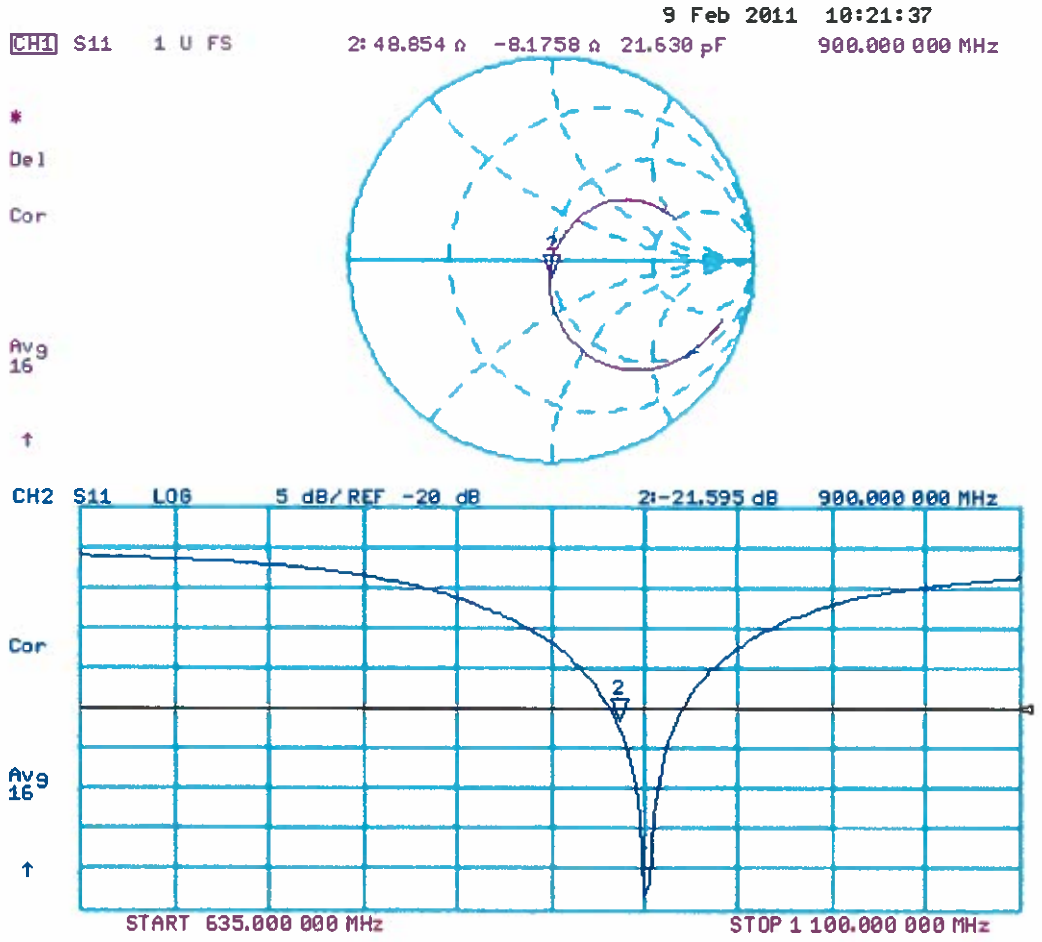
- Probe: ES3DV3 - SN3205; ConvF(5.88, 5.88, 5.88); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.560 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 4.135 W/kg
SAR(1 g) = 2.72 mW/g; SAR(10 g) = 1.74 mW/g
Maximum value of SAR (measured) = 3.183 mW/g



0 dB = 3.180mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 09.02.2011 14:54:48

Test Laboratory: SPEAG, Zurich, Switzerland

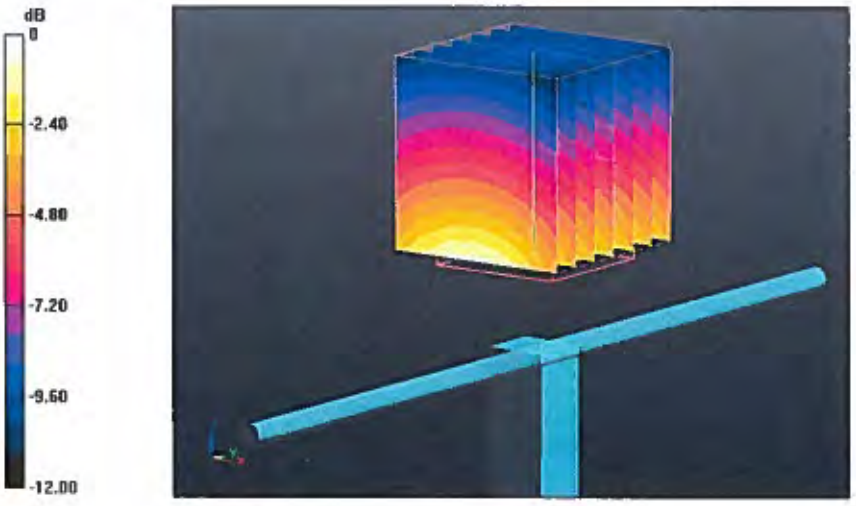
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:124

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: M900
Medium parameters used: f = 900 MHz; σ = 1.05 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

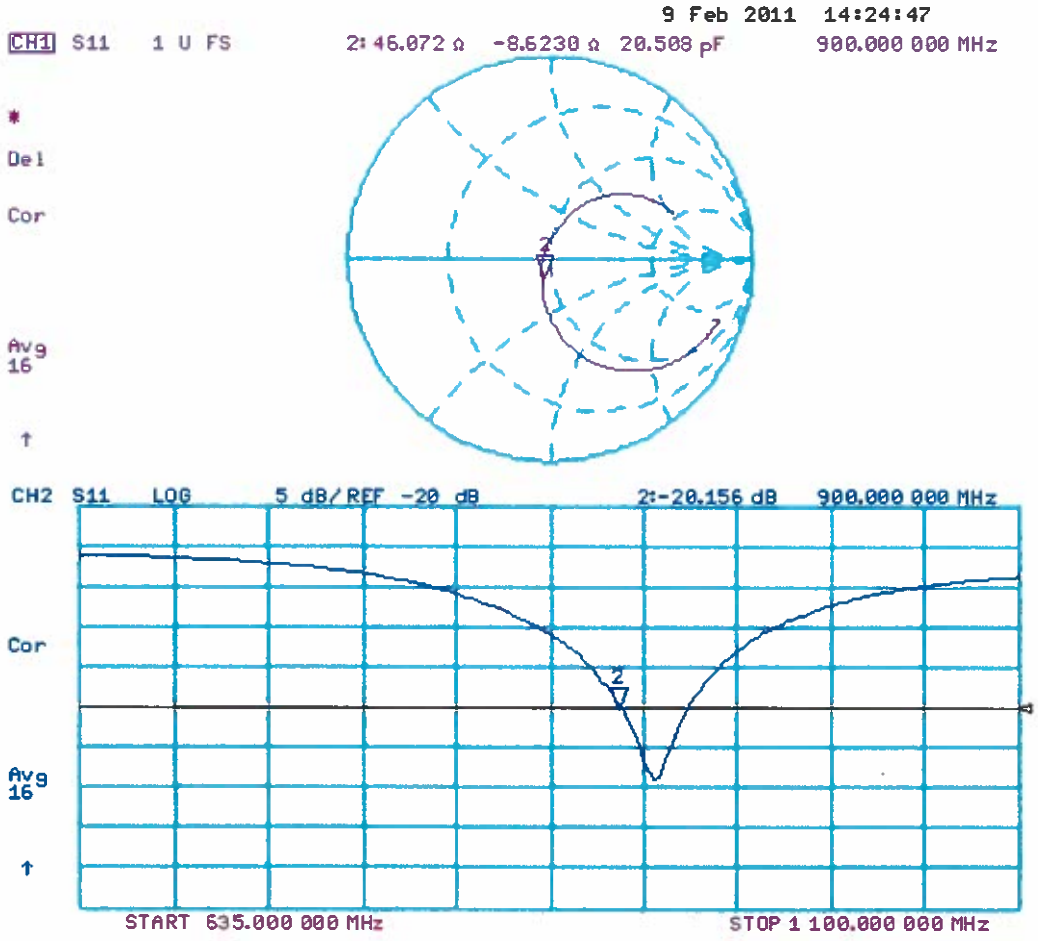
- Probe: ES3DV3 - SN3205; ConvF(5.81, 5.81, 5.81); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.520 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 4.203 W/kg
SAR(1 g) = 2.79 mW/g; SAR(10 g) = 1.79 mW/g
Maximum value of SAR (measured) = 3.271 mW/g



0 dB = 3.270mW/g

Impedance Measurement Plot for Body TSL



Check by [signature] DATE: 7-August 2012

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

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

Accredited by the Swiss Accreditation Service (SAS) ASSET: A220/ **Accreditation No.: SCS 108**
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client RFI **Certificate No: D900V2-035_Aug12**

CALIBRATION CERTIFICATE

Object	D900V2 - SN: 035
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	August 16, 2012

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: August 16, 2012

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) 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
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) DASY4/5 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.

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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.6 ± 6 %	0.96 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.62 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**10.5 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.68 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.74 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.0	1.05 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.6 ± 6 %	1.06 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.74 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**10.8 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.76 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.96 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.8 Ω - 5.8 jΩ
Return Loss	- 24.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5 Ω - 5.5 jΩ
Return Loss	- 24.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.404 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
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	February 26, 1998

DASY5 Validation Report for Head TSL

Date: 16.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 035

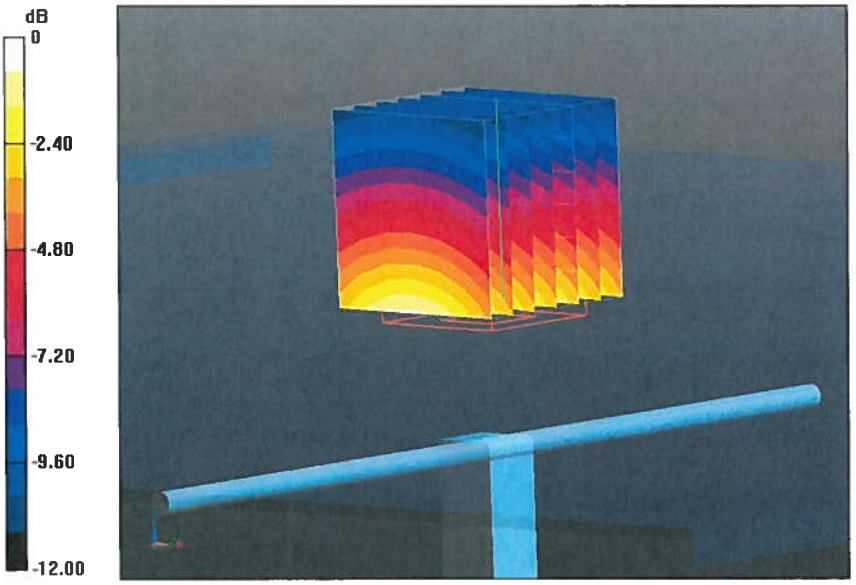
Communication System: CW; Frequency: 900 MHz
Medium parameters used: f = 900 MHz; σ = 0.96 mho/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.97, 5.97, 5.97); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

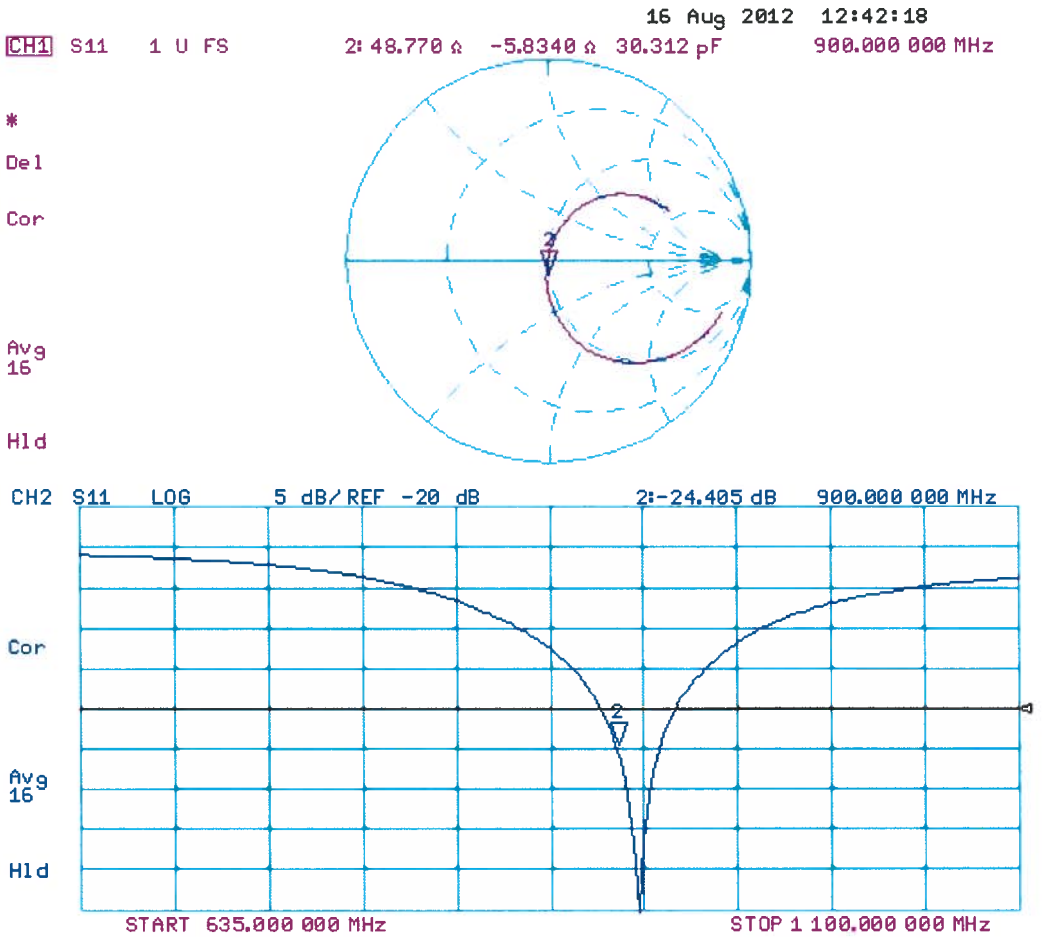
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.325 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.926 mW/g
SAR(1 g) = 2.62 mW/g; SAR(10 g) = 1.68 mW/g
Maximum value of SAR (measured) = 3.06 W/kg



0 dB = 3.06 W/kg = 9.71 dB W/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 035

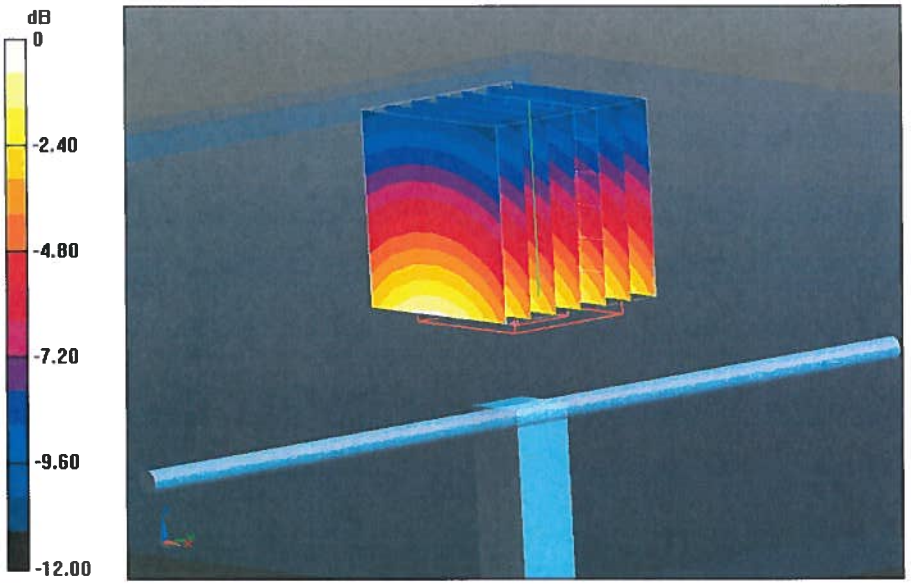
Communication System: CW; Frequency: 900 MHz
Medium parameters used: f = 900 MHz; σ = 1.06 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.94, 5.94, 5.94); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

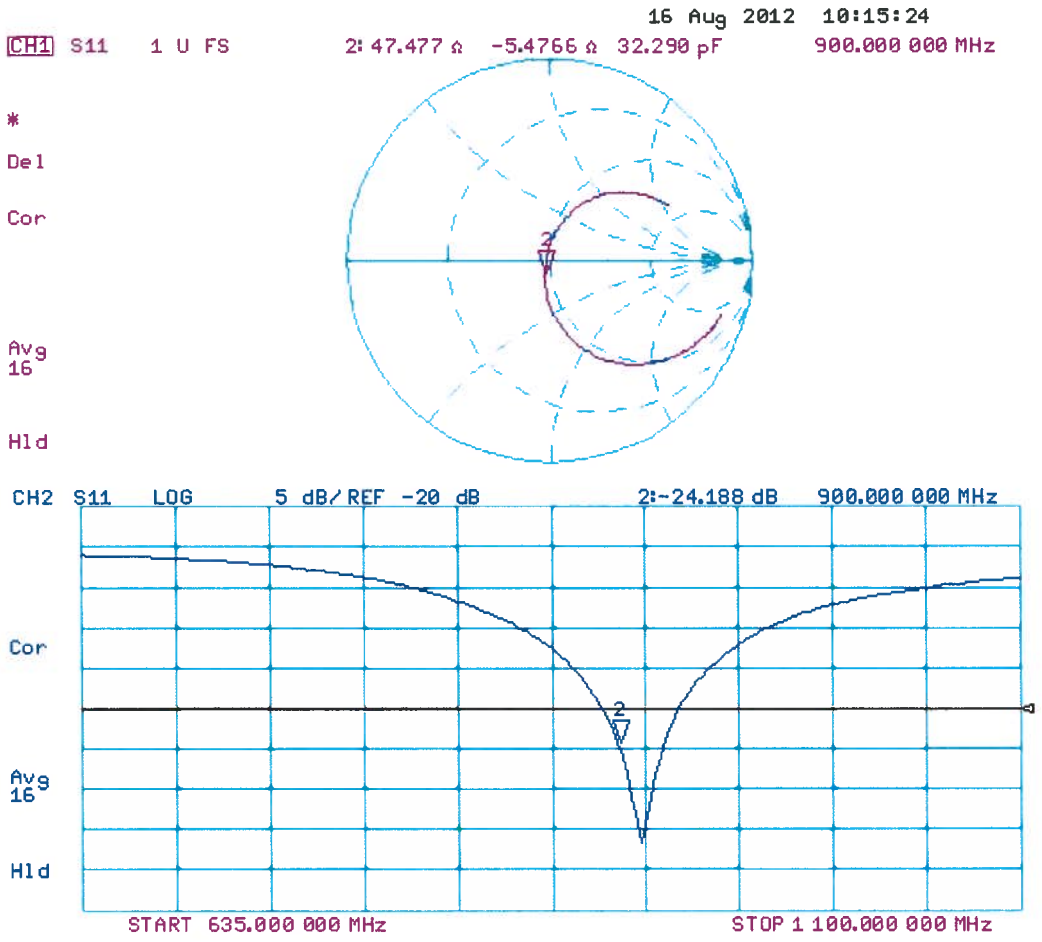
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.325 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 4.184 mW/g
SAR(1 g) = 2.74 mW/g; SAR(10 g) = 1.76 mW/g
Maximum value of SAR (measured) = 3.18 W/kg



0 dB = 3.18 W/kg = 10.05 dB W/kg

Impedance Measurement Plot for Body TSL



ASSET: A1237 – Checked by KB 21/02/2011

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

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C Service suisse d'étalonnage
S 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

Client RFI

Certificate No: D1900V2-540_Feb11

CALIBRATION CERTIFICATE

Object: D1900V2 - SN: 540

Calibration procedure(s): QA CAL-05.v8
Calibration procedure for dipole validation kits

Calibration date: February 08, 2011

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 8, 2011

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) 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
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) DASY4/5 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.

Measurement Conditions

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

DASY Version	DASY5	V52.6
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	

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	39.8 ± 6 %	1.41 mho/m ± 6 %
Head TSL temperature during test	(21.0 ± 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	normalized to 1W	**40.3 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.25 mW / g
SAR normalized	normalized to 1W	21.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**21.0 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	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	52.8 ± 6 %	1.55 mho/m ± 6 %
Body TSL temperature during test	(21.2 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 mW / g
SAR normalized	normalized to 1W	41.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**40.7 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.43 mW / g
SAR normalized	normalized to 1W	21.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.6 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.5 Ω + 4.2 jΩ
Return Loss	- 27.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.6 Ω + 5.0 jΩ
Return Loss	- 23.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.195 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 26, 2001

DASY5 Validation Report for Head TSL

Date/Time: 07.02.2011 15:18:47

Test Laboratory: SPEAG, Zurich, Switzerland

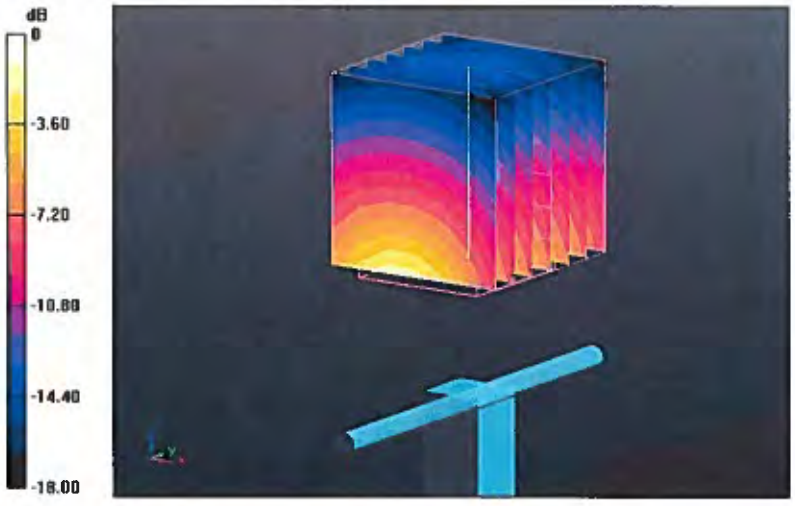
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:540

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL U12 BB
Medium parameters used: f = 1900 MHz; σ = 1.41 mho/m; ε_r = 39.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

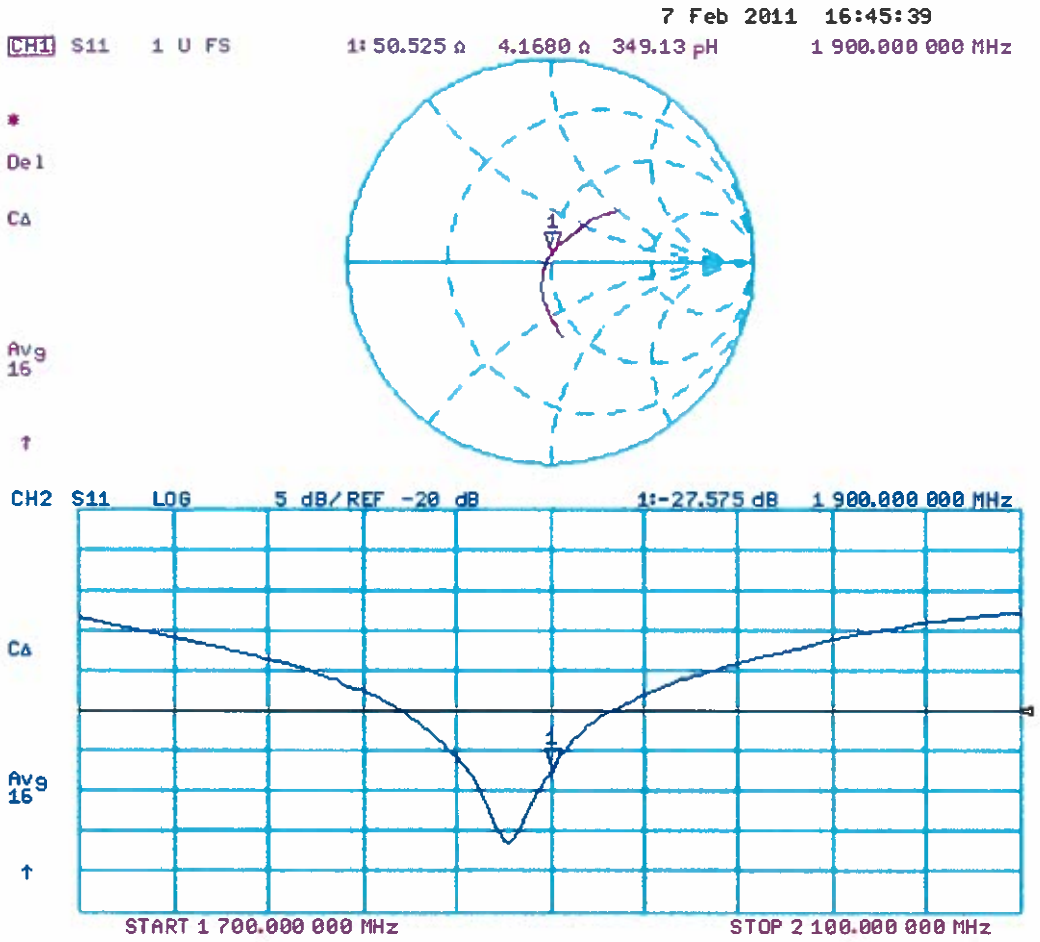
- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.936 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 18.544 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.25 mW/g
Maximum value of SAR (measured) = 12.384 mW/g



0 dB = 12.380mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 08.02.2011 12:04:35

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:540

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: MSL U12 BB
Medium parameters used: f = 1900 MHz; σ = 1.55 mho/m; ε_r = 52.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

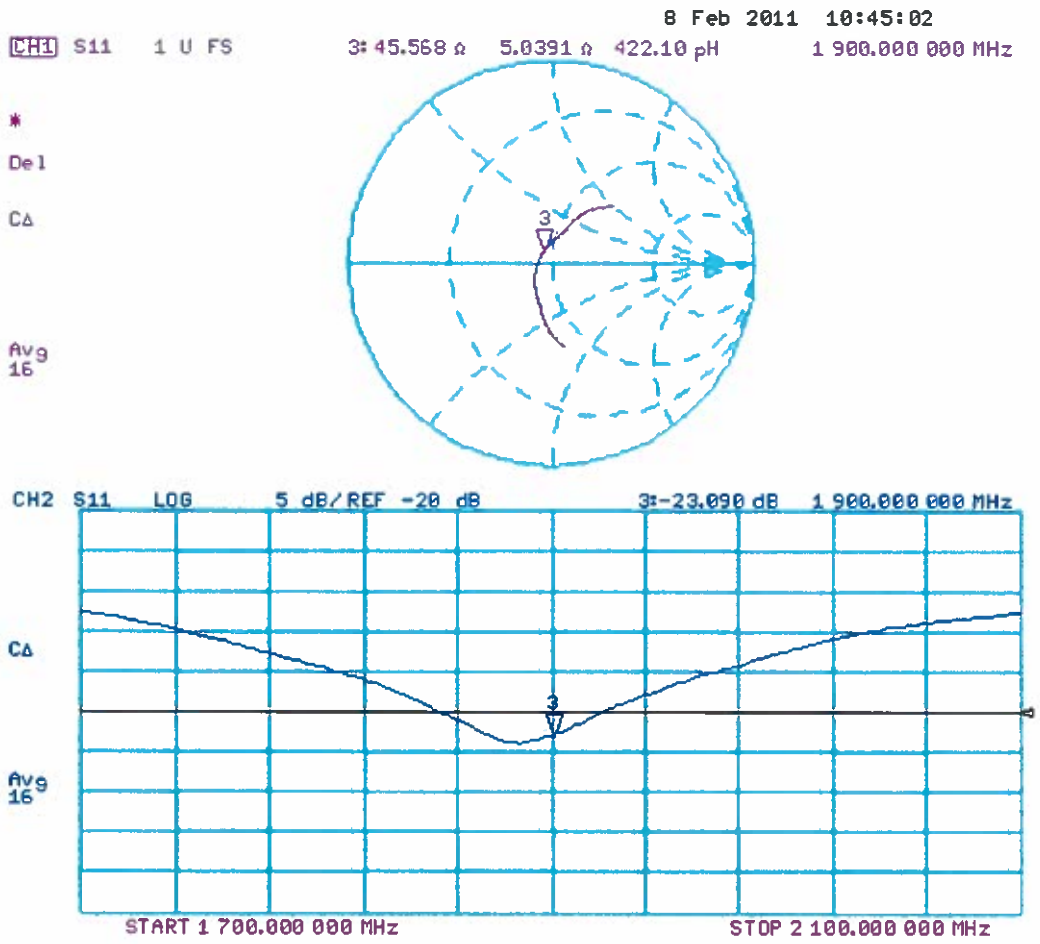
DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.59, 4.59, 4.59); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.899 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 17.597 W/kg
SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.43 mW/g
Maximum value of SAR (measured) = 13.038 mW/g

0 dB = 13.040mW/g

Impedance Measurement Plot for Body TSL



ASSET: A1322 - Checked by [illegible] 21/02/2011

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

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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

Client RFI

Certificate No: D2450V2-725_Feb11

CALIBRATION CERTIFICATE

Object: D2450V2 - SN: 725

Calibration procedure(s): QA CAL-05.v8
Calibration procedure for dipole validation kits

Calibration date: February 08, 2011

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	D. Iliev
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 8, 2011

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) 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
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) DASY4/5 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.

Measurement Conditions

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

DASY Version	DASY5	V52.6
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	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.1 ± 6 %	1.73 mho/m ± 6 %
Head TSL temperature during test	(21.0 ± 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	13.0 mW / g
SAR normalized	normalized to 1W	52.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**52.9 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.13 mW / g
SAR normalized	normalized to 1W	24.5 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.7 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.2 ± 6 %	1.94 mho/m ± 6 %
Body TSL temperature during test	(21.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR normalized	normalized to 1W	52.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**51.9 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.04 mW / g
SAR normalized	normalized to 1W	24.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.1 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	45.6 Ω + 7.9 jΩ
Return Loss	- 20.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.5 Ω + 9.7 jΩ
Return Loss	- 20.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 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	October 16, 2002

DASY5 Validation Report for Head TSL

Date/Time: 07.02.2011 14:34:55

Test Laboratory: SPEAG, Zurich, Switzerland

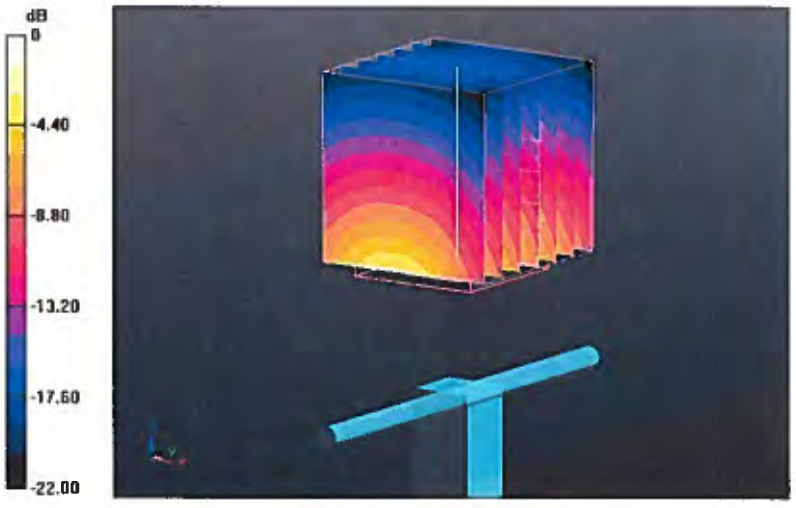
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:725

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U12 BB
Medium parameters used: f = 2450 MHz; σ = 1.74 mho/m; ε_r = 39.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

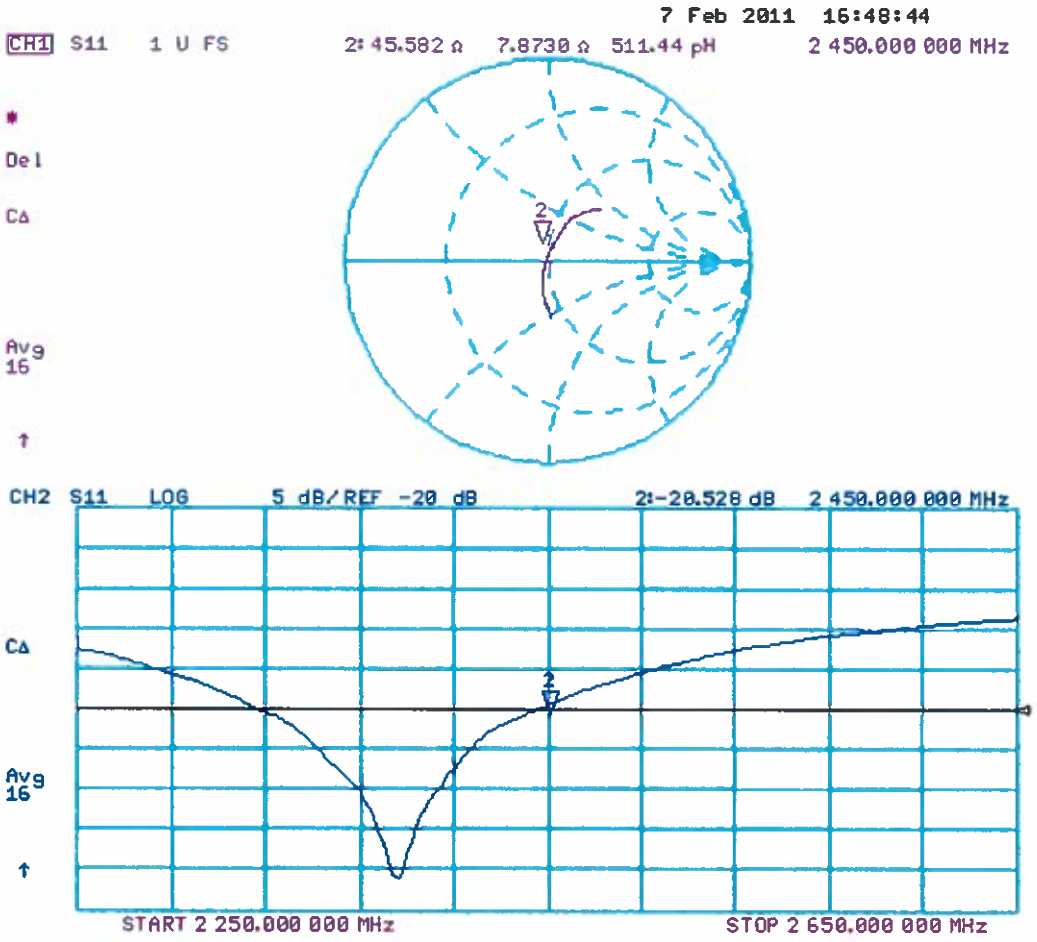
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.3 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 26.701 W/kg
SAR(1 g) = 13 mW/g; SAR(10 g) = 6.13 mW/g
Maximum value of SAR (measured) = 16.608 mW/g



0 dB = 16.610mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 08.02.2011 12:48:13

Test Laboratory: SPEAG, Zurich, Switzerland

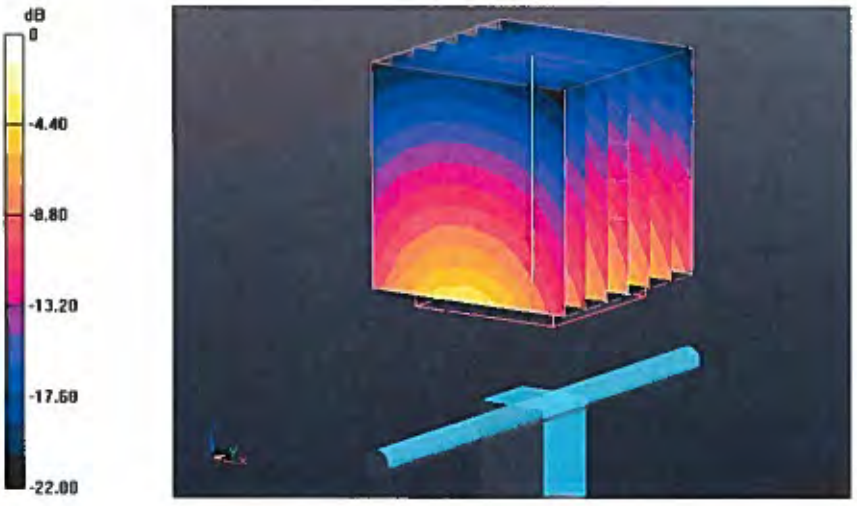
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:725

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U12 BB
Medium parameters used: f = 2450 MHz; σ = 1.95 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

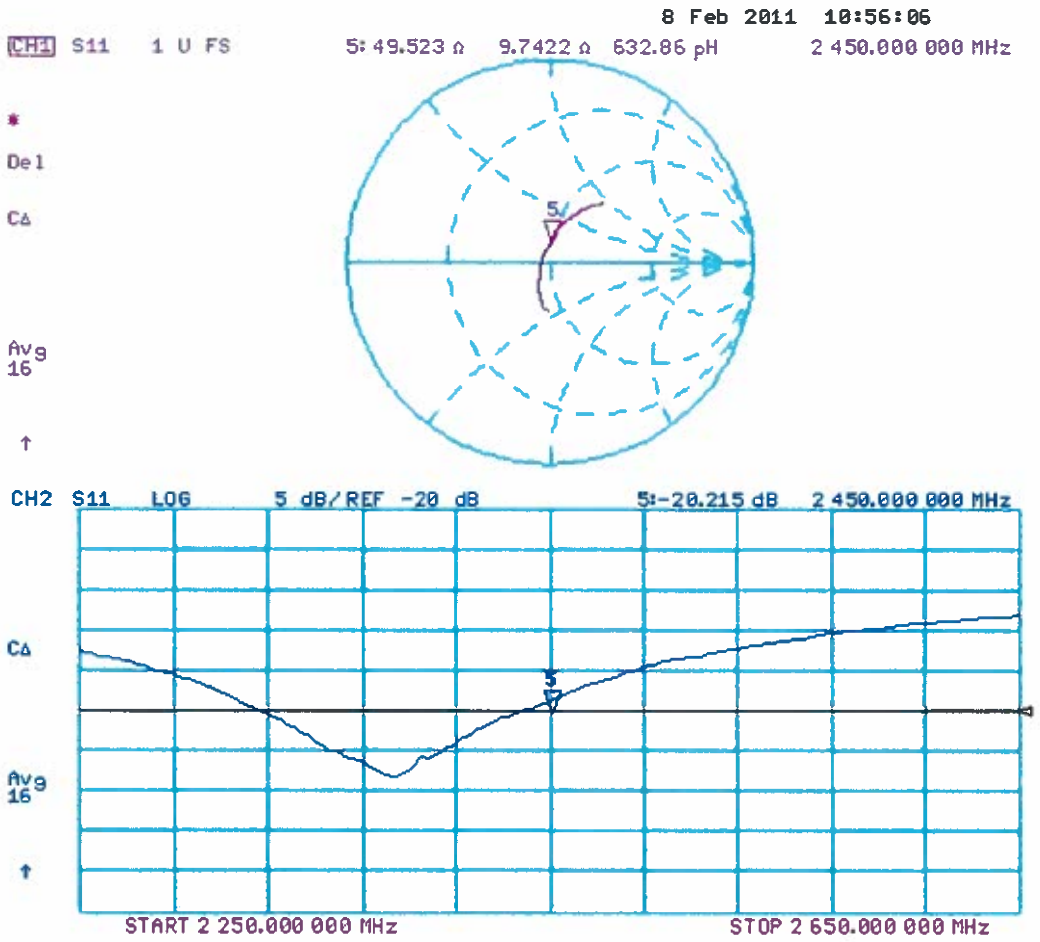
- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.406 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 27.401 W/kg
SAR(1 g) = 13 mW/g; SAR(10 g) = 6.04 mW/g
Maximum value of SAR (measured) = 17.121 mW/g



0 dB = 17.120mW/g

Impedance Measurement Plot for Body TSL



Appendix 2. Measurement Methods

A.2.1. Evaluation Procedure

The Specific Absorption Rate (SAR) evaluation was performed in the following manner:

a) (i) The evaluation was performed in an applicable area of the phantom depending on the type of device being tested. For devices worn about the ear during normal operation, both the left and right ear positions were evaluated at the centre frequency of the band at maximum power. The side, which produced the greatest SAR, determined which side of the phantom would be used for the entire evaluation. The positioning of the head worn device relative to the phantom was dictated by the test specification identified in section 3.1 of this report.

(ii) For body worn devices or devices which can be operated within 20 cm of the body, the flat section of the SAM phantom was used were the size of the device(s) is normal. for bigger devices and base station the 2mm Oval phantom is used for evaluation. The type of device being evaluated dictated the distance of the EUT to the outer surface of the phantom flat section.

b) The SAR was determined by a pre-defined procedure within the DASY4 software. The exposed region of the phantom was scanned near the inner surface with a grid spacing of 20mm x 20mm or appropriate resolution.

c) A 5x5x7 matrix for measurement < 4.5 GHz and 7x7x9 for > 4.5 GHz was performed around the greatest spatial SAR distribution found during the area scan of the applicable exposed region. SAR values were then calculated using a 3-D spline interpolation algorithm and averaged over spatial volumes of 1 and 10 grams.

d) If the EUT had any appreciable drift over the course of the evaluation, then the EUT was re-evaluated. Any unusual anomalies over the course of the test also warranted a re-evaluation.

A.2.2. Specific Absorption Rate (SAR) Measurements to OET Bulletin 65 Supplement C: (2001-01)

Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields

SAR measurements were performed in accordance with Appendix D of the standard FCC OET Bulletin 65 Supplement C: 2001, IEEE 1528 and FCC KDB procedures, against appropriate limits for each measurement position in accordance with the standard. In some cases the FCC was contacted using a PBA or KDB process to ensure test is performed correctly.

The test was performed in a shielded enclosure with the temperature controlled to remain between +18.0ºC and +25.0ºC. The tissue equivalent material fluid temperature was controlled to give a maximum variation of ± 2.0ºC

Prior to any SAR measurements on the EUT, system Check and material dielectric property measurements were conducted. In the absence of a detailed procedure within the specification, system Check and material dielectric property measurements were performed in accordance with Appendix C and Appendix D of FCC OET Bulletin 65 Supplement C: 2001 and FCC KDB publication 450824.

Following the successful system Check and material dielectric property measurements, a SAR versus time sweep shall be performed within 10 mm of the phantom inner surface. If the EUT power output is stable after three minutes then the measurement probe will perform a coarse surface level scan at each test position in order to ascertain the location of the maximum local SAR level. Once this area had been established, a 5x5x7 cube of 175 points below 4.5 GHz and above 4.5GHz 7x7x9 cube of 441 points (5 mm spacing in each axis ≈ 27g) will be centred at the area of concern. Extrapolation and interpolation will then be carried out on the 27g of tissue and the highest averaged SAR over a 1g cube determined.

Once the maximum interpolated SAR measurement is complete; the coarse scan is visually assessed to check for secondary peaks within 50% of the maximum SAR level. If there are any further SAR measurements required, extra 5x5x7 or 7x7x9 cubes shall be centred on each of these extra local SAR maxima.

At the end of each position test case a second time sweep shall be performed to check whether the EUT has remained stable throughout the test.