TEST REPORT

TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: LT30at

To: OET Bulletin 65 Supplement C: (2001-01)
and RSS-102 Issue 4 March 2010

FCC ID: PY7PM-0140; IC ID: 4170B-PM0140

Test Report Serial No:
RFI-SAR-RP88281JD02A V2.0

Version 2.0 Supersedes All Previous Versions

This Test Report Is Issued Under The Authority Of Chris Guy, Head of Global Approvals:	(APPROVED SIGNATORY)
Checked By: Richelieu Quoi	(APPROVED SIGNATORY)
Issue Date:	**21 August 2012**
Test Dates:	**18 June 2012 to 13 August 2012**

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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:	LT30at
Type Number:	PM-0140-BV
Serial Number:	CB511Z7M5R
IMEI Number:	00440245-023988-8
Hardware Version Number:	AP1.2
Software Version Number:	7.0.A.1.68
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0140
Industry Canada Number:	4170B-PM0140
Country of Manufacture:	China
Date of Receipt:	14 June 2012

Note(s):

This sample was used to perform WWAN SAR evaluation measurements on bands GSM850 and PCS1900. 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:	LT30at
Type Number:	PM-0140-BV
Serial Number:	CB511Z7M8D
IMEI Number:	00440245-023936-7
Hardware Version Number:	AP1.2
Software Version Number:	7.0.A.1.68
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0140
Industry Canada Number:	4170B-PM0140
Country of Manufacture:	China
Date of Receipt:	14 June 2012

Note(s):

This sample was used to perform WWAN SAR evaluation measurements on bands UMTS FDD IV, LTE Band II, LTE Band V. 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:	LT30at
Type Number:	PM-0140-BV
Serial Number:	CB511Z7M8G
IMEI Number:	00440245-023919-3
Hardware Version Number:	AP1.2
Software Version Number:	7.0.A.1.68
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0140
Industry Canada Number:	4170B-PM0140
Country of Manufacture:	China
Date of Receipt:	14 June 2012

Note(s):

This sample was used to perform WWAN SAR evaluation measurements on bands LTE Band IV and LTE Band XVII. 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:	LT30at
Type Number:	PM-0140-BV
Serial Number:	CB511Z7MAY
IMEI Number:	00440245-023917-7
Hardware Version Number:	AP1.2
Software Version Number:	7.0.A.1.68
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0140
Industry Canada Number:	4170B-PM0140
Country of Manufacture:	China
Date of Receipt:	14 June 2012

Note(s):

This sample was used to perform WWAN SAR measurements on bands UMTS FDD II and UMTS FDD V. 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:	LT30at
Type Number:	PM-0140-BV
Serial Number:	CB511Z7M35
IMEI Number:	00440245-023984-7
Hardware Version Number:	AP1.2
Software Version Number:	7.0.A.1.68
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0140
Industry Canada Number:	4170B-PM0140
Country of Manufacture:	China
Date of Receipt:	14 June 2012

Note(s):

This sample was used to perform WWAN 2G bands 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:	LT30at
Type Number:	PM-0140-BV
Serial Number:	CB511Z7M69
IMEI Number:	00440245-023920-1
Hardware Version Number:	AP1.2
Software Version Number:	7.0.A.1.68
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0140
Industry Canada Number:	4170B-PM0140
Country of Manufacture:	China
Date of Receipt:	14 June 2012

Note(s):

This sample was used to perform WWAN 3G and LTE Bands 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:	LT30at
Type Number:	PM-0140-BV
Serial Number:	CB511Z7M8U
IMEI Number:	00440245-023914-4
Hardware Version Number:	AP1.2
Software Version Number:	ETS Sw
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0140
Industry Canada Number:	4170B-PM0140
Country of Manufacture:	China
Date of Receipt:	14 June 2012

Note(s):

This sample was used to perform WLAN SAR 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"

Description:	Mobile Handset
Brand Name:	Sony
Model Name or Number:	LT30at
Type Number:	PM-0140-BV
Serial Number:	CB511Z7MJL
IMEI Number:	00440245-023927-6
Hardware Version Number:	AP1.2
Software Version Number:	ETS Sw
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0140
Industry Canada Number:	4170B-PM0140
Country of Manufacture:	China
Date of Receipt:	14 June 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 Quad band, LTE Quad Band and Wi-Fi bands. The EUT has GPRS Class 12 / EDGE Class 12, UMTS FDD I, II, IV, V With HSPA, LTE Band 2, 4, 5, 17, WLAN 802.11 a/b/g/n, *Bluetooth Class 1*, Personal hotspot mode and Auto RF Power Reduction' mode capabilities.

2.3. Modifications Incorporated in the EUT

EUT (IMEI: 00440245-023988-8) is used for WWAN GSM850 and PCS1900 SAR measurements.

EUT (IMEI: 00440245-023936-7) is used for WWAN UMTS FDD IV and LTE Band II, V SAR measurements only.

EUT (IMEI: 00440245-023919-3) is used for WWAN LTE Band IV, XVII SAR measurements only.

EUT (IMEI: 00440245-023917-7) is used for WWAN UMTS FDD II, V measurements only.

EUT (IMEI: 00440245-023984-7) is used for WWAN 2G bands conducted power measurements only

EUT (IMEI: 00440245-023920-1) is used for WWAN 3G and LTE Bands conducted power measurements only

EUT (IMEI: 00440245-023914-4) is used for WLAN SAR measurements only.

EUT (IMEI: 00440245-023927-6) is used for WLAN Conducted Power measurements only.

2.4. Accessories

Description:	Personal Hands-Free Kit (PHF)
Brand Name:	Sony
Model Name or Number:	MH10
Serial Number:	11480C1E0004D6E
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

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/GPRS/EDGE850, EGSM/GPRS/EDGE900, DCS/GPRS/EDGE1800, PCS/GPRS/EDGE1900, UMTS/HSPA FDD I, II, IV, V, LTE Band II, IV, V, XVII WiFi802.11a/b/g/n, *Bluetooth*.	
Type of Unit	Portable Transceiver	
Intended Operating Environment:	Within GSM, UMTS, LTE, Wi-Fi 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 Band II	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
	UMTS Band IV	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
	UMTS Band V	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
	LTE Band II	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
	LTE Band IV	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
	LTE Band V	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
	LTE Band XVII	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
	WiFi802.11b/g/n	Test Software was used to configure the EUT to transmit at a maximum power of up to 18.1dBm.
	5.0 GHz Wi-Fi 802.11a/n (HT20 / HT40)	Test Software was used to configure the EUT to transmit at a maximum power of up to 16.4 dBm.
	Bluetooth	:=7.4 mW

Additional Information Related to Testing (Continued):

Transmitter Frequency Range:	GSM850	824 to 849 MHz	
	PCS1900	1850 to 1910 MHz	
	UMTS Band II	1852 to 1908 MHz	
	UMTS Band IV	1712 to 1753 MHz	
	UMTS Band V	826 to 847 MHz	
	LTE Band II	1860 to 1900 MHz	
	LTE Band IV	1720 to 1745 MHz	
	LTE Band V	829 to 844 MHz	
	LTE Band XVII	709 to 711 MHz	
	Wi-Fi802.11b/g/n	2412 to 2462 MHz	
	5.0 GHz Wi-Fi 802.11a/n (HT20 / HT40)	5180 to 5825 MHz	
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
	9262	Low	1852.4
	9400	Middle	1880.0
	9538	High	1907.6
	1312	Low	1712.4
	1412	Middle	1732.4
	1513	High	1752.6
	4132	Low	826.4
	4183	Middle	836.6
	4233	High	846.6
	18700	Low	1860.0
	18900	Middle	1880.0
	19100	High	1900.0
	20050	Low	1720.0
	20175	Middle	1732.5
	20300	High	1745.0
	20450	Low	829.0
	20525	Middle	836.5
	20600	High	844.0

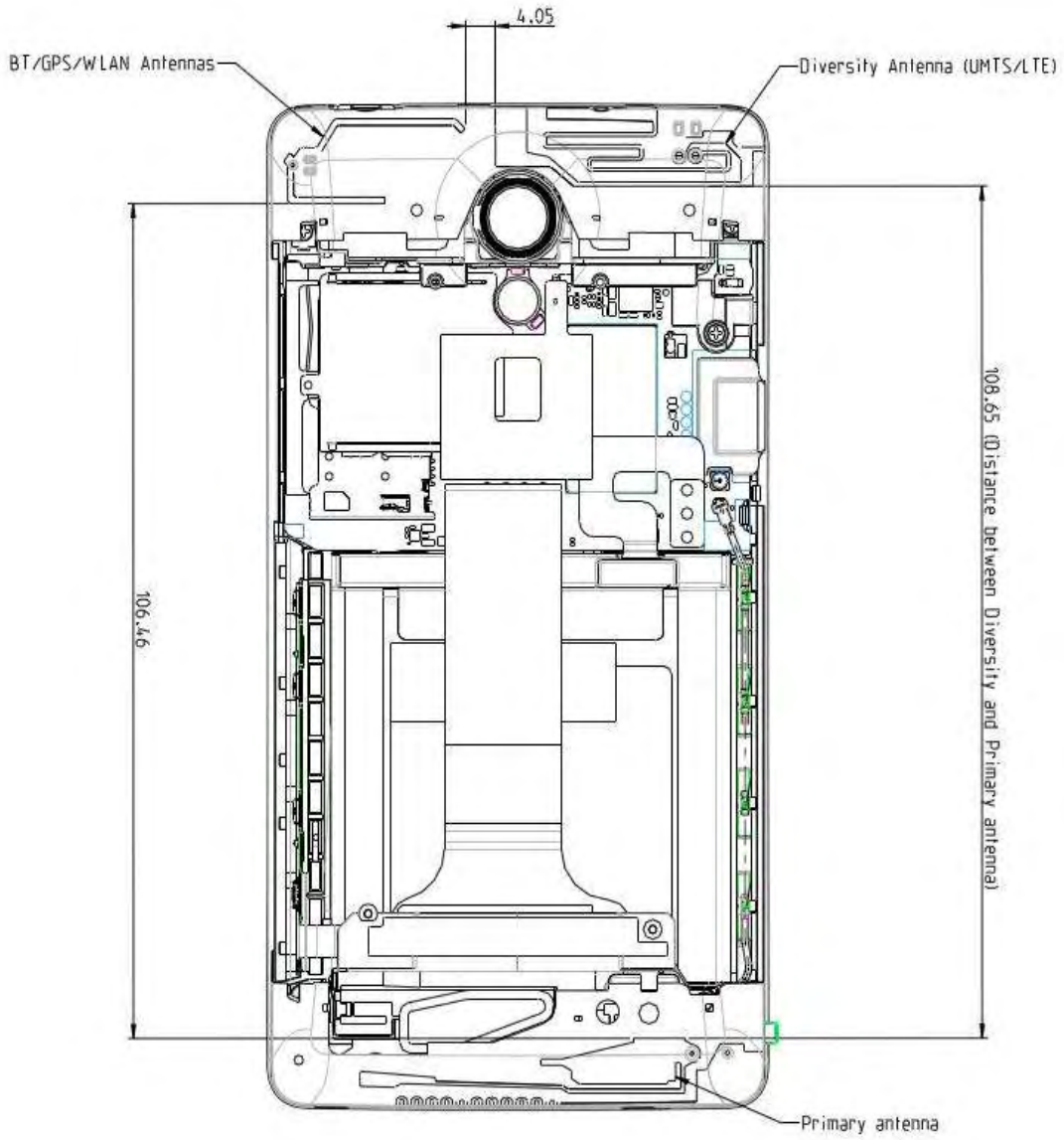
Additional Information Related to Testing (Continued):

Transmitter Frequency Allocation of EUT When Under Test:12	Channel Number	Channel Description	Frequency (MHz)
	23780	Low	709.0
	23790	Middle	710.0
	23800	High	711.0
	1	Low	2412.0
	6	Middle	2437.0
	11	High	2462.0
	36	Low	5180.0
	40	Middle	5200.0
	44	Middle	5220.0
	48	High	5240.0
	52	Low	5260.0
	54	Middle	5280.0
	60	Middle	5300.0
	64	High	5320.0
	100	Low	5500.0
	104	Middle	5520.0
	108	Middle	5540.0
	112	Middle	5560.0
	116	Middle	5580.0
	120	Middle	5600.0
	124	Middle	5620.0
	128	Middle	5640.0
	132	Middle	5660.0
	136	Middle	5680.0
	140	High	5700.0
	149	Low	5745.0
	157	Middle	5785.0
	165	High	5825.0

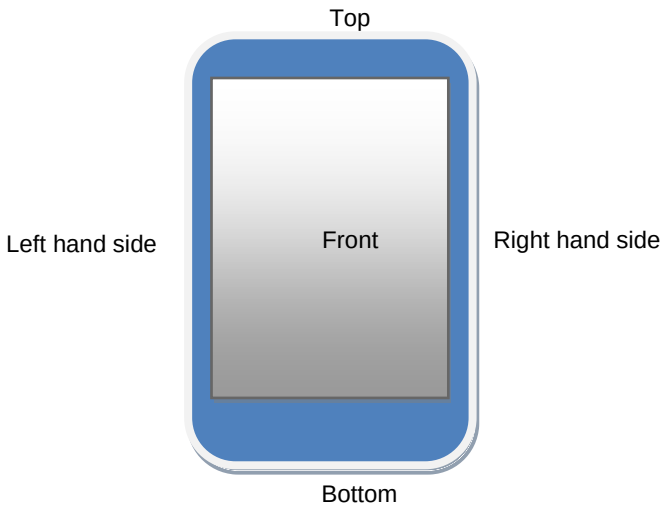
Additional Information Related to Testing (Continued):	
Modulation(s):	GMSK (GSM/ GPRS): 217 Hz QPSK(UMTS / HSDPA/HSPA):0Hz DBPSK, CCK (Wi-Fi): 0 Hz
Modulation Scheme (Crest Factor):	GSMK (GSM): 8.3 GMSK (GPRS): 4 DBPSK, CCK (Wi-Fi): 1 QPSK(UMTS FDD / HSDPA): 1
Antenna Type:	Internal integral
Antenna Length:	Unknown
Number of Antenna Positions:	2 fixed (WWAN and WLAN/*Bluetooth*)
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 band used by the device	Band 2: frequency range – 1850 MHz – 1910 MHz Band4: frequency range – 1710 MHz – 1755 MHz Band5: frequency range – 824 MHz– 849 MHz Band17: frequency range – 704 MHz– 716 MHz
2	Identify the channel bandwidths used in each frequency band; 1.4, 3, 5, 10, 15, 20 MHz etc	Channel Bandwidths used are: B2 (1.4, 3, 5 , 10, 15, 20) MHz B4 (1.4, 3, 5 , 10, 15, 20) MHz B5 (1.4, 3, 5 , 10) MHz B17(5 , 10) MHz
3	Identify the high, middle and low (H, M, L) channel numbers and frequencies in each LTE frequency band	B2 -1.4 MHz (H,M,L)= (19193,18900,18607) (1909.3,1880,1850.7) MHz B4 -1.4 MHz (H,M,L)= (20393, 20175, 19957) (1754.3, 1732.5, 1710.7) MHz B5 -1.4 MHz (H,M,L)= (20643, 20525, 20407) (848.3, 836.5, 824.7) MHz B17 -5 MHz (H,M,L)= (23825, 23790, 23755) (713.5, 710, 706.5) 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 (LT30at) shares hardware for LTE and UMTS for bands 2, 4, 5 while standalone hardware for LTE B17. However, there is only one main antenna for LTE/UMTS/GSM bands (as pictured below). Antenna distances are shown below: 

Additional Information Related to LTE Test parameter (Continued):

#	Description	Parameter
6	Identify the LTE Band 5oice/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, Rear 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. 
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 A-MPR is always disabled during the SAR testing.

Additional Information Related to LTE Test parameter (Continued):

<table>
<tr><th>#</th><th>Description</th><th>Parameter</th></tr>
<tr><td>8</td><td>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</td><td>This is indicated in section 7 of the SAR report.</td></tr>
<tr><td>9</td><td>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</td><td>The following bands are supported for the exposure conditions
1) GSM (850/1900) and WCDMA (850/1700/1900)
- Exposure conditions: Head/Body worn SAR required for GSM / WCDMA 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 < 12mW 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</td></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 indicated in section 7 of the SAR 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><th></th><th colspan="4">Simultaneous transmission conditions</th></tr>
<tr><th></th><th colspan="3">WWAN</th><th>WLAN</th><th>Sum of WWAN & WLAN</th></tr>
<tr><th>#</th><th>LTE BAND 5oice/Data</th><th>GSM Voice/Data</th><th>UMTS Voice/Data</th><th>Wi-Fi 802.11a/b/g/n</th><th></th></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>Device implements UMTS/SVLTE power reduction. The reduction is not required for SAR compliance. No power reduction on WiFi. A-MPR is not implemented.</td></tr>
</table>

Additional Information Related to LTE Test parameter (Continued):

#	Description	Parameter
13	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	An Anritsu MT8820C communication simulator which supports LTE modes (voice/data) was used for testing

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.
Reference:	RSS-102 Issue 4 March 2010
Title:	Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)
Purpose of Test:	To determine whether the equipment met the basic restrictions as defined in RSS-102 Issue 4 March 2010 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 715407.

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.

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 (v/m)	GPRS1900 Power (v/m)
1 uplink	11.49	5.27
2 uplink	**12.67**	**5.63**
3 uplink	11.69	4.96
4 uplink	11.78	4.99

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 II, IV, V Call allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum as per KDB 941225 D01.
- UMTS FDD II, IV, V - 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 II, IV, V - 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.
- LTE Band II, IV, data allocated mode at QPSK & 16 QAM on the 20 MHz channel only, using a Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D05.

Operating Modes (Continued)

- LTE Band V, XVII data allocated mode at QPSK & 16 QAM on the 10 MHz channel only, 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 18.1 dBm for ‘b’ mode and 16.5 dBm for ‘g’ and 15.4 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 16.4 dBm for ‘a’ mode and 15.5 dBm for ‘n’ modes

- **Activating the ‘Portable Wi-Fi hotspot’ mode**

Go to the home screen of the EUT:

1. Press the ‘*Applications’* icon on the screen of the device and then tap "*Settings*".
2. On the Settings screen, tap the "*Wireless & networks*" option, followed by "*Portable Wi-Fi hotspot*".
3. Click the check mark beside it to turn on the hotspot and the EUT starts acting like a wireless access point. (It should also see a message in the notification bar when it's activated.).
4. Once ‘*Portable Wi-Fi Hotspot’* mode is activated, it is active until it is deactivated by the user.

‘*Auto RF Power Reduction’* mode facility is available on ‘*Hotspot Mode Configuration* of UMTS FDD Band II, IV and LTE Band II and IV’ only.

Once the ‘Portable Wi-Fi hotspot’ mode is activated, the ‘Auto RF Power Reduction’ mode is active. This enables ‘Power Back-Off’ and the RF power gets reduced on the specific band on which it is supported. This option is available in the device to ‘Reduce the RF Power’ and to comply with the *Standard* for the measured SAR and conducted power level. Once ‘Auto RF Power Reduction’ mode is activated, power reduction applies until it is deactivated by the user.

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 12uplink setup of 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 Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-GPRS 850 Hotspot Mode Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-GSM 850 Body-Worn Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-PCS 1900 Head Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-GPRS 1900 Hotspot Mode Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-PCS 1900 Body-Worn Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-UMTS-FDD II Head Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-UMTS-FDD II Hotspot Mode Configuration 1g Power Back-off Enabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-UMTS-FDD II Body-worn Configuration 1gPower Back-off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-UMTS-FDD IV Head Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-UMTS-FDD IV Hotspot Mode Configuration 1g Power Back-off Enabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-UMTS-FDD IV Body-Worn Configuration 1g Power Back-off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-UMTS-FDD V Head Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-UMTS-FDD V Hotspot Mode Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-UMTS-FDD V Body-Worn Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied

Summary of Test Results (Continued)

Test Name	Specification Reference	Result
Specific Absorption Rate LTE BAND 2 Head Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-LTE BAND 2 Hotspot Mode Configuration 1g Power Back-off Enabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-LTE BAND 2 Body-worn Configuration 1gPower Back-off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-LTE BAND 4 Head Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-LTE BAND 4 Hotspot Mode Configuration 1g Power Back-off Enabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate LTE BAND 4 Body-Worn Configuration 1g Power Back-off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-LTE BAND 5 Head Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-LTE BAND 5 Hotspot Mode Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-LTE BAND 5 Body-Worn Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-LTE BAND 17 Head Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-LTE BAND 17 Hotspot Mode Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-LTE BAND 17 Body-Worn Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-Wi-Fi 2450 MHz Head Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-Wi-Fi 2450 MHz Hotspot Mode Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-Wi-Fi 2450 MHz Body-Worn Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-Wi-Fi 5GHz Head Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-Wi-Fi 5GHz Hotspot Mode Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied
Specific Absorption Rate-Wi-Fi 5GHz Body Worn Configuration 1g Power Back-Off Disabled	OET Bulletin 65 Supplement C: (2001-01) RSS-102 Issue 4 March 2010	Complied

Summary of Test Results (Continued)

SAR Individual Transmitter Evaluation

device, mode	Frequency, (MHz)	Phantom Configuration	P_x (mW)	P_{REF} (mW)	single SAR, W/kg	Remarks
WWAN, GSM	850	Right Hand Side	347	60/f	1.060	Routine Evaluation
WWAN, GSM	1900	Rear	120	60/f	0.729	Routine Evaluation
WWAN, UMTS	850	Rear	331	60/f	0.979	Routine Evaluation
WWAN, UMTS	1800	Bottom	245	60/f	1.220	Routine Evaluation
WWAN, UMTS	1900	Rear	302	60/f	1.260	Routine Evaluation
WWAN, LTE	750	Rear	263	60/f	0.488	Routine Evaluation
WWAN, LTE	850	Right Hand Side	257	60/f	1.140	Routine Evaluation
WWAN, LTE	1800	Bottom	195	60/f	1.320	Routine Evaluation
WWAN, LTE	1900	Rear	186	60/f	1.040	Routine Evaluation
WLAN, WiFi802.11b	2450	Rear	63	60/f	0.459	Routine Evaluation
WLAN, WiFi802.11a	5000	Touch Left	28	60/f	0.793	Routine Evaluation
BT, *Bluetooth*	2400	N/A	~ 7.5	12	:=0	{PBT ≤ 2PREF} {dWWAN, BT > 5cm}

Note(s):

1. Simultaneous transmission was not evaluated as though the sum of the individual SAR for WWAN and WLAN was > 1.6 W/kg. The SAR to peak location separation ratio distance was < 0.3
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.

Summary of Test Results (Continued)

SAR Individual Transmitter Evaluation SAR Simultaneous Transmitter Evaluation

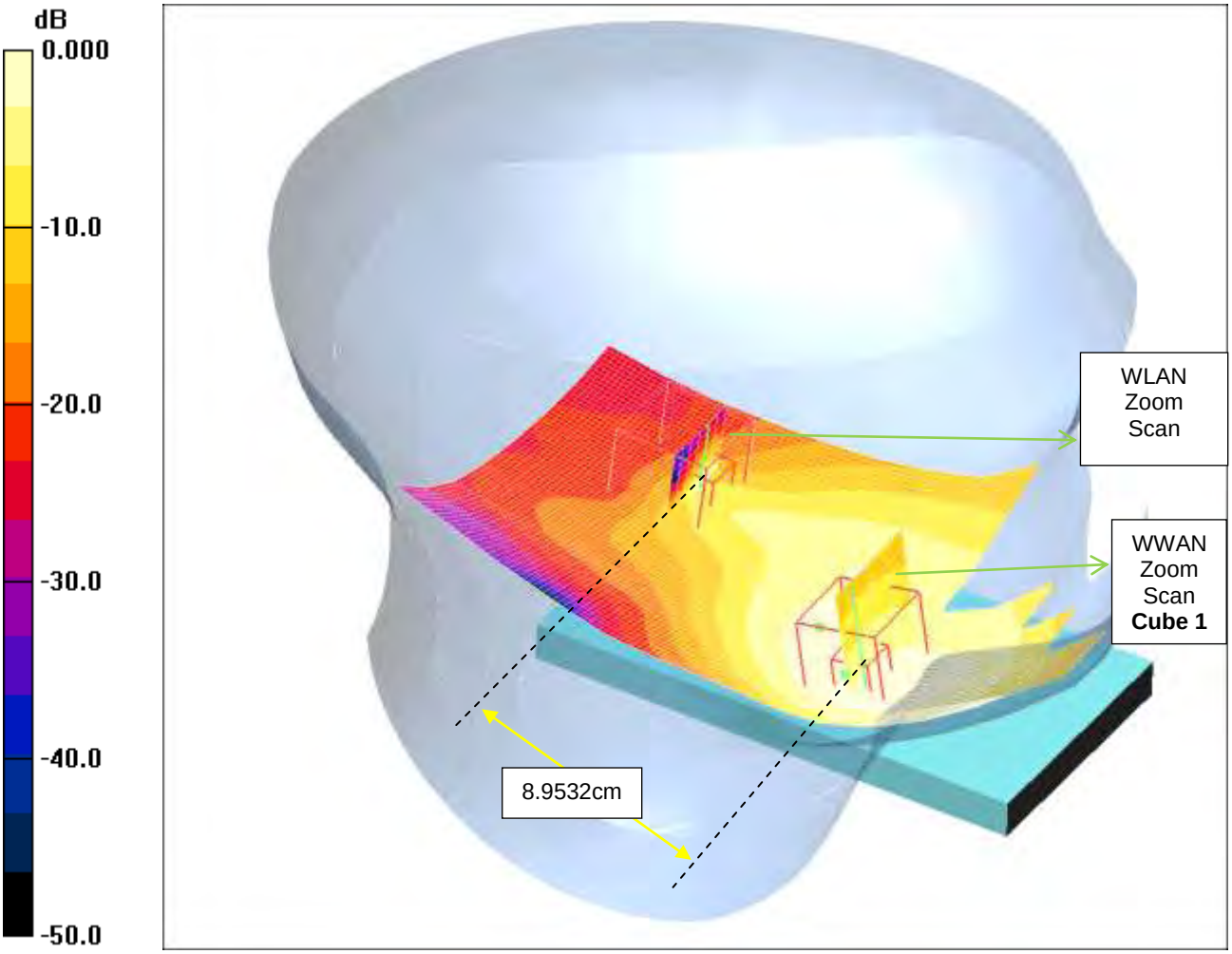
(x,y)	D(x,y) cm	L(x,y,z) cm	$SPLSR_{xyz}$	∑Sim-Tx SAR	Remarks
($WWAN_{LTE,UMTS}$, BT)	>5	N/A	N/A	N/A	{no stand-alone SAR for BT}
($WWAN_{LTE}$, $Wi\text{-}Fi_{5GHz}$)	>5	8.95	0.20	1.751	**Cube1:** {SAR to peak location separation ratio ≤ 0.3}
	>5	7.89	0.20	1.612	**Cube2**: Secondary peak SAR which is within 2dB of maximum primary peak level {SAR to peak location separation ratio ≤ 0.3}
($WWAN_{LTE}$, $Wi\text{-}Fi_{5GHz}$)	>5	8.98	0.18	1.611	**Cube1**: {SAR to peak location separation ratio ≤ 0.3}
	>5	7.97	N/A	1.472	**Cube2**: Secondary peak SAR which is within 2dB of maximum primary peak level {SUM of SAR < 1.6w/kg} {SAR to peak location separation ratio ≤ 0.3}
($WWAN_{UMTS}$, $Wi\text{-}Fi_{5GHz}$)	>5	8.33	0.21	1.722	{SAR to peak location separation ratio ≤ 0.3}
($WWAN_{UMTS}$, $Wi\text{-}Fi_{2.45GHz}$)	>5	12.08	0.14	1.719	{SAR to peak location separation ratio ≤ 0.3}

Note(s):

1. SPLSR threshold = 0.3
2. For WWAN LTE measurement, the worst case and most conservative configuration peak location measured more than one maximum cube as the secondary peak was within 2 dB of the maximum peak SAR level. Therefore SAR SPLSR had to be calculated for both cube to ensure they both had a SPLSR less than 0.3 as the sume of the SAR for each cube was greater >1.6 w/kg.

6.1. SAR to peak location separation ratio distance (SPLSR) plots calculations

6.1.1. Touch Left LTE Band 2 CH18900 (CUBE: 1) + WLAN 802.11a 6Mbps CH52 SPLSR



0 dB = 1.50mW/g

SPLSR Calculation:

WWAN (LTE BAND 2 CH18900 Cube 1) Peak Co-ordinates			WLAN802.11a 6.5Mbps CH52 Peak Co-ordinates		
X_1	Y_1	Z_1	X_2	Y_2	Z_2
(m)	(m)	(m)	(m)	(m)	(m)
0.0703	0.249	-0.168	0.0303	0.329	-0.172

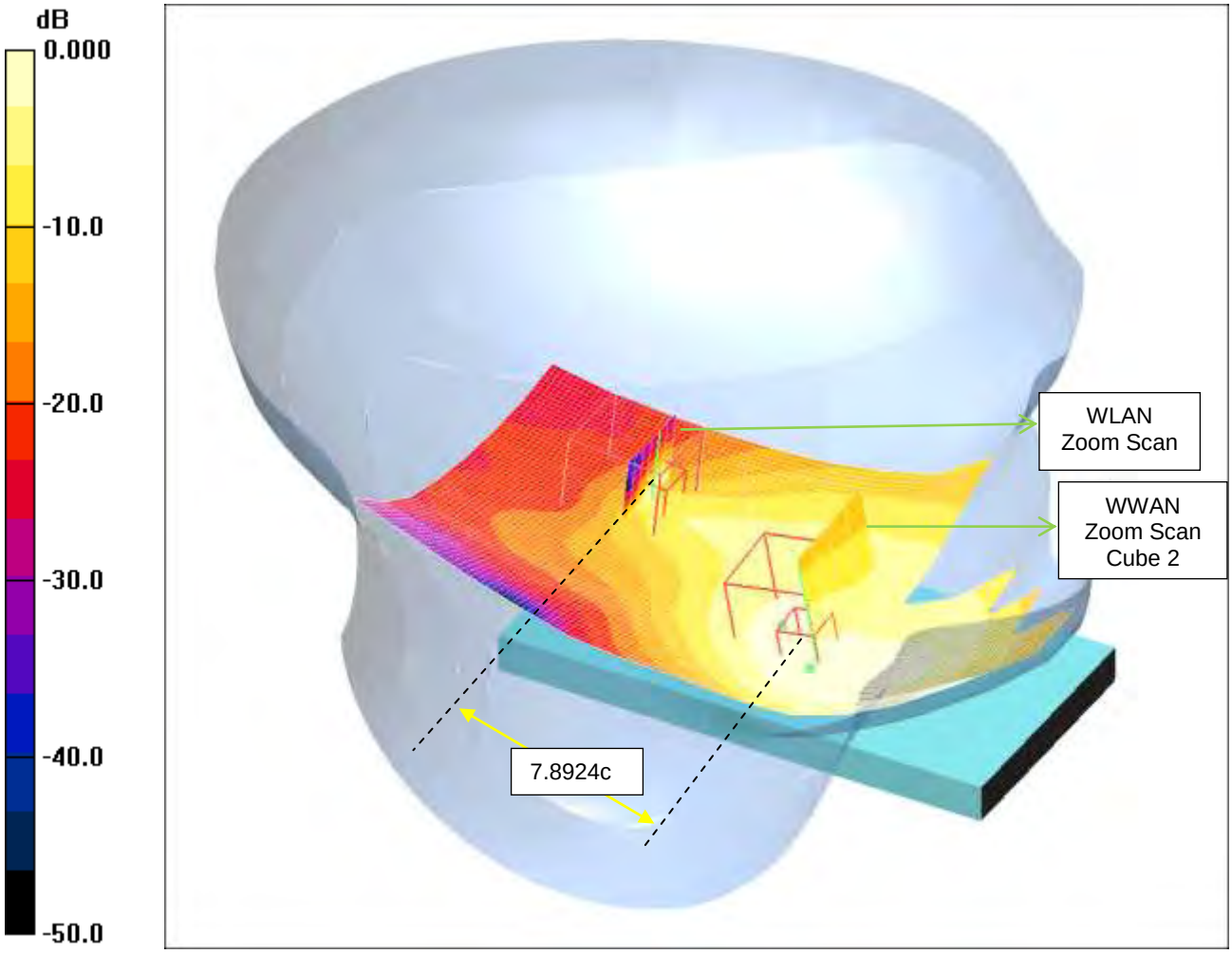
x=(X2- X1)^2	y=(Y2- Y1)^2	z=(Z2- Z1)^2	Square Root of Sum of x, y, z (m)
0.0016	0.0064	0.0000	0.0895

SPLSR =	Sum of PEAK WWAN and WLAN SAR (w/Kg) / Distance between Peak's Calculated (cm)
	(0.96+0.793)/8.9532 **= 0.1956** < 0.3
	As per KDB 648474 D01 v01r05, Simultaneous Transmission not Required

CONCLUSION:
Simultaneous transmission SAR evaluation is not required as the SAR to peak location separation ratio is lesser than 0.3.

Note:
There are 2 cubes for LTE BAND 2 bands as the SAR system is setup to measure any secondary peaks that are within 2dB of the maximum SAR level as per FCC OET Bulletin 65 Supplement C:2001. Therefore to SPLSR calculation was performed for both cubes. The above calculation is with consideration for cube1 only for the specified configuration on the LTE BAND 2 (WWAN) band combined with WLAN maximum cube.

6.1.2. Touch Left LTE Band 2 CH18900 (CUBE: 2) + WLAN 802.11a 6Mbps CH52 SPLSR



0 dB = 1.50mW/g

SPLSR Calculation:

WWAN (LTE BAND 2 CH18900 Cube 2) Peak Co-ordinates			WLAN802.11a 6.5Mbps CH52 Peak Co-ordinates		
X_1	Y_1	Z_1	X_2	Y_2	Z_2
(m)	(m)	(m)	(m)	(m)	(m)
0.0667	0.259	-0.17	0.0303	0.329	-0.172

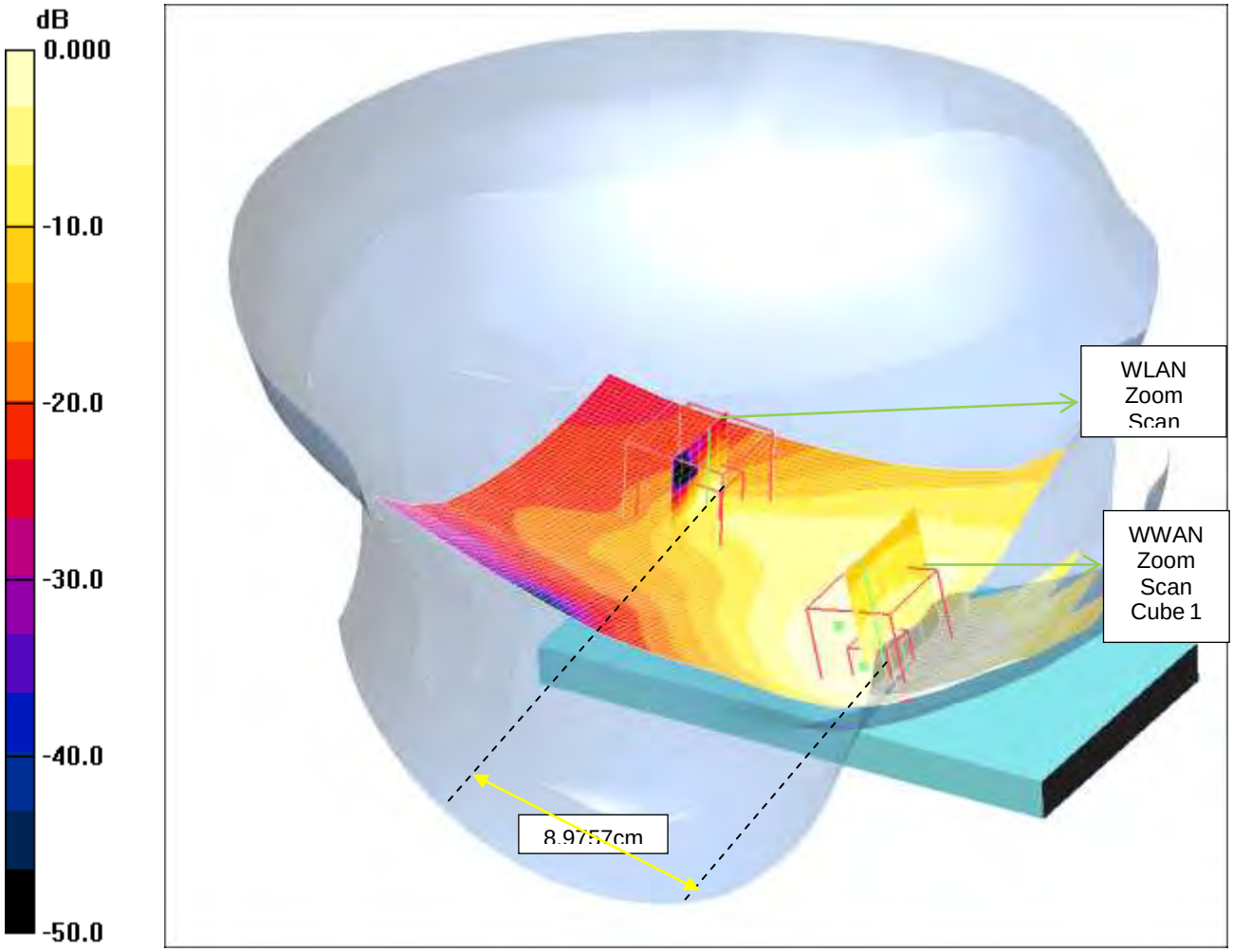
x=(X2- X1)^2	y=(Y2- Y1)^2	z=(Z2- Z1)^2	Square Root of Sum of x, y, z (m)
0.0013	0.0049	0.0000	0.0789

SPLSR =	Sum of PEAK WWAN and WLAN SAR (w/Kg) / Distance between Peak's Calculated (cm)
	(0.821+0.793)/7.8924 **= 0.2042** < 0.3
	As per KDB 648474 D01 v01r05, Simultaneous Transmission not Required

CONCLUSION:
Simultaneous transmission SAR evaluation is not required as the SAR to peak location separation ratio is lesser than 0.3.

Note:
There are 2 cubes for LTE BAND 2 bands as the SAR system is setup to measure any secondary peaks that are within 2dB of the maximum SAR level as per FCC OET Bulletin 65 Supplement C:2001. Therefore to SPLSR calculation was performed for both cubes. The above calculation is with consideration for cube2 only for the specified configuration on the LTE BAND 2 (WWAN) band combined with WLAN maximum cube.

6.1.3.Touch Left LTE Band 2 CH18900 (CUBE: 1) + WLAN 802.11a 6Mbps CH36 SPLSR



0 dB = 1.21mW/g

SPLSR Calculation:

WWAN (LTE BAND 2 CH18900 Cube 1) Peak Co-ordinates			WLAN802.11a 6.5Mbps CH36 Peak Co-ordinates		
X_1	Y_1	Z_1	X_2	Y_2	Z_2
(m)	(m)	(m)	(m)	(m)	(m)
0.0703	0.249	-0.168	0.0298	0.329	-0.172

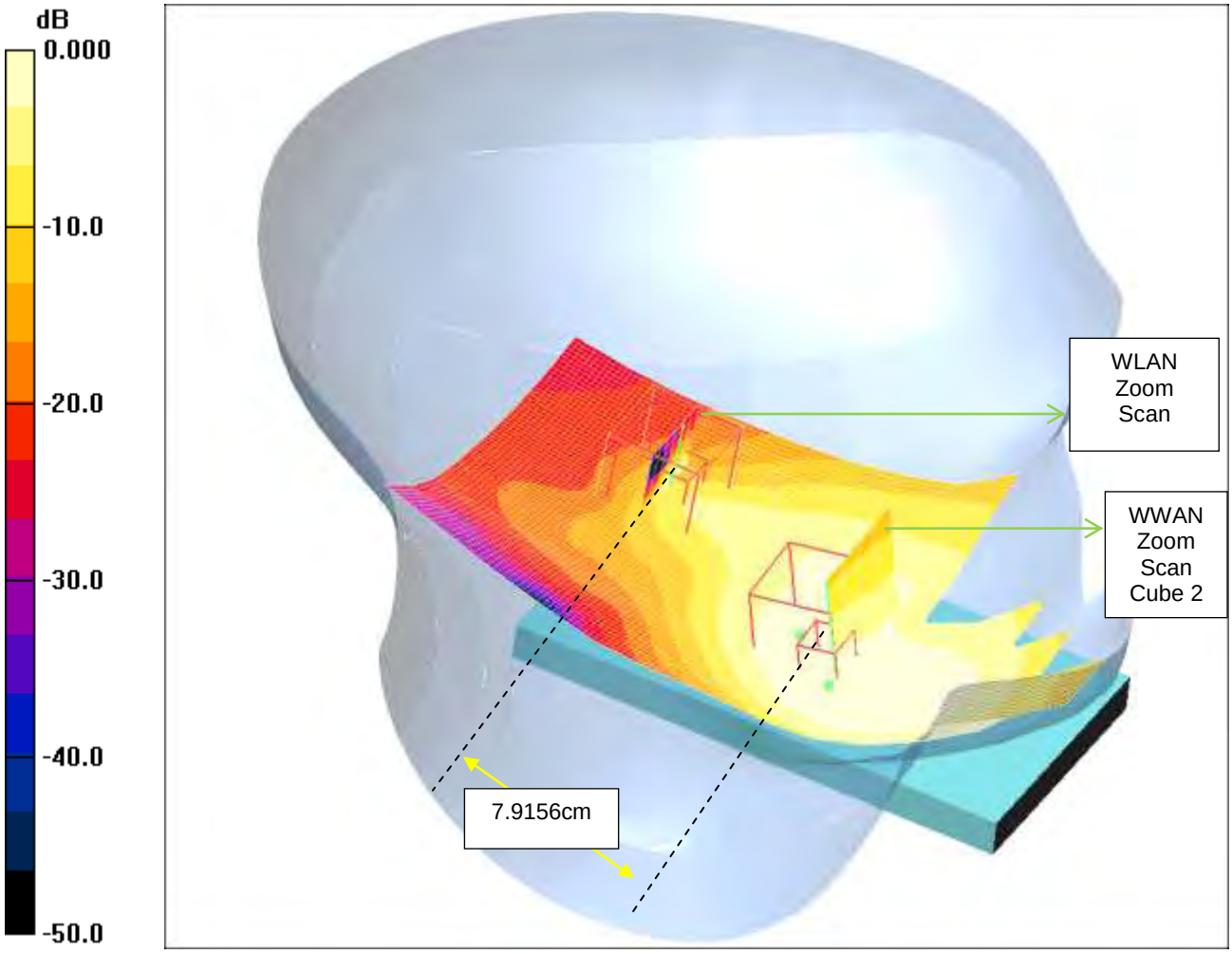
x=(X2- X1)^2	y=(Y2- Y1)^2	z=(Z2- Z1)^2	Square Root of Sum of x, y, z (m)
0.0016	0.0064	0.0000	0.0898

SPLSR =	Sum of PEAK WWAN and WLAN SAR (w/Kg) / Distance between Peak's Calculated (cm)
	(0.96+0.652)/8.9757 **= 0.1795** < 0.3
	As per KDB 648474 D01 v01r05, Simultaneous Transmission not Required

CONCLUSION:
Simultaneous transmission SAR evaluation is not required as the SAR to peak location separation ratio is lesser than 0.3.

Note:
There are 2 cubes for LTE BAND 2 bands as the SAR system is setup to measure any secondary peaks that are within 2dB of the maximum SAR level as per FCC OET Bulletin 65 Supplement C:2001. Therefore to SPLSR calculation was performed for both cubes. The above calculation is with consideration for cube1 only for the specified configuration on the LTE BAND 2 (WWAN) band combined with WLAN maximum cube.

6.1.4. Touch Left LTE Band 2 CH18900 (CUBE: 2) + WLAN 802.11a 6Mbps CH36 SPLSR



0 dB = 1.21mW/g

SPLSR Calculation:

WWAN (LTE BAND 2 CH18900 Cube 2) Peak Co-ordinates			WLAN802.11a 6.5Mbps CH36 Peak Co-ordinates		
X_1	Y_1	Z_1	X_2	Y_2	Z_2
(m)	(m)	(m)	(m)	(m)	(m)
0.0667	0.259	-0.17	0.0298	0.329	-0.172

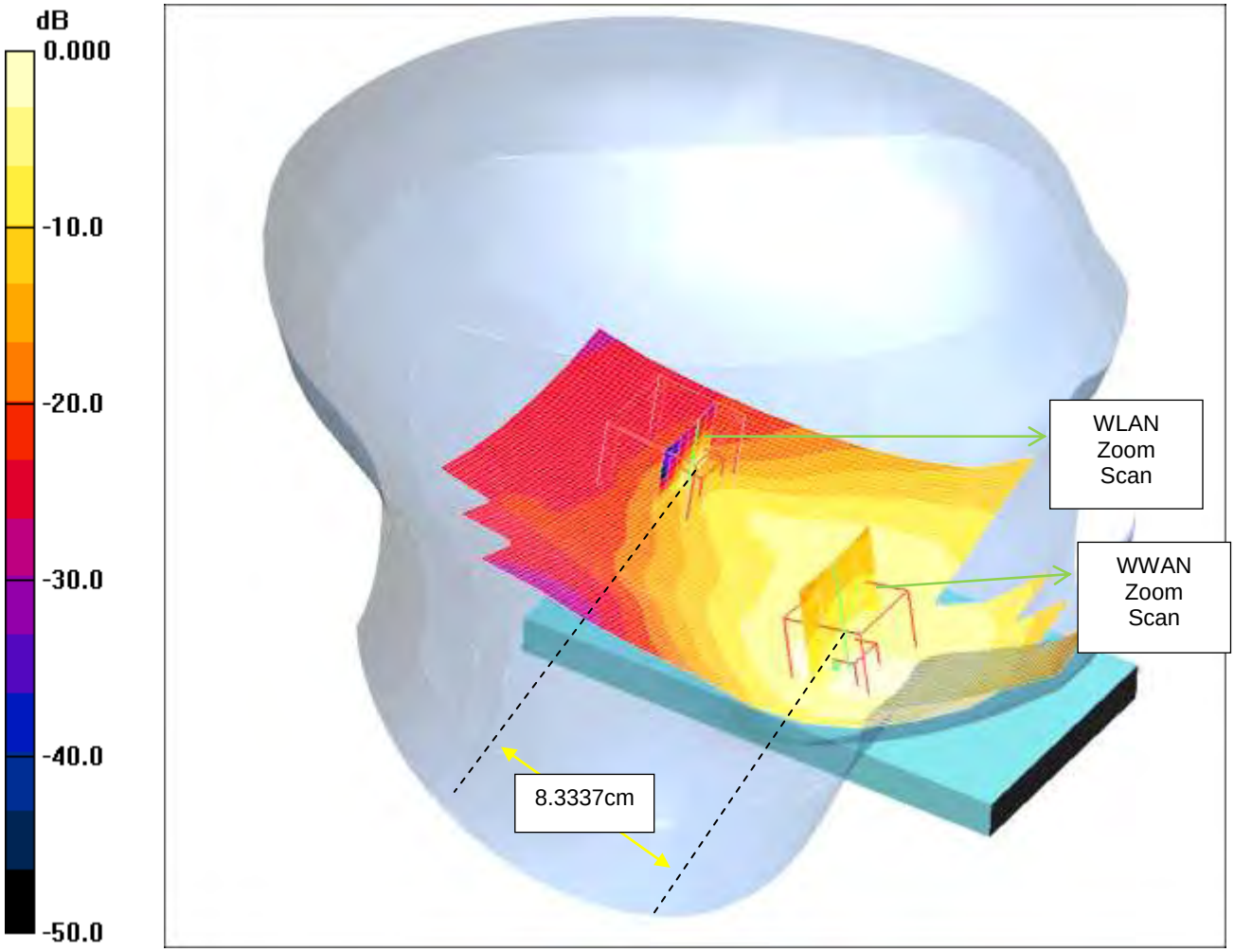
x=(X2- X1)^2	y=(Y2- Y1)^2	z=(Z2- Z1)^2	Square Root of Sum of x, y, z (m)
0.0014	0.0049	0.0000	0.0792

SPLSR =	Sum of PEAK WWAN and WLAN SAR (w/Kg) / Distance between Peak's Calculated (cm)
	(0.821+0.652)/7.9156 **= 0.1860** < 0.3
	As per KDB 648474 D01 v01r05, Simultaneous Transmission not Required

CONCLUSION:
Simultaneous transmission SAR evaluation is not required as the SAR to peak location separation ratio is lesser than 0.3.

Note:
There are 2 cubes for LTE BAND 2 bands as the SAR system is setup to measure any secondary peaks that are within 2dB of the maximum SAR level as per FCC OET Bulletin 65 Supplement C:2001. Therefore to SPLSR calculation was performed for both cubes. The above calculation is with consideration for cube2 only for the specified configuration on the LTE BAND 2 (WWAN) band combined with WLAN maximum cube.

6.1.5. Touch Left FDD Band II CH9262+WLAN 802.11a 6Mbps CH52 SPLSR



0 dB = 1.50mW/g

SPLSR Calculation:

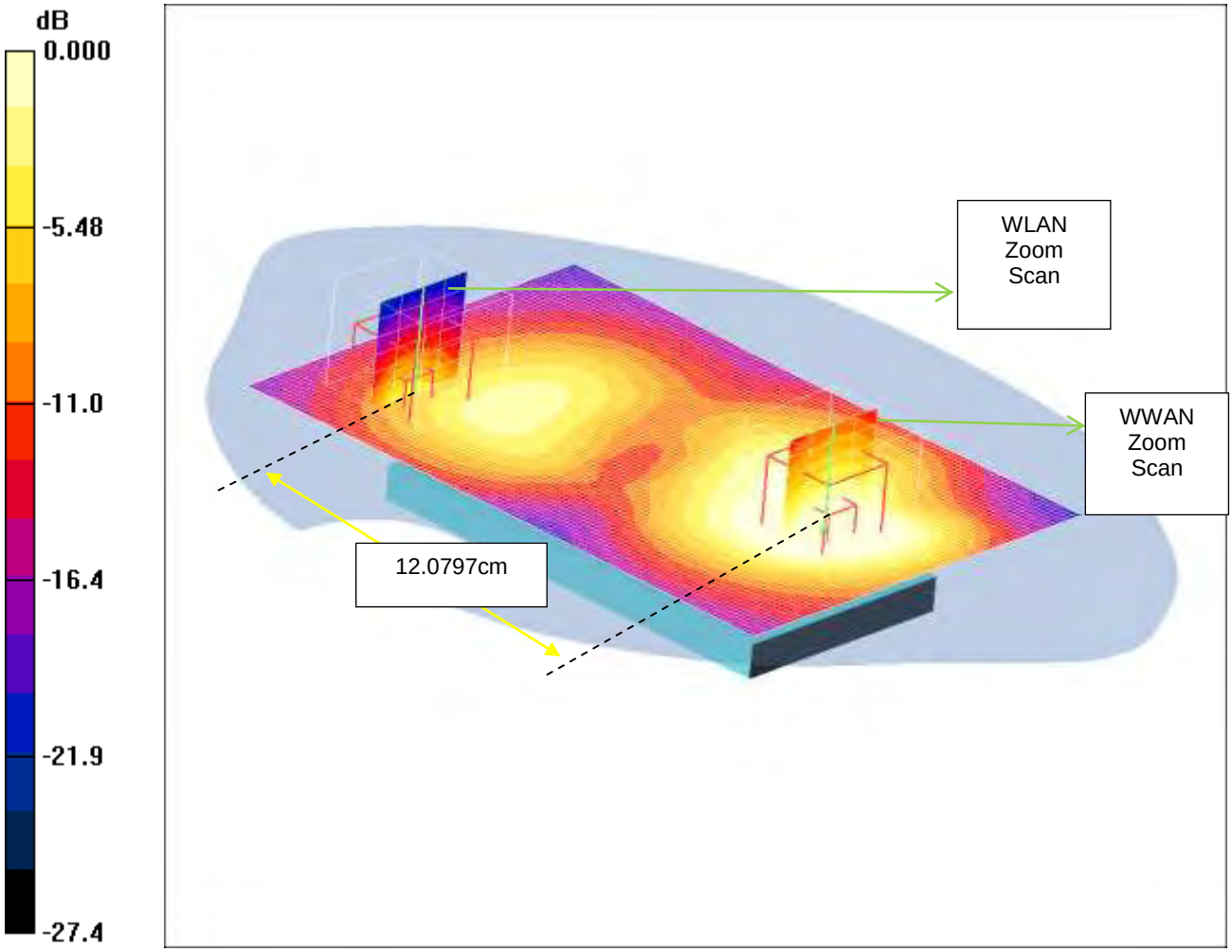
WWAN (FDDII CH9538) Peak Co-ordinates			WLAN802.11a 6.5Mbps CH52 Peak Co-ordinates		
X_1	Y_1	Z_1	X_2	Y_2	Z_2
(m)	(m)	(m)	(m)	(m)	(m)
0.0705	0.256	-0.172	0.0303	0.329	-0.172

x=(X2- X1)^2	y=(Y2- Y1)^2	z=(Z2- Z1)^2	Square Root of Sum of x, y, z (m)
0.0016	0.0053	0.0000	0.0833

SPLSR =	Sum of PEAK WWAN and WLAN SAR (w/Kg) / Distance between Peak's Calculated (cm)
	(0.931+0.793)/8.3337 **= 0.2066** < 0.3
	As per KDB 648474 D01 v01r05, Simultaneous Transmission not Required

CONCLUSION:
Simultaneous transmission SAR evaluation is not required as the SAR to peak location separation ratio is less 0.3.

6.1.6. Back of EUT FDD Band II CH9262+WLAN 802.11b 1Mbps CH11 SPLSR



0 dB = 1.00mW/g

SPLSR Calculation:

WWAN (FDDII CH9262) Peak Co-ordinates			WLAN802.11b 1Mbps CH11 Peak Co-ordinates		
X_1	Y_1	Z_1	X_2	Y_2	Z_2
(m)	(m)	(m)	(m)	(m)	(m)
-0.0169	0.0570	-0.2010	0.0130	-0.0600	-0.2040

$x=(X_2- X_1)^2$	$y=(Y_2- Y_1)^2$	$z=(Z_2- Z_1)^2$	Square Root of Sum of x, y, z (m)
0.0009	0.0137	0.0000	0.1208

SPLSR =	Sum of PEAK WWAN and WLAN SAR (w/Kg) / Distance between Peak's Calculated (cm)
	(1.26+0.459)/12.0797392 **= 0.1423** < 0.3
	As per KDB 648474 D01 v01r05, Simultaneous Transmission not Required

CONCLUSION:
Simultaneous transmission SAR evaluation is not required as the SAR to peak location separation ratio is lesser than 0.3.

6.2. 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 II	UMTS FDD IV	UMTS FDD V	Wi-Fi	
Touch Left	0.571					0.791	1.362
Touch Right	0.544					0.244	0.788
Touch Left		0.368				0.791	1.159
Touch Right		0.253				0.244	0.497
Touch Left			**0.931**			**0.793**	**1.724**
Touch Right			0.769			0.244	1.013
Touch Left				0.715		0.791	1.506
Touch Right				0.437		0.244	0.681
Touch Left					0.444	0.791	1.235
Touch Right					0.535	0.244	0.779

Head Configuration 1g (Continued) – Worst cases measurements

	Measured SAR 1g (W/Kg)					
	WWAN				WLAN	Sum of WWAN & WLAN
EUT Position	LTE Band 2	LTE Band 4	LTE Band 5	LTE Band 17	Wi-Fi	
Touch Left {Cube 1}	**0.960**				**0.793**	**1.753**
Touch Left {Cube 2 } Seconday Peak	**0.821**				**0.793**	**1.614**
Touch Left {Cube 1}	**0.960**				**0.652**	**1.612**
Touch Left {Cube 2 } Secondary Peak	0.821				0.652	1.473
Touch Right	0.650				0.244	0.894
Touch Left		0.592			0.791	1.383
Touch Right		0.401			0.244	0.645
Touch Left			0.367		0.791	1.158
Touch Right			0.505		0.244	0.749
Touch Left				0.260	0.791	1.021
Touch Right				0.341	0.244	0.585

Note(s):

1. For cases, where sum of WWAN and WLAN exceed 1.6W/kg, the SAR to peak location separation ratio distance was calculated. Simultaneous transmission was not evaluated as this value was lesser than 0.3. SPLSR calculations are shown in SAR distribution scans SCN/88281JD02/247 to SCN/88281JD02/252.

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 II	UMTS FDD IV	UMTS FDD V	Wi-Fi	
Front	0.629					0.081	0.71
Back	0.993					0.459	1.452
Left Hand Side	0.665					0.016	0.681
Right Hand Side	1.060					0.145	1.205
Bottom	0.413						0.413
Top						0.172	0.172
Front		0.500				0.081	0.581
Back		0.729				0.459	1.188
Left Hand Side		0.707				0.016	0.723
Right Hand Side		0.105				0.145	0.25
Bottom		0.606					0.606
Top						0.172	0.172
Front			1.050			0.081	1.131
Back			1.260			0.459	1.719
Left Hand Side			0.661			0.016	0.677
Right Hand Side			0.186			0.145	0.331
Bottom			1.190				1.190
Top						0.172	0.172
Front				0.690		0.081	0.771
Back				1.110		0.459	1.569
Left Hand Side				0.380		0.016	0.396
Right Hand Side				0.072		0.145	0.217
Bottom				1.220			1.220
Top						0.172	0.172
Front					0.607	0.081	0.688
Back					0.979	0.459	1.438
Left Hand Side					0.705	0.016	0.721
Right Hand Side					0.973	0.145	1.118
Bottom					0.405		0.688
Top						0.172	0.172

Simultaneous Transmission SAR Analysis (Continued)

Hotspot Mode Configuration 1g (Continued): – Worst cases measurements

	Measured SAR 1g (W/Kg)					
	WWAN				WLAN	Sum of WWAN & WLAN
EUT Position	LTE Band 2	LTE Band 4	LTE Band 5	LTE Band 17	Wi-Fi	
Front	0.788				0.081	0.869
Back	1.040				0.459	1.499
Left Hand Side	0.624				0.016	0.640
Right Hand Side	0.177				0.145	0.322
Bottom	1.030					1.030
Top					0.172	0.172
Front		0.695			0.081	0.776
Back		0.976			0.459	1.435
Left Hand Side		0.355			0.016	0.371
Right Hand Side		0.083			0.145	0.228
Bottom		1.320				1.320
Top					0.172	0.172
Front			0.464		0.081	0.545
Back			0.728		0.459	1.187
Left Hand Side			0.643		0.016	0.659
Right Hand Side			1.140		0.145	1.285
Bottom			0.301			0.301
Top					0.172	0.172
Front				0.410	0.081	0.491
Back				0.488	0.459	0.947
Left Hand Side				0.284	0.016	0.300
Right Hand Side				0.402	0.145	0.547
Bottom				0.211		0.211
Top					0.172	0.172

Note(s):

1. For cases, where sum of WWAN and WLAN exceed 1.6W/kg, the SAR to peak location separation ratio distance was calculated. Simultaneous transmission was not evaluated as this value was lesser than 0.3. SPLSR calculations are shown in SAR distribution scans SCN/88281JD02/247 to SCN/88281JD02/252.

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
Power Back-off Disabled
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.571

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	Uplink Meas. Burst Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	190	25.0	N/A	0.545	1	GMSK
Tilt	Left	190	25.0	N/A	0.374	1	GMSK
Touch	Right	190	25.0	N/A	0.544	1	GMSK
Tilt	Right	190	25.0	N/A	0.257	1	GMSK
Touch	Left	128	24.9	N/A	0.571	1	GMSK
Touch	Left	251	25.1	N/A	0.449	1	GMSK

Note(s):

1. Voice

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

Tissue Volume:	1g
Maximum Level (W/kg):	1.060

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.6 to 22.6

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	25.4	N/A	0.629	1, 2	GMSK
Back of EUT Facing Phantom	Flat (SAM)	190	25.4	N/A	0.993	1, 2	GMSK
Back of EUT Facing Phantom	Flat (SAM)	128	25.5	N/A	0.903	1, 2	GMSK
Back of EUT Facing Phantom	Flat (SAM)	251	25.4	N/A	0.926	1, 2	GMSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	190	25.4	N/A	0.665	1, 2	GMSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	190	25.4	N/A	0.909	1, 2	GMSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	128	25.5	N/A	0.760	1, 2	GMSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	251	25.4	N/A	1.060	1, 2	GMSK
Bottom of EUT Facing Phantom	Flat (SAM)	190	25.4	N/A	0.413	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 Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.632

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.6 to 22.6

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	25.0	N/A	0.632	1, 2	GMSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	190	25.0	N/A	0.564	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 Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.368

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.6 to 23.6

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	20.5	N/A	0.365	1	GMSK
Tilt	Left	661	20.5	N/A	0.166	1	GMSK
Touch	Right	661	20.5	N/A	0.253	1	GMSK
Tilt	Right	661	20.5	N/A	0.092	1	GMSK
Touch	Left	512	20.5	N/A	0.362	1	GMSK
Touch	Left	810	20.6	N/A	0.368	1	GMSK

Note(s):

1. Voice

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

Tissue Volume:	1g
Maximum Level (W/kg):	0.729

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.6 to 23.6

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	20.8	N/A	0.500	1, 2	GMSK
Back of EUT Facing Phantom	Flat (SAM)	661	20.8	N/A	0.729	1, 2	GMSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	661	20.8	N/A	0.449	1, 2	GMSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	661	20.8	N/A	0.105	1, 2	GMSK
Bottom of EUT Facing Phantom	Flat (SAM)	661	20.8	N/A	0.606	1, 2	GMSK
Back of EUT Facing Phantom	Flat (SAM)	512	20.9	N/A	0.707	1, 2	GMSK
Back of EUT Facing Phantom	Flat (SAM)	810	21.1	N/A	0.593	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 Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.321

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.6 to 23.6

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)	661	20.5	N/A	0.261	1, 2	GMSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	661	20.5	N/A	0.321	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.

7.2.7.Specific Absorption Rate - UMTS-FDD II Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.931

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.1 to 23.1

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	9400	24.7	N/A	0.794	1	QPSK
Tilt	Left	9400	24.7	N/A	0.389	1	QPSK
Touch	Right	9400	24.7	N/A	0.769	1	QPSK
Tilt	Right	9400	24.7	N/A	0.303	1	QPSK
Touch	Left	9262	24.8	N/A	0.833	1	QPSK
Touch	Left	9538	25.0	N/A	0.931	1	QPSK

Note(s):

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

7.2.8.Specific Absorption Rate - UMTS-FDD II Hotspot Mode Configuration 1g Power Back-off Enabled

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	1.260

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.6 to 23.6

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)	9400	23.3	1.4	0.929	1, 2	QPSK
Front of EUT Facing Phantom	Flat (SAM)	9262	23.4	1.4	1.050	1, 2	QPSK
Front of EUT Facing Phantom	Flat (SAM)	9538	23.6	1.4	0.922	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	9400	23.3	1.4	1.120	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	9262	23.4	1.4	1.260	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	9538	23.6	1.4	1.040	1, 2	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	9400	23.3	1.4	0.661	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	9400	23.3	1.4	0.186	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	9400	23.3	1.4	1.190	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 II Body-Worn Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.851

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.6 to 23.6

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Back of EUT Facing Phantom	Flat (SAM)	9400	24.7	N/A	0.655	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	9262	24.8	N/A	0.749	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	9538	25.0	N/A	0.599	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	9262	24.8	N/A	0.851	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. Back 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 - UMTS-FDD IV Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.715

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.6 to 23.6

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm))	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	1412	25.3	N/A	0.540	1	QPSK
Tilt	Left	1412	25.3	N/A	0.219	1	QPSK
Touch	Right	1412	25.3	N/A	0.437	1	QPSK
Tilt	Right	1412	25.3	N/A	0.140	1	QPSK
Touch	Left	1312	25.3	N/A	0.494	1	QPSK
Touch	Left	1523	25.3	N/A	0.715	1	QPSK

Note(s):

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

7.2.11.Specific Absorption Rate - UMTS-FDD IV Hotspot Mode Configuration 1g Power Back-off Enabled

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	1.220

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	Flat (SAM)	1412	21.8	3.5	0.690	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	1412	21.8	3.5	0.908	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	1312	21.8	3.5	0.761	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	1513	21.8	3.5	1.110	1, 2	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	1412	21.8	3.5	0.380	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	1412	21.8	3.5	0.072	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	1412	21.8	3.5	1.120	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	1312	21.8	3.5	1.100	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	1513	21.8	3.5	1.220	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.

7.2.12.Specific Absorption Rate - UMTS-FDD IV Body-Worn Configuration 1g Power Back-off Disabled

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	1.130

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.
Back of EUT Facing Phantom	Flat (SAM)	1412	25.3	N/A	0.943	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	1312	25.3	N/A	0.802	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	1513	25.3	N/A	1.050	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	1513	25.3	N/A	1.130	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. Back 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.

7.2.13.Specific Absorption Rate - UMTS-FDD V Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.535

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	4183	25.2	N/A	0.444	1	QPSK
Tilt	Left	4183	25.2	N/A	0.332	1	QPSK
Touch	Right	4183	25.2	N/A	0.535	1	QPSK
Tilt	Right	4183	25.2	N/A	0.316	1	QPSK
Touch	Right	4132	25.3	N/A	0.535	1	QPSK
Touch	Right	4233	25.4	N/A	0.531	1	QPSK

Note(s):

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

7.2.14.Specific Absorption Rate - UMTS-FDD V Hotspot Mode Configuration 1g Power Back-off Disabled

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.979

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.6 to 22.6

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	25.2	N/A	0.607	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	4183	25.2	N/A	0.979	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	4132	25.3	N/A	0.894	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	4233	25.4	N/A	0.861	1, 2	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	4183	25.2	N/A	0.705	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	4183	25.2	N/A	0.961	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	4132	25.3	N/A	0.824	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	4233	25.4	N/A	0.973	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	4183	25.2	N/A	0.405	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.

7.2.15.Specific Absorption Rate - UMTS-FDD V Body-Worn Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.700

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.6 to 22.6

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Back of EUT Facing Phantom	Flat (SAM)	4183	25.2	N/A	0.700	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	4132	25.3	N/A	0.641	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	4233	25.4	N/A	0.638	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	4183	25.2	N/A	0.511	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. Back 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.

7.2.16.Specific Absorption Rate - LTE Band 2; 20 MHz Channel BW Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.960

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.0 to 22.0

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	18900	23.4	N/A	0.765	1	QPSK
Tilt	Left	18900	23.4	N/A	0.380	1	QPSK
Touch	Right	18900	23.4	N/A	0.650	1	QPSK
Tilt	Right	18900	23.4	N/A	0.213	1	QPSK
Touch	**Left**	**18900**	**24.3**	**N/A**	**0.960**	**2**	**QPSK**
Touch	Left	18900	24.1	N/A	0.955	3	QPSK
Touch	Left	18900	22.2	N/A	0.712	1	16QAM
Touch	Left	18900	23.2	N/A	0.805	2	16QAM
Touch	Left	18900	22.9	N/A	0.803	3	16QAM
Touch	Left	18700	24.2	N/A	0.891	2	QPSK
Touch	Left	19100	24.2	N/A	0.937	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.
      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.
   I) 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).

7.2.17.Specific Absorption Rate - LTE Band 2; 20 MHz Channel BW Hotspot Mode Configuration 1g Power Back-off Enabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	1.040

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.7 to 22.7

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)	18900	22.6	0.8	0.788	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	18900	22.6	0.8	1.010	1, 2	QPSK
Back of EUT Facing Phantom	**Flat (SAM)**	**18700**	**22.7**	**0.6**	**1.040**	**1, 2**	**QPSK**
Back of EUT Facing Phantom	Flat (SAM)	19100	23.0	0.6	0.901	1, 2	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	18900	22.6	0.8	0.624	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	18900	22.6	0.8	0.177	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	18900	22.6	0.8	0.983	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	18700	22.7	0.6	1.030	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	19100	23.0	0.6	0.891	1, 2	QPSK

Specific Absorption Rate - LTE Band 2; 20 MHz Channel BW Hotspot Mode Configuration 1g
Power Back-off Enabled (Continued):

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Back of EUT Facing Phantom	Flat (SAM)	18700	22.5	1.8	0.987	1, 3	QPSK
Back of EUT Facing Phantom	Flat (SAM)	18700	22.5	1.6	1.020	1, 4	QPSK
Back of EUT Facing Phantom	Flat (SAM)	18700	22.1	0.1	0.779	1, 2	16QAM
Back of EUT Facing Phantom	Flat (SAM)	18700	22.7	0.5	1.010	1, 3	16QAM
Back of EUT Facing Phantom	Flat (SAM)	18700	22.6	0.3	0.900	1, 4	16QAM

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).

7.2.18.Specific Absorption Rate - LTE Band 2; 20 MHz Channel BW Body-Worn Configuration 1g
Power Back-off Disabled
Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.589

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.7 to 22.7

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Back of EUT Facing Phantom	Flat (SAM)	18900	23.4	N/A	0.479	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	18700	23.3	N/A	0.482	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	19100	23.6	N/A	0.438	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	18700	23.3	N/A	0.589	1, 2, 3, 4	QPSK

Note(s):

1. Back 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. 50% RB Allocation centred within the channel Bandwidth.
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.

7.2.19.Specific Absorption Rate - LTE Band 4; 20 MHz Channel BW Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.592
Environmental Conditions:	
Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	21.0 to 21.0

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	20175	23.3	N/A	0.478	1	QPSK
Tilt	Left	20175	23.3	N/A	0.212	1	QPSK
Touch	Right	20175	23.3	N/A	0.401	1	QPSK
Tilt	Right	20175	23.3	N/A	0.129	1	QPSK
Touch	**Left**	**20175**	**24.5**	**N/A**	**0.592**	**2**	**QPSK**
Touch	Left	20175	24.3	N/A	0.589	3	QPSK
Touch	Left	20175	22.3	N/A	0.393	1	16 QAM
Touch	Left	20175	23.5	N/A	0.494	2	16 QAM
Touch	Left	20175	23.5	N/A	0.502	3	16 QAM
Touch	Left	20050	24.5	N/A	0.463	2	QPSK
Touch	Left	20300	24.3	N/A	0.579	2	QPSK

Note(s):

1. 50% RB Allocation centred 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).

7.2.20.Specific Absorption Rate - LTE Band 4; 20 MHz Channel BW Hotspot Mode Configuration 1g Power Back-off Enabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	1.320

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.7 to 22.7

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)	20175	22.7	0.6	0.695	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20175	22.7	0.6	0.935	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20050	22.9	0.6	0.925	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20300	22.7	0.8	0.976	1, 2	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20175	22.7	0.6	0.355	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20175	22.7	0.6	0.083	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	20175	22.7	0.6	1.200	1, 2	QPSK
Bottom of EUT Facing Phantom	**Flat (SAM)**	**20050**	**22.9**	**0.6**	**1.320**	**1, 2**	**QPSK**
Bottom of EUT Facing Phantom	Flat (SAM)	20300	22.7	0.8	1.190	1, 2	QPSK

Specific Absorption Rate - LTE Band 4; 20 MHz Channel BW Hotspot Mode Configuration 1g
Power Back-off Enabled (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	Flat (SAM)	20050	22.7	1.8	1.110	1, 3	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	20050	22.9	1.5	1.290	1, 4	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	20050	22.4	0.0	1.200	1, 2	16QAM
Bottom of EUT Facing Phantom	Flat (SAM)	20050	23.1	0.3	1.090	1, 3	16QAM
Bottom of EUT Facing Phantom	Flat (SAM)	20050	23.2	0.4	1.300	1, 4	16QAM

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 centred 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).

7.2.21.Specific Absorption Rate - LTE Band 4; 20 MHz Channel BW Body-Worn Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.640

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	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Back of EUT Facing Phantom	Flat (SAM)	20175	23.3	N/A	0.636	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20050	23.5	N/A	0.640	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20300	23.5	N/A	0.608	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	20050	23.5	N/A	0.636	1, 2, 3, 4	QPSK

Note(s):

1. Back of EUT (QPSK 50 % RB Allocation centered 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. 50% RB Allocation centred within the channel Bandwidth.
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.

7.2.22.Specific Absorption Rate - LTE Band 5; 10 MHz Channel BW Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.505

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	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	20525	23.5	N/A	0.367	1	QPSK
Tilt	Left	20525	23.5	N/A	0.256	1	QPSK
Touch	Right	20525	23.5	N/A	0.406	1	QPSK
Tilt	Right	20525	23.5	N/A	0.251	1	QPSK
Touch	Right	20525	24.1	N/A	0.411	2	QPSK
Touch	**Right**	**20525**	**24.0**	**N/A**	**0.505**	**3**	**QPSK**
Touch	Right	20525	22.4	N/A	0.328	1	16QAM
Touch	Right	20525	23.4	N/A	0.367	2	16QAM
Touch	Right	20525	23.3	N/A	0.449	3	16QAM
Touch	Right	20450	24.0	N/A	0.451	3	QPSK
Touch	Right	20600	24.1	N/A	0.447	3	QPSK

Note(s):

1. 50% RB Allocation centred 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).

7.2.23.Specific Absorption Rate - LTE Band 5; 10 MHz Channel BW Hotspot Mode Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	1.140

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.4 to 22.4

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)	20525	23.5	N/A	0.464	1, 2	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20525	23.5	N/A	0.728	1, 2	QPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.5	N/A	0.643	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.5	N/A	0.908	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20450	23.3	N/A	0.932	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20600	23.4	N/A	0.866	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	20525	23.5	N/A	0.301	1, 2	QPSK

Specific Absorption Rate - LTE Band 5; 10 MHz 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.
Right Hand Side of EUT Facing Phantom	**Flat (SAM)**	**20525**	**24.1**	**N/A**	**1.140**	**1, 3**	**QPSK**
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	24.0	N/A	1.050	1, 4	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	22.4	N/A	0.726	1, 2	16QAM
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.4	N/A	0.942	1, 3	16QAM
Right Hand Side of EUT Facing Phantom	Flat (SAM)	20525	23.3	N/A	0.886	1, 4	16QAM

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 centred 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).

7.2.24.Specific Absorption Rate - LTE Band 5; 10 MHz Channel BW Body-Worn Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.779

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.4 to 22.4

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Back of EUT Facing Phantom	Flat (SAM)	20525	23.5	N/A	0.779	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20450	23.3	N/A	0.734	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	20600	23.4	N/A	0.708	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	20525	23.5	N/A	0.571	1, 2, 3, 4	QPSK

Note(s):

1. 50% RB Allocation cantered within the channel Bandwidth.
2. Back 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.
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.

7.2.25.Specific Absorption Rate - LTE Band 17; 10 MHz Channel BW Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.341

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.
Touch	Left	23790	23.4	N/A	0.260	1	QPSK
Tilt	Left	23790	23.4	N/A	0.135	1	QPSK
Touch	Right	23790	23.4	N/A	0.265	1	QPSK
Tilt	Right	23790	23.4	N/A	0.140	1	QPSK
Touch	Right	23790	24.2	N/A	0.310	2	QPSK
Touch	**Right**	**23790**	**24.1**	**N/A**	**0.320**	**3**	**QPSK**
Touch	Right	23790	22.5	N/A	0.215	1	16QAM
Touch	Right	23790	23.9	N/A	0.276	2	16QAM
Touch	Right	23790	23.8	N/A	0.286	3	16QAM
Touch	Right	23780	24.2	N/A	0.341	3	QPSK
Touch	Right	23800	23.8	N/A	0.315	3	QPSK

Note(s):

1. 50% RB Allocation centred 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).

7.2.26.Specific Absorption Rate - LTE Band 17; 10 MHz Channel BW Hotspot Mode Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.488

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	21.0 to 21.0

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)	23790	23.4	N/A	0.410	1, 2	QPSK
Back of EUT Facing Phantom	**Flat (SAM)**	**23790**	**23.4**	**N/A**	**0.411**	**1, 2**	**QPSK**
Left Hand Side of EUT Facing Phantom	Flat (SAM)	23790	23.4	N/A	0.284	1, 2	QPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	23790	23.4	N/A	0.402	1, 2	QPSK
Bottom of EUT Facing Phantom	Flat (SAM)	23790	23.4	N/A	0.211	1, 2	QPSK

Specific Absorption Rate - LTE Band 17; 10 MHz 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.
Back of EUT Facing Phantom	Flat (SAM)	23790	24.2	N/A	0.484	1, 3	QPSK
Back of EUT Facing Phantom	Flat (SAM)	23790	24.1	N/A	0.474	1, 4	QPSK
Back of EUT Facing Phantom	Flat (SAM)	23790	22.5	N/A	0.323	1, 2	16QAM
Back of EUT Facing Phantom	Flat (SAM)	23790	23.9	N/A	0.391	1, 3	16QAM
Back of EUT Facing Phantom	Flat (SAM)	23790	23.8	N/A	0.391	1, 4	16QAM
Back of EUT Facing Phantom	Flat (SAM)	23780	24.3	N/A	0.456	1, 3	QPSK
Back of EUT Facing Phantom	Flat (SAM)	23800	24.2	N/A	0.488	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 centred 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).

7.2.27.Specific Absorption Rate - LTE Band 17; 10 MHz Channel BW Body-Worn Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.353

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	21.0 to 21.0

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Back of EUT Facing Phantom	Flat (SAM)	23790	24.2	N/A	0.353	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	23780	24.3	N/A	0.349	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom	Flat (SAM)	23800	24.2	N/A	0.345	1, 2, 3, 5	QPSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	23790	24.2	N/A	0.273	1, 2, 3, 4	QPSK

Note(s):

1. 1 RB Allocation Low End of the Channel Edge.
2. Back of EUT (QPSK 1 RB Allocation Low End of the Channel Edge), is the worst case 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.

7.2.28.Specific Absorption Rate - Wi-Fi 2450 MHz Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.431

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.1 to 23.1

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	18.0	N/A	0.321	1	DBPSK
Tilt	Left	6	18.0	N/A	0.317	1	DBPSK
Touch	Right	6	18.0	N/A	0.143	1	DBPSK
Tilt	Right	6	18.0	N/A	0.150	1	DBPSK
Touch	Left	1	18.1	N/A	0.431	1	DBPSK
Touch	Left	11	18.0	N/A	0.276	1	DBPSK

Note(s):

1. WLAN 802.11b 1Mbps

*KDB 248227 - SAR is not required for 802.11g/n channels when the maximum average output power is less than ¼ dB higher than that measured on the corresponding 802.11b channels.

7.2.29.Specific Absorption Rate - Wi-Fi 2450 MHz Hotspot Mode Configuration 1g Power Back-off Disabled

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.459

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	22.2 to 22.2

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	18.0	N/A	0.081	1, 2	DBPSK
Back of EUT Facing Phantom	Flat (SAM)	6	18.0	N/A	0.380	1, 2	DBPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	6	18.0	N/A	0.016	1, 2	DBPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	6	18.0	N/A	0.145	1, 2	DBPSK
Top of EUT Facing Phantom	Flat (SAM)	6	18.0	N/A	0.172	1, 2	DBPSK
Back of EUT Facing Phantom	Flat (SAM)	1	18.1	N/A	0.403	1, 2	DBPSK
Back of EUT Facing Phantom	Flat (SAM)	11	18.0	N/A	0.459	1, 2	DBPSK

Note(s):

1. WLAN 802.11b 1Mbps
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.

7.2.30.Specific Absorption Rate - Wi-Fi 2450 MHz Body-Worn Configuration 1g Power Back-off Disabled

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.320

Environmental Conditions:

Temperature Variation in Lab (°C):	23.0 to 23.0
Temperature Variation in Liquid (°C):	22.2 to 22.2

Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Back of EUT Facing Phantom	Flat (SAM)	11	18.0	N/A	0.174	1, 2, 3, 5	DBPSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	11	18.0	N/A	0.320	1, 2, 3, 4	DBPSK

Note(s):

1. The Worst case configuration of Wi-Fi Hotspot Mode is applied on Body-Worn configuration.
2. WLAN 802.11b 1Mbps
3. EUT Supports Hotspot; 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.

7.2.31.Specific Absorption Rate- Wi-Fi 802.11a 5GHz Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.793

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.0 to 22.0

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	36	15.1	N/A	0.652	1, 3	DBPSK
Tilt	Left	36	15.1	N/A	0.462	1, 3	DBPSK
Touch	Right	36	15.1	N/A	0.244	1, 3	DBPSK
Tilt	Right	36	15.1	N/A	0.248	1,3	DBPSK
Touch	Left	52	14.5	N/A	0.793	1, 3	DBPSK
Touch	Left	136	14.1	N/A	0.558	2, 3	DBPSK
Touch	Left	104	13.4	N/A	0.597	2, 3	DBPSK
Touch	Left	116	13.6	N/A	0.530	2, 3	DBPSK
Touch	Left	124	13.6	N/A	0.551	2, 3	DBPSK
Touch	Left	165	14.1	N/A	0.474	1, 3	DBPSK

Note(s):

1. For frequency bands with an operating range of < 100 MHz, when the SAR measured for the highest output power channel within is ≤ 0.8 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) i)
2. For frequency bands with an operating range of < 200 MHz, when the SAR for the highest output power channel within is ≤ 0.4 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) i)
3. WLAN 802.11a 6Mbps

Specific Absorption Rate - Wi-Fi 802.11n HT40 5GHz Head Configuration 1g Power Back-off Disabled Results:

EUT Position	Phantom Configuration	Channel Number	Meas. Avg. Power (dBm)	Power Back-off (dB)	Meas. Level (W/Kg)	Note(s)	Mod.
Touch	Left	38	13.4	N/A	0.497	1, 2, 4	DBPSK
Touch	Left	54	12.8	N/A	0.602	1, 2, 4	DBPSK
Touch	Left	134	11.9	N/A	0.298	1, 3, 4	DBPSK
Touch	Left	159	12.5	N/A	0.195	1, 2, 4	DBPSK

Note(s):

1. The Worst case and most conservative configuration of Wi-Fi 802.11a Mode is applied to Wi-Fi 802.11n HT40 mode.
2. For frequency bands with an operating range of < 100 MHz, when the SAR measured for the highest output power channel within is ≤ 0.8 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) i)
3. For frequency bands with an operating range of < 200 MHz, when the SAR for the highest output power channel within is ≤ 0.4 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) i)
4. WLAN 802.11n 13.5Mbps

7.2.32.Specific Absorption Rate - Wi-Fi 802.11a 5GHz Hotspot Mode Configuration 1g Power Back-off Disabled

Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.207

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)	36	15.1	N/A	0.100	1, 2, 4	DBPSK
Back of EUT Facing Phantom	Flat (SAM)	36	15.1	N/A	0.117	1, 2, 4	DBPSK
Left Hand Side of EUT Facing Phantom	Flat (SAM)	36	15.1	N/A	0.005	1, 2, 4	DBPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	36	15.1	N/A	0.207	1, 2, 4	DBPSK
Top of EUT Facing Phantom	Flat (SAM)	36	15.1	N/A	0.127	1, 2, 4	DBPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	52	14.5	N/A	0.188	1, 2, 4	DBPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	136	14.1	N/A	0.064	1, 3, 4	DBPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	165	16.4	N/A	0.119	1, 2, 4	DBPSK

Note(s):

1. 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.
2. For frequency bands with an operating range of < 100 MHz, when the SAR measured for the highest output power channel within is ≤ 0.8 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) i)
3. For frequency bands with an operating range of < 200 MHz, when the SAR for the highest output power channel within is ≤ 0.4 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) i)
4. WLAN 802.11a 6Mbps

Specific Absorption Rate - Wi-Fi 802.11n HT40 5GHz Hotspot Mode Configuration 1g Power Back-off Disabled
Results:

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)	38	13.4	N/A	0.165	1, 2, 3	DBPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	54	12.8	N/A	0.160	1, 2, 3	DBPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	134	11.9	N/A	0.125	1, 2, 4	DBPSK
Right Hand Side of EUT Facing Phantom	Flat (SAM)	159	12.5	N/A	0.082	1, 2, 3	DBPSK

Note(s):

1. The Worst case configuration and most conservative of Wi-Fi Hotspot Mode 802.11a is applied on Wi-Fi Hotspot Mode 802.11n HT40.
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. For frequency bands with an operating range of < 100 MHz, when the SAR measured for the highest output power channel within is ≤ 0.8 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) i)
4. For frequency bands with an operating range of < 200 MHz, when the SAR for the highest output power channel within is ≤ 0.4 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) i)
5. WLAN 802.11n 13.5Mbps

7.2.33.Specific Absorption Rate - Wi-Fi 5GHz Body-Worn Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Level (W/kg):	0.170

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.
Back of EUT Facing Phantom	Flat (SAM)	36	15.1	N/A	0.076	1, 2, 3, 5	DBPSK
Back of EUT Facing Phantom With PHF	Flat (SAM)	36	15.1	N/A	0.170	1, 2, 3, 4	DBPSK

Note(s):

1. The Worst case configuration of Wi-Fi Hotspot Mode is applied on Body-Worn configuration.
2. WLAN 802.11a 6Mbps
3. EUT Supports Hotspot; 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.

7.2.34.Conducted Average Power Measurement 2G: GSM850 Power Back-Off Disabled

Channel Number	Frequency (MHZ)	Power (dBm)	Avg. Burst Power with consideration for uplink time slot (dBm)	Note
128	824.2	**33.9**	24.9	Conducted, GMSK
190	836.6	34.0	25.0	Conducted, GMSK
251	848.8	34.1	25.1	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	**33.9**	31.5	29.2	27.7	Conducted, GMSK
190	836.6	34.0	31.4	28.9	27.5	Conducted, GMSK
251	848.8	34.1	31.4	28.8	27.4	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	24.9	25.5	**24.9**	24.7	Conducted, GMSK
190	836.6	25.0	25.4	24.6	24.5	Conducted, GMSK
251	848.8	25.1	25.4	24.5	24.4	Conducted, 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	**33.9**	31.6	29.2	27.7	Conducted, GMSK
190	836.6	34.0	31.4	29.0	27.5	Conducted, GMSK
251	848.8	34.1	31.4	28.8	27.4	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	24.9	25.6	**24.9**	24.7	Conducted, GMSK
190	836.6	25.0	25.4	24.7	24.5	Conducted, GMSK
251	848.8	25.1	25.4	24.5	24.4	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	27.4	25.8	24.6	22.8	Conducted, 8PSK
190	836.6	27.4	25.7	24.5	22.7	Conducted, 8PSK
251	848.8	27.4	25.7	24.5	22.7	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	18.4	19.6	20.3	19.8	Conducted, 8PSK
190	836.6	18.4	19.5	20.2	19.7	Conducted, 8PSK
251	848.8	18.4	19.5	20.2	19.7	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**

7.2.35.Conducted Average Power Measurement 2G: PCS1900 Power Back-Off Disabled

Channel Number	Frequency (MHZ)	GSM TX Power (dBm)	Avg. Burst Power with consideration for uplink time slot (dBm)	Note
512	1850.2	**29.5**	20.5	Conducted, GMSK
661	1880.0	29.5	20.5	Conducted, GMSK
810	1909.8	29.6	20.6	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	**29.5**	26.9	23.8	22.6	Conducted, GMSK
661	1880.0	29.5	26.8	23.7	22.5	Conducted, GMSK
810	1909.8	29.6	27.1	23.9	22.6	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	20.5	20.9	**19.5**	19.6	Conducted, GMSK
661	1880.0	20.5	20.8	19.4	19.5	Conducted, GMSK
810	1909.8	20.6	21.1	**19.6**	19.6	Conducted, 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	**29.3**	26.7	23.6	22.6	Conducted, GMSK
661	1880.0	29.3	26.6	23.6	22.3	Conducted, GMSK
810	1909.8	29.4	26.9	23.7	22.5	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	20.3	20.7	**19.3**	19.6	Conducted, GMSK
661	1880.0	20.3	20.6	19.3	19.3	Conducted, GMSK
810	1909.8	20.4	20.9	**19.4**	19.5	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	27.0	25.2	24.0	22.7	Conducted, 8PSK
661	1880.0	26.9	25.1	23.9	22.7	Conducted, 8PSK
810	1909.8	26.9	25.2	23.9	22.7	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	18.0	19.2	19.7	19.7	Conducted, 8PSK
661	1880.0	17.9	19.1	19.6	19.7	Conducted, 8PSK
810	1909.8	17.9	19.2	19.6	19.7	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**

Conducted Average Power Measurement 3G: Power Back-Off Disabled

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]
1900 (Band II)	9262 9662	24.8	24.6	24.2	24.2	24.7	24.7	24.2	24.8	24.3	24.8
	9400 9800	24.7	24.6	24.2	24.2	24.7	24.7	24.2	24.7	24.3	24.7
	9538 9938	25.0	24.7	24.6	24.6	24.8	24.8	24.5	25.0	24.7	25.0
1700 (Band IV)	1312 1537	25.2	24.8	24.6	24.6	24.8	25.1	24.7	25.3	24.6	25.3
	1412 1637	25.2	24.7	24.4	24.4	24.6	24.9	24.5	25.1	24.5	25.3
	1513 1738	25.2	24.7	24.5	24.5	24.9	25.0	24.6	25.2	24.5	25.3
850 (Band V)	4132 4357	25.2	24.7	24.2	24.4	24.7	25.2	24.7	25.3	24.5	25.3
	4183 4408	25.0	24.7	24.2	24.2	24.7	24.9	24.3	25.1	24.3	25.2
	4233 4458	25.3	25.0	24.5	24.6	24.8	25.2	24.7	25.4	24.6	25.4

7.2.36.Conducted Average Power Measurement 3G: Power Back-Off Enabled

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]
1900 (Band II)	9262 9662	23.4	23.2	22.6	22.6	23.1	23.1	22.6	23.4	22.6	23.4
	9400 9800	23.3	23.1	22.5	22.6	23.0	23.0	22.5	23.3	22.5	23.3
	9538 9938	23.6	23.4	23.0	23.0	23.4	23.5	22.9	23.6	22.8	23.6
1700 (Band IV)	1312 1537	21.8	21.6	20.4	20.3	21.4	21.6	21.0	21.8	20.9	21.8
	1412 1637	21.7	21.5	20.4	20.3	21.5	21.6	21.0	21.7	20.9	21.8
	1513 1738	21.8	21.6	20.4	20.4	21.5	21.6	21.0	21.7	21.0	21.8
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	

Tthe 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} can not be set directly; it is set by Absolute Grant Value.

7.2.37.Conducted Average Power Measurement: LTE Band 2
Power Back-off Disabled

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **1860.0 MHz** (Low)	Frequency **1880.0 MHz** (Middle)	Frequency **1900.0 MHz** (High)
20 MHz	QPSK	1	Low	0	(0)	23.0	24.2	24.3	24.2
		1	High	99	(0)	23.0	24.1	24.1	24.0
		50	Mid	25	(1)	22.0	23.3	23.4	23.6
		100		0	(1)	22.0	23.3	23.3	23.5
20 MHz	16QAM	1	Low	0	(1)	22.0	23.6	23.2	23.4
		1	High	99	(1)	22.0	23.4	22.9	23.2
		50	Mid	25	(2)	21.0	22.2	22.2	22.3
		100		0	(2)	21.0	22.2	22.3	22.4
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1857.5 MHz** (Low)	Frequency **1880.0 MHz** (Middle)	Frequency **1902.5 MHz** (High)
15 MHz	QPSK	1	Low	0	(0)	23.0	24.2	24.2	23.8
		1	High	71	(0)	23.0	24.2	24.3	24.1
		36	Mid	18	(1)	22.0	23.4	23.3	23.4
		75		0	(1)	22.0	23.3	23.4	23.4
15 MHz	16QAM	1	Low	0	(1)	22.0	23.5	23.3	23.4
		1	High	71	(1)	22.0	23.6	23.4	22.8
		36	Mid	18	(2)	21.0	22.3	22.2	22.3
		75		0	(2)	21.0	22.3	22.3	22.2
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1855.0 MHz** (Low)	Frequency **1880.0 MHz** (Middle)	Frequency **1905.0 MHz** (High)
10 MHz	QPSK	1	Low	0	(0)	23.0	24.3	24.2	24.1
		1	High	49	(0)	23.0	24.2	24.2	24.0
		25	Mid	12	(1)	22.0	23.6	23.4	23.4
		50		0	(1)	22.0	23.6	23.5	23.3
10 MHz	16QAM	1	Low	0	(1)	22.0	23.4	23.3	23.3
		1	High	49	(1)	22.0	23.4	23.4	23.1
		25	Mid	12	(2)	21.0	22.5	22.2	22.3
		50		0	(2)	21.0	22.4	22.3	22.2

Conducted Average Power Measurement: LTE Band 2
Power Back-off Disabled (Continued)

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **1852.5 MHz** (Low)	Frequency **1880.0 MHz** (Middle)	Frequency **1907.5 MHz** (High)
5 MHz	QPSK	1	Low	0	(0)	23.0	24.2	24.2	24.2
		1	High	24	(0)	23.0	24.3	24.0	24.1
		12	Mid	6	(1)	22.0	23.5	23.5	23.6
		25		0	(1)	22.0	23.6	23.4	23.6
5 MHz	16QAM	1	Low	0	(1)	22.0	23.6	23.4	23.4
		1	High	24	(1)	22.0	23.6	23.3	23.5
		12	Mid	6	(2)	21.0	22.4	22.3	22.4
		25		0	(2)	21.0	22.5	22.1	22.5
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1851.5 MHz** (Low)	Frequency **1880.0 MHz** (Middle)	Frequency **1908.5 MHz** (High)
3 MHz	QPSK	1	Low	0	(0)	23.0	24.4	24.3	24.2
		1	High	14	(0)	23.0	24.3	24.1	24.0
		8	Mid	4	(1)	22.0	23.6	23.3	23.2
		15		0	(1)	22.0	23.6	23.4	23.3
3 MHz	16QAM	1	Low	0	(1)	22.0	23.3	23.3	23.2
		1	High	14	(1)	22.0	23.4	23.1	23.1
		8	Mid	4	(2)	21.0	22.4	22.3	22.3
		15		0	(2)	21.0	22.2	22.1	22.2
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1850.7 MHz** (Low)	Frequency **1880.0 MHz** (Middle)	Frequency **1909.3 MHz** (High)
1.4 MHz	QPSK	1	Low	0	(0)	23.0	24.3	24.3	24.3
		1	High	5	(0)	23.0	24.3	24.3	24.2
		3	Mid	2	(1)	22.0	24.2	24.4	24.4
		6		0	(1)	22.0	23.1	23.1	24.4
1.4 MHz	16QAM	1	Low	0	(1)	22.0	23.2	23.5	23.2
		1	High	5	(1)	22.0	23.2	23.4	23.2
		3	Mid	2	(2)	21.0	23.3	23.3	23.4
		6		0	(2)	21.0	22.1	22.1	22.2

7.2.38.Conducted Average Power Measurement: LTE Band 2 Power Back-off Enabled

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **1860.0 MHz** (Low)	Frequency **1880.0 MHz** (Middle)	Frequency **1900.0 MHz** (High)
20 MHz	QPSK	1	Low	0	(0)	23.0	22.6	22.5	22.6
		1	High	99	(0)	23.0	22.4	22.5	22.7
		50	Mid	25	(1)	22.0	22.7	22.6	23.0
		100		0	(1)	22.0	22.6	22.8	22.9
20 MHz	16QAM	1	Low	0	(1)	22.0	22.7	22.7	22.7
		1	High	99	(1)	22.0	22.6	22.6	22.7
		50	Mid	25	(2)	21.0	22.2	22.1	22.3
		100		0	(2)	21.0	22.2	22.3	22.4
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1857.5 MHz** (Low)	Frequency **1880.0 MHz** (Middle)	Frequency **1902.5 MHz** (High)
15 MHz	QPSK	1	Low	0	(0)	23.0	22.5	22.7	22.3
		1	High	71	(0)	23.0	22.5	22.5	22.7
		36	Mid	18	(1)	22.0	22.8	22.8	22.8
		75		0	(1)	22.0	22.8	22.8	22.8
15 MHz	16QAM	1	Low	0	(1)	22.0	23.0	22.8	22.6
		1	High	71	(1)	22.0	22.9	22.6	22.9
		36	Mid	18	(2)	21.0	22.3	22.2	22.2
		75		0	(2)	21.0	22.3	22.3	22.3
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1855.0 MHz** (Low)	Frequency **1880.0 MHz** (Middle)	Frequency **1905.0 MHz** (High)
10 MHz	QPSK	1	Low	0	(0)	23.0	22.5	22.5	22.5
		1	High	49	(0)	23.0	22.6	22.4	22.5
		25	Mid	12	(1)	22.0	22.8	22.6	22.8
		50		0	(1)	22.0	22.8	22.7	22.8
10 MHz	16QAM	1	Low	0	(1)	22.0	22.9	23.0	22.7
		1	High	49	(1)	22.0	22.9	22.7	22.8
		25	Mid	12	(2)	21.0	22.4	22.2	22.2
		50		0	(2)	21.0	22.4	22.2	22.2

Conducted Average Power Measurement: LTE Band 2
Power Back-off Enabled (Continued):

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **1852.5 MHz** (Low)	Frequency **1880.0 MHz** (Middle)	Frequency **1907.5 MHz** (High)
5 MHz	QPSK	1	Low	0	(0)	23.0	22.5	22.5	22.7
		1	High	24	(0)	23.0	22.7	22.4	22.6
		12	Mid	6	(1)	22.0	22.9	22.7	22.9
		25		0	(1)	22.0	22.7	22.7	22.9
5 MHz	16QAM	1	Low	0	(1)	22.0	22.4	22.6	22.8
		1	High	24	(1)	22.0	22.6	22.5	22.7
		12	Mid	6	(2)	21.0	22.2	22.1	22.3
		25		0	(2)	21.0	22.4	22.2	22.4
h. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1851.5 MHz** (Low)	Frequency **1880.0 MHz** (Middle)	Frequency **1908.5 MHz** (High)
3 MHz	QPSK	1	Low	0	(0)	23.0	22.5	22.5	22.7
		1	High	14	(0)	23.0	22.6	22.4	22.6
		8	Mid	4	(1)	22.0	22.8	22.7	23.0
		15		0	(1)	22.0	22.7	22.6	23
3 MHz	16QAM	1	Low	0	(1)	22.0	22.6	22.9	22.7
		1	High	14	(1)	22.0	23.0	22.5	22.6
		8	Mid	4	(2)	21.0	22.4	22.3	22.4
		15		0	(2)	21.0	22.0	22.1	22.3
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1850.7 MHz** (Low)	Frequency **1880.0 MHz** (Middle)	Frequency **1909.3 MHz** (High)
1.4 MHz	QPSK	1	Low	0	(0)	23.0	22.6	22.6	22.7
		1	High	5	(0)	23.0	22.5	22.7	22.6
		3	Mid	2	(1)	22.0	22.5	22.6	22.7
		6		0	(1)	22.0	22.5	22.6	22.7
1.4 MHz	16QAM	1	Low	0	(1)	22.0	22.6	22.5	23.0
		1	High	5	(1)	22.0	22.7	22.5	22.9
		3	Mid	2	(2)	21.0	22.6	22.6	22.9
		6		0	(2)	21.0	22.1	22.0	22.2

7.2.39.Conducted Average Power Measurement: LTE Band 4 Power Back-off Disabled

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **1720.0 MHz** (Low)	Frequency **1732.5 MHz** (Middle)	Frequency **1745.0 MHz** (High)
20 MHz	QPSK	1	Low	0	(0)	23.0	24.5	24.5	24.3
		1	High	99	(0)	23.0	24.4	24.3	24.1
		50	Mid	25	(1)	22.0	23.5	23.3	23.5
		100		0	(1)	22.0	23.4	23.4	23.6
20 MHz	16QAM	1	Low	0	(1)	22.0	23.4	23.5	23.4
		1	High	99	(1)	22.0	23.4	23.5	23.1
		50	Mid	25	(2)	21.0	22.5	22.3	22.6
		100		0	(2)	21.0	22.5	22.3	22.6
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1717.5 MHz** (Low)	Frequency **1732.5 MHz** (Middle)	Frequency **1747.5 MHz** (High)
15 MHz	QPSK	1	Low	0	(0)	23.0	24.4	24.3	23.4
		1	High	71	(0)	23.0	24.2	24.2	24.1
		36	Mid	18	(1)	22.0	23.5	23.3	23.6
		75		0	(1)	22.0	23.5	23.3	23.6
15 MHz	16QAM	1	Low	0	(1)	22.0	23.5	23.5	23.5
		1	High	71	(1)	22.0	23.5	23.6	23.4
		36	Mid	18	(2)	21.0	22.6	22.3	22.6
		75		0	(2)	21.0	22.6	22.3	22.6
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1715.0 MHz** (Low)	Frequency **1732.5 MHz** (Middle)	Frequency **1750.0 MHz** (High)
10 MHz	QPSK	1	Low	0	(0)	23.0	24.4	24.1	24.3
		1	High	49	(0)	23.0	24.4	24.3	24.2
		25	Mid	12	(1)	22.0	23.5	23.4	23.3
		50		0	(1)	22.0	23.5	23.4	23.6
10 MHz	16QAM	1	Low	0	(1)	22.0	23.5	23.3	23.3
		1	High	49	(1)	22.0	23.4	23.3	23.4
		25	Mid	12	(2)	21.0	22.5	22.4	22.7
		50		0	(2)	21.0	22.6	22.4	22.7

Conducted Average Power Measurement: LTE Band 4
Power Back-off Disabled (Continued):

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **1712.5 MHz** (Low)	Frequency **1732.5 MHz** (Middle)	Frequency **1752.5 MHz** (High)
5 MHz	QPSK	1	Low	0	(0)	23.0	24.2	24.3	24.1
		1	High	24	(0)	23.0	24.4	23.9	24.1
		12	Mid	6	(1)	22.0	23.5	23.4	23.7
		25		0	(1)	22.0	23.8	23.2	23.6
5 MHz	16QAM	1	Low	0	(1)	22.0	23.4	23.2	23.1
		1	High	24	(1)	22.0	23.5	23.0	23.2
		12	Mid	6	(2)	21.0	22.4	22.3	22.5
		25		0	(2)	21.0	22.4	22.2	22.5
h. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1711.5 MHz** (Low)	Frequency **1732.5 MHz** (Middle)	Frequency **1753.5 MHz** (High)
3 MHz	QPSK	1	Low	0	(0)	23.0	24.3	24.3	24.1
		1	High	14	(0)	23.0	24.4	24.0	24.0
		8	Mid	4	(1)	22.0	23.6	23.3	23.5
		15		0	(1)	22.0	23.6	23.3	23.5
3 MHz	16QAM	1	Low	0	(1)	22.0	23.4	23.4	23.5
		1	High	14	(1)	22.0	23.4	23.1	22.4
		8	Mid	4	(2)	21.0	22.6	22.4	22.6
		15		0	(2)	21.0	22.5	22.2	22.4
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1710.7 MHz** (Low)	Frequency **1732.5 MHz** (Middle)	Frequency **1754.3 MHz** (High)
1.4 MHz	QPSK	1	Low	0	(0)	23.0	24.1	24.3	24.2
		1	High	5	(0)	23.0	24.3	24.2	24.2
		3	Mid	2	(1)	22.0	24.3	24.2	24.1
		6		0	(1)	22.0	24.4	24.2	23.2
1.4 MHz	16QAM	1	Low	0	(1)	22.0	23.5	23.6	23.5
		1	High	5	(1)	22.0	23.4	23.4	23.3
		3	Mid	2	(2)	21.0	23.3	23.3	23.3
		6		0	(2)	21.0	22.2	22.3	22.4

7.2.40.Conducted Average Power Measurement: LTE Band 4 Power Back-off Enabled

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **1720.0 MHz** (Low)	Frequency **1732.5 MHz** (Middle)	Frequency **1745.0 MHz** (High)
20 MHz	QPSK	1	Low	0	(0)	23.0	22.7	22.8	22.6
		1	High	99	(0)	23.0	22.9	22.8	22.9
		50	Mid	25	(1)	22.0	22.9	22.7	22.7
		100		0	(1)	22.0	23.2	22.4	22.4
20 MHz	16QAM	1	Low	0	(1)	22.0	23.1	23.2	22.8
		1	High	99	(1)	22.0	23.2	23.1	22.3
		50	Mid	25	(2)	21.0	22.4	22.3	22.6
		100		0	(2)	21.0	22.4	22.3	22.7
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1717.5 MHz** (Low)	Frequency **1732.5 MHz** (Middle)	Frequency **1747.5 MHz** (High)
15 MHz	QPSK	1	Low	0	(0)	23.0	22.8	22.7	22.5
		1	High	71	(0)	23.0	22.9	22.9	22.9
		36	Mid	18	(1)	22.0	23.0	22.8	22.7
		75		0	(1)	22.0	22.7	22.4	22.4
15 MHz	16QAM	1	Low	0	(1)	22.0	22.9	23.0	22.8
		1	High	71	(1)	22.0	22.4	22.3	22.2
		36	Mid	18	(2)	21.0	22.5	22.2	22.6
		75		0	(2)	21.0	22.4	22.3	22.6
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **1715.0 MHz** (Low)	Frequency **1732.5 MHz** (Middle)	Frequency **1750.0 MHz** (High)
10 MHz	QPSK	1	Low	0	(0)	23.0	22.5	22.6	22.9
		1	High	49	(0)	23.0	23.0	22.7	22.9
		25	Mid	12	(1)	22.0	22.6	22.7	22.9
		50		0	(1)	22.0	22.9	22.4	22.5
10 MHz	16QAM	1	Low	0	(1)	22.0	23.1	22.7	23.1
		1	High	49	(1)	22.0	22.3	22.8	22.7
		25	Mid	12	(2)	21.0	22.5	22.3	22.6
		50		0	(2)	21.0	22.5	22.3	22.7

Conducted Average Power Measurement: LTE Band 4
Power Back-off Enabled (Continued):

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **1712.5 MHz** (Low)	Frequency **1732.5 MHz** (Middle)	Frequency **1752.5 MHz** (High)
5 MHz	QPSK	1	Low	0	(0)	23.0	22.7	22.8	22.8
		1	High	24	(0)	23.0	22.9	22.7	22.8
		12	Mid	6	(1)	22.0	22.9	22.7	22.7
		25		0	(1)	22.0	22.7	22.7	22.4
5 MHz	16QAM	1	Low	0	(1)	22.0	22.9	22.8	23.2
		1	High	24	(1)	22.0	22.9	22.4	22.3
		12	Mid	6	(2)	21.0	22.4	22.2	22.5
		25		0	(2)	21.0	22.4	22.2	22.5

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **1711.5 MHz** (Low)	Frequency **1732.5 MHz** (Middle)	Frequency **1753.5 MHz** (High)
3 MHz	QPSK	1	Low	0	(0)	23.0	22.6	22.6	22.6
		1	High	14	(0)	23.0	22.8	22.6	22.8
		8	Mid	4	(1)	22.0	22.8	22.7	22.8
		15		0	(1)	22.0	22.8	22.7	22.4
3 MHz	16QAM	1	Low	0	(1)	22.0	22.8	22.4	23.0
		1	High	14	(1)	22.0	22.6	22.5	22.4
		8	Mid	4	(2)	21.0	22.6	22.3	22.6
		15		0	(2)	21.0	22.5	22.2	22.4

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **1710.7 MHz** (Low)	Frequency **1732.5 MHz** (Middle)	Frequency **1754.3 MHz** (High)
1.4 MHz	QPSK	1	Low	0	(0)	23.0	22.4	22.8	22.6
		1	High	5	(0)	23.0	22.7	22.6	22.6
		3	Mid	2	(1)	22.0	22.7	22.7	22.6
		6		0	(1)	22.0	22.6	22.6	22.4
1.4 MHz	16QAM	1	Low	0	(1)	22.0	22.9	22.6	22.9
		1	High	5	(1)	22.0	22.7	22.7	22.2
		3	Mid	2	(2)	21.0	22.7	22.8	22.9
		6		0	(2)	21.0	22.2	22.2	22.4

7.2.41.Conducted Average Power Measurement: LTE Band 5 (850 MHz) Power Back-Off Disabled

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	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)	23.0	23.8	24.1	24.1
		1	High	49	(0)	23.0	24.0	24.0	24.1
		25	Mid	12	(1)	22.0	23.3	23.5	23.4
		50		0	(1)	22.0	23.1	23.3	23.4
10 MHz	16QAM	1	Low	0	(1)	22.0	23.3	23.4	23.1
		1	High	49	(1)	22.0	23.5	23.3	23.5
		25	Mid	12	(2)	21.0	22.2	22.4	22.3
		50		0	(2)	21.0	22.3	22.4	22.5
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **826.5 MHz** (Low)	Frequency **836.5 MHz** (Middle)	Frequency **846.5 MHz** (High)
5MHz	QPSK	1	Low	0	(1)	22.0	23.9	24.1	24.2
		1	High	24	(0)	22.0	24.1	24.0	24.2
		12	Mid	6	(1)	22.0	23.2	23.4	23.4
		25		0	(1)	22.0	23.2	23.3	23.4
5 MHz	16QAM	1	Low	0	(1)	22.0	23.2	23.3	23.2
		1	High	24	(1)	22.0	23.7	23.3	23.4
		12	Mid	6	(2)	21.0	22.0	22.3	22.4
		25		0	(2)	21.0	22.2	22.4	22.5
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**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)	23.0	24.0	24.2	24.3
		1	High	14	(0)	23.0	24.1	24.2	24.1
		8	Mid	4	(1)	22.0	23.2	23.4	23.4
		15		0	(1)	22.0	23.1	23.4	23.3
3 MHz	16QAM	1	Low	0	(1)	22.0	22.8	23.0	23.5
		1	High	14	(1)	22.0	22.8	23.1	23.3
		8	Mid	4	(2)	21.0	22.3	22.5	22.5
		15		0	(2)	21.0	22.1	22.2	22.3

Conducted Average Power Measurement: LTE Band 5 (850 MHz) Power Back-Off Disabled (Continued):

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **824.7.0 MHz** (Low)	Frequency **836.5 MHz** (Middle)	Frequency **848.3 MHz** (High)
1.4 MHz	QPSK	1	Low	0	(0)	23.0	24.1	24.3	24.1
		1	High	5	(0)	23.0	24.2	24.1	24.2
		3	Mid	2	(1)	22.0	23.9	24.1	24.1
		6		0	(1)	22.0	23.4	23.1	23.1
1.4 MHz	16QAM	1	Low	0	(1)	22.0	23.4	23.5	23.2
		1	High	5	(1)	22.0	23.4	23.5	23.1
		3	Mid	2	(2)	21.0	22.9	23.4	23.4
		6		0	(2)	21.0	22.0	22.3	22.1

7.2.42.Conducted Average Power Measurement: LTE Band 17 (Lower 700 MHz) Power Back-Off Disabled

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Actual Max Power (dBm)	Measured Avg Power (dBm).		
							Frequency **709.0 MHz** (Low)	Frequency **710.0 MHz** (Middle)	Frequency **711.0 MHz** (High)
10 MHz	QPSK	1	Low	0	(0)	23.0	24.3	24.2	24.2
		1	High	49	(0)	23.0	24.2	24.1	23.8
		25	Mid	12	(1)	22.0	23.5	23.4	23.2
		50		0	(1)	22.0	23.5	23.5	23.1
10 MHz	16QAM	1	Low	0	(1)	22.0	23.7	23.9	23.3
		1	High	49	(1)	22.0	23.8	23.8	23.0
		25	Mid	12	(2)	21.0	22.5	22.5	22.3
		50		0	(2)	21.0	22.5	22.5	22.3
Ch. BW	**Modulations**	**RB Config**	**Start RB Offset**		**MPR**	**Actual Max Power (dBm)**	**Measured Avg Power (dBm).**		
							Frequency **706.5 MHz** (Low)	Frequency **710.0 MHz** (Middle)	Frequency **713.5 MHz** (High)
5 MHz	QPSK	1	Low	0	(0)	23.0	24.2	24.3	24.1
		1	High	24	(0)	23.0	24.3	24.4	23.8
		12	Mid	6	(1)	22.0	23.5	23.4	23.4
		25		0	(1)	22.0	23.4	23.4	23.2
5 MHz	16QAM	1	Low	0	(1)	22.0	23.4	23.4	23.5
		1	High	24	(1)	22.0	23.6	23.4	23.6
		12	Mid	6	(2)	21.0	22.4	22.4	22.5
		25		0	(2)	21.0	22.5	22.5	22.3

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

802.11b/g

Power Back-Off Disabled

Channel Number	Frequency (MHZ)	TX Power (dBm)	Note
1	2412.0	18.1	**2.4GHz 802.11b** (1Mbps)
6	2437.0	18.0	
11	2462.0	**18.0**	
1	2412.0	16.4	**2.4GHz 802.11b** (11Mbps)
6	2437.0	16.4	
11	2462.0	16.3	
1	2412.0	16.5	**2.4GHz 802.11g** (6Mbps)
6	2437.0	16.5	
11	2462.0	**16.3**	
1	2412.0	14.2	**2.4GHz 802.11g** (54Mbps)
6	2437.0	14.0	
11	2462.0	14.0	

802.11n

Power Back-Off Disabled

Channel Number	Frequency (MHZ)	TX Power (dBm)	Note
1	2412.0	15.4	**2.4GHz 802.11n** (MCS0 6.5Mbps)
6	2437.0	15.1	
11	2462.0	**15.0**	
1	2412.0	9.5	**2.4GHz 802.11n** (MCS7 65Mbps)
6	2437.0	9.2	
11	2462.0	**9.0**	

7.2.44.Conducted Power Measurements Wi-Fi802.11a/n (5.0 GHz)
802.11a (5.0 GHz)
Power Back-Off Disabled

Channel Number	Frequency (MHZ)	TX Power (dBm) 6 Mbps	TX Power (dBm) 54 Mbps	Note
36	5180	15.1	10.5	**5.2 GHz**
40	5200	15.3	10.5	
48	5240	14.9	10.1	
52	5260	14.5	9.9	**5.3 GHz**
60	5300	14.0	9.6	
64	5320	**13.7**	9.3	
100	5500	13.4	8.8	**5.6 GHz**
120	5600	13.6	9.1	
136	5680	14.1	9.6	
140	5700	14.1	9.6	
149	5745	14.4	9.9	**5.8 GHz**
157	5785	**15.5**	11.1	
165	5825	16.4	12.4	

802.11n (5.0 GHz) (HT20)
Power Back-off Disabled

Channel Number	Frequency (MHZ)	TX Power (dBm) 6.5 Mbps	TX Power (dBm) 65 Mbps	Note
36	5180	14.0	8.7	5.2 GHz
40	5200	13.8	8.8	
48	5240	13.7	8.4	
52	5260	13.4	8.2	5.3 GHz
60	5300	12.8	7.7	
64	5320	**12.6**	7.2	
100	5500	12.0	6.8	5.6 GHz
120	5600	12.5	7.3	
136	5680	12.7	7.4	
140	5700	12.7	7.4	
149	5745	13.3	7.9	5.8 GHz
157	5785	**14.2**	9.3	
165	5825	15.5	10.6	

802.11n (5.0 GHz) (HT40)
Power Back-off Disabled

Channel Number	Frequency (MHZ)	TX Power (dBm) 13.5 Mbps	TX Power (dBm) 135 Mbps	Note
38	5170	13.4	10.5	5.2 GHz
46	5230	13.0	10.5	
54	5270	12.8	10.2	5.3 GHz
62	5310	12.4	10.0	
102	5510	11.3	10.5	5.6 GHz
110	5550	**11.6**	10.5	
118	5590	11.6	10.7	
126	5630	11.8	10.8	
134	5670	11.9	10.8	
151	5755	12.2	10.2	5.8 GHz
159	5795	**12.5**	10.0	

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 V Head Configuration 1g	95%	19.94
Specific Absorption Rate-GSM / GPRS / EDGE 850 / UMTS FDD V Body Configurations 1g	95%	20.07
Specific Absorption Rate-PCS 1900 / UMTS FDD II Head Configuration 1g	95%	20.72
Specific Absorption Rate-GSM / GPRS / EDGE 1900 / UMTS FDD II Body Configuration 1g	95%	20.00
Specific Absorption Rate-UMTS FDD IV Head Configuration 1g	95%	18.49
Specific Absorption Rate- UMTS FDD IV Body Configuration 1g	95%	18.27
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
Specific Absorption Rate-Wi-Fi 5GHz Head Configuration 1g	95%	20.14
Specific Absorption Rate-Wi-Fi 5GHz Body Configuration 1g	95%	20.14

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 V 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 V 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 / UMTS FDD II 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 / UMTS FDD II 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-UMTS FDD IV 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	1.700	1.700	normal (k=1)	1.0000	1.0000	1.700	1.700	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	0.4300	1.241	1.241	∞
A	Liquid Conductivity (measured value)	4.980	4.980	normal (k=1)	1.0000	0.4300	2.141	2.141	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.4900	1.415	1.415	∞
A	Liquid Permittivity (measured value)	4.770	4.770	normal (k=1)	1.0000	0.4900	2.337	2.337	5
	Combined standard uncertainty			t-distribution			9.43	9.43	>500
	Expanded uncertainty			k = 1.96			18.49	18.49	>500

8.6. Specific Absorption Rate-UMTS FDD IV 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	1.000	1.000	normal (k=1)	1.0000	1.0000	1.000	1.000	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	0.4300	1.241	1.241	∞
A	Liquid Conductivity (measured value)	4.990	4.990	normal (k=1)	1.0000	0.4300	2.146	2.146	5
B	Liquid Permittivity (target value)	5.000	5.000	Rectangular	1.7321	0.4900	1.415	1.415	∞
A	Liquid Permittivity (measured value)	4.660	4.660	normal (k=1)	1.0000	0.4900	2.283	2.283	5
	Combined standard uncertainty			t-distribution			9.32	9.32	>500
	Expanded uncertainty			k = 1.96			18.27	18.27	>500

8.7. 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

8.8. 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

8.9. Specific Absorption Rate-Wi-Fi 5GHz 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	6.550	6.550	normal (k=1)	1.0000	1.0000	6.550	6.550	∞
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	2.540	2.540	normal (k=1)	1.0000	1.0000	2.540	2.540	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)	3.830	3.830	normal (k=1)	1.0000	0.6000	2.298	2.298	5
	Combined standard uncertainty			t-distribution			10.28	10.28	>400
	Expanded uncertainty			k = 1.96			20.14	20.14	>400

8.10. Specific Absorption Rate-Wi-Fi 5GHz 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	6.550	6.550	normal (k=1)	1.0000	1.0000	6.550	6.550	∞
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	2.540	2.540	normal (k=1)	1.0000	1.0000	2.540	2.540	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)	3.830	3.830	normal (k=1)	1.0000	0.6000	2.298	2.298	5
	Combined standard uncertainty			t-distribution			10.28	10.28	>400
	Expanded uncertainty			k = 1.96			20.14	20.14	>400

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
A2077	Probe (Additional Conversion Factors)	Schmid & Partner Engineering AG	EX3 DV4	3814	12 Mar 2012	12
A2113	Probe	Schmid & Partner Engineering AG	ET3 DV6	1587	11 May 2012	12
A1985	750 Dipole Kit	Schmid & Partner Engineering AG	D750V3	1011	09 Feb 2012	12
A1235	900 MHz Dipole Kit	Schmid & Partner Engineering AG	D900V2	124	09 Feb 2011	24
A1190	1800 MHz Dipole Kit	Schmid & Partner Engineering AG	D1800V2	264	13 July 2010	24
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
A1377	5.0 GHz Dipole Kit (Body)	Schmid & Partner Engineering AG	D5GHzV2	1016	10 Feb 2011	24

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A1377	5.0 GHz Dipole Kit (Head)	Schmid & Partner Engineering AG	D5GHzV2	1016	23 March 2012	12
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	-
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	-
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	-
M1159	Signal Generator	Agilent Technologies	E8241A	US42110332	Internal Checked 14 Apr 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
S256	SAR Lab	RFI	Site 56	N/A	Calibrated before use	-
S512	SAR Lab	RFI	Site 57	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%**		

Cal Date	Dipole Calibration History									
	Dipole SN: 264, Frequency 1800 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)
05-JuL-12	Lab Annual Check of dipole		-22.97	46.16	-6.05	Lab Annual Check of dipole		-21.40	45.46	-6.79
13-Jul-10	38.80	20.40	-22.50	45.80	-5.80	38.80	20.80	-20.30	43.00	-5.70
19-Jun-08	38.20	20.20	-25.00	46.50	-4.10	38.50	20.50	-20.10	42.00	-4.50
18-Apr-06	38.50	20.30	-23.50	46.00	-5.00	39.90	21.40	-19.70	41.70	-4.80
14-Apr-04	37.20	19.90	-23.50	46.90	-5.90	37.00	20.00	-21.30	44.30	-5.70
14-May-03	38.20	20.20	-22.60	46.70	-6.30	37.20	19.90	-19.70	42.30	-5.70
Standard Deviation	**0.60**	**0.19**	**0.92**	**0.43**	**0.82**	**1.20**	**0.61**	**0.76**	**1.47**	**0.81**
|Mean Value|	**38.18**	**20.20**	**23.42**			**38.28**	**20.52**	**20.22**		
Relative standard deviation %	**1.58%**	**0.93%**	**3.91%**			**3.13%**	**2.99%**	**3.76%**		

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).**

ASSET: A2077

27-SEPT-2011 Checked by R. [illegible]

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
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: EX3-3814_Sep11

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3814

Calibration procedure(s): QA CAL-01.v8, QA CAL-12.v7, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: September 22, 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 E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	**ID**	**Check Date (in house)**	**Scheduled Check**
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Fin Bomholt	R&D Director	

Issued: September 22, 2011

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

S Schweizerischer Kalibrierdienst
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S Servizio svizzero di taratura
S Swiss Calibration Service

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
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 22, 2011

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]	0.52	0.51	0.44	± 10.1 %
DCP (mV)[B]	100.8	96.5	101.1	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	121.7	±2.7 %
			Y	0.00	0.00	1.00	115.0	
			Z	0.00	0.00	1.00	105.3	

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)
450	43.5	0.87	9.55	9.55	9.55	0.12	1.00	± 13.4 %
750	41.9	0.89	9.26	9.26	9.26	0.80	0.67	± 12.0 %
900	41.5	0.97	8.75	8.75	8.75	0.71	0.73	± 12.0 %
1750	40.1	1.37	8.13	8.13	8.13	0.80	0.62	± 12.0 %
1900	40.0	1.40	7.78	7.78	7.78	0.80	0.61	± 12.0 %
2450	39.2	1.80	7.02	7.02	7.02	0.80	0.60	± 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.

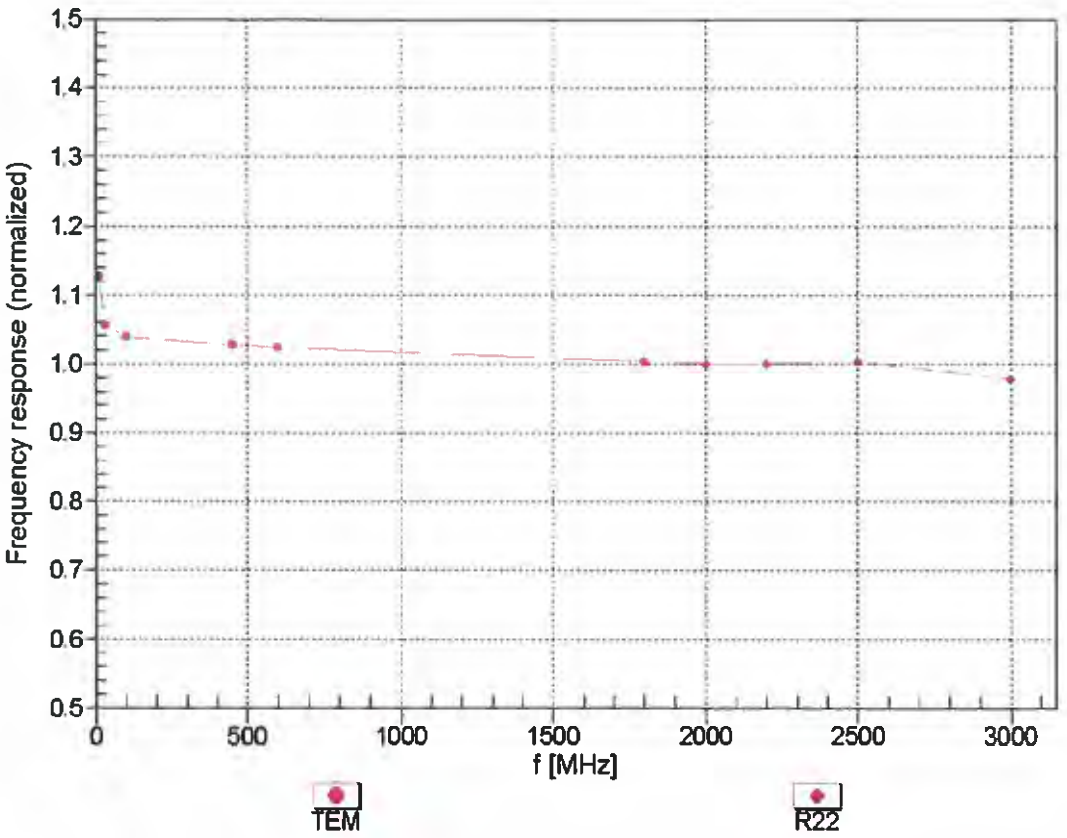
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3814

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)
450	56.7	0.94	10.39	10.39	10.39	0.04	1.00	± 13.4 %
750	55.5	0.96	9.28	9.28	9.28	0.80	0.65	± 12.0 %
900	55.0	1.05	8.92	8.92	8.92	0.80	0.65	± 12.0 %
1750	53.4	1.49	7.58	7.58	7.58	0.80	0.67	± 12.0 %
1900	53.3	1.52	7.31	7.31	7.31	0.80	0.68	± 12.0 %
2150	53.1	1.66	7.38	7.38	7.38	0.80	0.65	± 12.0 %
2450	52.7	1.95	7.15	7.15	7.15	0.80	0.50	± 12.0 %
2600	52.5	2.16	7.02	7.02	7.02	0.80	0.50	± 12.0 %
3700	51.0	3.55	6.35	6.35	6.35	0.26	1.68	± 13.1 %
5200	49.0	5.30	4.19	4.19	4.19	0.60	1.95	± 13.1 %
5500	48.6	5.65	3.86	3.86	3.86	0.60	1.95	± 13.1 %
5800	48.2	6.00	3.94	3.94	3.94	0.60	1.95	± 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.

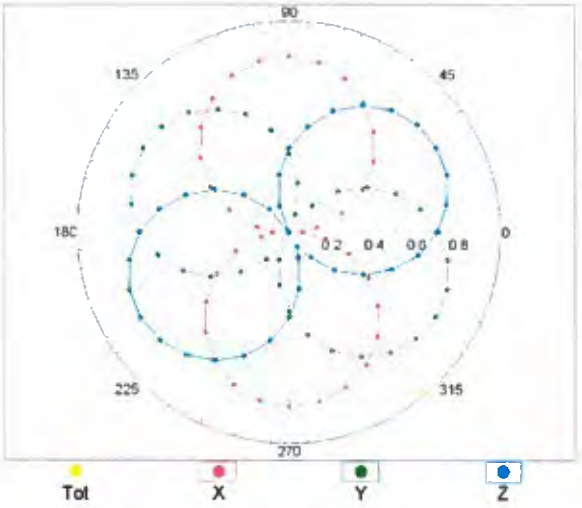
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



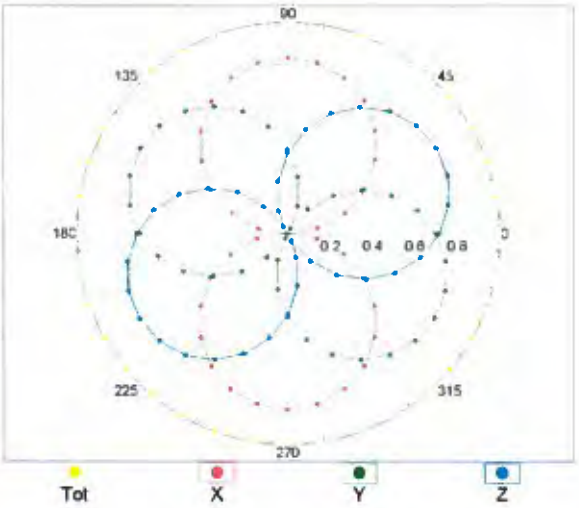
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

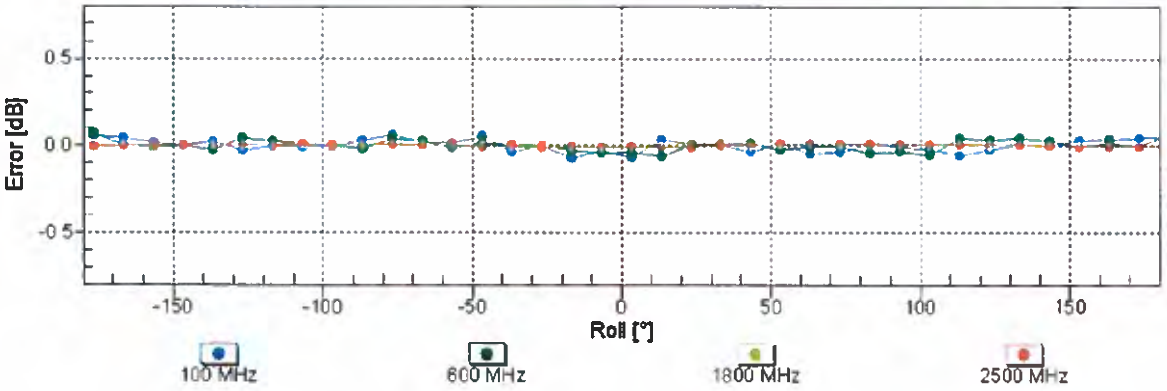
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



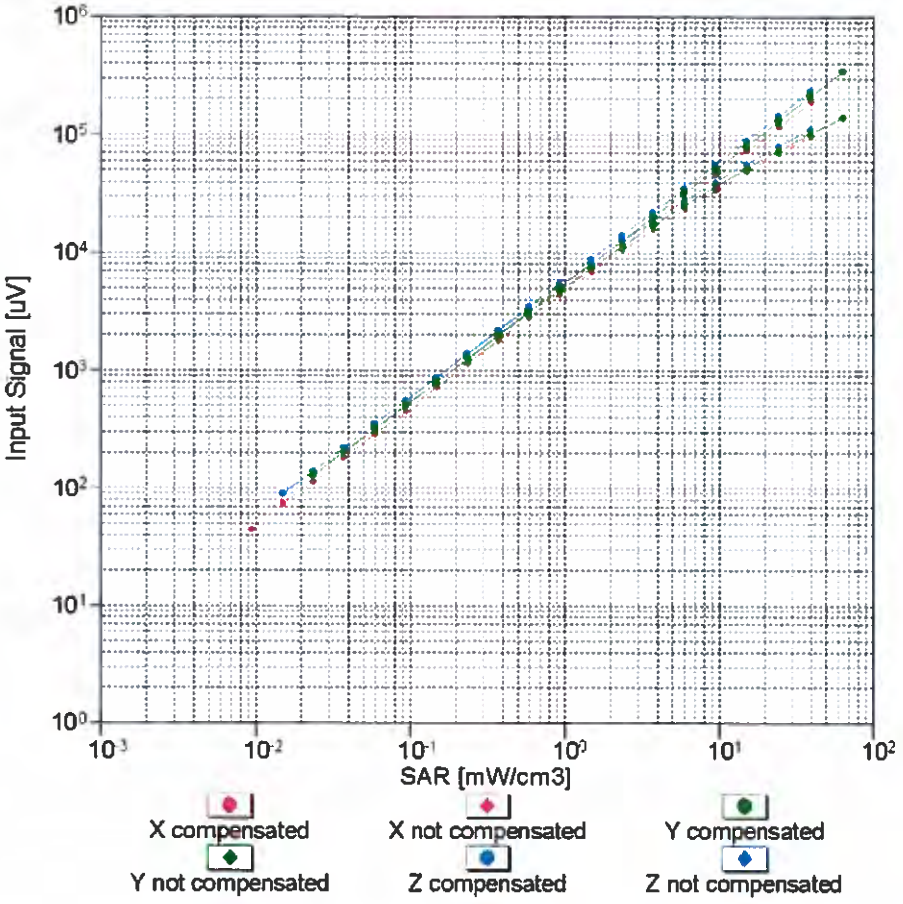
f=1800 MHz,R22

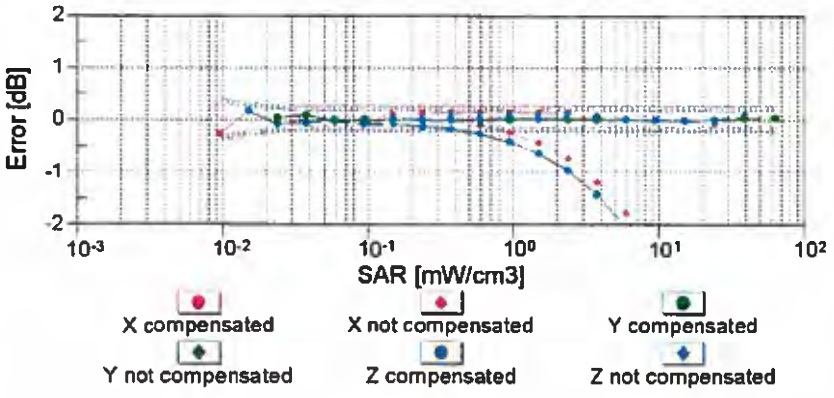




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

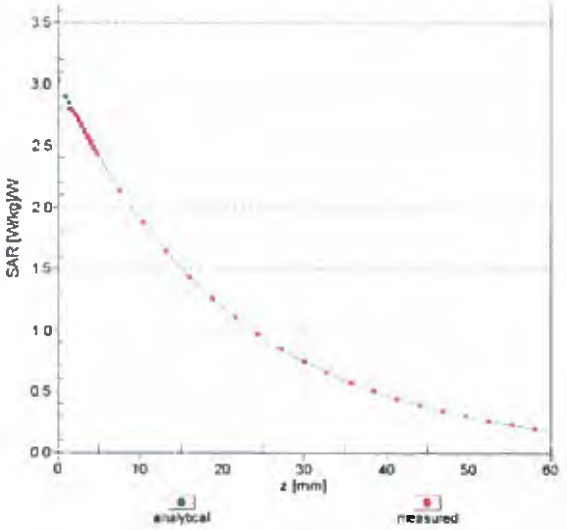




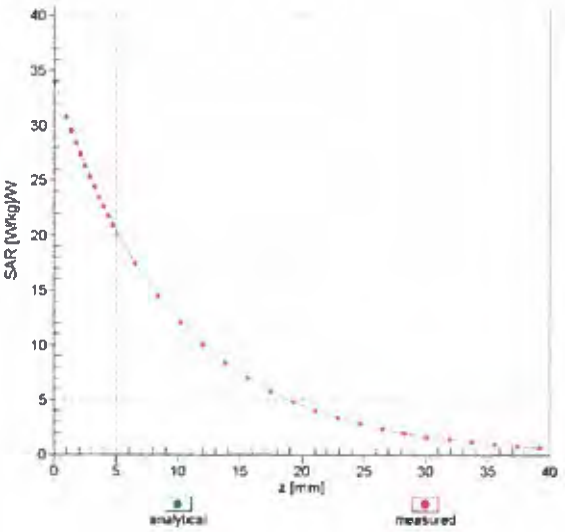
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 750 MHz,WGLS R9 (H_convF)

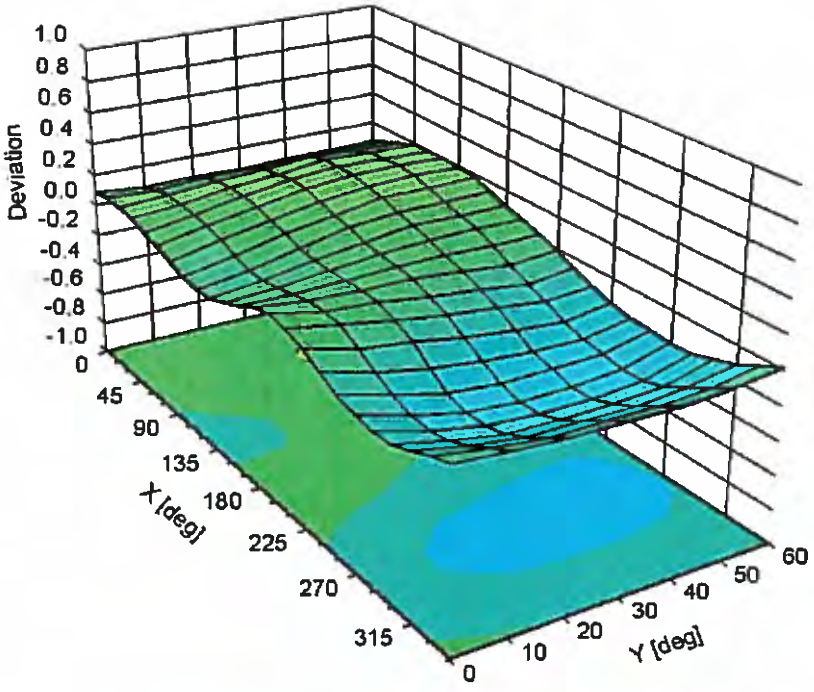


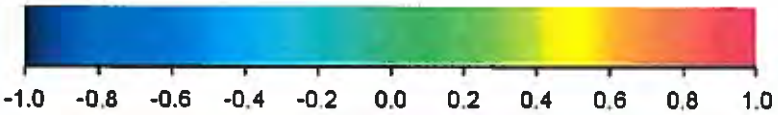
f = 2450 MHz,WGLS R22 (H_convF)



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: EX3DV4 - SN:3814

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
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

Asset: A2077 Checked by: [illegible] Date: 27-March-2012

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Accreditation No.: SCS 108

Client RFI

Certificate No: EX3-3814_Mar12

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: March 12, 2012 (Additional Conversion Factors)

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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
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: March 13, 2012

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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., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ 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 $f \leq 800$ 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

Additional Conversion Factors

Manufactured: September 2, 2011
Calibrated: March 12, 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]	0.52	0.51	0.44	± 10.1 %
DCP (mV)[B]	100.8	96.5	101.1	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	121.7	±2.7 %
			Y	0.00	0.00	1.00	115.0	
			Z	0.00	0.00	1.00	105.3	

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)
5200	36.0	4.66	5.10	5.10	5.10	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.80	4.80	4.80	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.67	4.67	4.67	0.45	1.80	± 13.1 %
5600	35.5	5.07	4.54	4.54	4.54	0.45	1.80	± 13.1 %
5800	35.3	5.27	4.48	4.48	4.48	0.48	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

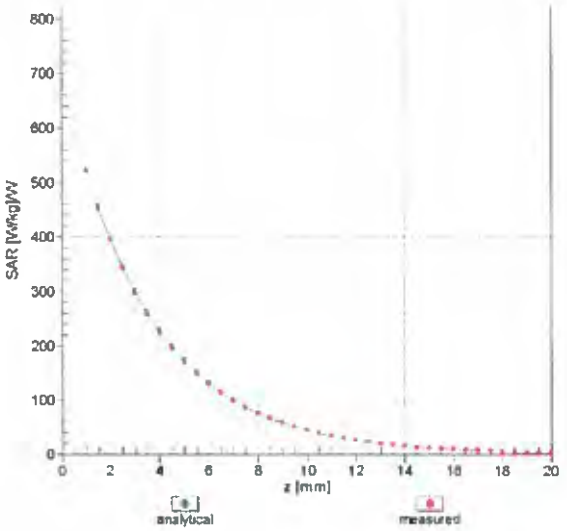
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
5300	48.9	5.42	4.37	4.37	4.37	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.79	3.79	3.79	0.55	1.90	± 13.1 %

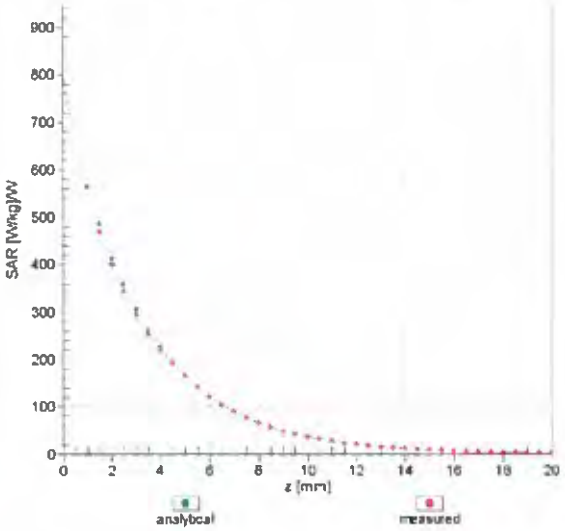
[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of 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.

Conversion Factor Assessment

f = 5200 MHz,WGLS R58 (H_convF)-SCS

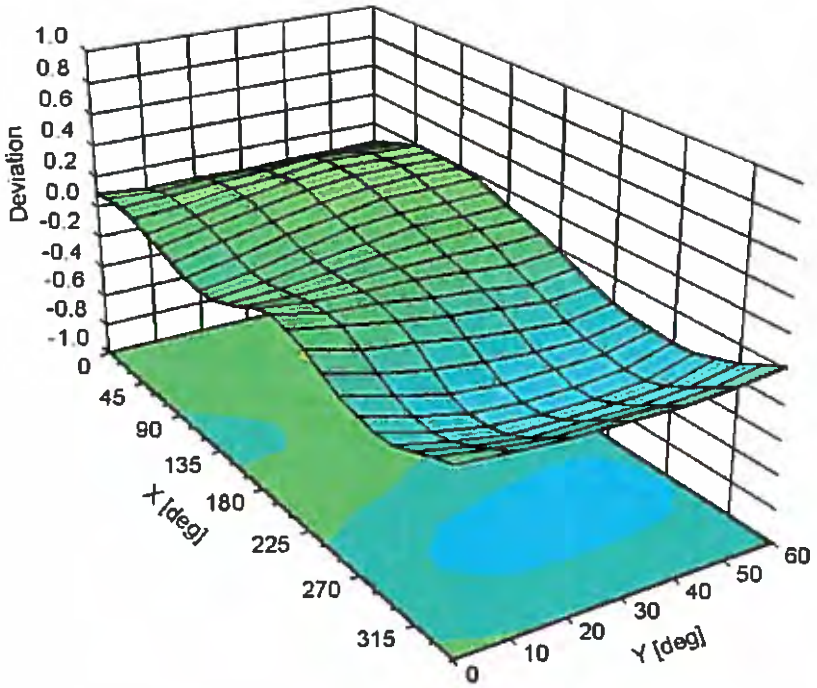


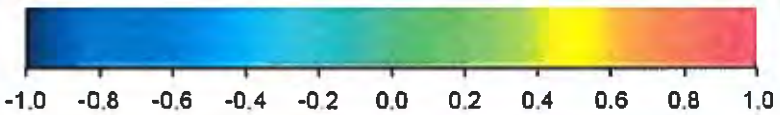
f = 5800 MHz,WGLS R58 (H_convF)-SCS



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 (°)	Not applicable
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 [illegible] 17-May-2012

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Accreditation No.: SCS 108

Asset A2113

Client RFI

Certificate No: ET3-1587_May12

CALIBRATION CERTIFICATE

Object: ET3DV6 - SN:1587

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

Calibration date: May 11, 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	10-Jan-12 (No. DAE4-660_Jan12)	Jan-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:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 11, 2012

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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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., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ 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 $f \leq 800$ 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:1587

Manufactured: May 7, 2001
Calibrated: May 11, 2012

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

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1587

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	2.14	1.92	1.79	± 10.1 %
DCP (mV)[B]	99.0	97.5	99.1	

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	119.0	±2.7 %
			Y	0.00	0.00	1.00	114.6	
			Z	0.00	0.00	1.00	111.6	

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:1587

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)
835	41.5	0.90	6.33	6.33	6.33	0.24	3.00	± 12.0 %
900	41.5	0.97	6.18	6.18	6.18	0.28	3.00	± 12.0 %
1750	40.1	1.37	5.47	5.47	5.47	0.58	2.35	± 12.0 %
1900	40.0	1.40	5.18	5.18	5.18	0.80	1.68	± 12.0 %
2450	39.2	1.80	4.52	4.52	4.52	0.80	1.95	± 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:1587

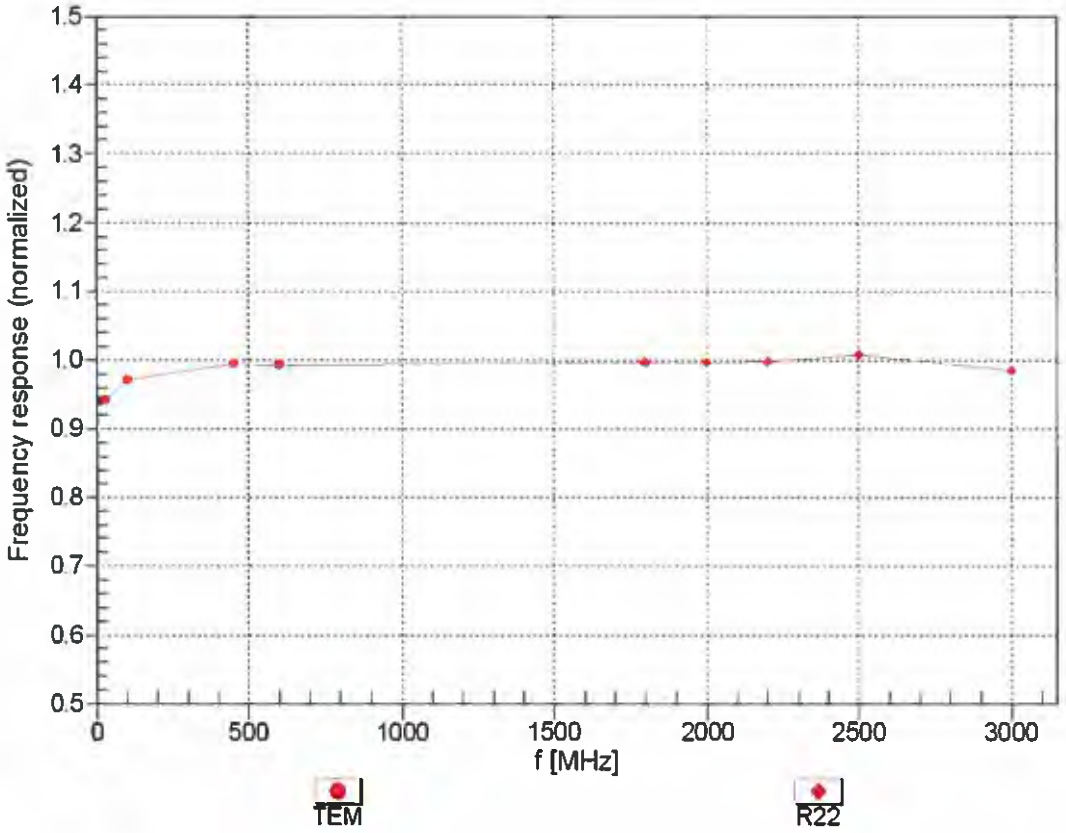
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
835	55.2	0.97	6.28	6.28	6.28	0.30	3.00	± 12.0 %
900	55.0	1.05	6.26	6.26	6.26	0.37	2.56	± 12.0 %
1750	53.4	1.49	4.92	4.92	4.92	0.74	2.18	± 12.0 %
1900	53.3	1.52	4.69	4.69	4.69	0.77	2.38	± 12.0 %
2450	52.7	1.95	4.13	4.13	4.13	0.80	2.02	± 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

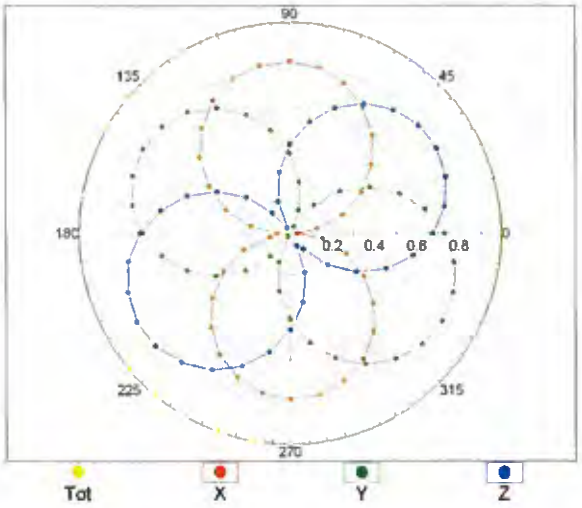
(TEM-Cell:ifi110 EXX, Waveguide: R22)



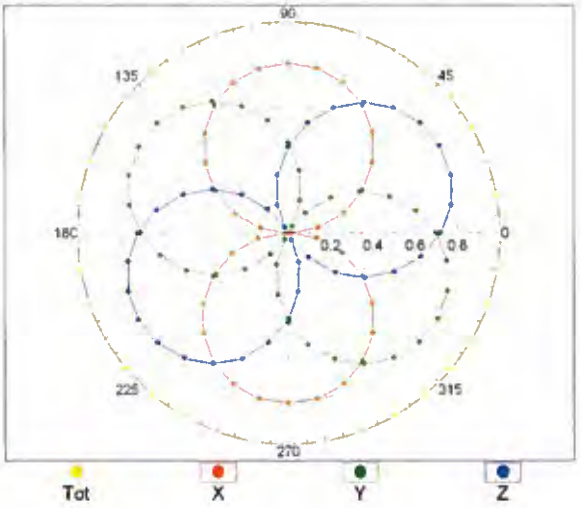
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

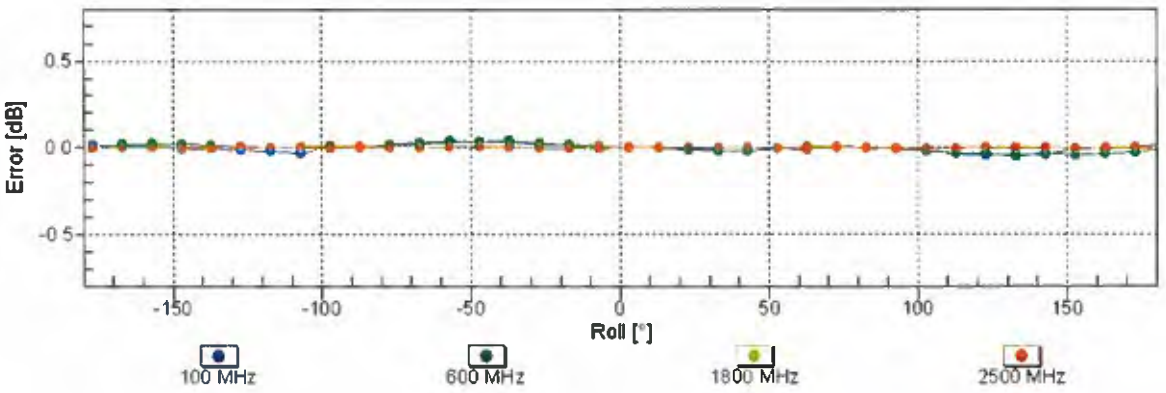
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



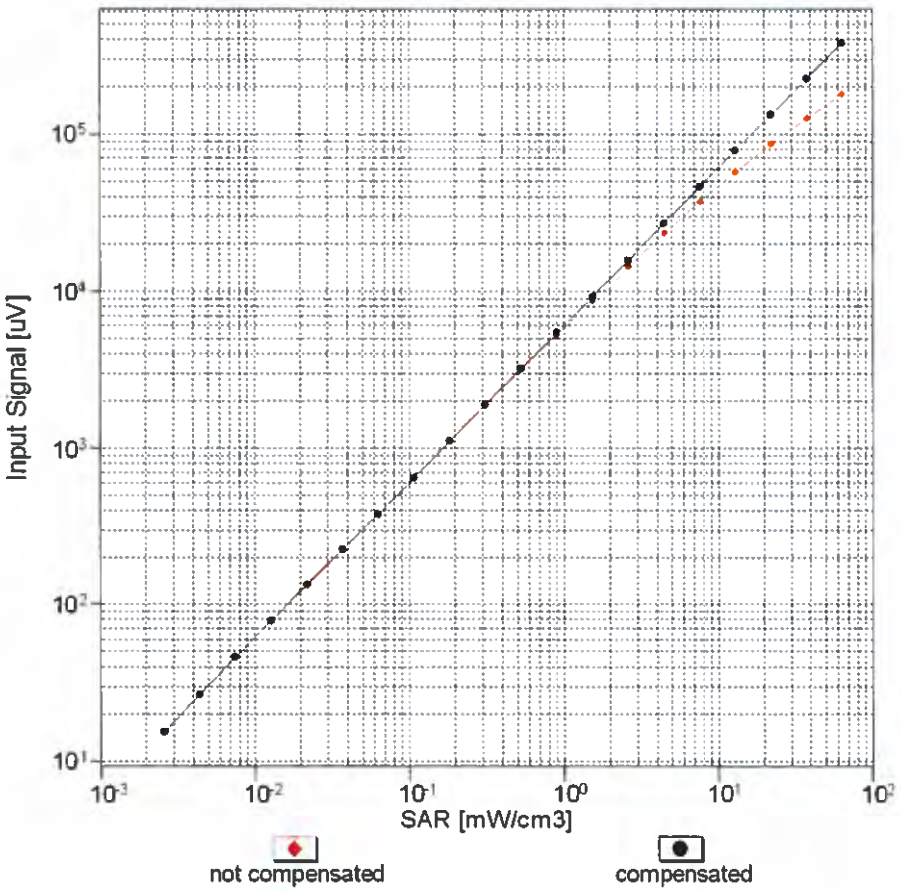
f=1800 MHz,R22

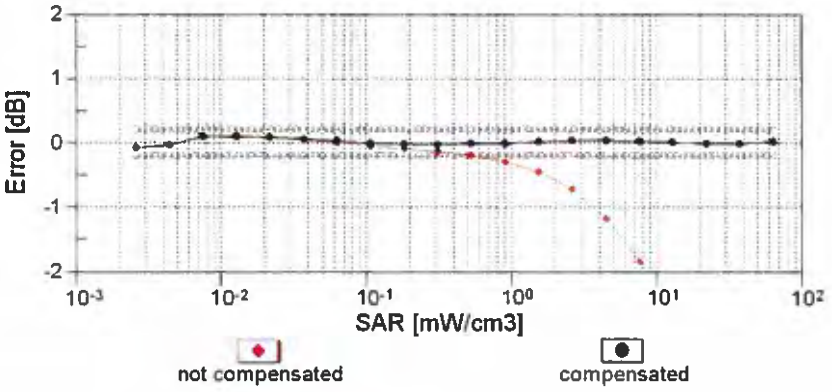




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

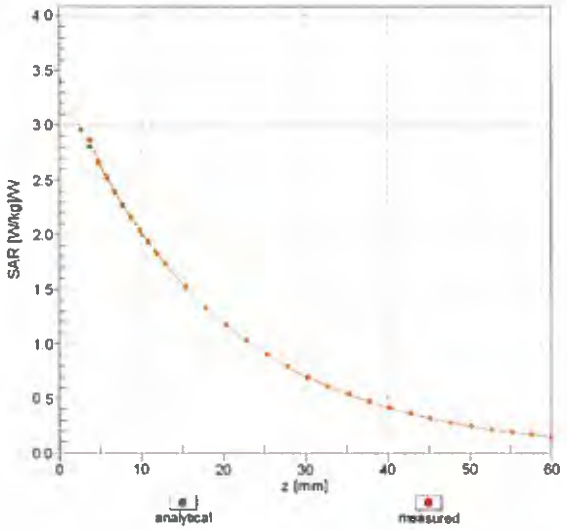




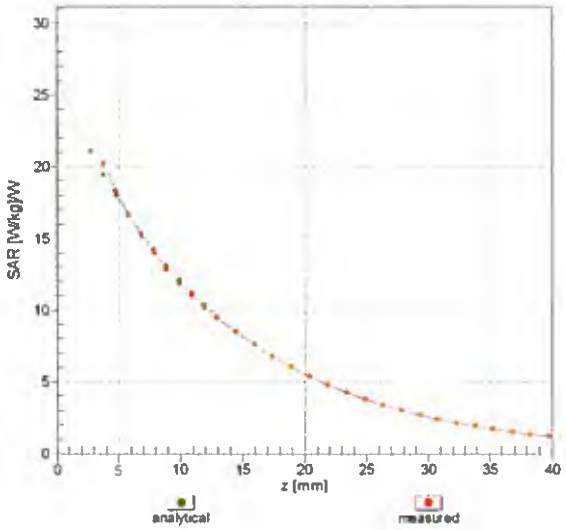
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

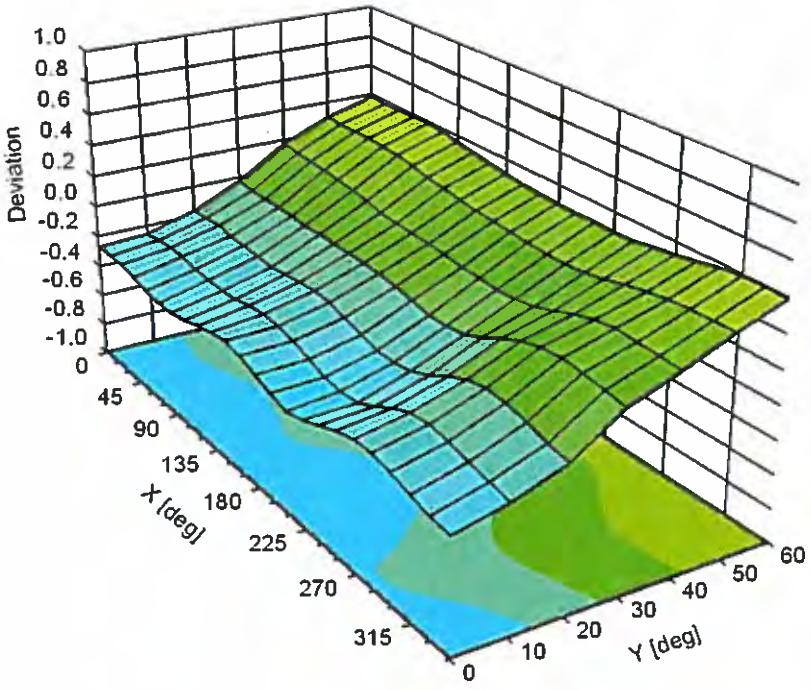


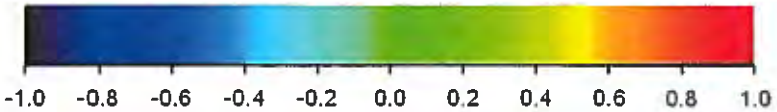
f = 1750 MHz,WGLS R22 (H_convF)



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:1587

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	72.9
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: A1985 checked by: DATE 17 FEB 20

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)
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: D750V3-1011_Feb12

CALIBRATION CERTIFICATE

Object	D750V3 - SN: 1011
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 09, 2012

Device under 1 year calibration

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: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

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	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 9, 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.

Measurement Conditions

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

DASY Version	DASY5	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.3 ± 6 %	0.92 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	2.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**8.48 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.42 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**5.57 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	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.6 ± 6 %	0.96 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	2.21 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**8.84 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.46 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**5.84 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.6 Ω + 0.2 jΩ
Return Loss	- 29.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.9 Ω - 2.7 jΩ
Return Loss	- 30.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.039 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	September 29, 2009

DASY5 Validation Report for Head TSL

Date: 09.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1011

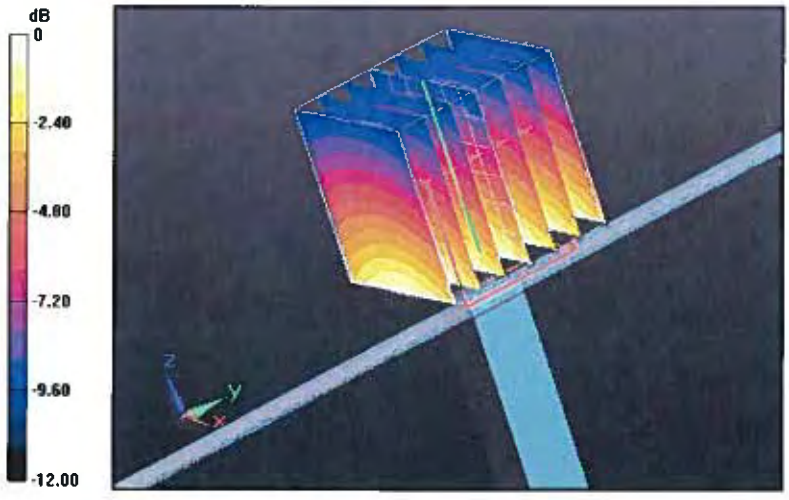
Communication System: CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.92 mho/m; ε_r = 42.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.33, 6.33, 6.33); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

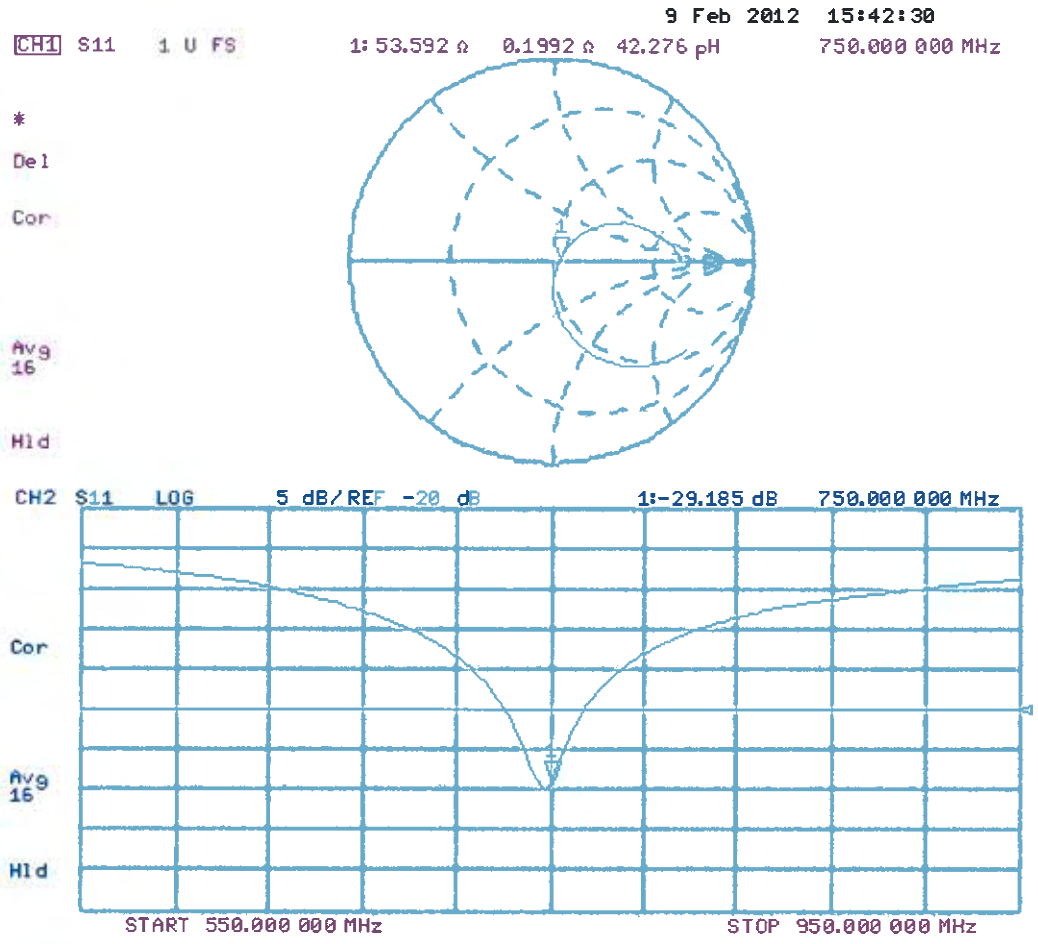
Dipole Calibration for Head Tissue/Pin=250mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.774 V/m; Power Drift = 0.003 dB
Peak SAR (extrapolated) = 3.3050
SAR(1 g) = 2.17 mW/g; SAR(10 g) = 1.42 mW/g
Maximum value of SAR (measured) = 2.549 mW/g



0 dB = 2.550mW/g = 8.13 dB mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 09.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1011

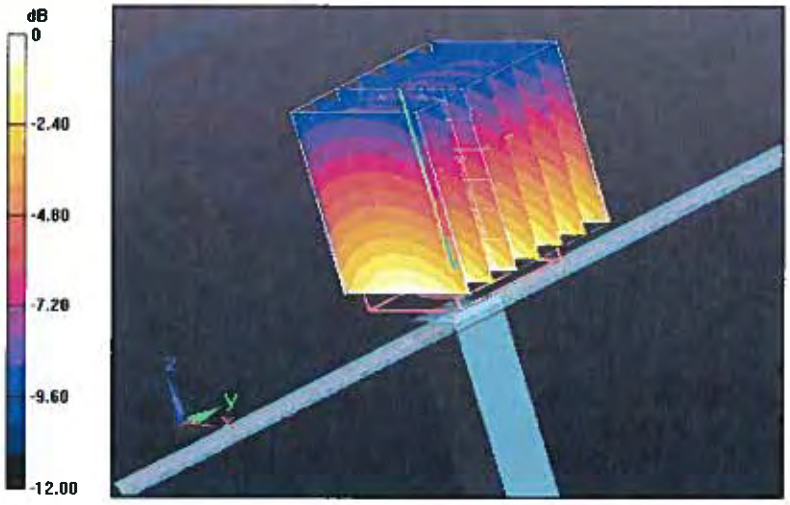
Communication System: CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.96 mho/m; ε_r = 55.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.12, 6.12, 6.12); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

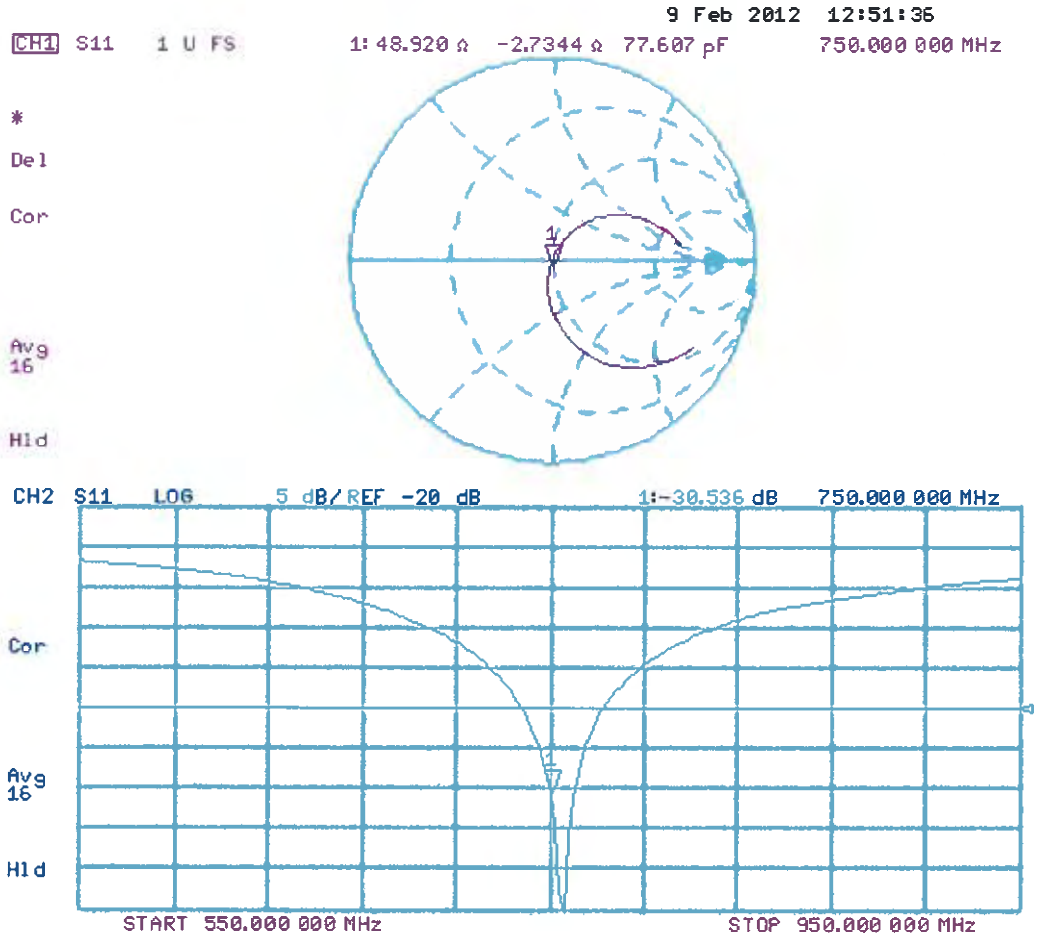
Dipole Calibration for Body Tissue/Pin=250mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.902 V/m; Power Drift = 0.0098 dB
Peak SAR (extrapolated) = 3.2810
SAR(1 g) = 2.21 mW/g; SAR(10 g) = 1.46 mW/g
Maximum value of SAR (measured) = 2.573 mW/g



0 dB = 2.570mW/g = 8.20 dB mW/g

Impedance Measurement Plot for Body TSL



ASSET: #1235 Checked by 21/02/2011

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S 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

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

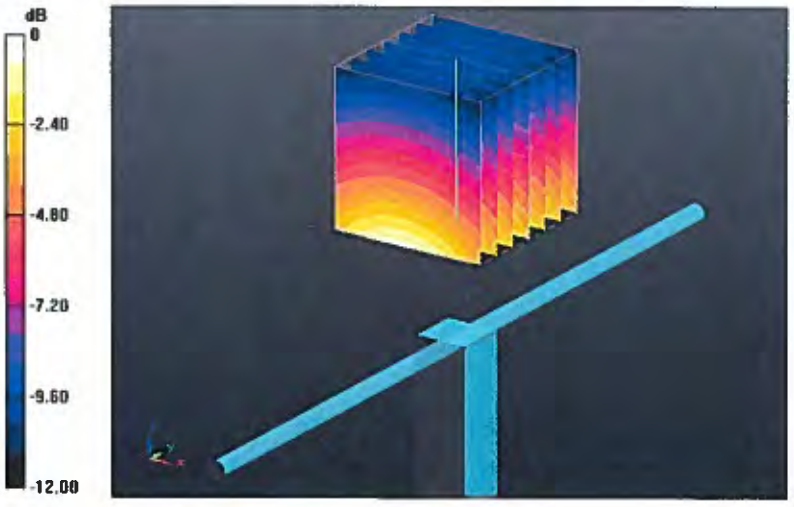
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:124

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:

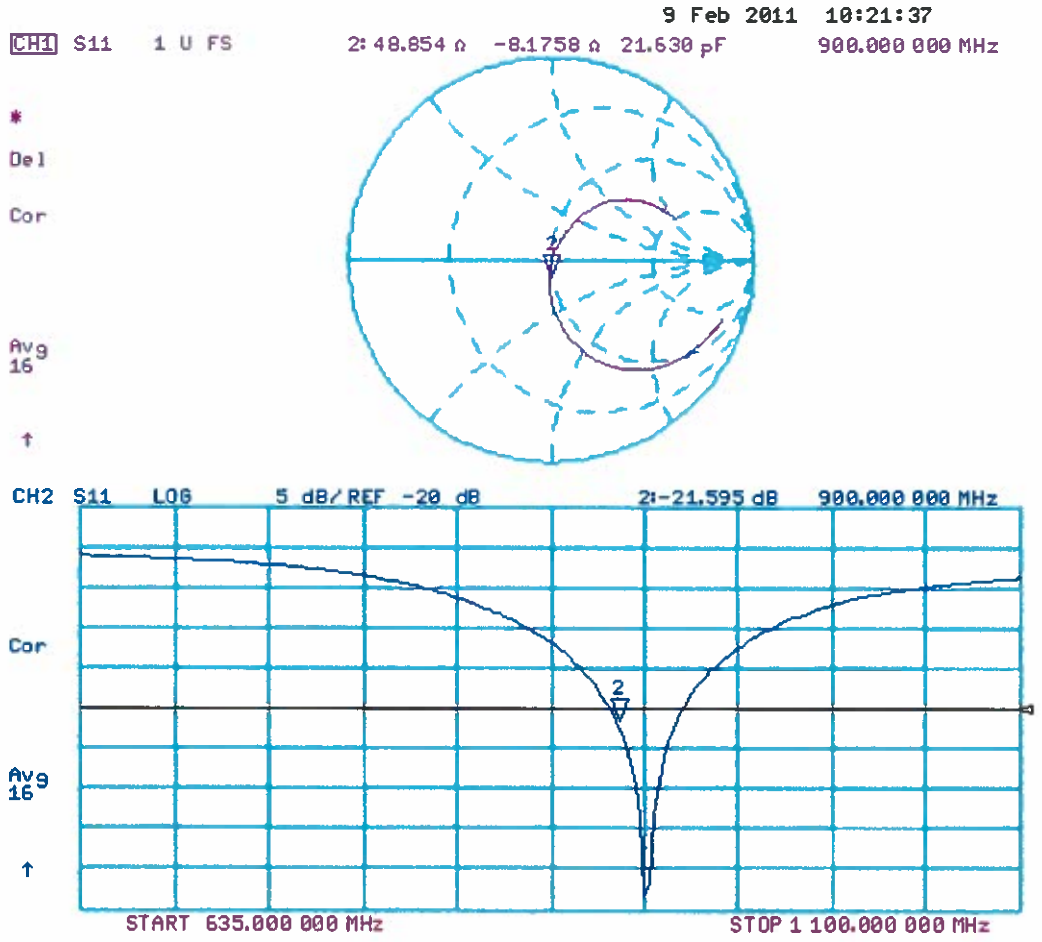
- Probe: ES3DV3 - SN3205; ConvF(5.88, 5.88, 5.88); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing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

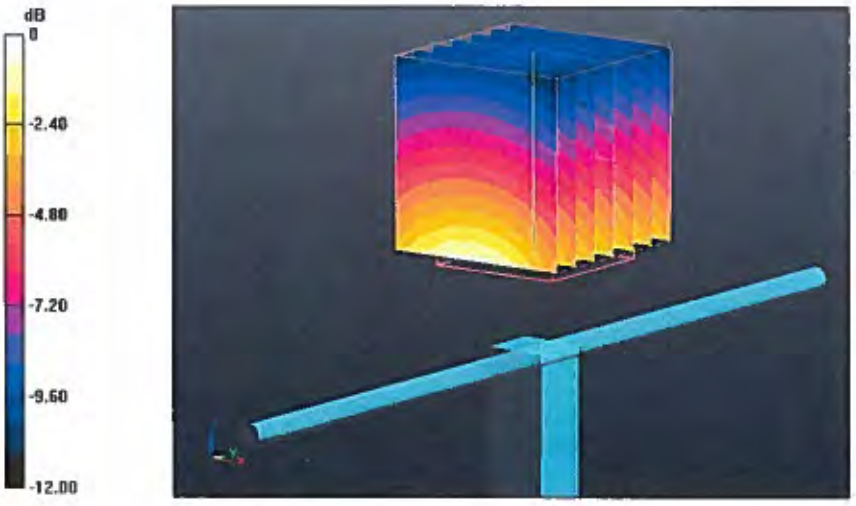
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:124

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:

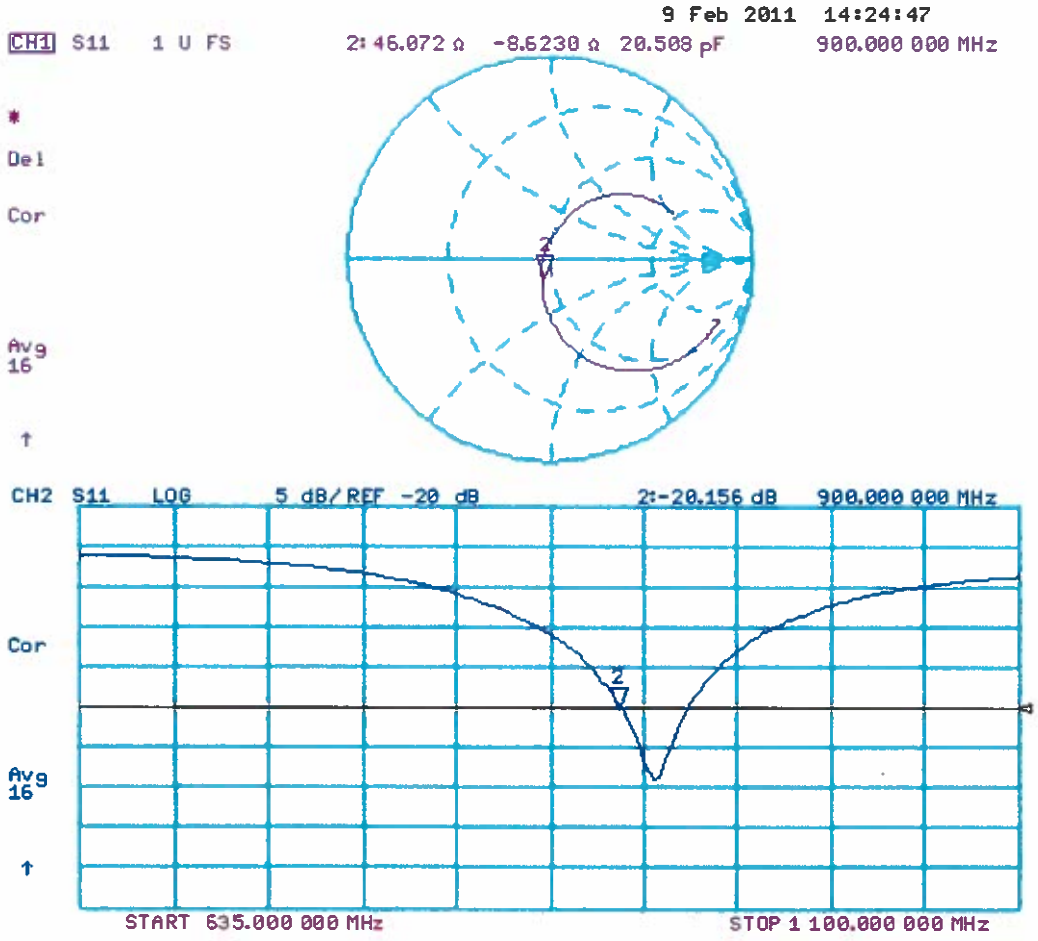
- Probe: ES3DV3 - SN3205; ConvF(5.81, 5.81, 5.81); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing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



Checked by
DATE: 19-07-2010

Calibration Laboratory of
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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

RFI ASSET: A1190

Client RFI

Certificate No: D1800V2-264_Jul10

CALIBRATION CERTIFICATE

Object	D1800V2 - SN: 264
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	July 13, 2010

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-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
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-09)	In house check: Oct-10

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

Issued: July 13, 2010

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

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	V52.2
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	1800 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	40.5 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 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	9.58 mW / g
SAR normalized	normalized to 1W	38.3 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**38.8 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.06 mW / g
SAR normalized	normalized to 1W	20.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.4 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	53.5 ± 6 %	1.48 mho/m ± 6 %
Body TSL temperature during test	(23.0 ± 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	9.56 mW / g
SAR normalized	normalized to 1W	38.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**38.8 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.17 mW / g
SAR normalized	normalized to 1W	20.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.8 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	45.8 Ω - -5.8 jΩ
Return Loss	- 22.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.0 Ω - 5.7 jΩ
Return Loss	- 20.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 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	March 05, 2000

DASY5 Validation Report for Head TSL

Date/Time: 06.07.2010 10:49:53

Test Laboratory: SPEAG, Zurich, Switzerland

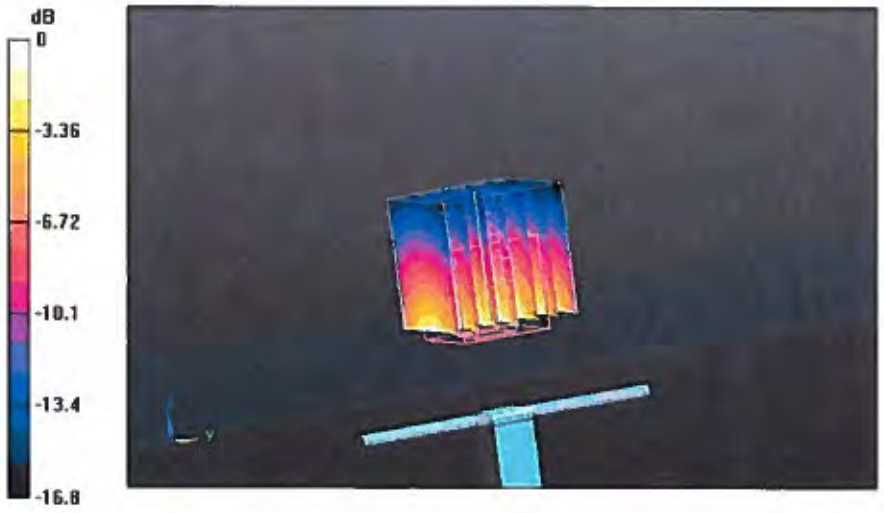
DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:264

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: HSL U12 BB
Medium parameters used: f = 1800 MHz; σ = 1.38 mho/m; ε_r = 40.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

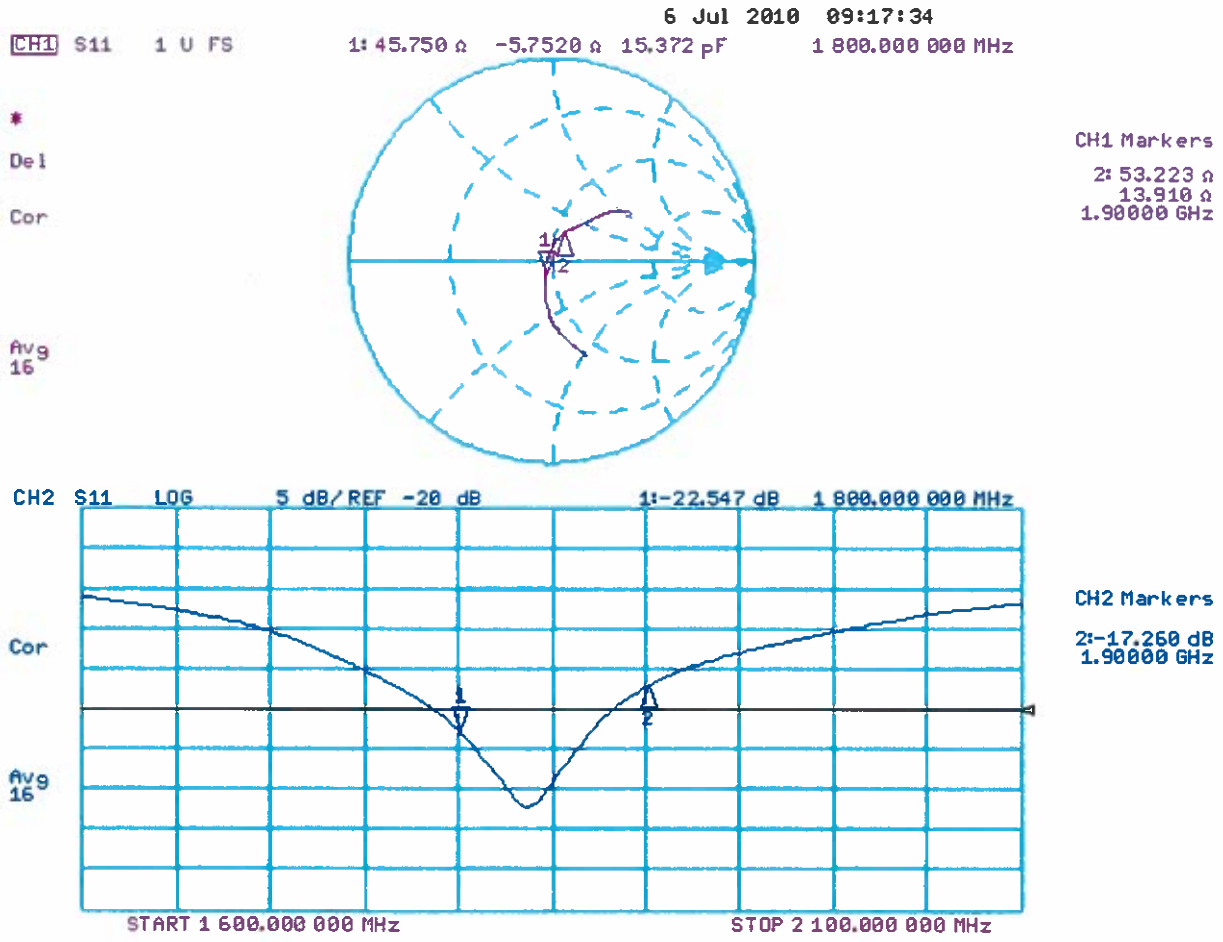
- Probe: ES3DV3 - SN3205; ConvF(5.05, 5.05, 5.05); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

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 = 97.5 V/m; Power Drift = -0.000637 dB
Peak SAR (extrapolated) = 17.3 W/kg
SAR(1 g) = 9.58 mW/g; SAR(10 g) = 5.06 mW/g
Maximum value of SAR (measured) = 12.2 mW/g



0 dB = 12.2mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body

Date/Time: 13.07.2010 11:05:37

Test Laboratory: SPEAG, Zurich, Switzerland

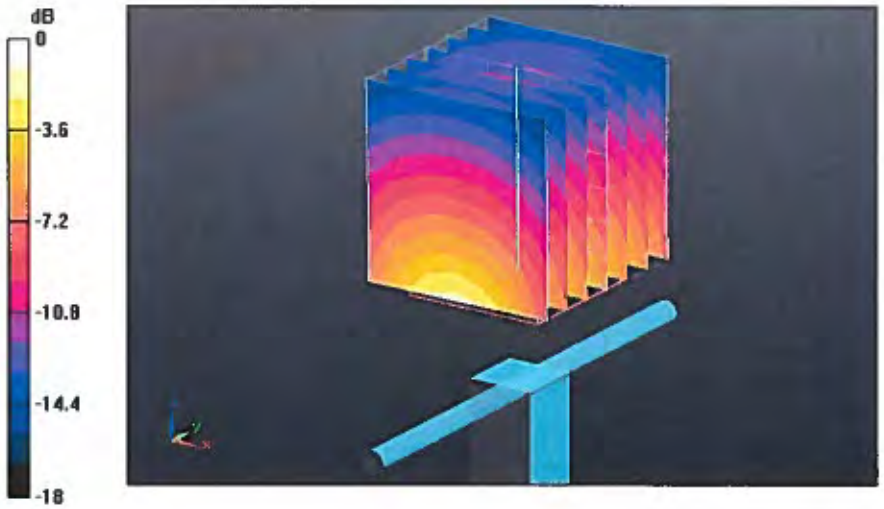
DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:264

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: MSL U11 BB
Medium parameters used: f = 1800 MHz; σ = 1.48 mho/m; ε_r = 53.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

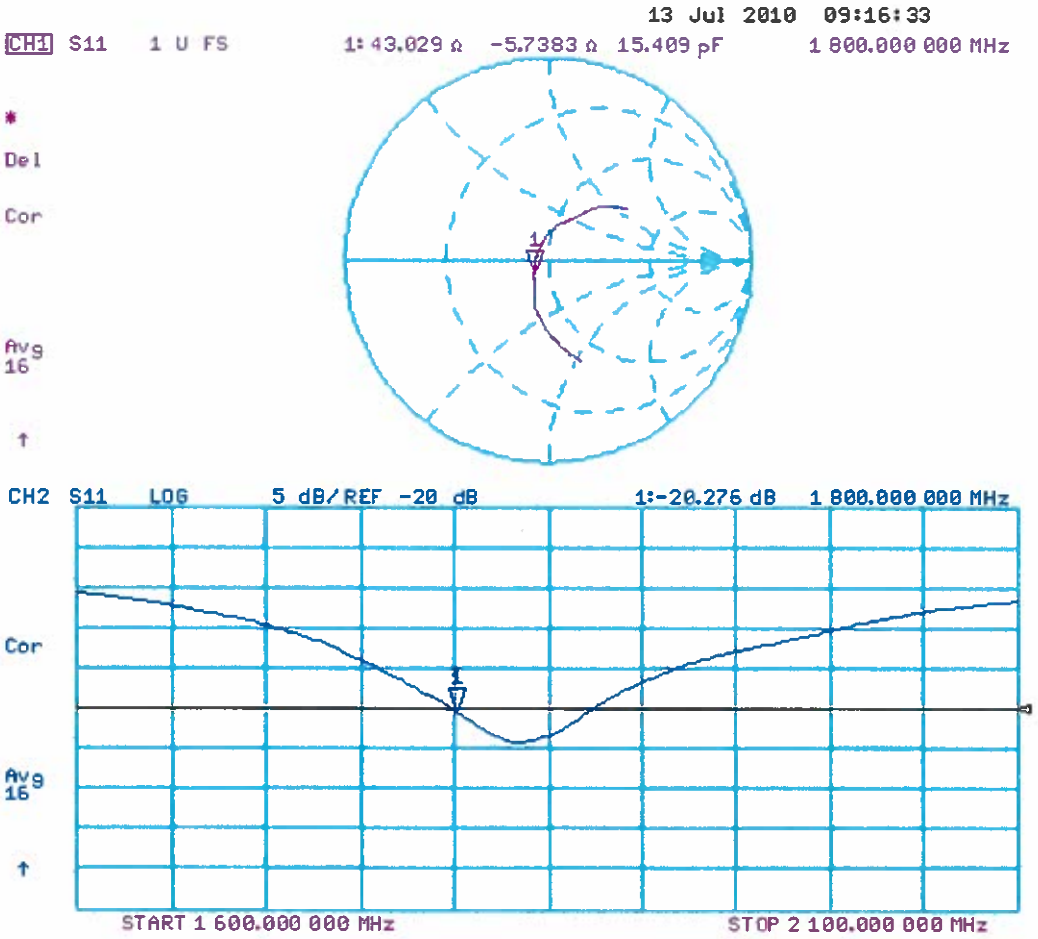
- Probe: ES3DV3 - SN3205; ConvF(4.74, 4.74, 4.74); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

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 = 94.5 V/m; Power Drift = 0.00823 dB
Peak SAR (extrapolated) = 16.1 W/kg
SAR(1 g) = 9.56 mW/g; SAR(10 g) = 5.17 mW/g
Maximum value of SAR (measured) = 11.9 mW/g



0 dB = 11.9mW/g

Impedance Measurement Plot for Body TSL



Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Consignee's Name:
RFI Global Services Ltd
Pavilion A
Ashwood Park
Basingstoke
Hampshire RG23 8BG
United Kingdom

Contact Person: Naseer Mirza / Rich Quoi (+44-12563-12000)

Forwarder: UPS

Delivery terms: EXW Zurich / Switzerland (Incoterms 2000)

Zurich, July 16, 2010

Proforma Invoice no. 1607/10/76

Your Purchase Order No.: 119145

HS-Code: 9030.90.90

Item	Description	Qty.	Unit Price USD	Total Value USD
1	Probe EX3DV3 – SN: 3508	1	10.00	10.00
2	Dipole D1800V2 – SN: 264	1	10.00	10.00
Total (w/o VAT)			**USD**	**20.00**

FREE OF CHARGE – VALUE FOR CUSTOMS PURPOSES ONLY! RETURN ITEMS FROM RECALIBRATION.

The exporter of the products covered by this document declares that, except where otherwise clearly indicated these products are of Swiss preferential origin.

Zurich, July 16, 2010

Schmid & Partner Engineering AG

Livia Mussato

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

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Zeughausstrasse 43, 8004 Zurich, Switzerland

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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

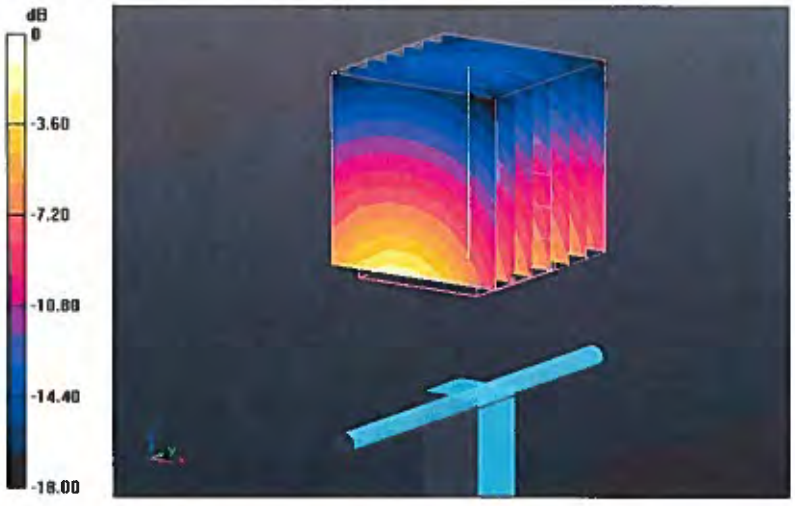
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:540

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:

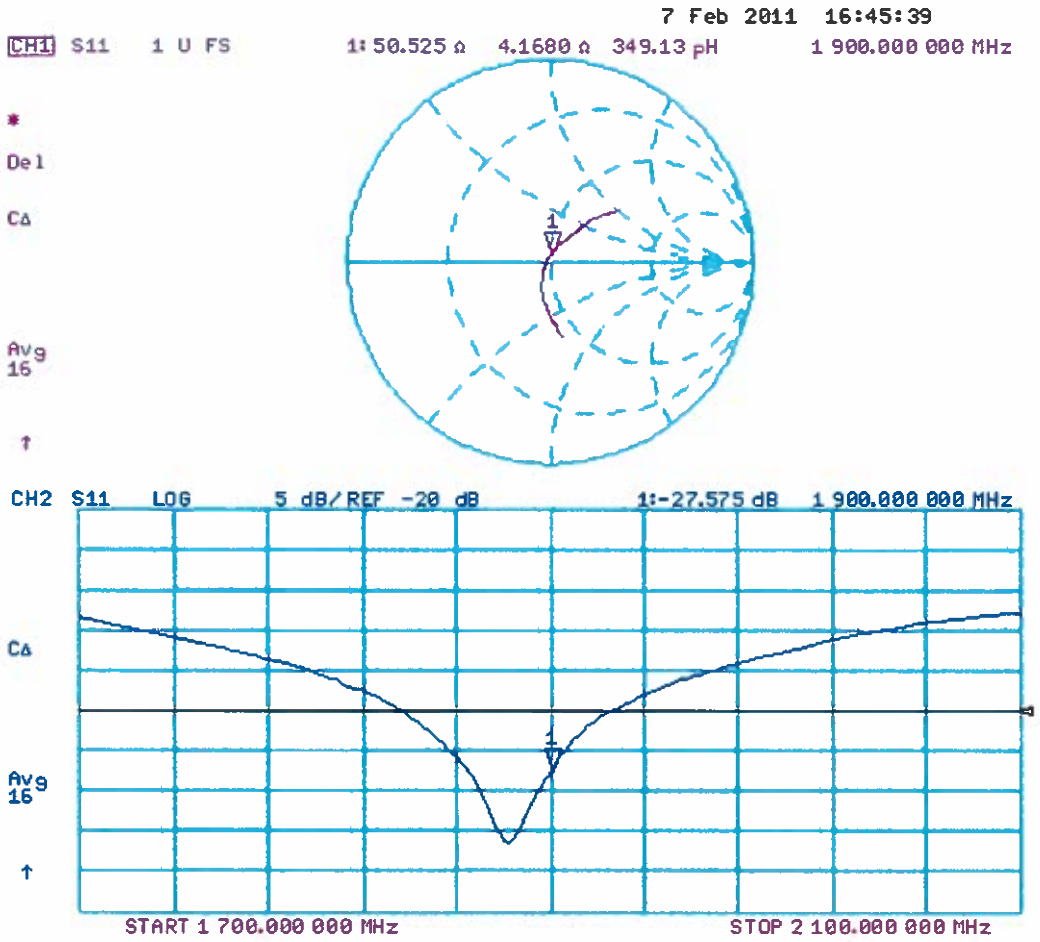
- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing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

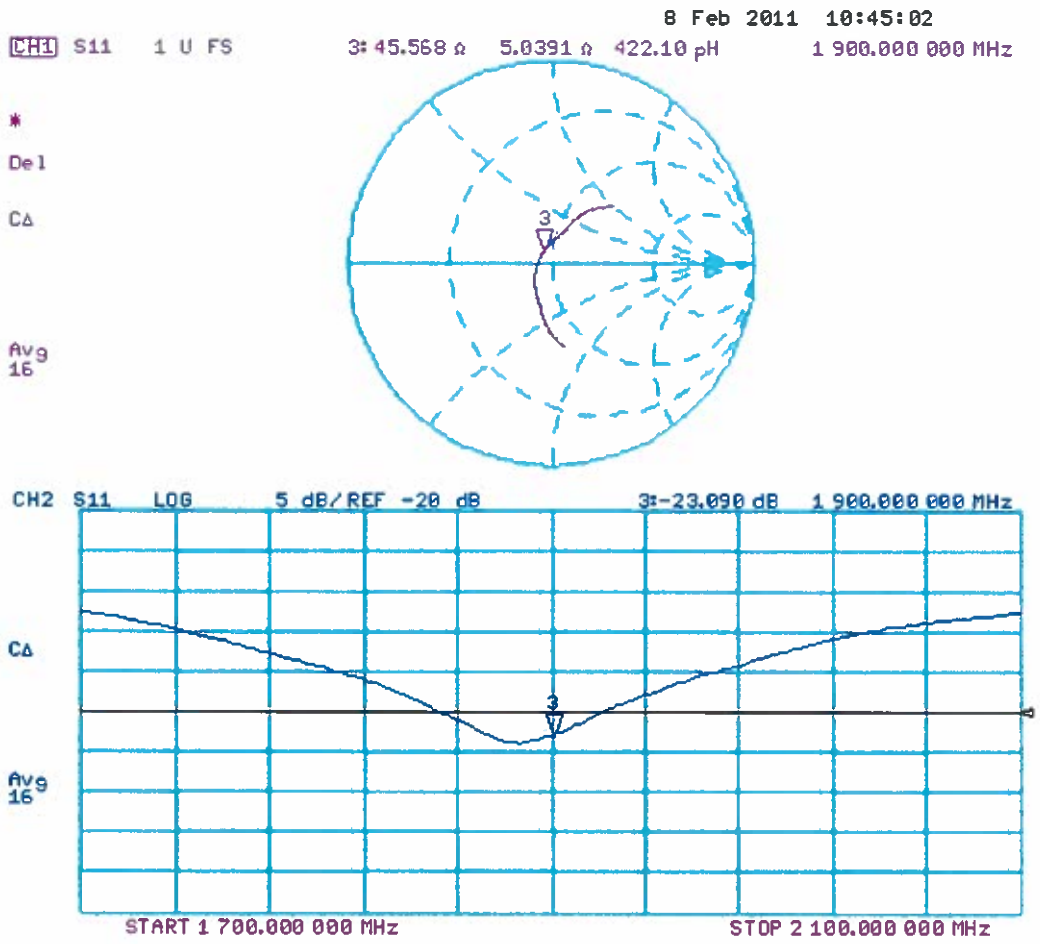
DASY5 Configuration:

- 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

S Schweizerischer Kalibrierdienst
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: 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

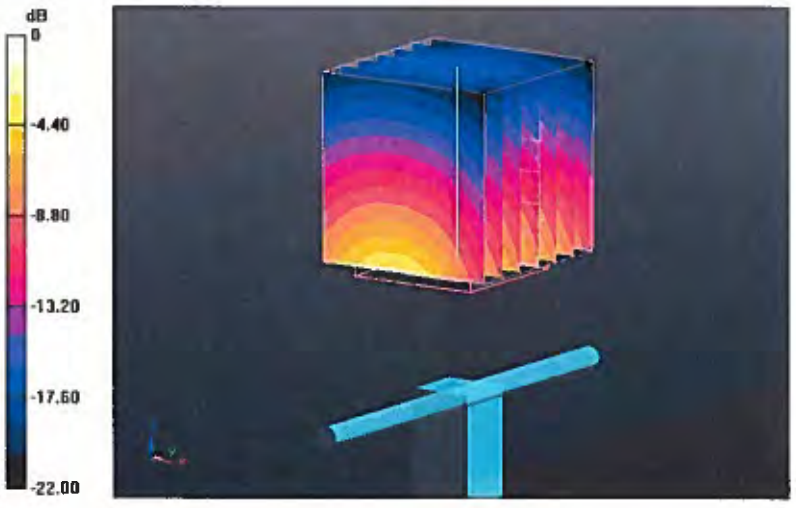
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:725

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:

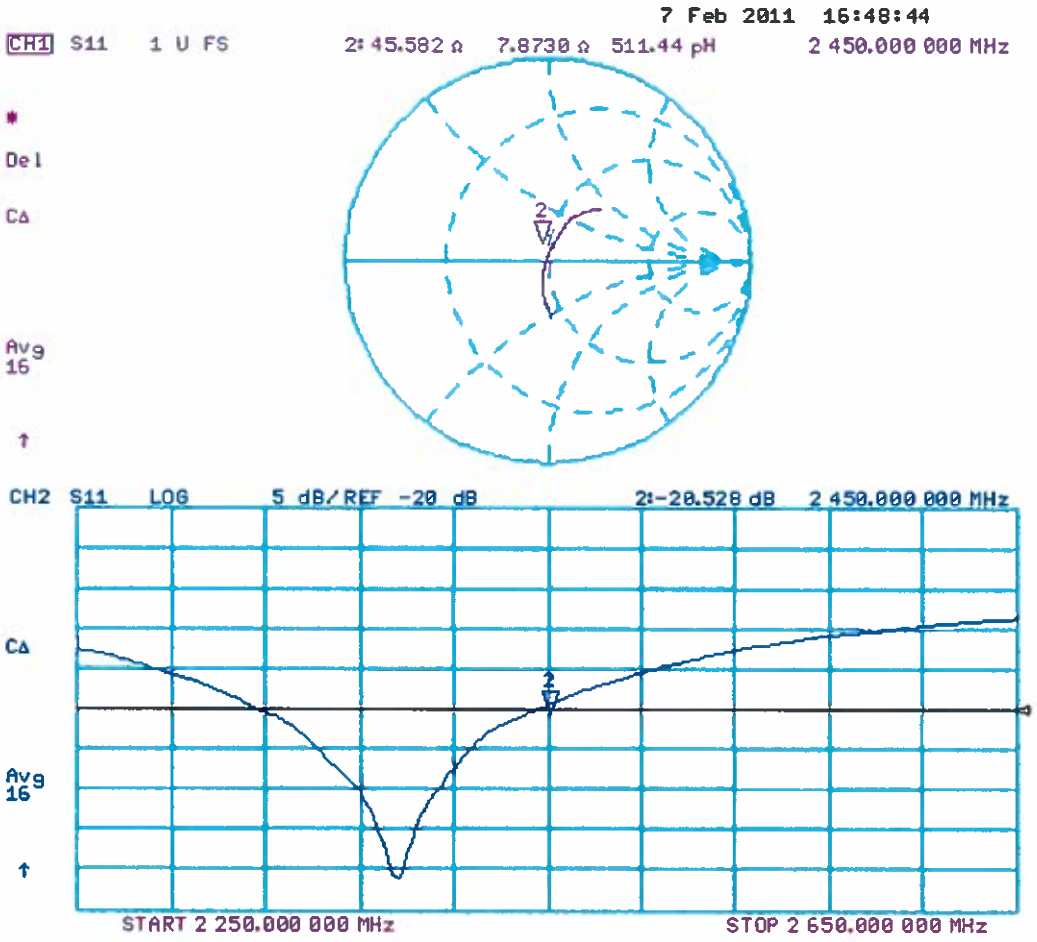
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing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

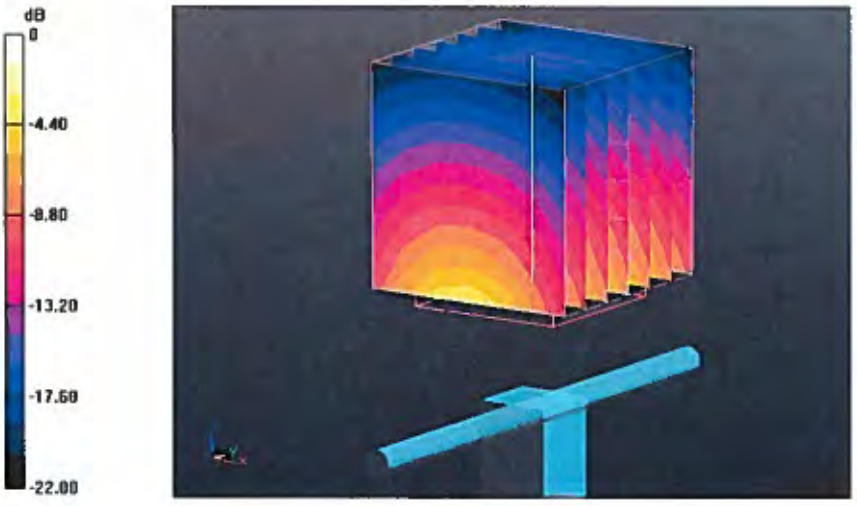
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:725

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:

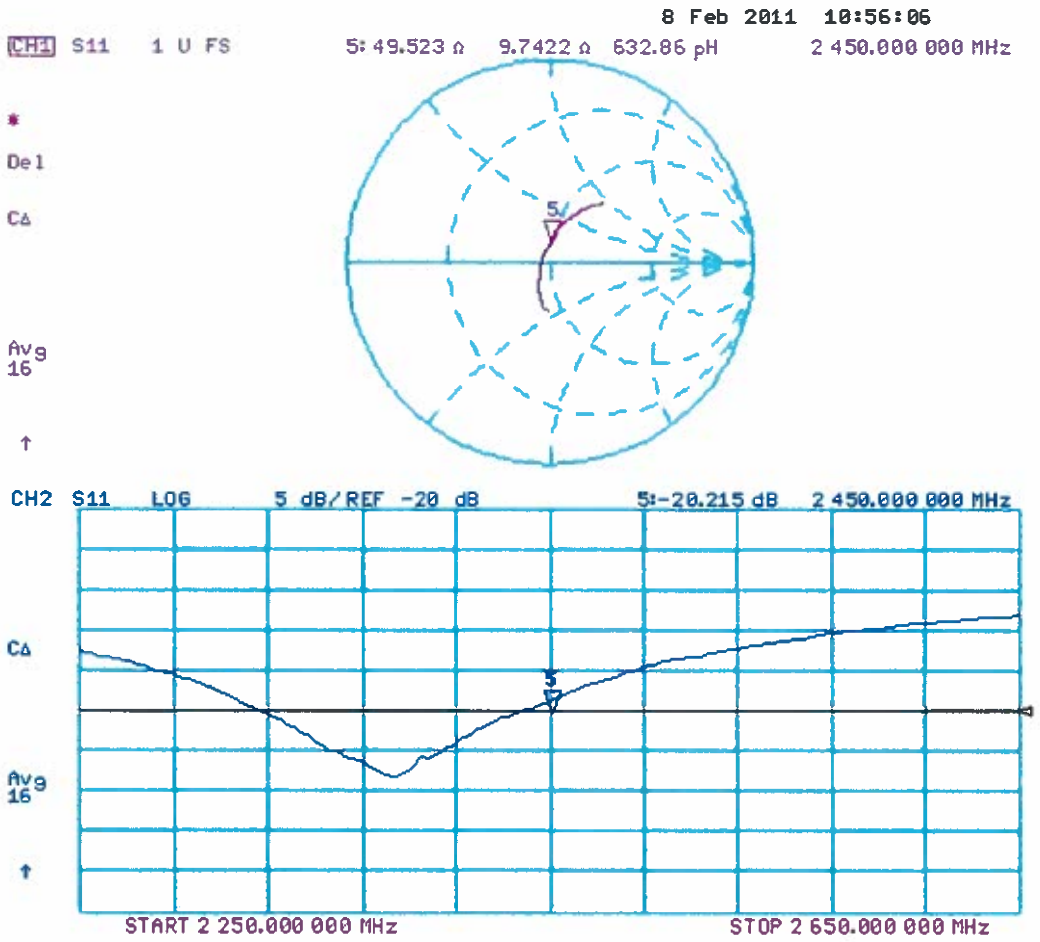
- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing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



ASSET: 1377 (BODY ONLY) Checked by 21/02/2011

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)
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: D5GHzV2-1016_Feb11

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN: 1016

Calibration procedure(s): QA CAL-22.v1
Calibration procedure for dipole validation kits between 3-6 GHz

Calibration date: February 10, 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 EX3DV4	SN: 3503	05-Mar-10 (No. EX3-3503_Mar10)	Mar-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 11, 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) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010

b) 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:

c) 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 dipoie 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
Area Scan resolution	dx, dy = 10 mm	
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 2.0 mm	
Frequency	5200 MHz ± 1 MHz 5500 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.2 ± 6 %	5.37 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	100 mW input power	7.73 mW / g
SAR normalized	normalized to 1W	77.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**76.7 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 mW / g
SAR normalized	normalized to 1W	21.4 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.2 mW / g ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	5.75 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	100 mW input power	8.35 mW / g
SAR normalized	normalized to 1W	83.5 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**82.8 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.30 mW / g
SAR normalized	normalized to 1W	23.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**22.8 mW / g ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.2 ± 6 %	6.16 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	100 mW input power	7.22 mW / g
SAR normalized	normalized to 1W	72.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**71.7 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	1.99 mW / g
SAR normalized	normalized to 1W	19.9 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**19.7 mW / g ± 19.5 % (k=2)**

Appendix

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	53.8 Ω - 8.9 jΩ
Return Loss	-20.6 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	48.4 Ω - 0.9 jΩ
Return Loss	-34.8 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	54.4 Ω + 8.3 jΩ
Return Loss	-21.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.200 ns

After long term use with 40 W 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	November 14, 2003

DASY5 Validation Report for Body TSL

Date/Time: 10.02.2011 17:44:53

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1016

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: MSL 5000 MHz
Medium parameters used: f = 5200 MHz; σ = 5.37 mho/m; ε_r = 47.2; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5500 MHz; σ = 5.75 mho/m; ε_r = 46.6; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5800 MHz; σ = 6.16 mho/m; ε_r = 46.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

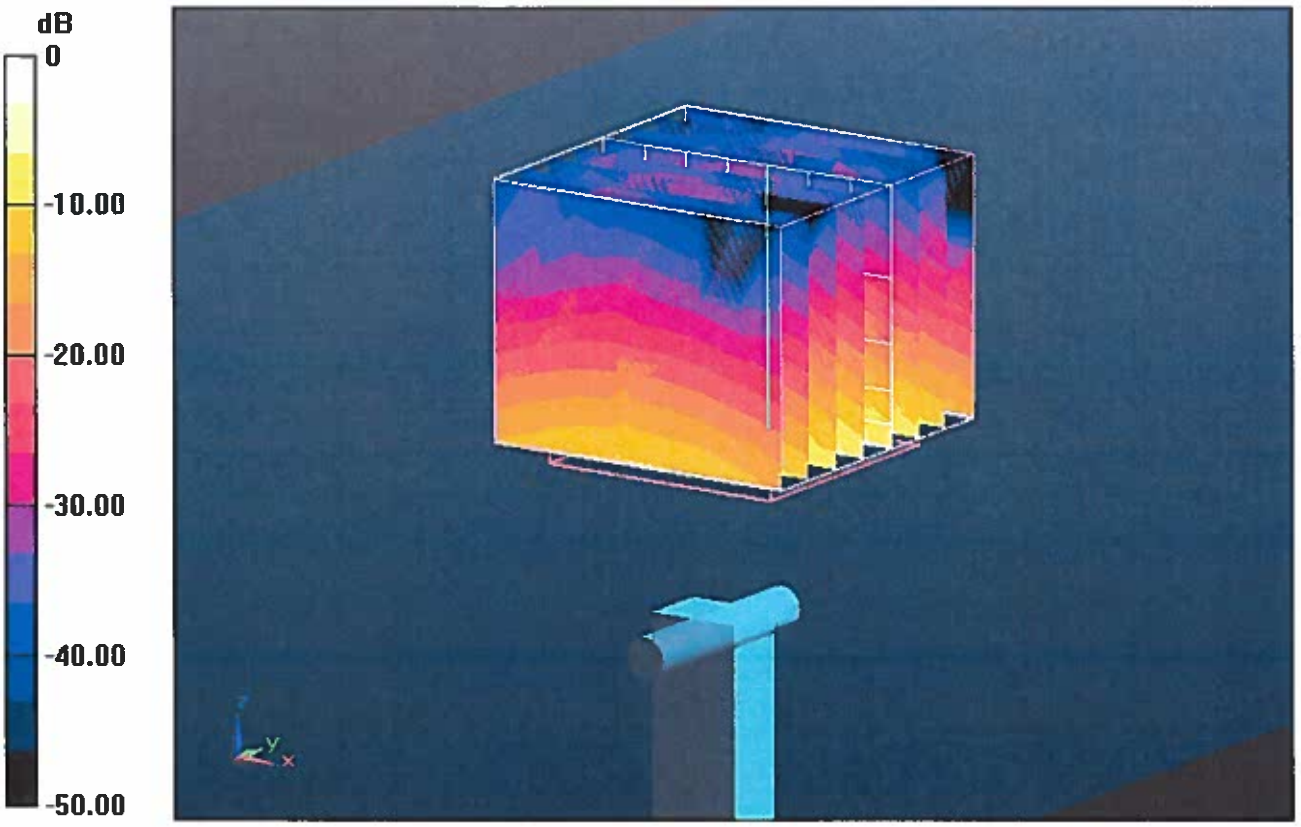
DASY5 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.88, 4.88, 4.88), ConvF(4.37, 4.37, 4.37), ConvF(4.57, 4.57, 4.57); Calibrated: 05.03.2010
- Sensor-Surface: 2mm (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=100mW, d=10mm, f=5200 MHz /Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 59.968 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 30.597 W/kg
SAR(1 g) = 7.73 mW/g; SAR(10 g) = 2.14 mW/g
Maximum value of SAR (measured) = 14.853 mW/g

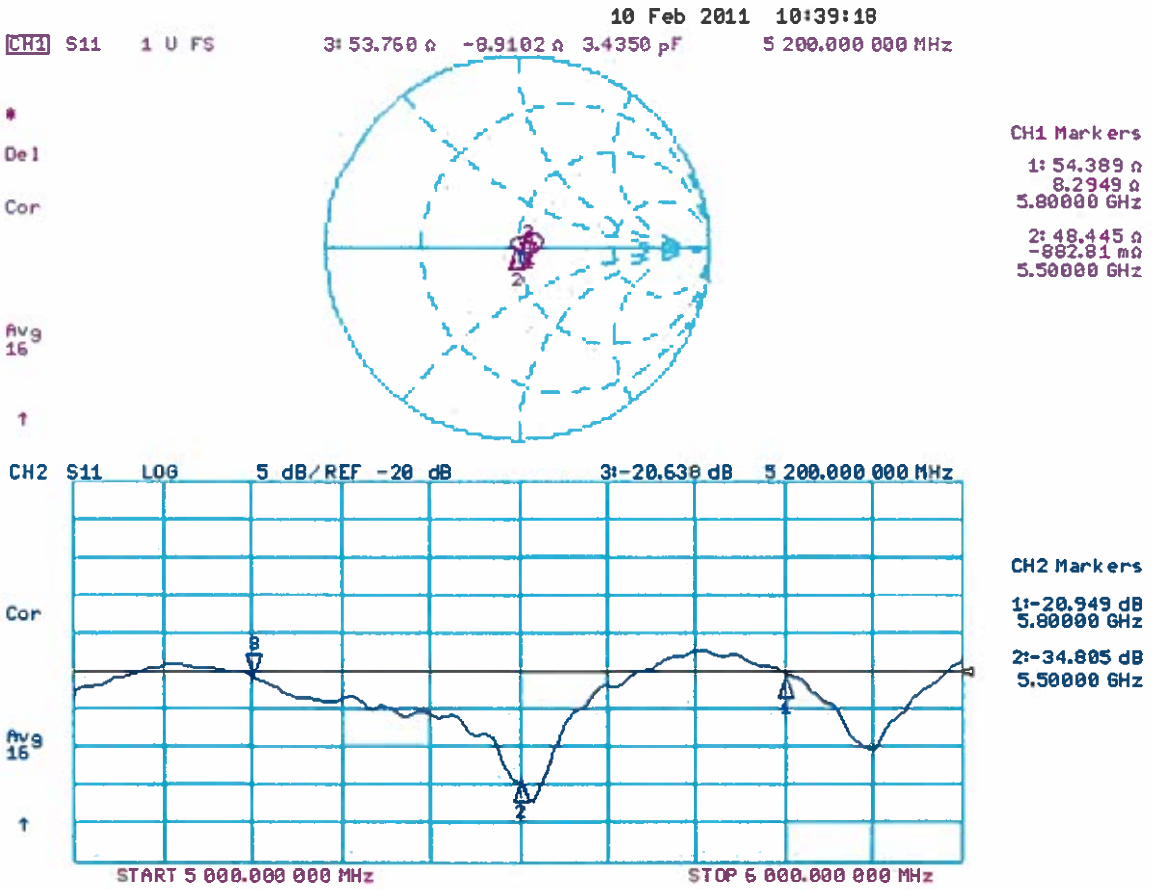
Pin=100mW, d=10mm, f=5500 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 60.866 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 35.356 W/kg
SAR(1 g) = 8.35 mW/g; SAR(10 g) = 2.3 mW/g
Maximum value of SAR (measured) = 16.244 mW/g

Pin=100mW, d=10mm, f=5800 MHz /Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 54.353 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 32.295 W/kg
SAR(1 g) = 7.22 mW/g; SAR(10 g) = 1.99 mW/g
Maximum value of SAR (measured) = 14.254 mW/g



0 dB = 14.250mW/g

Impedance Measurement Plot for Body TSL



Checked by [redacted] DATE CHECKED: 29-MARCH-2012

RFI ASSET A1377

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
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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: D5GHzV2-1016_Mar12

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN: 1016

Calibration procedure(s): QA CAL-22.v1
Calibration procedure for dipole validation kits between 3-6 GHz

Calibration date: March 23, 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: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe EX3DV4	SN: 3503	30-Dec-11 (No. EX3-3503_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

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:	Dimce Iliev	Laboratory Technician	D. Iliev
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 26, 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) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010

b) 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:

c) 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	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5500 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.7 ± 6 %	4.59 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.88 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**78.6 mW /g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.26 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**22.5 mW /g ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.2 ± 6 %	4.89 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.48 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**84.5 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.43 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 mW / g ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.8 ± 6 %	5.19 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.84 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**78.1 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.24 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**22.3 mW / g ± 19.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	52.9 Ω - 9.6 jΩ
Return Loss	- 20.3 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	48.7 Ω - 0.2 jΩ
Return Loss	- 37.8 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	57.5 Ω + 7.1 jΩ
Return Loss	- 20.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. 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	November 14, 2003

DASY5 Validation Report for Head TSL

Date: 23.03.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1016

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.59 mho/m; ε_r = 35.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.89 mho/m; ε_r = 35.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.19 mho/m; ε_r = 34.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

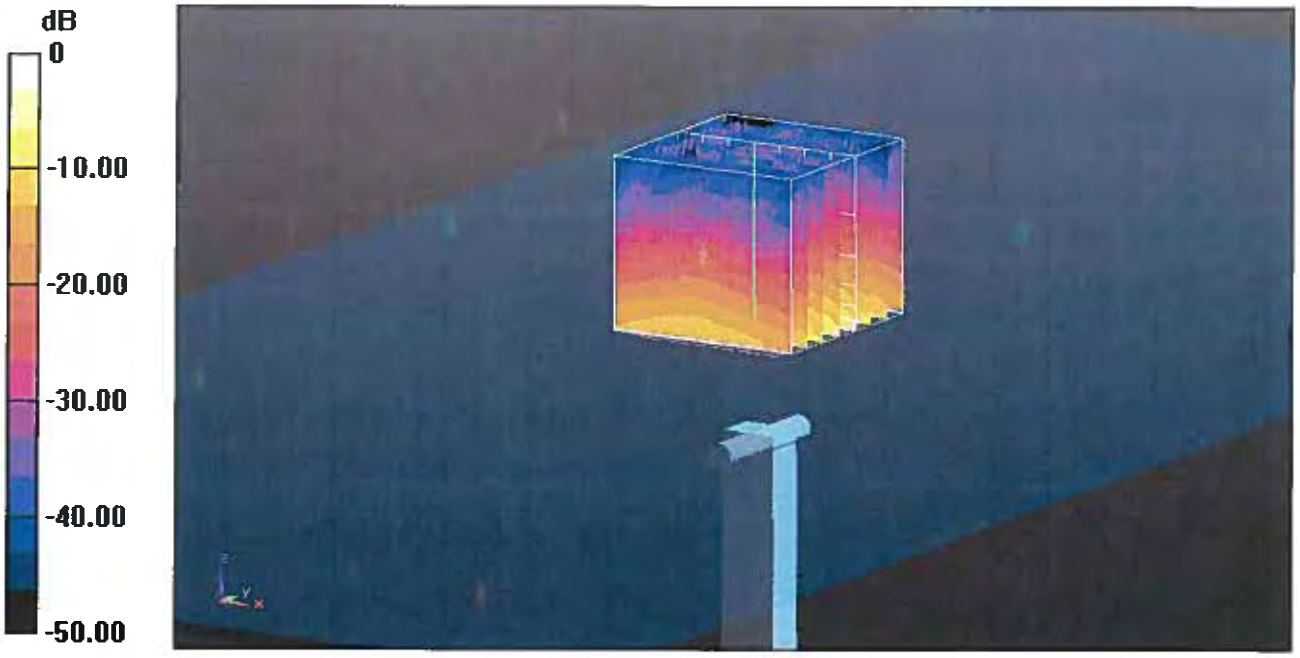
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41), ConvF(4.91, 4.91, 4.91), ConvF(4.81, 4.81, 4.81); Calibrated: 30.12.2011
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.845 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 29.2070
SAR(1 g) = 7.88 mW/g; SAR(10 g) = 2.26 mW/g
Maximum value of SAR (measured) = 18.432 mW/g

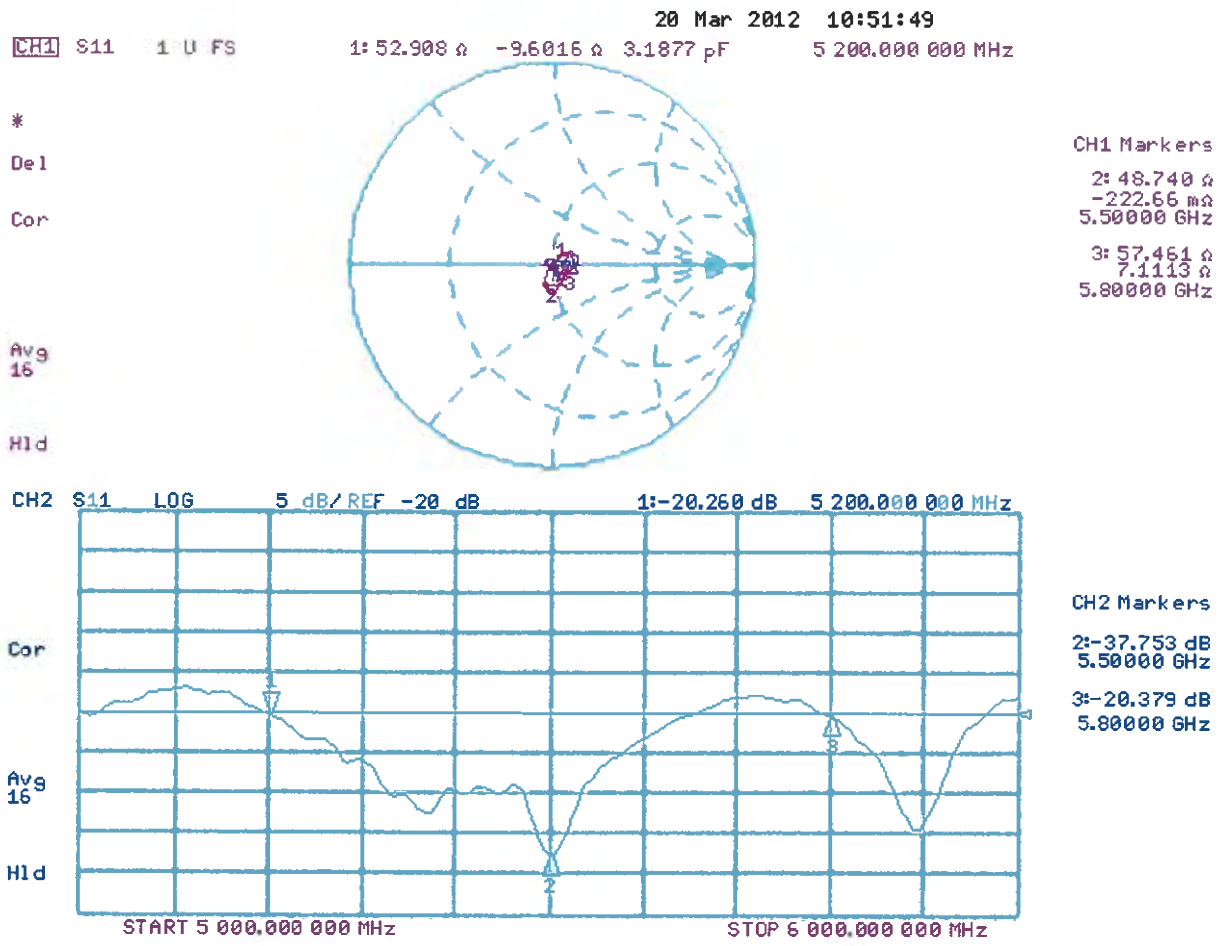
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.039 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 33.1850
SAR(1 g) = 8.48 mW/g; SAR(10 g) = 2.43 mW/g
Maximum value of SAR (measured) = 20.139 mW/g

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.534 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 32.5190
SAR(1 g) = 7.84 mW/g; SAR(10 g) = 2.24 mW/g
Maximum value of SAR (measured) = 19.191 mW/g



0 dB = 19.190mW/g = 25.66 dB mW/g

Impedance Measurement Plot for Head 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.

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

Calibration Laboratory of
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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: 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

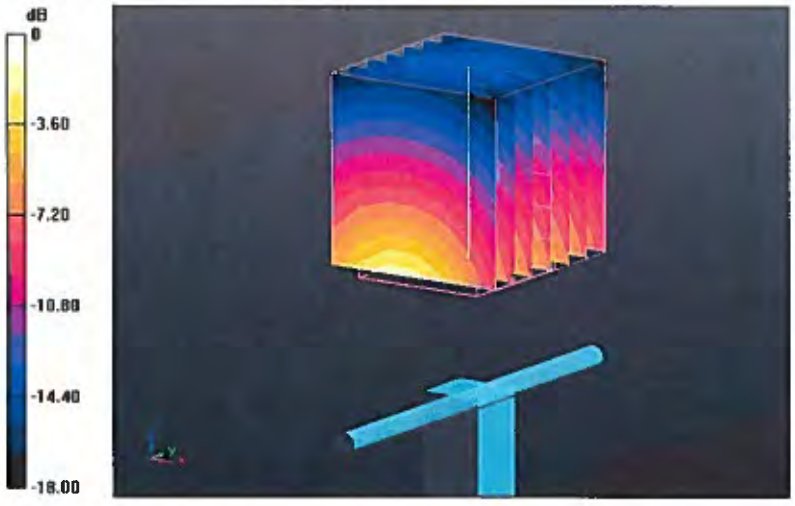
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:540

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:

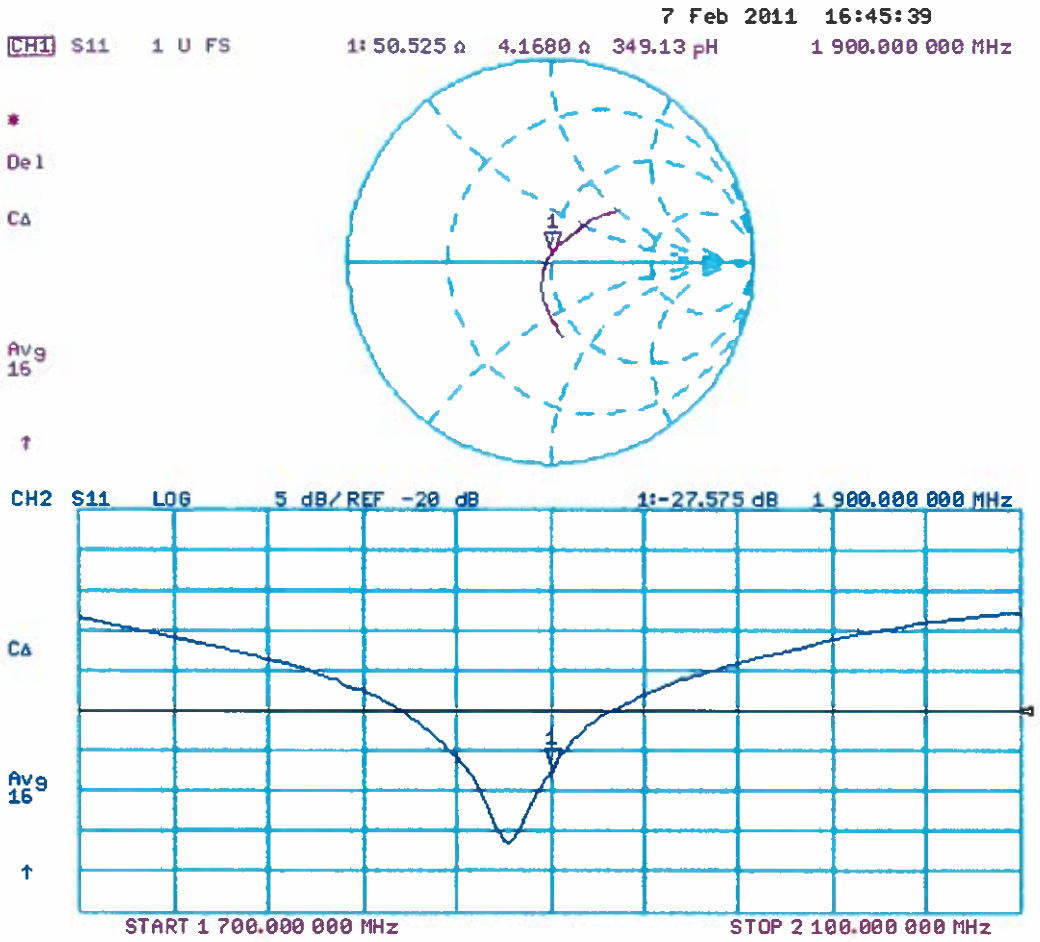
- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing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

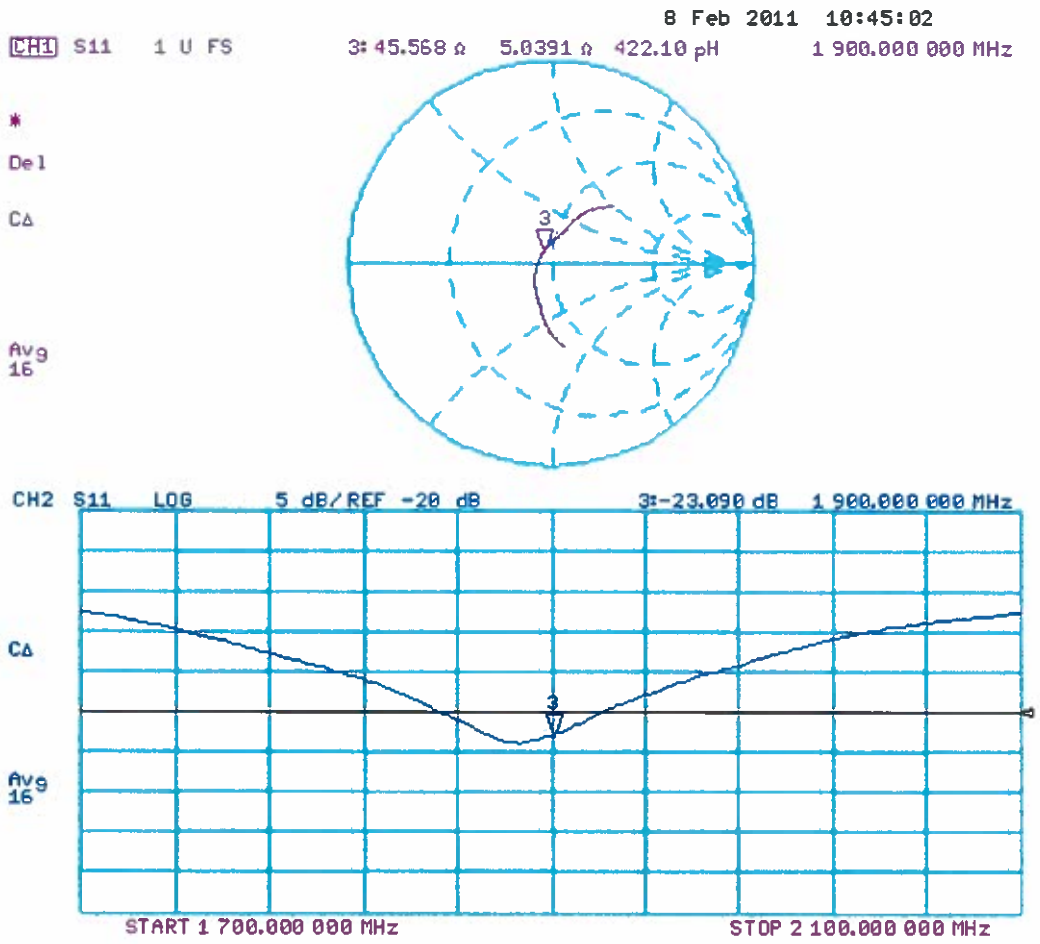
DASY5 Configuration:

- 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



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.