TEST REPORT

Test of: C6503

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

Test Report Seial No:
UL-SAR-RP90574JD02A V11.0

Version 11.0 supersedes all previous versions

This Test Report Is Issued Under The Authority Of Richelieu Quoi, SAR Technology Consultant:	(APPROVED SIGNATORY)
Checked By: Naseer Mirza	(APPROVED SIGNATORY)
Issue Date:	**08 February 2013**
Test Dates:	**22 October 2012 to 10 January 2013**

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1. Customer Information

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

2. Summary of Test Results

Test Name	Specification Reference	Result
Specific Absorption Rate-GSM 850	OET Bulletin 65 Supplement C: (2001-01)	✓
Specific Absorption Rate-PCS 1900	OET Bulletin 65 Supplement C: (2001-01)	✓
Specific Absorption Rate-UMTS-FDD 5	OET Bulletin 65 Supplement C: (2001-01)	✓
Specific Absorption Rate - LTE Band 5 (1.4 MHz & 10MHz)	OET Bulletin 65 Supplement C: (2001-01)	✓
Specific Absorption Rate-Wi-Fi 802.11b/g/n 2.4 GHz	OET Bulletin 65 Supplement C: (2001-01)	✓
Specific Absorption Rate- Wi-Fi 802.11a/n 5GHz	OET Bulletin 65 Supplement C: (2001-01)	✓
Key to Results	✓ = Complied ✗ = Did not comply	

2.1. Highest Reported Individual SAR per Band per Exposure condition

Exposure Configuration	Technology Band	Highest Reported 1g -SAR (W/kg)	Equipment Class	Max Rated Source base Avg Power + Max Tolerance [dBm]	Highest Reported 1g-SAR (W/kg)
HEAD (Separation Distance 0mm)	GSM850	0.166	PCE	23.8	0.383
	PCS1900	0.236		19.5	
	UMTS FDD 5	0.383		25.1	
	LTE Band 5 (1.4 MHz)	0.343		24.2	
	WLAN 2.4 GHz (802.11b)	0.159	DTS	19.0	0.159
	WLAN 5.0 GHz (802.11a)	0.095		15.0	
HOTSPOT (Separation Distance 10mm)	GSM850	0.562	PCE	25.4	1.238
	PCS1900	1.238		20.5	
	UMTS FDD 5	1.004		25.1	
	LTE Band 5 (1.4 MHz)	0.742		24.2	
	WLAN 2.4 GHz (802.11b)	0.439	DTS	19.0	0.439
	WLAN 5.0 GHz (802.11a)	0.304		15.0	
BODY-WORN (Separation Distance 15mm)	GSM850	0.388	PCE	23.8	0.825
	PCS1900	0.737		22.1	
	UMTS FDD 5	0.825		25.1	
	LTE Band 5 (1.4 MHz)	0.487		24.2	
	WLAN 2.4 GHz (802.11b)	0.173	DTS	19.0	0.203
	WLAN 5.0 GHz (802.11a)	0.203		15.0	

2.2. Highest Reported Simultineous Transmitter SAR per Exposure condition

Simultineous Transmitter Evaluation:

Exposure Configuration	Technology Band	Highest Reported 1g SAR (W/kg)	Equipment Class	Max Rated Source base Avg Power + Max Tolerance [dBm]	Highest Reported Sum-SAR 1g-SAR (W/kg)
HEAD (Separation Distance 0mm)	LTE Band 5	0.343	PCE	24.2	0.502
	WLAN 2.4 GHz	0.159	DTS	19.0	
HOTSPOT (Separation Distance 10mm)	UMTS FDD 5	1.004	PCE	25.1	1.443
	WLAN 2.4 GHz	0.439	DTS	19.0	
	UMTS FDD 5	1.004	PCE	25.1	1.192
	Bluetooth 2.4 GHz	0.188	DSS	9.6	
BODY-WORN (Separation Distance 15mm)	UMTS FDD 5	0.825	PCE	25.1	1.020
	WLAN 5.0 GHz	0.195	DTS	15.0	
	UMTS FDD 5	0.825	PCE	25.1	0.951
	Bluetooth 2.4 GHz	0.126	DSS	9.6	

Note(s):

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the *reported* standalone SAR of each applicable simultaneous transmitting antenna.

Simultaneous transmission was not required as t he summation was < 1.6 W/kg (See section 7.4 of this report)

2.3. SAR measurement variability and measurement uncertainty analysis:

Exposure Configuration	Technology Band	Measured 1g -SAR (W/kg)	Equipment Class	Max Meas. Source base Avg Power [dBm]	Ratio of Largest to Smallest SAR Measured
HOTSPOT (Separation Distance 10mm)	PCS1900 (Original)	1.210	PCE	20.4	1.02
	PCS1900 (Repeat)	1.190		20.4	
	UMTS FDD 5 (Original)	0.981		25.0	1.02
	UMTS FDD 5 (Repeat)	0.966		25.0	

Note(s):

1. The following step below were followed as per KDB publication 865664 D01:

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

2.4. Location of Tests

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

2.5.Nominal and Maximum Ouput power

Note: The following source based average rated powers for GSM/GPRS/EDGE are without consideration of uplink time slot.

Bands	Speech (Voice Mode)	
	Target (dBm)	Tolerance + - (dB)
GSM850	32.0	-1.0 ~ +0.8
PCS1900	27.8	-0.8 ~ +0.7

Bands	GPRS (Power Back Off Disabled)							
	Tx Slot 1		Tx Slot 2		Tx Slot 3		Tx Slot 4	
	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)
GSM850	32.0	-1.0 ~ +0.8	30.5	-1.5 ~ +0.9	28.7	-1.5 ~ +0.9	27.5	-1.5 ~ +0.9
PCS1900	27.8	-0.8 ~ +0.7	27.5	-1.5 ~ +0.6	25.7	-1.5 ~ +0.5	24.5	-1.5 ~ +0.7

Bands	GPRS (Hotspot On ~ Power Back Off Enabled)							
	Tx Slot 1		Tx Slot 2		Tx Slot 3		Tx Slot 4	
	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)
GSM850	32.0	-1.0 ~ +0.8	30.5	-1.5 ~ +0.9	28.7	-1.5 ~ +0.9	27.5	-1.5 ~ +0.9
PCS1900	27.8	-0.8 ~ +0.7	25.9	-1.5 ~ +0.6	24.2	-1.5 ~ +0.5	22.8	-1.5 ~ +0.7

Bands	EDGE GMSK (MCS1-4) (Power Back Off Disabled)							
	Tx Slot 1		Tx Slot 2		Tx Slot 3		Tx Slot 4	
	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)
GSM850	32.0	-1.0 ~ +0.8	30.5	-1.5 ~ +0.9	28.7	-1.5 ~ +0.9	27.5	-1.5 ~ +0.9
PCS1900	27.8	-0.8 ~ +0.7	27.5	-1.5 ~ +0.6	25.7	-1.5 ~ +0.5	24.5	-1.5 ~ +0.7

Bands	EDGE GMSK (MCS1-4) (Hotspot On ~ Power Back Off Enabled)							
	Tx Slot 1		Tx Slot 2		Tx Slot 3		Tx Slot 4	
	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)
GSM850	32.0	-1.0 ~ +0.8	30.5	-1.5 ~ +0.9	28.7	-1.5 ~ +0.9	27.5	-1.5 ~ +0.9
PCS1900	27.8	-0.8 ~ +0.7	25.9	-1.5 ~ +0.6	24.2	-1.5 ~ +0.5	22.8	-1.5 ~ +0.7

Bands	EDGE 8PSK (MCS5-9) (Power Back Off Disabled)							
	Tx Slot 1		Tx Slot 2		Tx Slot 3		Tx Slot 4	
	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)
GSM850	27.0	-1.5 ~ +1.5	24.0	-1.5 ~ +2.2	23.2	-1.5 ~ +2.2	22.0	-1.5 ~ +2.2
PCS1900	25.2	-1.5 ~ +1.5	23.0	-1.5 ~ +1.5	22.2	-1.5 ~ +1.5	21.0	-1.5 ~ +1.5

Bands	EDGE 8PSK (MCS5-9) (Hotspot On ~ Power Back Off Enabled)							
	Tx Slot 1		Tx Slot 2		Tx Slot 3		Tx Slot 4	
	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)
GSM850	27.0	-1.5 ~ +1.5	24.0	-1.5 ~ +2.2	23.2	-1.5 ~ +2.2	22.0	-1.5 ~ +2.2
PCS1900	25.2	-1.5 ~ +1.5	23.0	-1.5 ~ +1.5	22.2	-1.5 ~ +1.5	21.0	-1.5 ~ +1.5

Nominal and Maximum Ouput power (Continued)

Bands	CS		HS	
	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)
UMTS FDD 5	24.0	-1.5 ~ +1.1	24.0	-1.5 ~ +1.1

Bands	QPSK (1 RB, 50%RB, 100%RB)		16QAM (1 RB, 50%RB, 100%RB)	
	Target (dBm)	Tolerance + - (dB)	Target (dBm)	Tolerance + - (dB)
LTE Band 5	23.0	-1.0 ~ +1.2	22.5	-1.0 ~ +1.2

	WLAN Modes					
	2.4 GHz 802.11b		2.4 GHz 802.11g		2.4 GHz 802.11n	
	1 Mbps	11 Mbps	6 Mbps	54 Mbps	6.5 Mbps	65 Mbps
Max Tx Power + Upper Tolerance (dBm)	19.0	13.0	18.0	10.0	17.0	10.0

WLAN Modes								
5.0 GHz 802.11a								
	5.2 GHz 802.11a		5.3 GHz 802.11a		5.6 GHz 802.11a		5.8 GHz 802.11a	
	6 Mbps	54 Mbps	6 Mbps	54 Mbps	6 Mbps	54 Mbps	6 Mbps	54 Mbps
Max Tx Power + Upper Tolerance (dBm)	15.0	7.0	15.0	7.0	15.0	7.0	15.0	7.0

WLAN Modes								
5.0 GHz 802.11n HT20								
	5.2 GHz 802.11n		5.3 GHz 802.11n		5.6 GHz 802.11n		5.8 GHz 802.11n	
	6.5 Mbps	65 Mbps	6.5 Mbps	65 Mbps	6.5 Mbps	65 Mbps	6.5 Mbps	65 Mbps
Max Tx Power + Upper Tolerance (dBm)	14.0	7.0	14.0	7.0	14.0	7.0	14.0	7.0

WLAN Modes								
5.0 GHz 802.11n HT40								
	5.2 GHz 802.11n		5.3 GHz 802.11n		5.6 GHz 802.11n		5.8 GHz 802.11n	
	13.5 Mbps	135 Mbps	13.5 Mbps	135 Mbps	13.5 Mbps	135 Mbps	13.5 Mbps	135 Mbps
Max Tx Power + Upper Tolerance (dBm)	10.0	5.0	12.0	6.5	9.5	5.5	9.0	5.0

Note:

1. As per KDB865664 D02 SAR Reporting v01, 2.1.4(a), the nominal and maximum average source based rated power, declared by manufacute are shown in the above tables.
2. These are specified maximum allowed average power for all the wireless modes and frequency bands supported.

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.

The Equipment Under Test complied with the Specific Absorption Rate for general population/uncontrolled exposure limit of 1.6 W/kg as specified in FCC 47 CFR part 2 (2.1093) and ANSI C95.1-1992 and has been tested inaccordance with the reference documents in section 3.2 of this report.

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.

IEEE 1528: 2003
IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

FCC KDB Publication:

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

KDB 447498 D01 General RF Exposure Guidance v05

KDB 648474 D04 SAR Handsets Multi Xmiter and Ant v01

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 v02

KDB 941225 D06 Hot Spot SAR v01

KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01

KDB 865664 D02 SAR Reporting v01

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. Equipment Under Test (EUT)

4.1. Identification of Equipment Under Test (EUT)

Description:	Mobile Handset
Brand Name:	Sony
Model Name or Number:	C6503
Type Number:	PM-0240-BV
Serial Number:	CB5121TTZN
IMEI Number:	00440245-045237-4
Hardware Version Number:	SP1.2
Software Version Number:	10.1.A.0.228
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0240
Country of Manufacture:	China
Date of Receipt:	22 October 2012

Note(s):

This sample was used to perform WWAN SAR evaluation measurements on bands GSM850 Head, PCS1900 and LTE Band 5 only. The sample supports simultaneous transmission with the WWAN and WLAN. 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:	C6503
Type Number:	PM-0240-BV
Serial Number:	CB5121TU04
IMEI Number:	00440245-045128-5
Hardware Version Number:	SP1.2
Software Version Number:	10.1.A.0.228
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0240
Country of Manufacture:	China
Date of Receipt:	22 October 2012

Note(s):

This sample was used to perform WWAN SAR evaluation measurements on bands UMTS FDD 5 and LTE Band 5 only. The sample supports simultaneous transmission with the WWAN and WLAN. 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:	C6503
Type Number:	PM-0240-BV
Serial Number:	CB5121TUAF
IMEI Number:	00440245-045245-7
Hardware Version Number:	SP1.2
Software Version Number:	10.1.A.0.228
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0240
Country of Manufacture:	China
Date of Receipt:	22 October 2012

Note(s):

This sample was used to perform WWAN SAR evaluation measurements on band GSM850 Body only. The sample supports simultaneous transmission with the WWAN and WLAN. 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:	C6503
Type Number:	PM-0240-BV
Serial Number:	CB5121SWNV
IMEI Number:	00440245-045251-5
Hardware Version Number:	SP1.2
Software Version Number:	ETS Special
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0240
Country of Manufacture:	China
Date of Receipt:	22 October 2012

Note(s):

This sample was used to perform WLAN SAR measurements on bands WLAN 2.4 GHz and WLAN 5GHz Head only. The sample supports simultaneous transmission with the WWAN and WLAN. 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:	C6503
Type Number:	PM-0240-BV
Serial Number:	CB5121TU6L
IMEI Number:	00440245-045247-3
Hardware Version Number:	SP1.2
Software Version Number:	ETS Special
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0240
Country of Manufacture:	China
Date of Receipt:	22 October 2012

Note(s):

This sample was used to perform WLAN SAR evaluation on 5GHz Body only. The sample supports simultaneous transmission with the WWAN and WLAN. 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:	C6503
Type Number:	PM-0240-BV
Serial Number:	CB5121TUAT
IMEI Number:	00440245-045227-5
Hardware Version Number:	SP1.2
Software Version Number:	10.1.A.0.228
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0240
Country of Manufacture:	China
Date of Receipt:	22 October 2012

Note(s):

This sample was used to perform WWAN conducted power measurements only. The sample supports simultaneous transmission with the WWAN and WLAN. 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:	C6503
Type Number:	PM-0240-BV
Serial Number:	CB5121TU3L
IMEI Number:	00440245-045248-1
Hardware Version Number:	SP1.2
Software Version Number:	ETS Special
Hardware Revision of GSM Module:	Not Specified
Software Revision of GSM Module:	Not Specified
FCC ID Number:	PY7PM-0240
Country of Manufacture:	China
Date of Receipt:	22 October 2012

Note(s):

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

Auto RF Power Back-off' mode facility is available on 'Hotspot Mode Configuration of PCS1900 band only. There is no power back-off to the WLAN 2.4 GHz or WLAN 5.0 GHz.

4.2. Description of EUT

The Equipment Under Test is a Smart Phone with GSM 2G Quad Band, 3G Penta band, LTE Penta Band and Wi-Fi bands. The EUT has GPRS Class 33 / EDGE Class 33, UMTS FDD 1, 5, 8 With HSPA (with HSDPA Category 24 and HSUPA Category 6) , LTE Band 1, 3, 5, 7, 8, 20 WLAN 802.11 a/b/g/n, Bluetooth Class 1, Personal hotspot mode with 'Auto RF Power Back-Off' and RFID mode capabilities.

4.3. Modifications Incorporated in the EUT

EUT (IMEI: 00440245-045237-4) is used to perform GSM850 Head, PCS1900 and LTE Band 5 SAR measurements only.

EUT (IMEI: 00440245-045128-5) is used to perform UMTS FDD 5 and LTE Band 5 SAR measurements only.

EUT (IMEI: 00440245-045245-7) is used to perform GSM850 Body SAR measurements only.

EUT (IMEI: 00440245-045251-5) is used to perform WLAN 2.4 GHz and WLAN 5GHz Head SAR measurements only.

EUT (IMEI: 00440245-045247-3) is used to perform WLAN 5GHz Body SAR measurements only

EUT (IMEI: 00440245-045227-5) is used to perform WWAN conducted power measurements only.

EUT (IMEI: 00440245-045248-1) is used to perform WLAN conducted power measurements only.

4.4. Accessories

The following accessories were supplied with the EUT during testing:

Description:	Personal Hands-Free Kit (PHF)
Brand Name:	Sony
Model Name or Number:	None Stated
Serial Number:	None Stated
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

4.5. 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 (E5515C)
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 (E5515E)
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

Description:	CMW500 Communication tester
Brand Name:	Rohde & Schwartz
Model Name or Number:	CMW500
Serial Number:	112933
Cable Length and Type:	~4.0m Utiflex Cable
Connected to Port:	RF (Input / Output) Air Link

4.6. Additional Information Related to Testing

Equipment Category	GSM/GPRS850 PCS/GPRS1900 UMTS FDD 5 LTE Band 5 WiFi802.11 a/b/g/n	
Type of Unit	Portable Transceiver	
Intended Operating Environment:	Within GSM, UMTS, LTE , WiFi and *Bluetooth* Coverage	
Transmitter Maximum Output Power Characteristics:	GSM850	Communication Test Set was configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 5.
	PCS1900	Communication Test Set was configured to allow the EUT to transmit at a maximum power using Power Control Level (PCL) setting of 0.
	UMTS FDD 5	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
	LTE Band 5	Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D05.
	2.4 GHz WiFi 802.11b/g/n	Test Software was used to configure the EUT to transmit at a maximum power of up to 18.5dBm.
	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 15.0dBm.
	Bluetooth	:=9.6 dBm or ~9.12 mW
Transmitter Frequency Range:	GSM850	824 to 849 MHz
	PCS1900	1850 to 1910 MHz
	UMTS FDD 5	826 to 847 MHz
	LTE Band 5	829 to 844 MHz
	2.4 GHz WiFi 802.11b/g/n	2412 to 2462 MHz
	5.0 GHz Wi-Fi 802.11a/n (HT20 / HT40)	5180 to 5825 MHz

Additional Information Related to Testing (Continued)

Transmitter Frequency Allocation of EUT When Under Test:	Bands	Channel Number	Channel Description	Frequency (MHz)
	GSM850	128	Low	824.2
		190	Middle	836.6
		251	High	848.8
	PCS1900	512	Low	1850.2
		661	Middle	1880.0
		810	High	1909.8
	UMTS FDD 5	4132	Low	826.4
		4183	Middle	836.6
		4233	High	846.6
	LTE Band 5	20450(10MHz)	Low	829.0
		20525(10MHz)	Middle	836.5
		20600(10MHz)	High	844.0
		20407(1.4MHz)	Low	824.7
		20525(1.4MHz)	Middle	836.5
		20643(1.4MHz)	High	848.3
	2.4 GHz WiFi 802.11b/g/n	1	Low	2412.0
		6	Middle	2437.0
		11	High	2462.0

Additional Information Related to Testing (Continued)

Transmitter Frequency Allocation of EUT When Under Test:

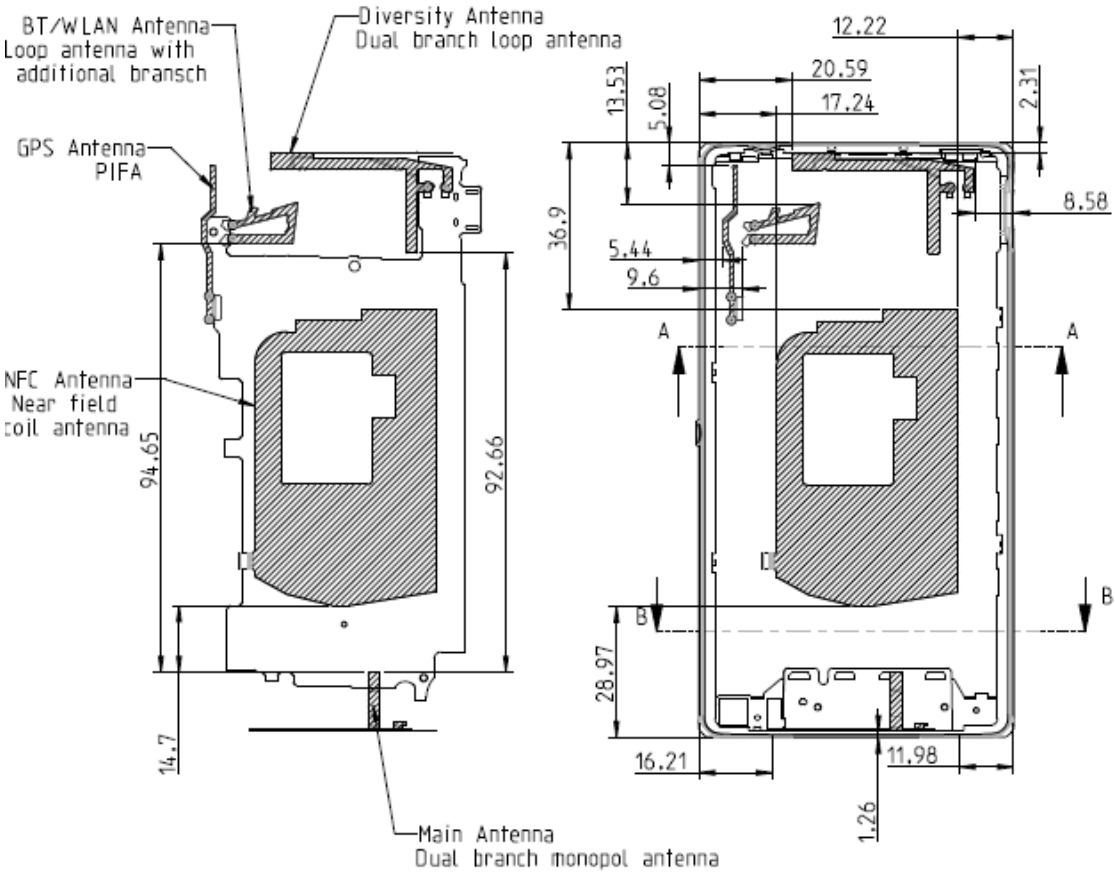
Band: 5.0 GHz Wi-Fi 802.11a/n (HT20 / HT40)

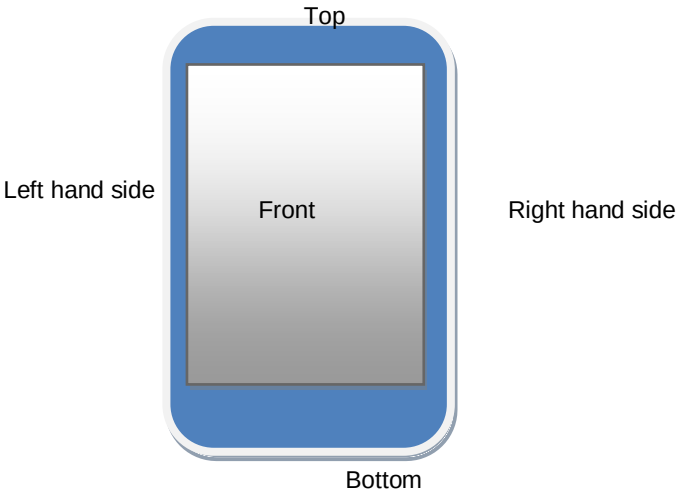
Channel Number	Frequency (MHz)
36	5180.0
38	5190.0
40	5200.0
44	5220.0
46	5230.0
48	5240.0
52	5260.0
54	5270.0
56	5280.0
60	5300.0
62	5310.0
64	5320.0
100	5500.0
102	5510.0
104	5520.0
108	5540.0
110	5550.0
112	5560.0
116	5580.0
118	5590.0
120	5600.0
124	5620.0
126	5630.0
128	5640.0
132	5660.0
134	5670.0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

Additional Information Related to Testing (Continued):	
Modulation(s):	GMSK (GSM/ GPRS): 217 Hz QPSK(UMTS / HSDPA/HSPA):0Hz DBPSK, CCK (Wi-Fi): 0 Hz FDD (QPSK/ 16QAM): 0 Hz
Modulation Scheme (Crest Factor):	GSMK (GSM): 8.3 GMSK (GPRS850): 2 GMSK (GPRS1900): 4 DBPSK, CCK (Wi-Fi): 1 QPSK(UMTS FDD / HSDPA): 1 FDD (QPSK/ 16QAM): 1
Antenna Type:	Internal integral
Antenna Length:	Unknown
Number of Antenna Positions:	1 fixed (WWAN) 1 fixed (GPS/WLAN/*Bluetooth*) 1 fixed (NFC) 1 fixed (Diversity)
Power Supply Requirement:	3.7V
Battery Type(s):	Li-ion

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

Additional Information Related to LTE Test parameter (Continued):		
#	**Description**	**Parameter**
5	Descriptions of the LTE transmitter and antenna implementation & identify whether it is a standalone transmitter operating independently of other wireless transmitters in the device or sharing hardware components and/or antenna(s) with other transmitters etc.	This model (C6503) has only one main antenna for LTE/UMTS/GSM bands (as pictured below).



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

Additional Information Related to LTE Test parameter (Continued):		
#	Description	Parameter
7	Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design: a) only mandatory MPR may be considered during SAR testing, when the maximum output power is permanently limited by the MPR implemented within the UE; and only for the applicable RB (resource block) configurations specified in LTE standards b) A-MPR (additional MPR) must be disabled.	The EUT incorporates MPR as per 36.101 as shown in the table below. MPR cannot be disabled after the phone is manufactured, MPR is mandatory.
8	Include the maximum average conducted output power measured on the required test channels for each channel bandwidth and UL modulation used in each frequency band: a) using 1 RB allocated at the low edge, centered and high edge of a channel b) using 50% RB allocated at the low edge, centered and high edge of a channel c) using 100% RB allocation	This is included in the section 7.2.1 of this report.
9	Identify all other U.S. wireless operating modes (3G, Wi-Fi, WiMax, Bluetooth etc), device/exposure configurations (head and body, antenna and handset flip-cover or slide positions, antenna diversity conditions etc.) and frequency bands used for these modes	The following bands are supported for the exposure conditions 1) GSM (850/1900) and UMTS FDD (850) - Exposure conditions: Head/Body worn SAR required for GSM / UMTS FDD and wireless personal hotspot. DTM is not supported. 2) Bluetooth 2.4GHz (Basic Rate & EDR) - Exposure conditions: BT SAR is not required as maximum output power < 19 mW & antenna separation distance > 5cm. 3) WiFi 2.4GHz - Exposure conditions: Head/Body SAR required for wireless personal hotspot. No power reduction. 4) WiFi 5 GHz - Exposure conditions: Head/Body SAR required for wireless personal hotspot. No power reduction

Additional Information Related to LTE Test parameter (Continued):

<table>
<tr><th>#</th><th>Description</th><th>Parameter</th></tr>
<tr><td>10</td><td>Include the maximum average conducted output power measured for the other wireless mode and frequency bands</td><td>This is included in the section 7.2.1 to 7.2.7 of this report.</td></tr>
<tr><td>11</td><td>Identify the simultaneous transmission conditions for the voice and data configurations supported by all wireless modes, device configurations and frequency bands, for the head and body exposure conditions and device operating configurations (handset flip or cover positions, antenna diversity conditions etc.)</td><td>
<table>
<tr><td></td><td colspan="6">Simultaneous transmission conditions</td></tr>
<tr><td></td><td colspan="3">WWAN</td><td>WLAN</td><td>WPAN</td><td rowspan="2">Sum of WWAN & WLAN or WPAN</td></tr>
<tr><td>#</td><td>LTE BAND Voice/ Data</td><td>GSM Voice/Data</td><td>UMTS Voice/ Data</td><td>Wi-Fi 802.11a/b/g /n</td><td>Bluetooth</td></tr>
<tr><td>1</td><td>X</td><td></td><td></td><td>X</td><td></td><td>X</td></tr>
<tr><td>2</td><td></td><td>X</td><td></td><td>X</td><td></td><td>X</td></tr>
<tr><td>3</td><td></td><td></td><td>X</td><td>X</td><td></td><td>X</td></tr>
<tr><td>4</td><td>X</td><td></td><td></td><td></td><td>X</td><td>X</td></tr>
<tr><td>5</td><td></td><td>X</td><td></td><td></td><td>X</td><td>X</td></tr>
<tr><td>6</td><td></td><td></td><td>X</td><td></td><td>X</td><td>X</td></tr>
</table>
Bluetooth average power measurement is below the rated threshold therefore Individual SAR will not be tested. Sim_Tx consideration will be based on the estimated SAR level.
</td></tr>
<tr><td>12</td><td>When power reduction is applied to certain wireless modes to satisfy SAR compliance for simultaneous transmission conditions, other equipment certification or operating requirements, include the maximum average conducted output power measured in each power reduction mode applicable to the simultaneous voice/data transmission configurations for such wireless configurations and frequency bands; and also include details of the power reduction implementation and measurement setup</td><td>Not applicable.</td></tr>
<tr><td>13</td><td>Include descriptions of the test equipment, test software, built-in test firmware etc. required to support testing the device when power reduction is applied to one or more transmitters/antennas for simultaneous voice/data transmission</td><td>Anritsu MT8820C communication simulator and CMW500 Communication tester which support LTE modes (voice/data) were used for testing.</td></tr>
<tr><td>14</td><td>When appropriate, include a SAR test plan proposal with respect to the above.</td><td>Not Applicable</td></tr>
<tr><td>15</td><td>If applicable, include preliminary SAR test data and/or supporting information in laboratory testing inquiries to address specific issues and concerns or for requesting further test reduction considerations appropriate for the device; for example simultaneous transmission configurations.</td><td>Not Applicable</td></tr>
</table>

5. Deviations from the Test Specification

Test was performed as per KDB 248227 D01 "SAR measurements for 802.11a/b/g v01r02", KDB 447498 D01 General RF Exposure Guidance v05, KDB 648474 D04 SAR Handsets Multi Xmiter and Ant v01, 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 v02, KDB 941225 D06 "Hot Spot SAR v01" , KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01, KDB 865664 D02 SAR Reporting 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".

The following settings were use for DC-HSDPA:
Apply FRC H-Set 12 (QPSK) in Table C.8.1.12 of TS 34.121-1 to measure DCHSDPA uplink maximum output power using the 4 Rel. 5 HSDPA subtests in Table C.10.1.4 of TS 234.121-1

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".

As per KDB 447498, the SAR exclusion threshold value for separation distance of 10mm is 19 mW for frequencies between 2450 MHz and hence Stand-Alone SAR body testing was not performed for the *Bluetooth* Technology.

As per conducted average power measured, SAR test was performed in the middle channels for WWAN and WiFi 2.4 GHz. The worstcase configuration for both Head and Body test was evaluated in the low and high channels.

The measured maximum conducted power for WLAN 2.4 HGz 802.11b/n is 18.5dBm (equivalent to 71mW) and for WLAN 5GHz is 14.0dBm (equivalent to 33mW).

As per KDB 447498, the SAR exclusion threshold value for separation distance of 10mm is 19mW for 2450MHz, 13mW for frequencies between 5.2- 5.4GHz and 12mW for 5.6GHz and hence, Stand-Alone SAR testing was performed on 2.4 GHz and 5GHz bands.

GPRS clas33 / 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. 4-uplink was found to give the highest power reference point measurement on the DASY4 system (unit v/m) for GPRS850 and 2-uplink was found to give the highest power reference point measurement on the DASY4 system (unit v/m) for GPRS1900. All settings were performed with the device in a fixed position Front facing phantom at 0mm separation to ensure there were no positioning errors. The following values were measured relative to the uplink settings:

GPRS Mode	GPRS850 Power reference (v/m)	GPRS1900 Power reference (v/m)
1 uplink	12.94	3.28
2 uplink	15.91	3.48
3 uplink	15.45	3.47
4 uplink	16.11	3.45

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.

For LTE testing,as per *KDB 941225 D05 SAR for LTE Devices v02r01, section 5.3*, when the maximum average conducted output power for a smaller channel Bandwidth is > ½ dB higher than that measured for the highest channel Bandwidth, the largest channel Bandwidth test procedures are applied to the smaller channel Bandwidth. Hence, for LTE Band 5, testing was performed on both 10MHz and 1.4MHz channel Bandwidth.

6. Operation and Configuration of the EUT during Testing

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 4 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**			**PCS1900:** **Power Table Settings used for Test Set**	
Power Control Level PCL	Nominal Power (dBm)		Power Control Level PCL	Nominal Power (dBm)
0 … 2	39		22 … 29	Reserved
3	37		30	33
4	35		31	32
5	**33**		**0**	**30**
6	31		1	28
7	29		2	26
8	27		3	24
9	25		4	22
10	23		5	20
11	21		6	18
12	19		7	16
13	17		8	14
14	15		9	12
15	13		10	10
16	11		11	8
17	9		12	6
18	7		13	4
19 ... 31	5		14	2
			15	0
			16 … 21	Reserved

- UMTS FDD 5 Call allocated mode with Communication Test Set configured to allow the EUT to transmit at a maximum as per KDB 941225 D01.
- UMTS FDD 5 - RMC 12.2kbps + HSUPA With Test loop mode 1 and TPC bits configured to all "1's", Sub-test 5, AG Index set to 21 and E-TFCI set to 81 with Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
- UMTS FDD 5 - RMC 12.2kbps + HSDPA With Test loop mode 1 and TPC bits configured to all "1's", Sub-test 1 with Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D01.
- UMTS FDD 5 - DC HSDPA (Cat 24) 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. (See Appendix 8 for detailed description)

6.1. Operating Modes

- LTE Band 5 data allocated mode at QPSK & 16 QAM on the 1.4MHz BW and 10MHz BW channels, using a Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D05.
- LTE Band 5 data allocated mode at QPSK & 16 QAM on the 20MHz BW channels, using a Communication Test Set configured to allow to EUT to transmit at a maximum power as per KDB 941225 D05.
- 2.4 GHz WiFi802.11b/g/n Data allocated mode using 'HyperTerminal' software to excise mode 'b', 'g' and 'n', with maximum power of up to 18.5 dBm for 'b' mode and 17.6 dBm for 'g' and 16.5 dBm for 'n' modes.
- 5.0 GHz WiFi802.11a/n HT20 Data allocated mode using 'HyperTerminal' software to excise mode 'a' and 'n', with maximum power of up to 15.0 dBm for 'a' mode and 13.0 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 Back-off' mode facility is available on 'Hotspot Mode Configuration of PCS1900 band only. There is no power back-off to the WLAN 2.4 GHz or WLAN 5.0 GHz.

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 Back-off' mode is activated, power reduction applies until 'Portable Wi-Fi hotspot' is deactivated by the user.

6.2. 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 33: setup for 1-uplink, 2-uplink, 3-uplink and 4-uplink were evaluated to find the setting with the highest power reference measurements. 4-uplink was found to give the highest power reference point measurement on the DASY4 system (unit v/m) for GPRS850 and 2-uplink was found to give the highest power reference point measurement on the DASY4 system (unit v/m) for GPRS1900. 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. 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.

6.3. Configuration Consideration

Technology Antenna	Configuration	Antenna-to-User Separation	Position	Antenna-to-Edge Separation	Evaluation Considered
WWAN	Head	0mm	Touch Left	<25mm	Yes
			Tilt Left	<25mm	Yes
			Touch Right	<25mm	Yes
			Tilt Right	<25mm	Yes
	Hotspot	10mm	Front	<25mm	Yes
			Back	<25mm	Yes
			Top Edge	>25mm	No
			Bottom Edge	<25mm	Yes
			Right Edge	<25mm	Yes
			Left Edge	<25mm	Yes
	Body	15mm	Front	<25mm	Yes
			Back	<25mm	Yes
WLAN	Head	0mm	Touch Left	<25mm	Yes
			Tilt Left	<25mm	Yes
			Touch Right	<25mm	Yes
			Tilt Right	<25mm	Yes
	Hotspot	10mm	Front	<25mm	Yes
			Back	<25mm	Yes
			Top Edge	<25mm	Yes
			Bottom Edge	>25mm	No
			Right Edge	<25mm	Yes
			Left Edge	<25mm	Yes
	Body	15mm	Front	<25mm	Yes
			Back	<25mm	Yes

Note:

1. Test distances are as per FCC KDB publication 447498 D01v05 for mobile handsets.
2. Bluetooth standalone SAR is excluded as the output power meets the exclusion threshold:

"

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,[16] where

   - $f_{(GHz)}$ is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation[17]
   - The result is rounded to one decimal place for comparison

" **Taken from FCC KDB publication 447498 D01v05**

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. Conducted Average Power Measurement

7.2.1.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	32.4	23.4	Conducted, GMSK
190	836.6	32.4	23.4	Conducted, GMSK
251	848.8	32.6	23.6	Conducted, GMSK

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

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	32.4	31.2	29.5	28.2	Conducted, GMSK
190	836.6	32.4	31.2	29.5	28.4	Conducted, GMSK
251	848.8	32.6	31.4	29.5	28.4	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	23.4	25.2	25.2	25.2	Conducted, GMSK
190	836.6	23.4	25.2	25.2	25.4	Conducted, GMSK
251	848.8	23.6	25.4	25.2	25.4	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	32.4	31.2	29.5	28.2	Conducted, GMSK
190	836.6	32.4	31.2	29.5	28.4	Conducted, GMSK
251	848.8	32.6	31.4	29.5	28.4	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	23.4	25.2	25.2	25.2	Conducted, GMSK
190	836.6	23.4	25.2	25.2	25.4	Conducted, GMSK
251	848.8	23.6	25.4	25.2	25.4	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: Power Back-off Disabled

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	28.3	26.2	25.2	24.0	Conducted, 8PSK
190	836.6	28.3	26.2	25.1	24.0	Conducted, 8PSK
251	848.8	28.5	26.2	25.1	24.0	Conducted, 8PSK

EDGE850 - Calculated Value with consideration for Uplink time slots:

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
128	824.2	19.3	20.2	20.9	21.0	Conducted, 8PSK
190	836.6	19.3	20.2	20.8	21.0	Conducted, 8PSK
251	848.8	19.5	20.2	20.8	21.0	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**

7.2.2.Conducted Average Power Measurement 2G: PCS1900 Power Back-off Disabled

Channel Number	Frequency (MHZ)	Power (dBm)	Avg. Burst Power with consideration for uplink time slot (dBm)	Note
512	1850.2	28.5	19.5	Conducted, GMSK
661	1880.0	28.4	19.4	Conducted, GMSK
810	1909.8	28.5	19.5	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	28.5	28.1	26.2	25.1	Conducted, GMSK
661	1880.0	28.4	28.1	26.2	25.1	Conducted, GMSK
810	1909.8	28.5	28.1	26.2	25.1	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	19.5	22.1	21.9	22.1	Conducted, GMSK
661	1880.0	19.4	22.1	21.9	22.1	Conducted, GMSK
810	1909.8	19.5	22.1	21.9	22.1	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	28.5	28.0	26.2	25.2	Conducted, GMSK
661	1880.0	28.5	28.0	26.2	25.2	Conducted, GMSK
810	1909.8	28.5	28.0	26.2	25.1	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	19.5	22.0	21.9	22.2	Conducted, GMSK
661	1880.0	19.5	22.0	21.9	22.2	Conducted, GMSK
810	1909.8	19.5	22.0	21.9	22.1	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:
Power Back-off Disabled

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	25.1	23.4	22.6	21.6	Conducted, 8PSK
661	1880.0	25.2	23.4	22.6	21.6	Conducted, 8PSK
810	1909.8	25.2	23.4	22.6	21.6	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	16.1	17.4	18.3	18.6	Conducted, 8PSK
661	1880.0	16.2	17.4	18.3	18.6	Conducted, 8PSK
810	1909.8	16.2	17.4	18.3	18.6	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**

7.2.3.Conducted Average Power Measurement 2G: PCS1900

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

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	28.5	26.3	24.7	23.4	Conducted, GMSK
661	1880.0	28.4	26.4	24.7	23.3	Conducted, GMSK
810	1909.8	28.5	26.4	24.6	23.4	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	19.5	20.3	20.4	20.4	Conducted, GMSK
661	1880.0	19.4	20.4	20.4	20.3	Conducted, GMSK
810	1909.8	19.5	20.4	20.3	20.4	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	28.5	26.3	24.7	23.3	Conducted, GMSK
661	1880.0	28.4	26.4	24.7	23.4	Conducted, GMSK
810	1909.8	28.5	26.4	24.6	23.4	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	19.5	20.3	20.4	20.3	Conducted, GMSK
661	1880.0	19.4	20.4	20.4	20.4	Conducted, GMSK
810	1909.8	19.5	20.4	20.3	20.4	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):
EDGE1900 - Measured Average Power without consideration for Uplink time slots: Power Back-off Enabled

Channel Number	Frequency (MHZ)	Power (dBm) 1Uplink	Power (dBm) 2Uplink	Power (dBm) 3Uplink	Power (dBm) 4Uplink	Note
512	1850.2	25.1	23.4	22.5	21.5	Conducted, 8PSK
661	1880.0	25.1	23.4	22.6	21.5	Conducted, 8PSK
810	1909.8	25.1	23.4	22.6	21.5	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	16.1	17.4	18.2	18.5	Conducted, 8PSK
661	1880.0	16.1	17.4	18.3	18.5	Conducted, 8PSK
810	1909.8	16.1	17.4	18.3	18.5	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**

7.2.4.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]
850 (Band 5)	4132 4357	24.1	23.3	22.5	22.4	23.4	23.7	22.5	24.0	22.7	25.1
	4183 4408	24.1	23.3	22.4	22.3	23.3	23.5	22.5	24.0	22.7	25.0
	4233 4458	24.2	23.5	22.5	22.4	23.4	23.6	22.5	24.0	22.8	25.0
Modes		HSDPA				HSPA					WCDMA
Sets		1	2	3	4	1	2	3	4	5	Voice / RMC 12.2kbps
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	

Modes		DC HSDPA (CAT 24)				WCDMA
Sets		1	2	3	4	Voice / RMC 12.2kbps
Band	Channel	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]	Power [dBm]
850 (Band 5)	4132 4357	23.0	23.5	23.5	23.4	25.1
	4183 4408	23.0	23.4	23.5	23.5	25.0
	4233 4458	22.9	23.4	23.4	23.5	25.0
ßc		2	12	15	15	
ßd		15	15	8	4	
ΔACK, ΔNACK, ΔCQI		8	8	8	8	
AGV		-	-	-	-	

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

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

Sub-test Setup for Release 5 HSDPA

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

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

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

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

Sub-test Setup for Release 6 HSPA

Sub-test	β_c	β_d	B_d *(SF)*	β_c/β_d	β_{hs} (1)	B_{oc}	B_{od}	B_{od} *(SF)*	B_{od} *(codes)*	CM (2) (dB)	Power Back-off (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 Power Back-off 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.

7.2.5.Conducted Average Power Measurement: LTE Band 5 (850 MHz) Power Reduction Disabled

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Max Target 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	24.2	24.1	24.1
		1	Mid	24	(0)	23.0	24.2	24.2	24.2
		1	High	49	(0)	23.0	24.2	24.1	24.1
		25	Low	0	(1)	23.0	23.2	23.2	23.1
		25	Mid	12	(1)	23.0	23.2	23.2	23.1
		25	High	25	(1)	23.0	23.2	23.2	23.1
		50	-	0	(1)	23.0	22.8	22.8	22.8
	16QAM	1	Low	0	(1)	22.5	22.8	22.9	22.8
		1	Mid	24	(1)	22.5	22.9	22.9	22.9
		1	High	49	(1)	22.5	22.9	22.8	22.9
		25	Low	0	(2)	22.5	21.9	21.9	21.8
		25	Mid	12	(2)	22.5	21.9	21.9	21.8
		25	High	25	(2)	22.5	21.9	21.9	21.8
		50	-	0	(2)	22.5	21.9	21.8	21.8

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Max Target Power (dBm)	Measured Avg Power (dBm).		
							Frequency **826.5 MHz** (Low)	Frequency **836.5 MHz** (Middle)	Frequency **846.5 MHz** (High)
5 MHz	QPSK	1	Low	0	(0)	23.0	24.2	24.1	23.9
		1	Mid	12	(0)	23.0	24.2	24.2	24.1
		1	High	24	(0)	23.0	24.2	24.1	23.9
		12	low	0	(1)	23.0	23.2	23.2	23.1
		12	Mid	6	(1)	23.0	23.2	23.2	23.1
		12	High	13	(1)	23.0	23.2	23.2	23.1
		25	-	0	(1)	23.0	23.2	23.1	23.1
	16QAM	1	Low	0	(1)	22.5	22.9	22.9	22.8
		1	Mid	12	(1)	22.5	23.0	23.0	22.9
		1	High	24	(1)	22.5	23.0	23.0	22.8
		12	low	0	(2)	22.5	22.0	22.1	21.9
		12	Mid	6	(2)	22.5	22.0	22.1	21.9
		12	High	13	(2)	22.5	22.0	22.1	21.9
		25	-	0	(2)	22.5	22.0	22.0	21.9

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

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Max Target 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	23.8	23.7	23.6
		1	Mid	7	(0)	23.0	23.9	23.8	23.7
		1	High	14	(0)	23.0	23.8	23.7	23.4
		8	Low	0	(1)	23.0	22.9	22.9	22.8
		8	Mid	4	(1)	23.0	22.9	22.9	22.8
		8	High	7	(1)	23.0	22.9	22.9	22.8
		15	-	0	(1)	23.0	22.9	22.9	22.8
	16QAM	1	Low	0	(1)	22.5	22.8	22.7	22.7
		1	Mid	7	(1)	22.5	22.9	22.7	22.8
		1	High	14	(1)	22.5	22.8	22.7	22.7
		8	Low	0	(2)	22.5	21.8	21.9	21.8
		8	Mid	4	(2)	22.5	21.9	21.9	21.8
		8	High	7	(2)	22.5	21.9	21.9	21.8
		15	-	0	(2)	22.5	21.9	21.9	21.8

Ch. BW	Modulations	RB Config	Start RB Offset		MPR	Max Target Power (dBm)	Measured Avg Power (dBm).		
							Frequency **824.7 MHz** (Low)	Frequency **836.5 MHz** (Middle)	Frequency **848.3 MHz** (High)
1.4 MHz	QPSK	1	Low	0	(0)	23.0	23.6	23.6	23.4
		1	Mid	3	(0)	23.0	23.7	23.7	23.6
		1	High	5	(0)	23.0	23.6	23.6	23.3
		3	Low	0	(0)	23.0	23.7	23.7	23.5
		3	Mid	1	(0)	23.0	23.7	23.7	23.5
		3	high	3	(0)	23.0	23.7	23.7	23.5
		6	-	0	(1)	23.0	22.8	22.8	22.7
	16QAM	1	Low	0	(1)	22.5	22.5	22.6	22.4
		1	Mid	3	(1)	22.5	22.6	22.7	22.5
		1	High	5	(1)	22.5	22.5	22.6	22.4
		3	Low	0	(1)	22.5	22.6	22.6	22.4
		3	Mid	1	(1)	22.5	22.6	22.6	22.4
		3	high	3	(1)	22.5	22.6	22.6	22.4
		6	-	0	(2)	22.5	21.7	21.7	21.6

Note(s):

1. The *Max Target Power* is the *Target Avergare Power* declared by manufacturer without consideration of the MPR.

7.2.6.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	18.5	**2.4GHz 802.11b** (1Mbps)
6	2437.0	18.2	
11	2462.0	18.1	
1	2412.0	11.7	**2.4GHz 802.11b** (11Mbps)
6	2437.0	12.5	
11	2462.0	11.4	
1	2412.0	17.4	**2.4GHz 802.11g** (6Mbps)
6	2437.0	17.3	
11	2462.0	17.6	
1	2412.0	8.3	**2.4GHz 802.11g** (54Mbps)
6	2437.0	9.4	
11	2462.0	8.9	

802.11n

Channel Number	Frequency (MHZ)	TX Power (dBm)	Note
1	2412.0	16.3	**2.4GHz 802.11n** (MCS0 6.5Mbps)
6	2437.0	16.5	
11	2462.0	16.4	
1	2412.0	8.0	**2.4GHz 802.11n** (MCS7 65Mbps)
6	2437.0	9.2	
11	2462.0	8.9	

7.2.7. Conducted Power Measurements Wi-Fi802.11a/n (5.0 GHz)
802.11a (5.0 GHz) (HT20)
Power Back-off Disabled

Channel Number	Frequency (MHZ)	TX Power (dBm) 6 Mbps	TX Power (dBm) 54 Mbps	Note
36*	**5180.0**	15.0	5.9	**5.2 GHz**
40	5200.0	14.9	5.8	
44	5220.0	14.9	5.8	
48*	**5240.0**	15.0	5.3	
52*	**5260.0**	14.6	7.0	**5.3 GHz**
56	5280.0	14.6	6.6	
60	5300.0	14.6	5.8	
64*	**5320.0**	14.8	5.6	
100	5500.0	14.6	5.0	**5.6 GHz**
104*	**5520.0**	14.6	5.2	
108	5540.0	14.6	5.4	
112	5560.0	14.6	5.6	
116*	**5580.0**	14.6	6.0	
120	5600.0	14.6	5.4	
124*	**5620.0**	14.6	5.2	
128	5640.0	14.6	6.5	
132	5660.0	14.6	5.6	
136*	**5680.0**	14.6	5.6	
140	5700.0	14.6	5.8	
149*	**5745.0**	14.8	5.6	**5.8 GHz**
153	5765.0	14.8	5.2	
157*	**5785.0**	14.8	6.1	
161	5805.0	14.8	5.7	
165*	**5825.0**	14.8	6.5	

*** Default test Channels**

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*	**5180.0**	12.8	6.0	**5.2 GHz**
40	5200.0	12.8	5.7	
44	5220.0	12.8	5.6	
48*	**5240.0**	12.8	5.6	
52*	**5260.0**	12.8	5.9	**5.3 GHz**
56	5280.0	12.8	6.0	
60	5300.0	12.9	6.0	
64*	**5320.0**	13.0	5.9	
100	5500.0	12.8	5.8	**5.6 GHz**
104*	**5520.0**	12.8	5.5	
108	5540.0	12.8	5.9	
112	5560.0	12.8	6.0	
116*	**5580.0**	12.9	6.1	
120	5600.0	12.9	6.1	
124*	**5620.0**	12.9	6.0	
128	5640.0	12.9	6.2	
132	5660.0	12.9	6.2	
136*	**5680.0**	13.0	6.2	
140	5700.0	13.0	6.0	
149*	**5745.0**	13.0	5.5	**5.8 GHz**
153	5765.0	13.0	5.1	
157*	**5785.0**	13.0	5.3	
161	5805.0	13.0	5.4	
165*	**5825.0**	13.0	5.9	

* Default test Channels

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	5190.0	8.6	4.1	**5.2 GHz**
46	5230.0	8.3	4.4	
54	5270.0	10.6	6.4	**5.3 GHz**
62	5310.0	9.1	3.7	
102	5510.0	7.5	3.1	**5.6 GHz**
110	5550.0	8.1	3.4	
118	5590.0	8.5	5.4	
126	5630.0	9.4	4.7	
134	5670.0	8.5	3.6	
151	5755.0	8.1	3.7	**5.8 GHz**
159	5795.0	8.8	4.7	

7.3. Test Results

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

All Maximum Rated Power in the following table is inclusive of the maximum tolerance.

7.3.1.Specific Absorption Rate - GSM 850 Head Configuration 1g
Power Back-off Disabled
Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.159
Maximum Reported Level (W/kg):	0.166

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
1	Touch Left	190	23.4	23.8	0.133	0.146	1	GMSK
2	Tilt Left	190	23.4	23.8	0.089	0.098	1	GMSK
3	Touch Right	190	23.4	23.8	0.136	0.149	1	GMSK
4	Tilt Right	190	23.4	23.8	0.083	0.091	1	GMSK
5	Touch Right	128	23.4	23.8	0.112	0.123	1	GMSK
6	Touch Right	251	23.6	23.8	0.159	0.166	1	GMSK

Note(s):

1. Voice Mode

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

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.562
Maximum Reported Level (W/kg):	0.562

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
7	Front	190	25.4	25.4	0.313	0.313	1, 2	GMSK
8	Back	190	25.4	25.4	0.456	0.456	1, 2	GMSK
9	Left Hand Side	190	25.4	25.4	0.333	0.333	1, 2	GMSK
10	Right Hand Side	190	25.4	25.4	0.418	0.418	1, 2	GMSK
11	Bottom	190	25.4	25.4	0.06	0.060	1, 2	GMSK
12	Back	128	25.2	25.4	0.424	0.444	1, 2	GMSK
13	Back	251	25.4	25.4	0.562	0.562	1, 2	GMSK

Note(s):

1. SAR measurements were performed using 4 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 D03 - SAR is not required for EDGE technology when the maximum average output power is lowe than that measured on the corresponding GPRS channels.

7.3.3.Specific Absorption Rate - GSM 850 Body-Worn Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.371
Maximum Reported Level (W/kg):	0.388

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
14	Back	190	23.4	23.8	0.272	0.298	1, 2	GMSK
15	Back	128	23.4	23.8	0.268	0.294	1, 2	GMSK
16	Back	251	23.6	23.8	0.371	0.388	1, 2	GMSK
17	Back with PHF	251	23.6	23.8	0.358	0.375	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.

7.3.4.Specific Absorption Rate - PCS 1900 Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.236
Maximum Reported Level (W/kg):	0.236

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
18	Touch Left	661	19.4	19.5	0.180	0.184	1	GMSK
19	Tilt Left	661	19.4	19.5	0.078	0.080	1	GMSK
20	Touch Right	661	19.4	19.5	0.113	0.116	1	GMSK
21	Tilt Right	661	19.4	19.5	0.053	0.054	1	GMSK
22	Touch Left	512	19.5	19.5	0.126	0.126	1	GMSK
23	Touch Left	810	19.5	19.5	0.236	0.236	1	GMSK

Note(s):

1. Voice Mode

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

Tissue Volume:	1g
Maximum Measured Level (W/kg):	1.210
Maximum Reported Level (W/kg):	1.238

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
24	Front	661	20.4	20.5	0.886	0.907	1, 2	GMSK
25	Front	512	20.3	20.5	0.835	0.874	1, 2	GMSK
26	Front	810	20.4	20.5	0.917	0.938	1, 2	GMSK
27	Back	661	20.4	20.5	0.720	0.737	1, 2	GMSK
28	Left Hand Side	661	20.4	20.5	0.142	0.145	1, 2	GMSK
29	Right Hand Side	661	20.4	20.5	0.088	0.090	1, 2	GMSK
30	Bottom	661	20.4	20.5	1.120	1.146	1, 2	GMSK
31	Bottom	512	20.3	20.5	1.020	1.068	1, 2	GMSK
32	Bottom	810	20.4	20.5	1.210	1.238	1, 2, 3	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.
3. As per 865664 D01, the highest SAR measured > 0.8 W/Kg has been re-measured and included in the report in section 2.3 under ***SAR Measurement Variability and Measurement Uncertainty Analysis Results*** Table.

*KDB 941225 D03- SAR is not required for EDGE technology when the maximum average output power is lowe than that measured on the corresponding GPRS channels.

7.3.6.Specific Absorption Rate - PCS 1900 Body-Worn Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.374
Maximum Reported Level (W/kg):	0.374

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
33	Front	661	19.4	19.5	0.349	0.357	1, 2	GMSK
34	Front	512	19.5	19.5	0.357	0.357	1, 2	GMSK
35	Front	810	19.5	19.5	0.325	0.325	1, 2	GMSK
36	Front with PHF	512	19.5	19.5	0.374	0.374	1, 2, 3	GMSK

Note(s):

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

7.3.7.Specific Absorption Rate- GPRS 1900 Body-Worn Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.737
Maximum Reported Level (W/kg):	0.737

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Uplink Meas. Burst Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
37	Front	661	22.1	22.1	0.695	0.695	1, 2, 3	GMSK
38	Front	512	22.1	22.1	0.697	0.697	1, 2, 3	GMSK
39	Front	810	22.1	22.1	0.737	0.737	1, 2, 3	GMSK

Note(s):

1. Data- SAR measurements were performed using 2 uplink timeslots
2. Front of EUT is worst case and most conservative configuration of GPRS hotspot mode and is applied to GPRS Body-worn.
3. SAR measurements were performed with the closest edge of the EUT at a separation distance of 15mm from the 'SAM' phantom flat section.

7.3.8.Specific Absorption Rate - UMTS-FDD 5 Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.374
Maximum Reported Level (W/kg):	0.383

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
40	Touch Left	4183	25.0	25.1	0.245	0.251	1	QPSK
41	Tilt Left	4183	25.0	25.1	0.165	0.169	1	QPSK
42	Touch Right	4183	25.0	25.1	0.26	0.266	1	QPSK
43	Tilt Right	4183	25.0	25.1	0.18	0.184	1	QPSK
44	Touch Right	4132	25.1	25.1	0.273	0.273	1	QPSK
45	Touch Right	4233	25.0	25.1	0.374	0.383	1	QPSK

Note(s):

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

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

7.3.9.Specific Absorption Rate - UMTS-FDD 5 Hotspot Mode Configuration 1g Power Back-off Disabled
Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.981
Maximum Reported Level (W/kg):	1.004

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
46	Front	4183	25.0	25.1	0.379	0.388	1, 2	QPSK
47	Back	4183	25.0	25.1	0.834	0.853	1, 2	QPSK
48	Back	4132	25.1	25.1	0.939	0.939	1, 2	QPSK
49	Back	4233	25.0	25.1	0.981	1.004	1, 2, 3	QPSK
50	Left Hand Side	4183	25.0	25.1	0.456	0.467	1, 2	QPSK
51	Right Hand Side	4183	25.0	25.1	0.436	0.446	1, 2	QPSK
52	Bottom	4183	25.0	25.1	0.112	0.115	1, 2	QPSK

Note(s):

1. Circuit Switch (CS) - RMC 12.2kbps with Test loop mode 1 and TPC bits configured to All "1's"
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.
3. As per 865664 D01, the highest SAR measured > 0.8 W/Kg has been re-measured and included in the report in section 2.3 under ***SAR Measurement Variability and Measurement Uncertainty Analysis Results*** Table.

*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

7.3.10.Specific Absorption Rate - UMTS-FDD 5 Body-Worn Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.806
Maximum Reported Level (W/kg):	0.825

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
53	Back	4183	25.0	25.1	0.672	0.688	1, 2	QPSK
54	Back	4132	25.1	25.1	0.774	0.774	1, 2	QPSK
55	Back	4233	25.0	25.1	0.806	0.825	1, 2	QPSK
56	Back with PHF	4233	25.0	25.1	0.728	0.745	1, 2, 3	QPSK

Note(s):

1. Back of EUT, is worst case and most conservative 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. Personal Hands-Free Kit attached, using the worst-case configuration acquired.

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

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.305
Maximum Reported Level (W/kg):	0.305

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.3 to 23.3

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
57	Touch Left	20525	24.2	24.2	0.221	0.221	1	QPSK
58	Touch Left	20525	23.2	24.2	0.184	0.232	2	QPSK
59	Tilt Left	20525	24.2	24.2	0.127	0.127	1	QPSK
60	Tilt Left	20525	23.2	24.2	0.120	0.151	2	QPSK
61	Touch Right	20525	24.2	24.2	0.208	0.208	1	QPSK
62	Touch Right	20525	23.2	24.2	0.163	0.205	2	QPSK
63	Tilt Right	20525	24.2	24.2	0.119	0.119	1	QPSK
64	Tilt Right	20525	23.2	24.2	0.101	0.127	2	QPSK
65	Touch Left	20450	24.2	24.2	0.201	0.201	1	QPSK
66	Touch Left	20600	24.2	24.2	0.305	0.305	1	QPSK

Note(s):

1. 1 RB Allocation centered on the Channel Bandwidth
2. 50% RB Allocation centered within the channel Bandwidth.

*As per KDB 941225 D05 SAR for LTE Devices v02r01, the following stpes were followed to perform SAR evaluation:

Largest Channel BW

1. QPSK 1RB Allocation

Start with 1RB offset Config with the highest maximum output power on required test channel (1RB low, 1RB high or 1RB mid). If value in (1) is <0.8W/kg, testing of remaining RB offset configurations and test channels not required for 1RB

2. QPSK 50% RB Allocation

Apply steps followed in (1) for measuring 50% RB

3. QPSK 100% RB Allocation

SAR not required if highest output power from (1) and (2) is higher than 100% RB output power and if SAR Values in step (1) and (2) ≤0.8W/kg

4. 16 QAM

Apply steps (1), (2) and (3) for testing 16-QAM/64-QAM, for each configuration SAR required only when highest maximum output power for the highest order modulation (ex. 16-QAM) > QPSK by 0.5dB or when reported SAR for QPSK > 1.45W/kg

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

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.696
Maximum Reported Level (W/kg):	0.696

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.3 to 23.3

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
67	Front	20525	24.2	24.2	0.277	0.277	1, 2	QPSK
68	Front	20525	23.2	24.2	0.228	0.287	1, 3	QPSK
69	Back	20525	24.2	24.2	0.511	0.511	1, 2	QPSK
70	Back	20525	23.2	24.2	0.410	0.516	1, 3	QPSK
71	Left Hand Side	20525	24.2	24.2	0.205	0.205	1, 2	QPSK
72	Left Hand Side	20525	23.2	24.2	0.227	0.286	1, 3	QPSK
73	Right Hand Side	20525	24.2	24.2	0.233	0.233	1, 2	QPSK
74	Right Hand Side	20525	23.2	24.2	0.324	0.408	1, 3	QPSK
75	Bottom	20525	24.2	24.2	0.057	0.057	1, 2	QPSK
76	Bottom	20525	23.2	24.2	0.057	0.072	1, 3	QPSK

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

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
77	Back	20450	24.2	24.2	0.613	0.613	1, 2	QPSK
78	Back	20600	24.2	24.2	0.696	0.696	1, 2	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. 1 RB Allocation centered on the Channel Bandwidth
3. 50% RB Allocation centered on the Channel Bandwidth

*As per KDB 941225 D05 SAR for LTE Devices v02r01, the following stpes were followed to perform SAR evaluation:

Largest Channel BW

1. QPSK 1RB Allocation

Start with 1RB offset Config with the highest maximum output power on required test channel (1RB low, 1RB high or 1RB mid). If value in (1) is <0.8W/kg, testing of remaining RB offset configurations and test channels not required for 1RB

2. QPSK 50% RB Allocation

Apply steps followed in (1) for measuring 50% RB

3. QPSK 100% RB Allocation

SAR not required if highest output power from (1) and (2) is higher than 100% RB output power and if SAR Values in step (1) and (2) ≤0.8W/kg

4. 16 QAM

Apply steps (1), (2) and (3) for testing 16-QAM/64-QAM, for each configuration SAR required only when highest maximum output power for the highest order modulation (ex. 16-QAM) > QPSK by 0.5dB or when reported SAR for QPSK > 1.45W/kg

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

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.419
Maximum Reported Level (W/kg):	0.419

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.3 to 23.3

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
79	Back with PHF	20600	24.2	24.2	0.419	0.419	1, 2, 3	QPSK

Note(s):

1. 1 RB Allocation centered on the Channel Bandwidth - Back of EUT is worst case and most conservative configuration of hotspot mode and is applied to 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.

*As per KDB 941225 D05 SAR for LTE Devices v02r01, the following stpes were followed to perform SAR evaluation:

Largest Channel BW

1. QPSK 1RB Allocation

Start with 1RB offset Config with the highest maximum output power on required test channel (1RB low, 1RB high or 1RB mid). If value in (1) is <0.8W/kg, testing of remaining RB offset configurations and test channels not required for 1RB

2. QPSK 50% RB Allocation

Apply steps followed in (1) for measuring 50% RB

3. QPSK 100% RB Allocation

SAR not required if highest output power from (1) and (2) is higher than 100% RB output power and if SAR Values in step (1) and (2) ≤0.8W/kg

4. 16 QAM

Apply steps (1), (2) and (3) for testing 16-QAM/64-QAM, for each configuration SAR required only when highest maximum output power for the highest order modulation (ex. 16-QAM) > QPSK by 0.5dB or when reported SAR for QPSK > 1.45W/kg

7.3.14.Specific Absorption Rate - LTE Band 5 – 1.4MHz Channel BW Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.292
Maximum Reported Level (W/kg):	0.343
Environmental Conditions:	
Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.3 to 23.3

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
80	Touch Left	20525	23.7	24.2	0.211	0.237	1	QPSK
81	Touch Left	20525	23.7	24.2	0.245	0.275	2	QPSK
82	Tilt Left	20525	23.7	24.2	0.114	0.128	1	QPSK
83	Tilt Left	20525	23.7	24.2	0.138	0.155	2	QPSK
84	Touch Right	20525	23.7	24.2	0.197	0.221	1	QPSK
85	Touch Right	20525	23.7	24.2	0.219	0.246	2	QPSK
86	Tilt Right	20525	23.7	24.2	0.114	0.128	1	QPSK
87	Tilt Right	20525	23.7	24.2	0.127	0.142	2	QPSK
88	Touch Left	20407	23.7	24.2	0.184	0.126	2	QPSK
89	Touch Left	20643	23.5	24.2	0.292	0.343	2	QPSK

Note(s):

1. 1 RB Allocation centered on the Channel Bandwidth
2. 50% RB Allocation centered within the channel Bandwidth.

*As per KDB 941225 D05 SAR for LTE Devices v02r01, the following stpes were followed to perform SAR evaluation, as when the maximum average conducted output power for a smaller channel Bandwidth is >0.5 dB higher than that measured for the highest channel Bandwidth, the largest channel Bandwidth test procedures are applied to the smaller channel Bandwidth.

Other Channel BW

1. QPSK 1RB Allocation

Start with 1RB offset Config with the highest maximum output power on required test channel (1RB low, 1RB high or 1RB mid). If value in (1) is <0.8W/kg, testing of remaining RB offset configurations and test channels not required for 1RB

2. QPSK 50% RB Allocation

Apply steps followed in (1) for measuring 50% RB

3. QPSK 100% RB Allocation

SAR not required if highest output power from (1) and (2) is higher than 100% RB output power and if SAR Values in step (1) and (2) ≤0.8W/kg

4. 16 QAM

Apply steps (1), (2) and (3) for testing 16-QAM/64-QAM, for each configuration SAR required only when highest maximum output power for the highest order modulation (ex. 16-QAM) > QPSK by 0.5dB or when reported SAR for QPSK > 1.45W/kg

7.3.15.Specific Absorption Rate - LTE Band 5 – 1.4MHz Channel BW Hotspot Mode Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.646
Maximum Reported Level (W/kg):	0.742

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.3 to 23.3

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
90	Front	20525	23.7	24.2	0.302	0.339	1, 2	QPSK
91	Front	20525	23.7	24.2	0.319	0.358	1, 3	QPSK
92	Back	20525	23.7	24.2	0.632	0.709	1, 2	QPSK
93	Back	20525	23.7	24.2	0.541	0.607	1, 3	QPSK
94	Left Hand Side	20525	23.7	24.2	0.466	0.523	1, 2	QPSK
95	Left Hand Side	20525	23.7	24.2	0.320	0.359	1, 3	QPSK
96	Right Hand Side	20525	23.7	24.2	0.465	0.522	1, 2	QPSK
97	Right Hand Side	20525	23.7	24.2	0.311	0.349	1, 3	QPSK
98	Bottom	20525	23.7	24.2	0.066	0.074	1, 2	QPSK
99	Bottom	20525	23.7	24.2	0.082	0.092	1, 3	QPSK

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

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
100	Back	20407	23.7	24.2	0.616	0.691	1, 2	QPSK
101	Back	20643	23.6	24.2	0.646	0.742	1, 2	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. 1 RB Allocation centered on the Channel Bandwidth
3. 50% RB Allocation centered within the channel Bandwidth.

*As per KDB 941225 D05 SAR for LTE Devices v02r01, the following stpes were followed to perform SAR evaluation, as when the maximum average conducted output power for a smaller channel Bandwidth is >0.5 dB higher than that measured for the highest channel Bandwidth, the largest channel Bandwidth test procedures are applied to the smaller channel Bandwidth.

Other Channel BW

1. QPSK 1RB Allocation

Start with 1RB offset Config with the highest maximum output power on required test channel (1RB low, 1RB high or 1RB mid). If value in (1) is <0.8W/kg, testing of remaining RB offset configurations and test channels not required for 1RB

2. QPSK 50% RB Allocation

Apply steps followed in (1) for measuring 50% RB

3. QPSK 100% RB Allocation

SAR not required if highest output power from (1) and (2) is higher than 100% RB output power and if SAR Values in step (1) and (2) ≤0.8W/kg

4. 16 QAM

Apply steps (1), (2) and (3) for testing 16-QAM/64-QAM, for each configuration SAR required only when highest maximum output power for the highest order modulation (ex. 16-QAM) > QPSK by 0.5dB or when reported SAR for QPSK > 1.45W/kg

7.3.16.Specific Absorption Rate - LTE Band 5 – 1.4MHz Channel BW Body-Worn Configuration 1g
Power Back-off Disabled
Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.424
Maximum Reported Level (W/kg):	0.487

Environmental Conditions:

Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	23.3 to 23.3

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
102	Back with PHF	20643	23.6	24.2	0.424	0.487	1, 2, 3	QPSK

Note(s):

1. 1 RB Allocation centered on the Channel Bandwidth - Back of EUT is worst case and most conservative configuration of hotspot mode and is applied to 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.

*As per KDB 941225 D05 SAR for LTE Devices v02r01, the following stpes were followed to perform SAR evaluation, as when the maximum average conducted output power for a smaller channel Bandwidth is >0.5 dB higher than that measured for the highest channel Bandwidth, the largest channel Bandwidth test procedures are applied to the smaller channel Bandwidth.

Other Channel BW

1. QPSK 1RB Allocation

Start with 1RB offset Config with the highest maximum output power on required test channel (1RB low, 1RB high or 1RB mid). If value in (1) is <0.8W/kg, testing of remaining RB offset configurations and test channels not required for 1RB

2. QPSK 50% RB Allocation

Apply steps followed in (1) for measuring 50% RB

3. QPSK 100% RB Allocation

SAR not required if highest output power from (1) and (2) is higher than 100% RB output power and if SAR Values in step (1) and (2) ≤0.8W/kg

4. 16 QAM

Apply steps (1), (2) and (3) for testing 16-QAM/64-QAM, for each configuration SAR required only when highest maximum output power for the highest order modulation (ex. 16-QAM) > QPSK by 0.5dB or when reported SAR for QPSK > 1.45W/kg

7.3.17.Specific Absorption Rate - Wi-Fi 2.4 GHz Head Configuration 1g Power Back-off Disabled Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.132
Maximum Reported Level (W/kg):	0.159
Environmental Conditions:	
Temperature Variation in Lab (°C):	24.0 to 24.0
Temperature Variation in Liquid (°C):	22.7 to 22.7

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
103	Touch Left	6	18.2	19.0	0.107	0.129	1	DBPSK
104	Tilt Left	6	18.2	19.0	0.081	0.097	1	DBPSK
105	Touch Right	6	18.2	19.0	0.061	0.073	1	DBPSK
106	Tilt Right	6	18.2	19.0	0.056	0.067	1	DBPSK
107	Touch Left	1	18.5	19.0	0.132	0.148	1	DBPSK
108	Touch Left	11	18.1	19.0	0.129	0.159	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 equal to that measured on the corresponding 802.11b channels.

7.3.18.Specific Absorption Rate - Wi-Fi 2.4 GHz Hotspot Mode Configuration 1g Power Back-off Disabled

Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.365
Maximum Reported Level (W/kg):	0.439

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
109	Front	6	18.2	19.0	0.023	0.028	1, 2	DBPSK
110	Back	6	18.2	19.0	0.365	0.439	1, 2	DBPSK
111	Left Hand Side	6	18.2	19.0	0.004	0.005	1, 2	DBPSK
112	Right Hand Side	6	18.2	19.0	0.044	0.053	1, 2	DBPSK
113	Top	6	18.2	19.0	0.049	0.059	1, 2	DBPSK
114	Back	1	18.5	19.0	0.34	0.381	1, 2	DBPSK
115	Back	11	18.1	19.0	0.235	0.289	1, 2	DBPSK

Note(s):

1. WLAN 802.11b 1Mbps
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.

7.3.19.Specific Absorption Rate - Wi-Fi 2.4 GHz Body-Worn Configuration 1g Power Back-off Disabled

Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.154
Maximum Reported Level (W/kg):	0.173

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
116	Back	1	18.5	19.0	0.154	0.173	1, 2	DBPSK
117	Back with PHF	1	18.5	19.0	0.154	0.173	1, 2, 3	DBPSK

Note(s):

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

7.3.20.Specific Absorption Rate - Wi-Fi 802.11a 5GHz Head Configuration 1g Power Back-off Disabled

Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.087
Maximum Reported Level (W/kg):	0.095

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
118	Touch Left	36	15.0	15.0	0.067	0.067	1, 3	BPSK
119	Tilt Left	36	15.0	15.0	0.077	0.077	1, 3	BPSK
120	Touch Right	36	15.0	15.0	0.046	0.046	1, 3	BPSK
121	Tilt Right	36	15.0	15.0	0.047	0.047	1, 3	BPSK
122	Tilt Left	64	14.8	15.0	0.087	0.091	1, 3	BPSK
123	Tilt Left	104	14.6	15.0	0.087	0.095	2, 3	BPSK
124	Tilt Left	149	14.8	15.0	0.017	0.018	1, 3	BPSK

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

*KDB 248227 - SAR is not required for 802.11n HT20 channels as the maximum average output power is less than ¼ db higher than 802.11a.

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

Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.011
Maximum Reported Level (W/kg):	0.014

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
125	Tilt Left	38	8.6	10.0	0.010	0.014	1, 2, 4	BPSK
126	Tilt Left	54	10.6	12.0	0.010	0.014	1, 2, 4	BPSK
127	Tilt Left	126	9.4	9.5	0.003	0.003	1, 3, 4	BPSK
128	Tilt Left	159	8.8	9.0	0.011	0.012	1, 2, 4	BPSK

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

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

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.304
Maximum Reported Level (W/kg):	0.304

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
129	Front	36	15.0	15.0	0.007	0.007	1, 2, 4	BPSK
130	Back	36	15.0	15.0	0.304	0.304	1, 2, 4	BPSK
131	Left Hand Side	36	15.0	15.0	0.001	0.001	1, 2, 4	BPSK
132	Right Hand Side	36	15.0	15.0	0.027	0.027	1, 2, 4	BPSK
133	Top	36	15.0	15.0	0.052	0.052	1, 2, 4	BPSK
134	Back	64	14.8	15.0	0.233	0.244	1, 2, 4	BPSK
135	Back	104	14.6	15.0	0.231	0.253	1, 3, 4	BPSK
136	Back	149	14.8	15.0	0.18	0.188	1, 2, 4	BPSK

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

KDB 248227 - SAR is not required for 802.11n HT20 channels as the maximum average output power is less than ¼ db higher than 802.11a.

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

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.091
Maximum Reported Level (W/kg):	0.095

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
137	Back	38	8.6	10.0	0.033	0.046	1, 2, 3, 5	BPSK
138	Back	54	10.6	12.0	0.045	0.062	1, 2, 3, 5	BPSK
139	Back	126	9.4	9.5	0.040	0.041	1, 2, 4, 5	BPSK
140	Back with PHF	159	8.8	9.0	0.091	0.095	1, 2, 3, 5	BPSK

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

7.3.24.Specific Absorption Rate - Wi-Fi 5GHz Body-Worn Configuration 1g Power Back-off Disabled

Test Summary:

Tissue Volume:	1g
Maximum Measured Level (W/kg):	0.203
Maximum Reported Level (W/kg):	0.203

Environmental Conditions:

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

Results:

Scan No.	EUT Position	Channel Number	Meas. Avg. Power (dBm)	Max. Rated Power (dBm)	Meas. Level (W/Kg)	Reported SAR (W/kg)	Note(s)	Mod.
141	Back	36	15.0	15.0	0.195	0.195	1, 2, 3	BPSK
142	Back	36	15.0	15.0	0.203	0.203	1, 2, 3, 4	BPSK

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.

7.4. Simultaneous Transmission SAR Analysis WWAN + WLAN

Simultaneous transmission is not required as the overall analysis shows that the sum of SAR is < 1.6 W/kg

Overall Worst Case:

1. WWAN+WLAN
2. WWAN+WPAN

	Reported SAR 1g (W/Kg)			
	WWAN	WLAN	WPAN	Maximum Sum of SAR
EUT Position	UMTS FDD 5	Wi-Fi 802.11b 2.4 GHz	Bluetooth 2.4 GHz	
Back	1.004	0.439		1.443
Back	1.004		0.188	1.192

Normal Analysis:

Head Configuration 1g – Worst cases measurements WWAN + WLAN

	Reported SAR 1g (W/Kg)						
	WWAN					WLAN	Sum of WWAN & WLAN
EUT Position	GSM 850	PCS 1900	UMTS FDD 5	LTE Band 5 (10MHz)	LTE Band 5 (1.4MHz)	Wi-Fi (2.4 GHz)	
Touch Left	0.146					0.159	0.305
Touch Right	0.166					0.073	0.239
Tilt Left	0.098					0.097	0.195
Tilt Right	0.091					0.067	0.158
Touch Left		0.236				0.159	0.395
Touch Right		0.116				0.073	0.189
Tilt Left		0.080				0.097	0.177
Tilt Right		0.054				0.067	0.121
Touch Left			0.251			0.159	0.410
Touch Right			0.383			0.073	0.456
Tilt Left			0.169			0.097	0.266
Tilt Right			0.184			0.067	0.251
Touch Left				0.305		0.159	0.464
Touch Right				0.215		0.073	0.288
Tilt Left				0.158		0.097	0.255
Tilt Right				0.133		0.067	0.200
Touch Left					0.343	0.159	0.502
Touch Right					0.246	0.073	0.319
Tilt Left					0.155	0.097	0.252
Tilt Right					0.142	0.067	0.209

Simultaneous Transmission SAR Analysis (Continued)

Hotspot Mode Configuration 1g – Worst cases measurements WWAN + WLAN

	Reported SAR 1g (W/Kg)				
	WWAN			WLAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 5	Wi-Fi (2.4 GHz)	
Front	0.313			0.028	0.341
Back	0.562			0.439	1.001
Left Hand Side	0.333			0.005	0.338
Right Hand Side	0.418			0.053	0.471
Bottom	0.060				0.060
Top				0.059	0.059
Front		0.938		0.028	0.966
Back		0.737		0.439	1.176
Left Hand Side		0.145		0.005	0.15
Right Hand Side		0.090		0.053	0.143
Bottom		1.238			1.238
Top				0.059	0.059
Front			0.388	0.028	0.416
Back			**1.004**	**0.439**	**1.443**
Left Hand Side			0.467	0.005	0.472
Right Hand Side			0.446	0.053	0.499
Bottom			0.115		0.115
Top				0.059	0.059

	Reported SAR 1g (W/Kg)			
	WWAN		WLAN	Sum of WWAN & WLAN
EUT Position	LTE Band 5 (10MHz)	LTE Band 5 (1.4MHz)	Wi-Fi (2.4 GHz)	
Front	0.301		0.028	0.329
Back	0.696		0.439	1.135
Left Hand Side	0.299		0.005	0.304
Right Hand Side	0.427		0.053	0.48
Bottom	0.075			0.075
Top			0.059	0.059
Front		0.358	0.028	0.386
Back		0.742	0.439	1.181
Left Hand Side		0.523	0.005	0.528
Right Hand Side		0.522	0.053	0.575
Bottom		0.093		0.093
Top			0.059	0.059

Simultaneous Transmission SAR Analysis WWAN + WLAN (Continued):

Body-Worn Configuration 1g – Worst cases measurements WWAN + WLAN

	Reported SAR 1g (W/Kg)				
	WWAN			WLAN	Sum of WWAN & WLAN
EUT Position	GSM850	PCS1900	UMTS FDD 5	Wi-Fi (5GHz)	
Front					
Back	0.388			0.195	0.583
Front With PHF					
Back with PHF	0.375			0.203	0.578
Front		0.737			0.737
Back				0.195	0.195
Front With PHF		0.374			0.374
Back with PHF				0.203	0.203
Front					
Back			0.825	0.195	1.020
Front With PHF					
Back with PHF			0.745	0.203	0.948

	Reported SAR 1g (W/Kg)			
	WWAN		WLAN	Sum of WWAN & WLAN
EUT Position	LTE Band 5 (10MHz)	LTE Band 5 (1.4MHz)	Wi-Fi (5GHz)	
Front				
Back			0.195	0.195
Front With PHF				
Back with PHF	0.419		0.203	0.622
Front				
Back			0.195	0.195
Front With PHF				
Back with PHF		0.487	0.203	0.690

Note(s):

1. The sum of WWAN and WLAN did not exceed 1.6 W/kg in any of the above cases and hence, the SAR to peak location separation ratio distance was not calculated.
2. For Bluetooth, SAR results are provided in the following table below. The separation distance of 10mm was used for hotspot mode and 15mm for body-worn configuration.
3. Since WLAN 2.4 GHz 1g Reported SAR for head and Hotspot were higher than WLAN 5.0 GHz 1g Reported SAR, WLAN 2.4 GHz is considered as worst case for the Simultaneous transmission worst case measurements in Head and Hotspot tables and WLAN 5.0 GHz 1g Reported SAR for Body-Worn was higher than WLAN 2.0 GHz 1g Reported SAR, WLAN 5.0 GHz is considered as worst case for the Simultaneous transmission worst case measurements in Body-worn table.
4. All the above EUT positions used for Hotpsot and Body-worn configurations are most conservative configuration.

***All WWAN and WLAN 1g SAR values used for Simultaneous Transmission SAR analysis are Reported SAR values**

7.5. Simultaneous Transmission SAR Analysis WWAN + WPAN

Hotspot Mode Configuration 1g – Worst cases measurements WWAN + WPAN

	Reported SAR 1g (W/Kg)				
	WWAN			WPAN	Sum of WWAN & WPAN
EUT Position	GSM850	PCS1900	UMTS FDD 5	*Bluetooth*	
Front	0.313			0.188	0.501
Back	0.562			0.188	0.750
Left Hand Side	0.333			0.188	0.521
Right Hand Side	0.418			0.188	0.606
Bottom	0.060				0.060
Top				0.188	0.188
Front		0.938		0.188	1.126
Back		0.737		0.188	0.925
Left Hand Side		0.145		0.188	0.333
Right Hand Side		0.090		0.188	0.278
Bottom		1.238			1.238
Top				0.188	0.188
Front			0.388	0.188	0.576
Back			**1.004**	**0.188**	**1.192**
Left Hand Side			0.467	0.188	0.655
Right Hand Side			0.446	0.188	0.634
Bottom			0.115		0.115
Top				0.188	0.188

	Reported SAR 1g (W/Kg)			
	WWAN		WPAN	Sum of WWAN & WPAN
EUT Position	LTE Band 5 (10MHz)	LTE Band 5 (1.4MHz)	*Bluetooth*	
Front	0.301		0.188	0.489
Back	0.696		0.188	0.884
Left Hand Side	0.299		0.188	0.487
Right Hand Side	0.427		0.188	0.615
Bottom	0.075			0.075
Top			0.188	0.188
Front		0.358	0.188	0.546
Back		0.742	0.188	0.930
Left Hand Side		0.523	0.188	0.711
Right Hand Side		0.522	0.188	0.710
Bottom		0.093		0.093
Top			0.188	0.188

Body-Worn Configuration 1g – Worst cases measurements WWAN + WPAN

	Reported SAR 1g (W/Kg)				
	WWAN			WPAN	Sum of WWAN & WPAN
EUT Position	GSM850	PCS1900	UMTS FDD 5	*Bluetooth*	
Front					
Back	0.388			0.126	0.514
Front With PHF					
Back with PHF	0.375			0.126	0.501
Front		0.737		0.126	0.863
Back					
Front With PHF		0.374		0.126	0.500
Back with PHF					
Front					
Back			0.825	0.126	0.951
Front With PHF					
Back with PHF			0.745	0.126	0.871

	Reported SAR 1g (W/Kg)			
	WWAN		WPAN	Sum of WWAN & WPAN
EUT Position	LTE Band 5 (10MHz)	LTE Band 5 (1.4MHz)	*Bluetooth*	
Front				
Back				
Front With PHF				
Back with PHF	0.419		0.126	0.545
Front				
Back				
Front With PHF				
Back with PHF		0.487	0.126	0.613

Note(s):

1. The sum of WWAN and WLAN or WWAN and WPAN does not exceed 1.6W/kg in any of the above cases and hence, the SAR to peak location separation ratio distance was not calculated.
2. Bluetooth SAR result is calculated as shown below following FCC KDB publication 447498.
3. The separation distance of 10mm was used for hotspot mode and 15mm for body-worn configuration.

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

- *(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;*
  where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
  - **10mm Bluetooth estimated SAR level:**

    Estimated *Bluetooth* SAR = (9.12mW/10mm)*(√2.4 / 7.5) = 0.188 W/kg
  - **15mm Bluetooth estimated SAR level:**

    Estimated *Bluetooth* SAR = (9.12mW/15mm)*(√2.4 / 7.5) = 0.126 W/kg

***All WWAN 1g SAR values used for Simultaneous Transmission SAR analysis are Reported SAR values.**

8. Measurement Uncertainty

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

8.7. 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

8.8. 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

UL 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
A2110	Data Acquisition Electronics	Schmid & Partner Engineering AG	DAE3	431	20 Sept 2012	12
A2077	Probe	Schmid & Partner Engineering AG	EX3 DV4	3814	24 Sept 2012	12
A1185	Probe	Schmid & Partner Engineering AG	ET3 DV6	1528	26 Jul 2012	12
A2113	Probe	Schmid & Partner Engineering AG	ET3 DV6	1587	11 May 2012	12
A2243	Probe	Schmid & Partner Engineering AG	ES3DV3	3304	31 Aug 2012	12
A2201	900 MHz Dipole Kit	Schmid & Partner Engineering AG	D900V2	035	16 Aug 2012	12
A1237	1900 MHz Dipole Kit	Schmid & Partner Engineering AG	D1900V2	540	08 Feb 2011	24
A1322	2450 MHz Dipole Kit	Schmid & Partner Engineering AG	D2450V2	725	08 Feb 2011	24
A1377	5.0 GHz Dipole Kit (Body)	Schmid & Partner Engineering AG	D5GHzV2	1016	10 Feb 2011	24
A1377	5.0 GHz Dipole Kit (Head)	Schmid & Partner Engineering AG	D5GHzV2	1016	23 Mar 2012	12

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
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	-
A2252	2mm Oval Phantom	Schmid & Partner Engineering AG	Eli5	1177	Calibrated before use	-
A215	20 dB Attenuator	Narda	766-20	9402	Calibrated as part of system	-
A1531	Antenna	AARONIA AG	7025	02458	-	-
A2263	Digital Camera	Samsung	PL211	9453C90B 607487L	-	-
M1015	Network Analyser	Agilent Technologies	8753ES	US39172406	09 Oct 2012	12
C1145	Cable	Rosenberger MICRO-COAX	FA147A F003003030	41843-1	Calibrated as part of system	-
C1146	Cable	Rosenberger MICRO-COAX	FA147A F030003030	41752-1	Calibrated as part of system	-
G0528	Robot Power Supply	Schmid & Partner Engineering AG	DASY4	None	Calibrated before use	-
GO591	Robot Power Supply	Schmid & Partner Engineering AG	DASY4	None	Calibrated before use	-
G0592	Robot Power Supply	Schmid & Partner Engineering AG	DASY53	None	Calibrated before use	-
G087	PSU	Thurlby Thandar	CPX200	100701	Calibrated before use	-
M1047	Robot Arm	Staubli	RX908 L	F00/SD8 9A1/A/01	Calibrated before use	-
M1653	Robot Arm	Staubli	RX908 L	F01/5J8 6A1/C/01	Calibrated before use	-
M1680	Robot Arm	Staubli	TX60 L	F12/5MZ7 A1/A/01	Calibrated before use	-
M1159	Signal Generator	Agilent Technologies	E8241A	US42110332	Internal Checked 10 Aug 2012 10 Dec 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

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
M1023	Dual Channel Power Meter	R & S	NRVD	863715/030	18 July 2012	12
S256	SAR Lab	UL	Site 56	N/A	Calibrated before use	-
S512	SAR Lab	UL	Site 57	N/A	Calibrated before use	-
S513	SAR Lab	UL	Site 58	N/A	Calibrated before use	-

Note:

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

A.1.1. Calibration Certificates

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

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

Cal Date	Dipole Calibration History									
	Dipole SN: 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%**		

Calibration Certificates (Continued)

Cal Date	Dipole Calibration History									
	Dipole SN: 1016, Frequency 5200 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)
28-Mar-12	Dipole calibrated for Body Only					Lab Annual Check of dipole		-20.48	48.89	-8.20
23-Mar-12	78.60	22.50	-20.30	52.90	-9.60	Dipole calibrated for Head Only				
10-Feb-11	Dipole calibrated for Body Only					76.70	21.20	-20.60	53.80	-8.90
14-Jan-09	Dipole calibrated for Body Only					76.40	21.40	-21.60	53.40	-8.00
19-Apr-07	80.50	22.80	-20.30	53.60	-9.40	77.10	21.70	-21.60	53.00	-8.00
17-Mar-06	80.20	22.60	-19.50	54.40	-10.20	74.50	20.90	-21.10	54.10	-8.20
19-Feb-05	86.00	24.10	-20.00	53.75	-9.73	78.40	21.80	-21.02	53.09	-8.68
Standard Deviation	**3.23**	**0.74**	**0.38**	**0.62**	**0.34**	**1.41**	**0.37**	**0.48**	**1.92**	**0.37**
|Mean Value|	**81.33**	**23.00**	**20.03**			**76.62**	**21.40**	**21.07**		
Relative standard deviation %	**3.97%**	**3.23%**	**1.88%**			**1.84%**	**1.72%**	**2.26%**		

Cal Date	Dipole Calibration History									
	Dipole SN: 1016, Frequency 5500 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)
28-Mar-12	Dipole calibrated for Body Only					Lab Annual Check of dipole		-30.54	46.65	0.50
23-Mar-12	84.50	24.20	-37.80	48.70	-0.20	Dipole calibrated for Head Only				
10-Feb-11	Dipole calibrated for Body Only					82.80	22.80	-34.80	48.40	-0.90
14-Jan-09	Dipole calibrated for Body Only					79.80	22.00	-36.60	48.60	0.50
19-Apr-07	80.60	22.70	-36.30	48.50	-0.10	76.20	21.40	-35.10	48.30	0.30
17-Mar-06	85.10	23.80	-36.00	48.80	-0.90	77.00	21.50	-35.90	48.40	0.00
19-Feb-05	86.00	24.10	-34.33	49.36	-1.79	78.80	21.90	-41.52	49.26	-0.25
Standard Deviation	**2.38**	**0.69**	**1.42**	**0.37**	**0.78**	**2.59**	**0.55**	**3.54**	**0.87**	**0.54**
|Mean Value|	**84.05**	**23.70**	**36.11**			**78.92**	**21.92**	**35.74**		
Relative standard deviation %	**2.83%**	**2.90%**	**3.94%**			**3.29%**	**2.53%**	**9.89%**		

Calibration Certificates (Continued)

Cal Date	Dipole Calibration History									
	Dipole SN: 1016, Frequency 5800 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)
28-Mar-12	Dipole calibrated for Body Only					Lab Annual Check of dipole		-22.41	47.77	8.27
23-Mar-12	78.10	22.30	-20.40	57.50	7.10	Dipole calibrated for Head Only				
10-Feb-11	Dipole calibrated for Body Only					71.70	19.70	-21.00	54.40	8.30
14-Jan-09	Dipole calibrated for Body Only					67.90	18.70	-19.40	56.70	9.30
19-Apr-07	74.10	20.80	-19.60	56.70	8.90	67.80	19.00	-18.50	57.30	10.60
17-Mar-06	79.80	22.30	-19.80	54.60	9.70	71.00	20.00	-18.60	55.40	11.20
19-Feb-05	80.80	22.40	-20.35	56.75	7.64	74.40	20.60	-19.15	56.85	9.54
Standard Deviation	**2.95**	**0.77**	**0.40**	**1.25**	**1.18**	**2.78**	**0.76**	**1.55**	**3.58**	**1.19**
|Mean Value|	**78.20**	**21.95**	**20.04**			**70.56**	**19.60**	**19.84**		
Relative standard deviation %	**3.77%**	**3.50%**	**1.99%**			**3.94%**	**3.90%**	**7.79%**		

Note:

1. 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 10.42 %. And the real and imaginary impedance standard deviation is within 5 **(Ω).**

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

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS) ASSET A2077 **Accreditation No.: SCS 108**
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

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

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3814

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

Calibration date: September 24, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: September 24, 2012

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

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

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF.*
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3814

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

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

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

Basic Calibration Parameters

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

Modulation Calibration Parameters

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

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

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

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

Calibration Parameter Determined in Head Tissue Simulating Media

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

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

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

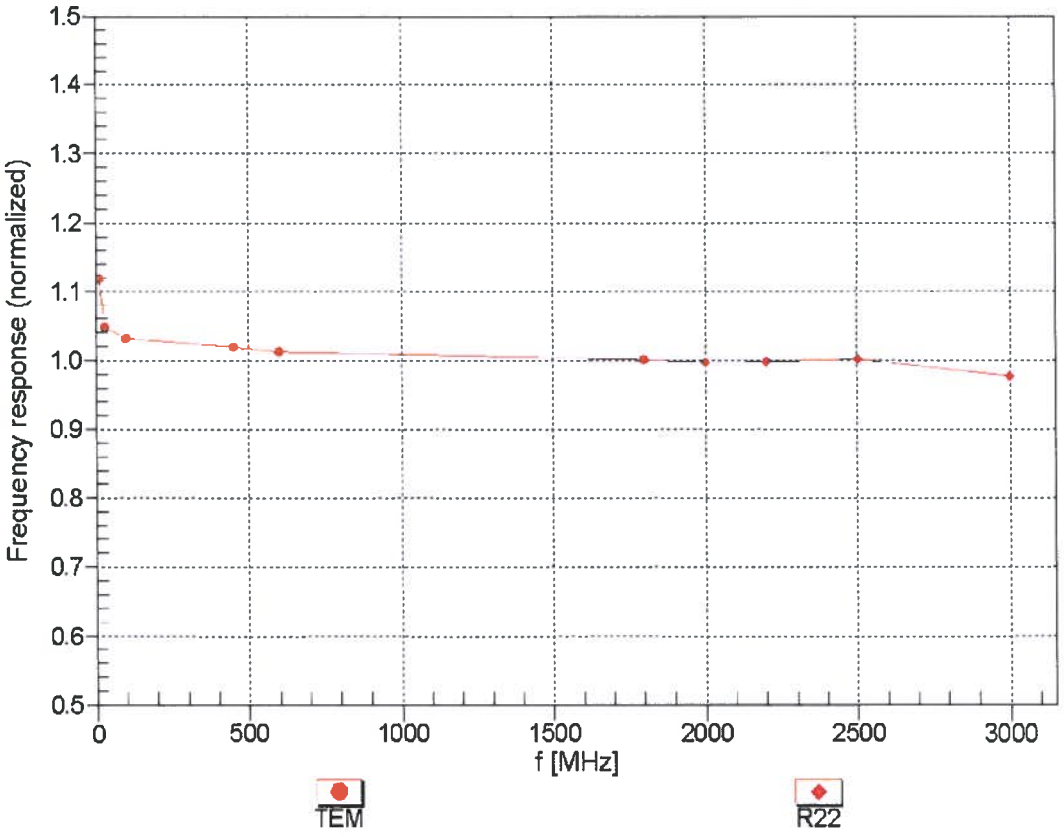
Calibration Parameter Determined in Body Tissue Simulating Media

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

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

Frequency Response of E-Field

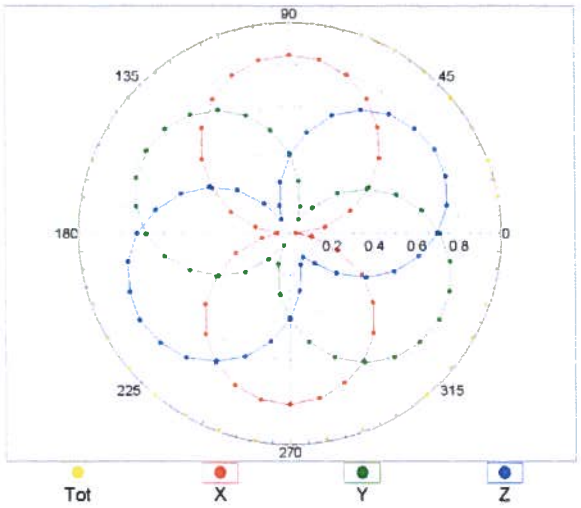
(TEM-Cell:ifi110 EXX, Waveguide: R22)



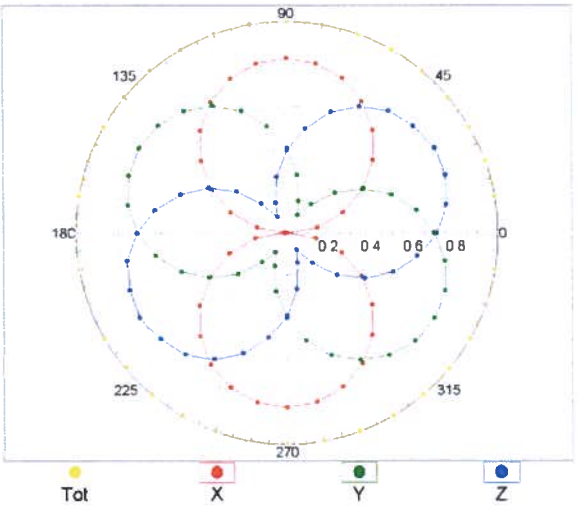
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

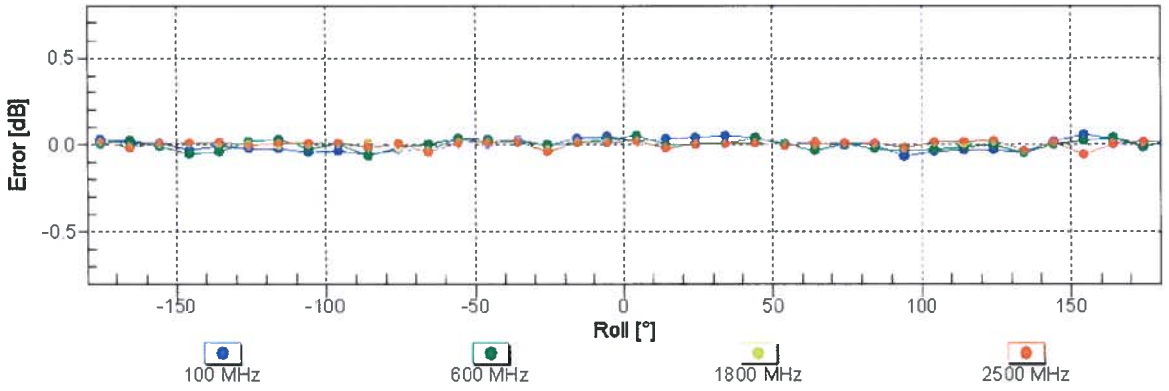
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



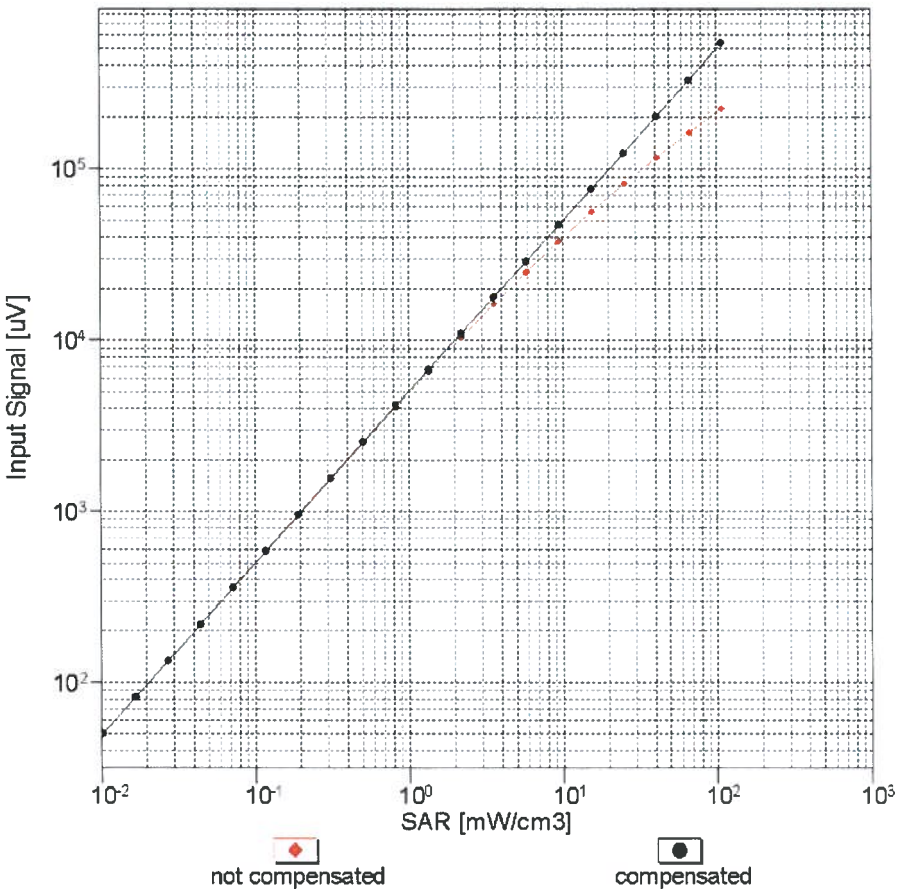
f=1800 MHz,R22

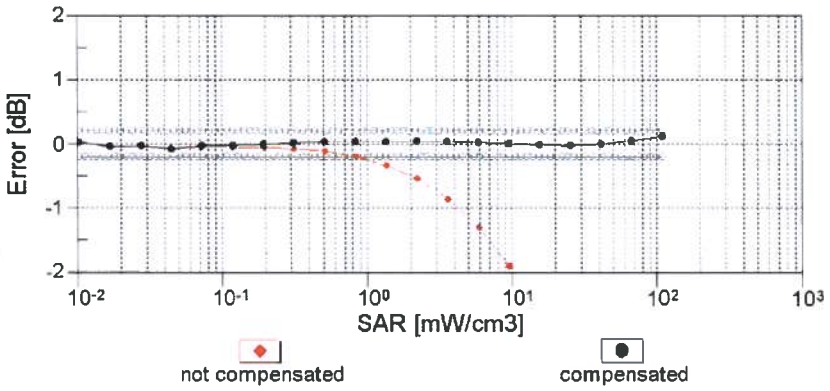




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)
(TEM cell , f = 900 MHz)

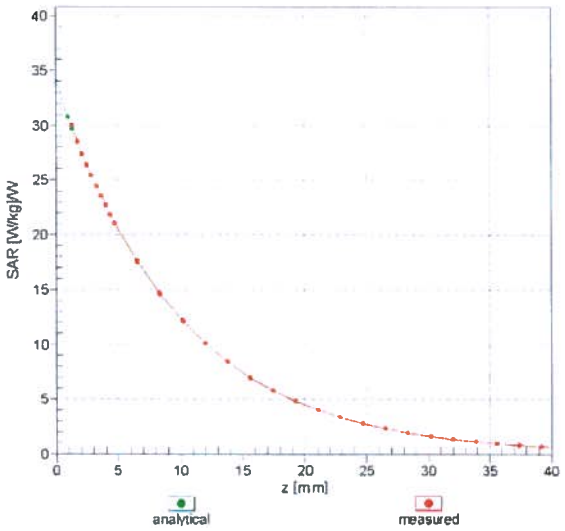




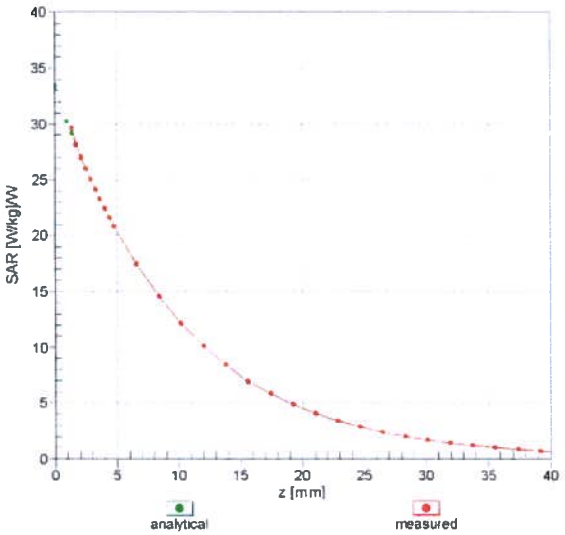
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 2450 MHz,WGLS R22 (H_convF)

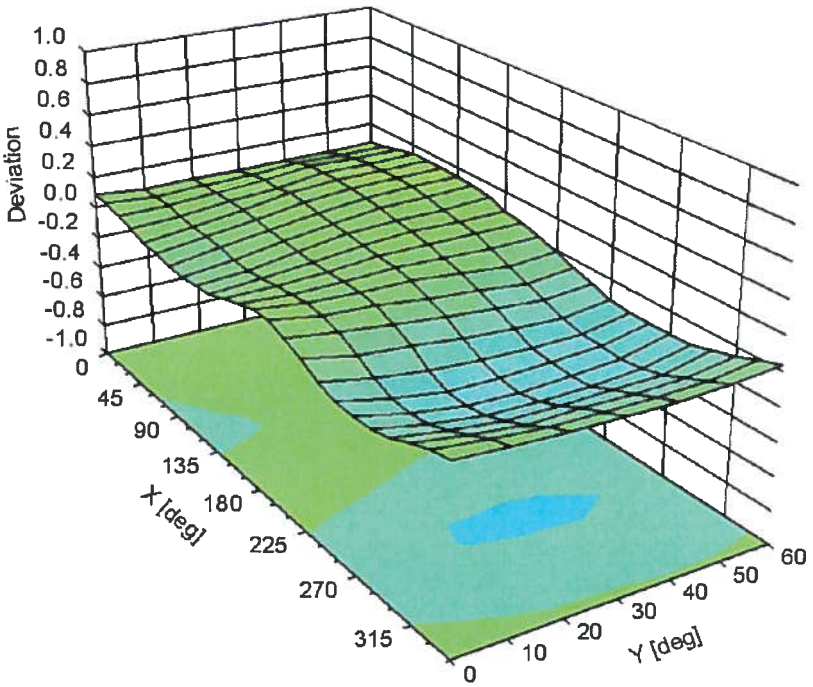


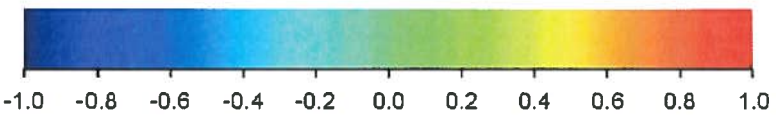
f = 2450 MHz,WGLS R22 (M_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

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

Other Probe Parameters

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

checked by KD 16 Aug 2012

ASSET: A1185

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

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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: ET3-1528_Jul12

CALIBRATION CERTIFICATE

Object: ET3DV6 - SN:1528

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

Calibration date: July 26, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: July 26, 2012

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

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Accredited by the Swiss Accreditation Service (SAS)
Accreditation No.: SCS 108
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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ET3DV6

SN:1528

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

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

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

Basic Calibration Parameters

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

Modulation Calibration Parameters

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

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

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

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

Calibration Parameter Determined in Head Tissue Simulating Media

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

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

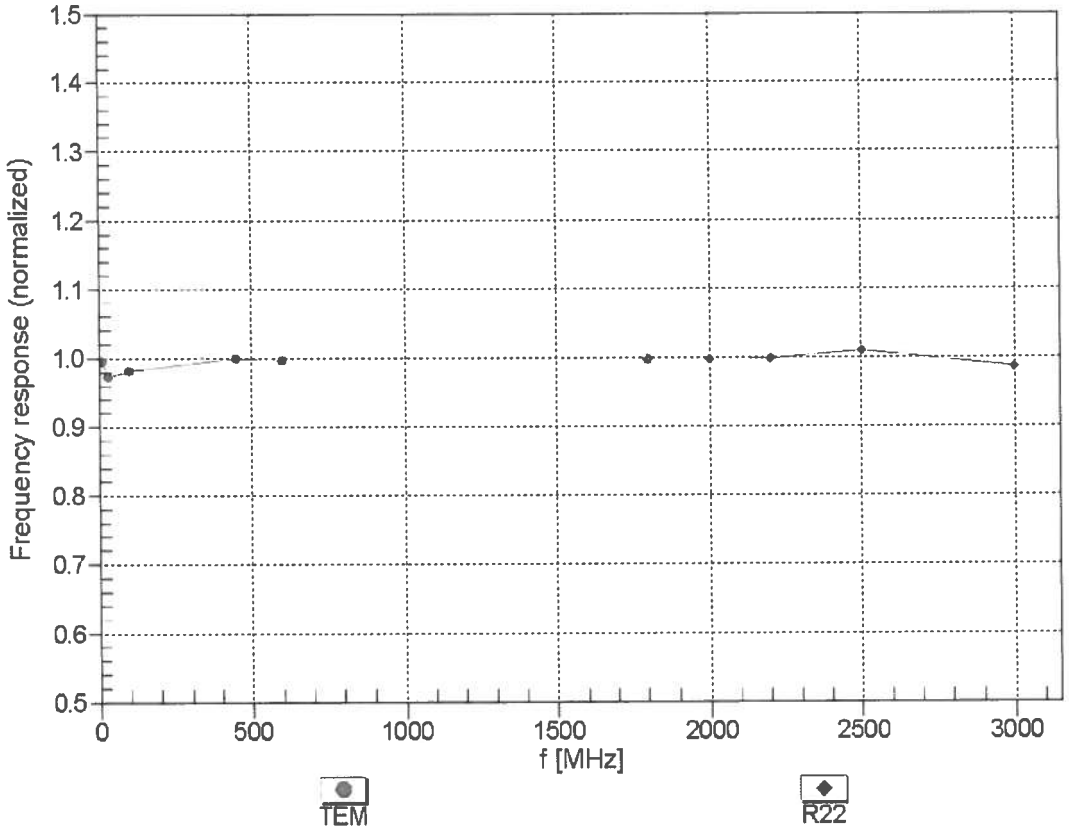
DASY/EASY - Parameters of Probe: ET3DV6 - SN:1528

Calibration Parameter Determined in Body Tissue Simulating Media

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

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

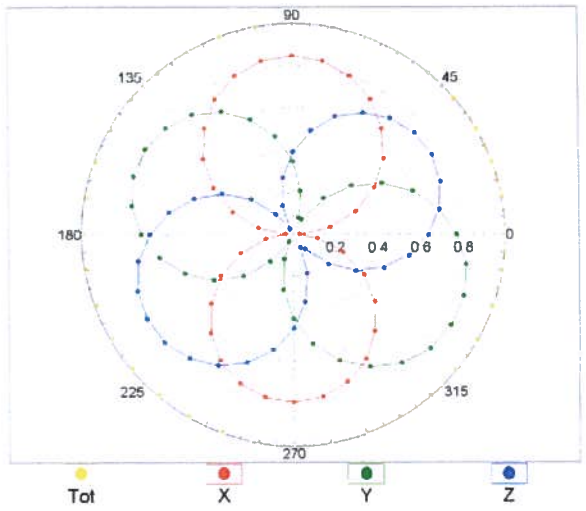
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



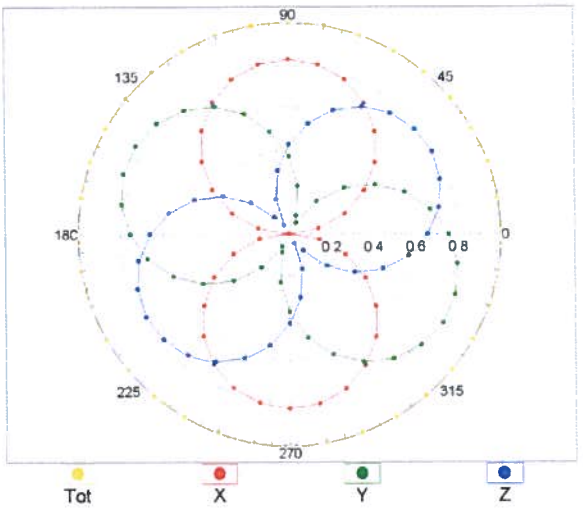
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

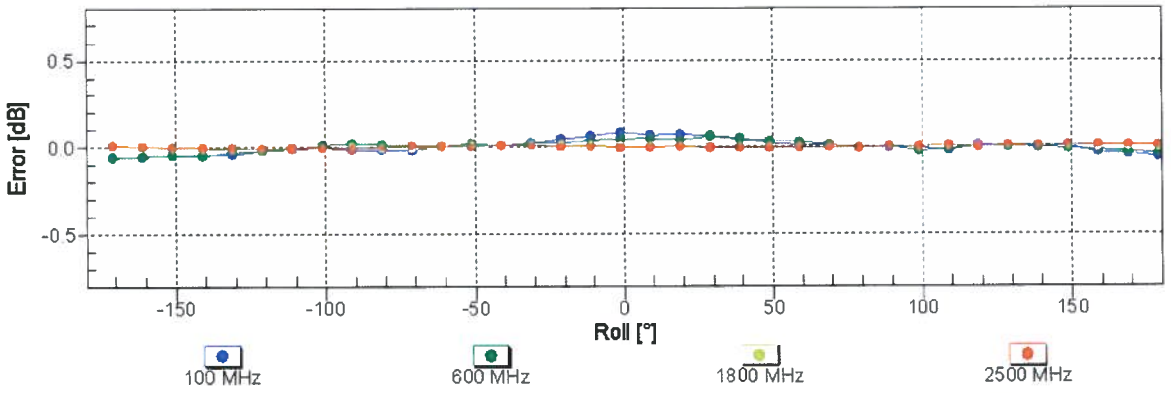
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



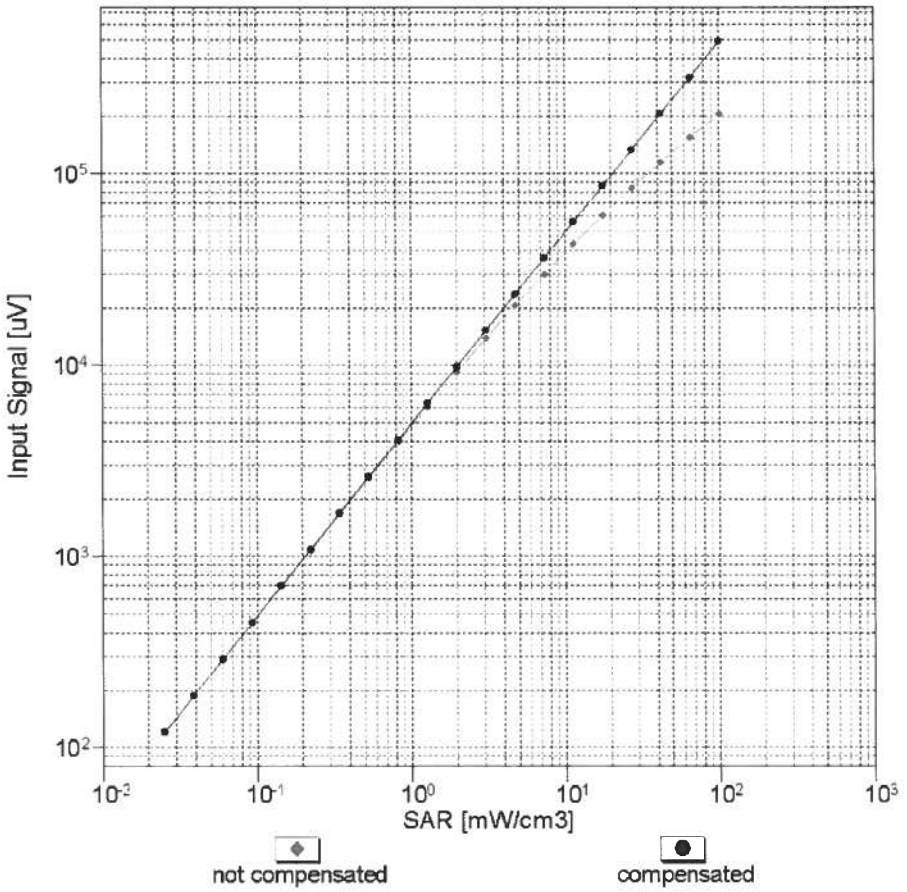
f=1800 MHz,R22

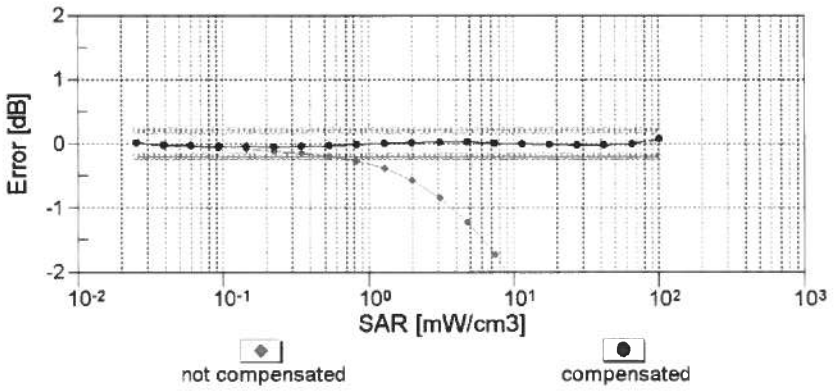




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

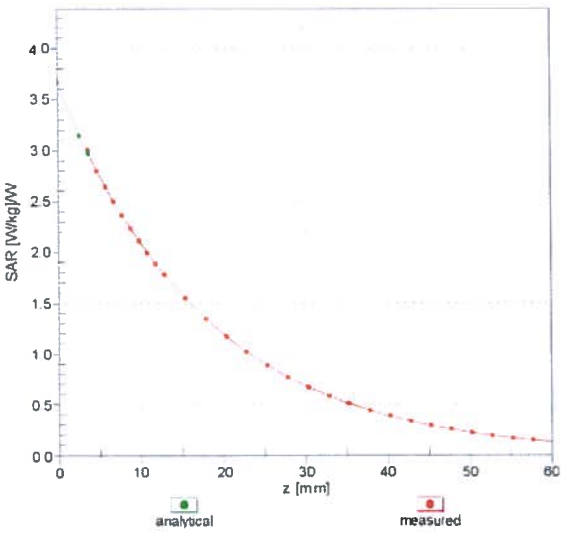




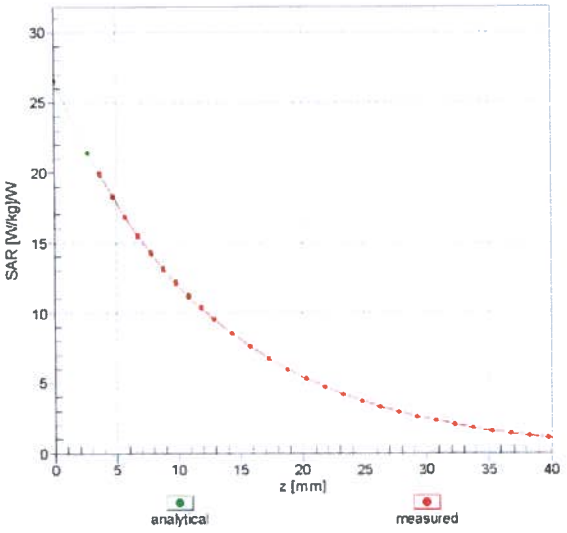
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

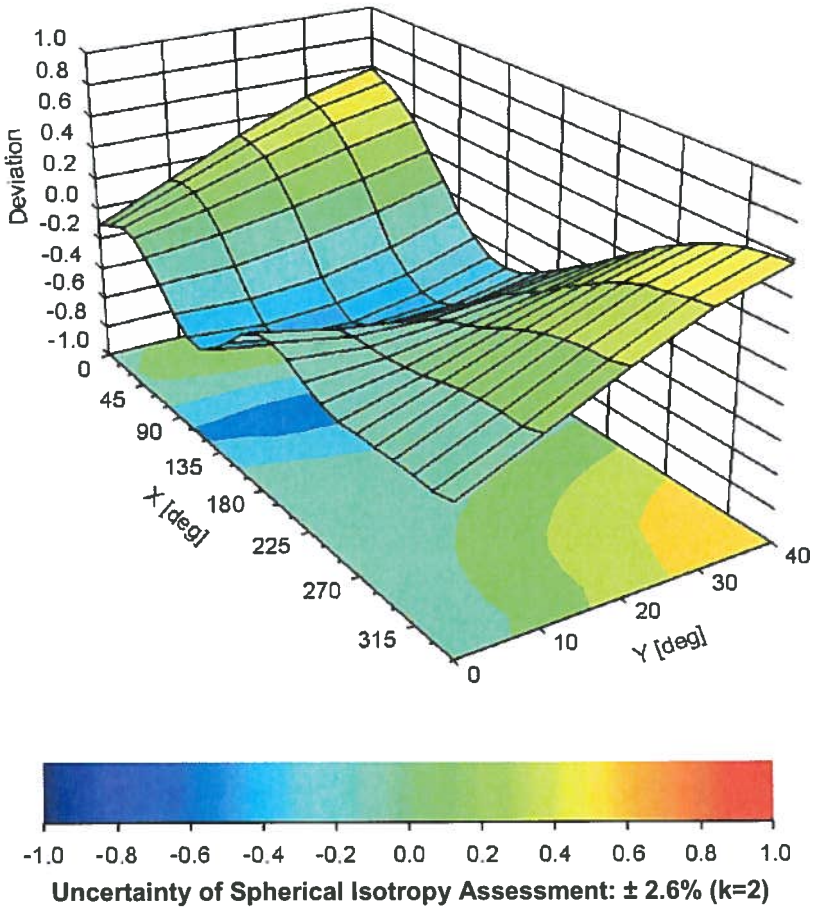


f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

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

Other Probe Parameters

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

Checked by [illegible] 17-May-2012

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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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

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
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) **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., $\vartheta = 0$ 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.

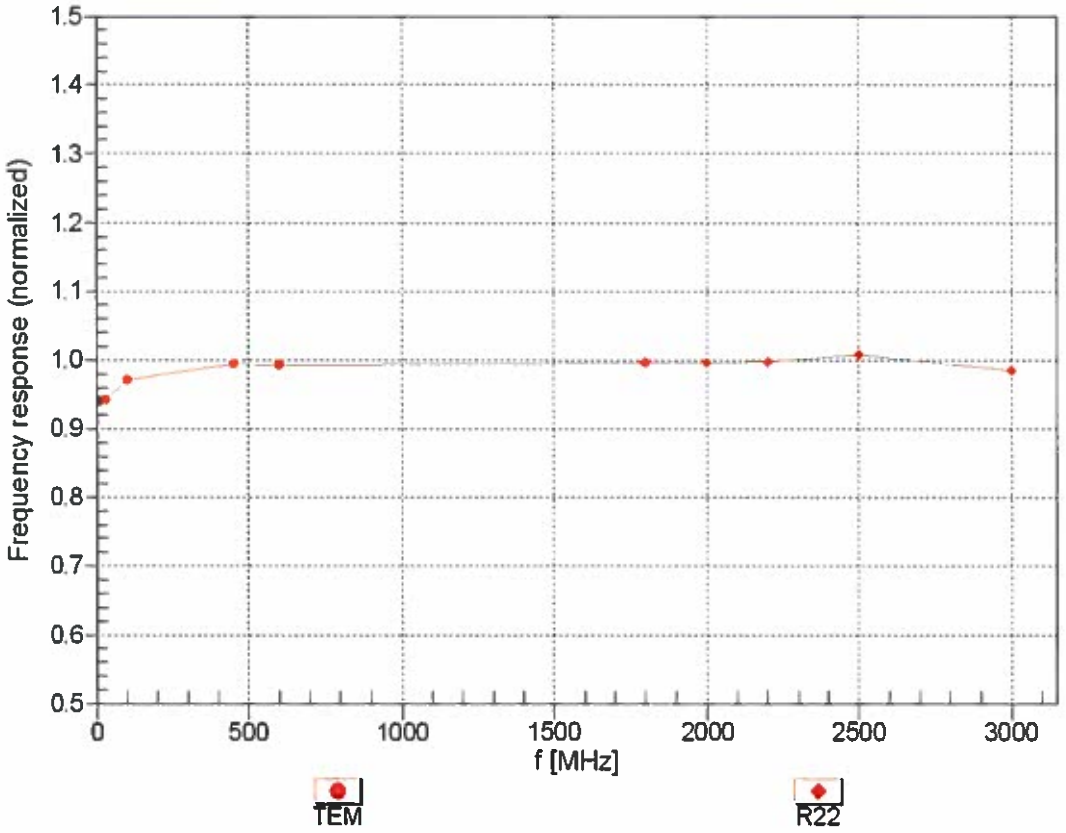
DASY/EASY - Parameters of Probe: ET3DV6 - SN:1587

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.

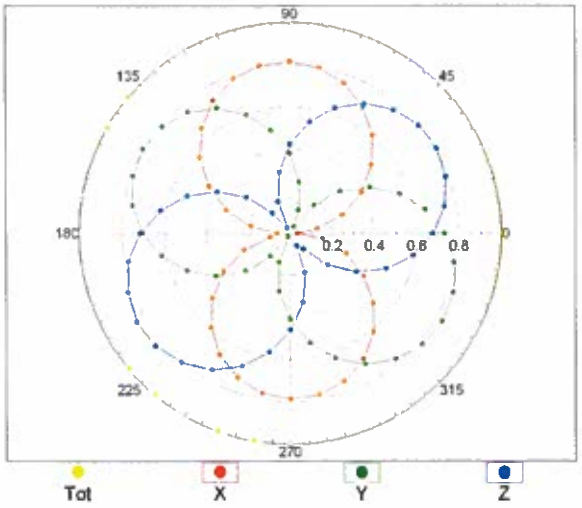
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



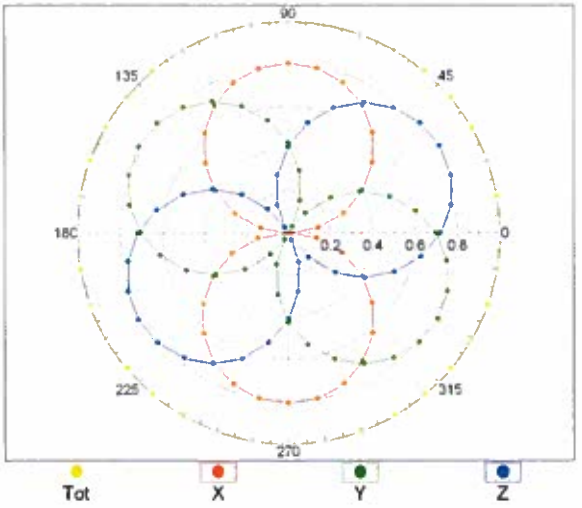
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

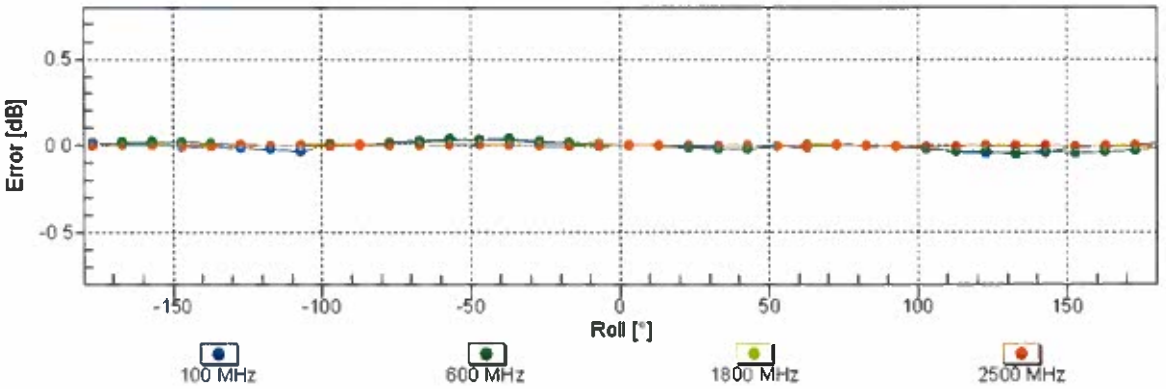
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



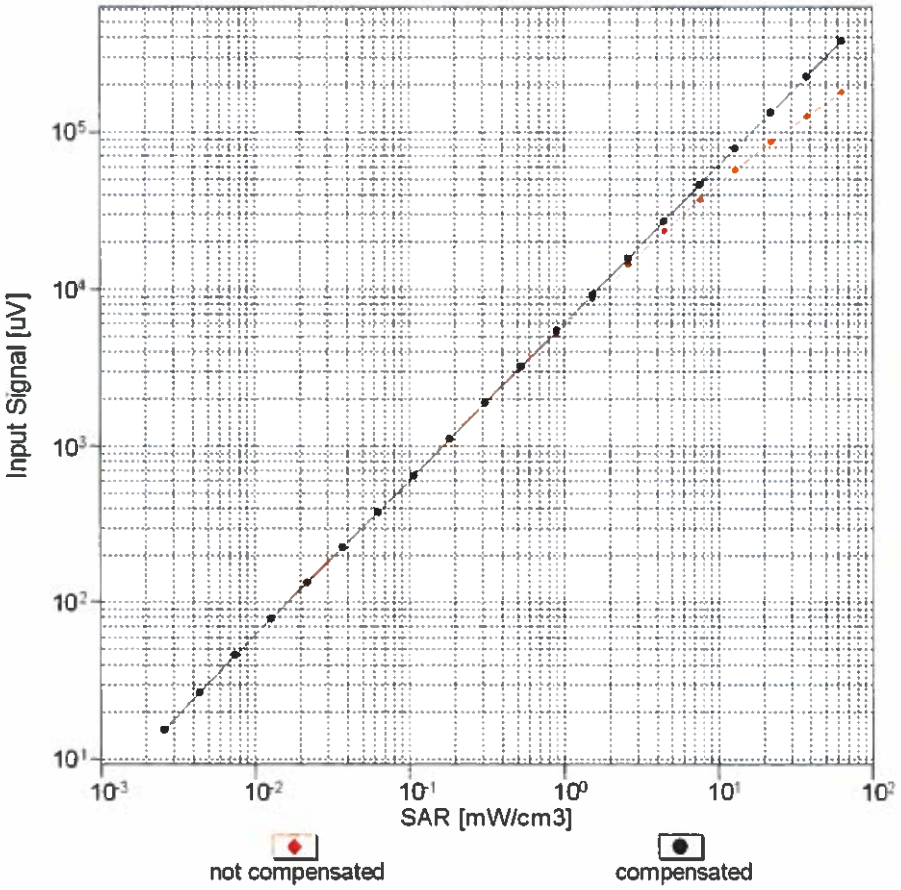
f=1800 MHz,R22

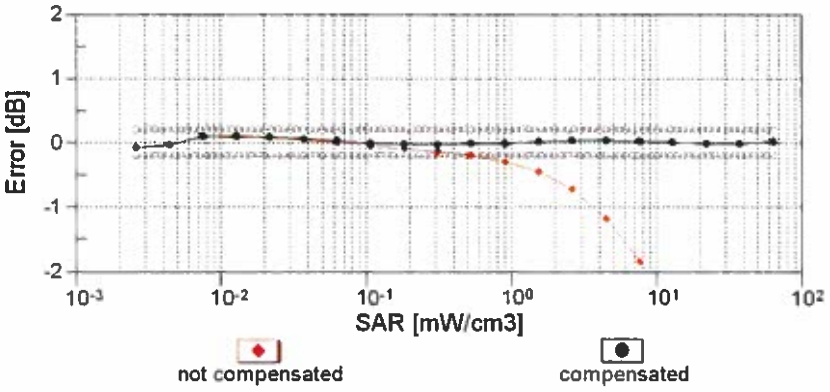




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

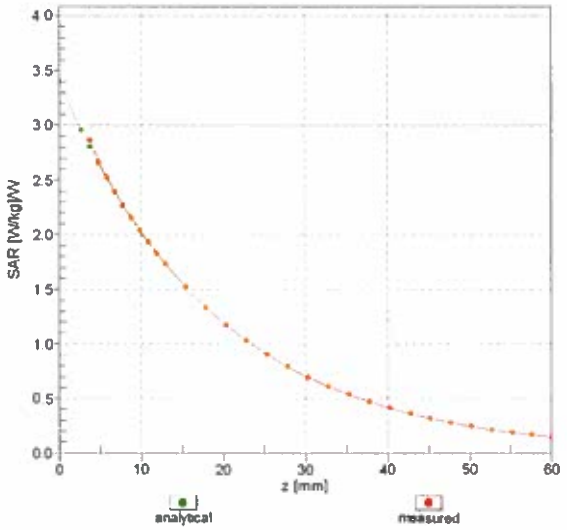




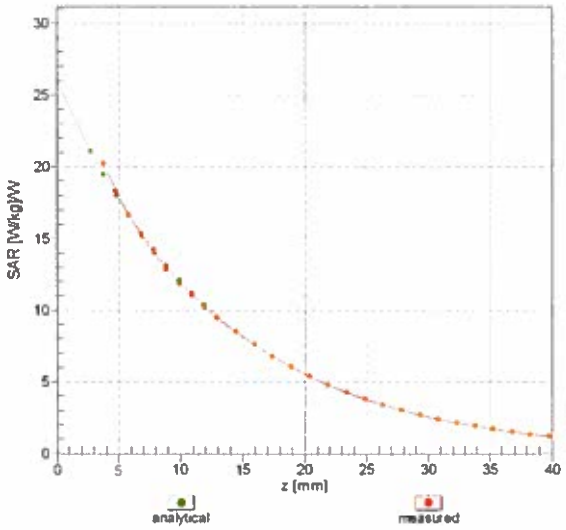
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

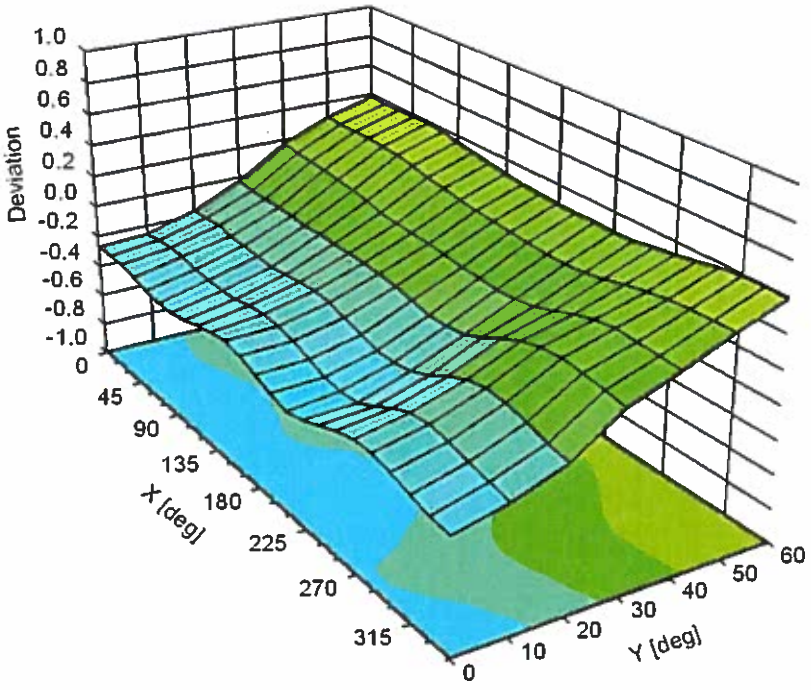


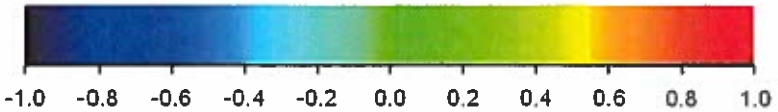
f = 1750 MHz,WGLS R22 (H_convF)



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

checked by DATE: 18-09-2012

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Client RFI **Certificate No: ES3-3304_Aug12**

CALIBRATION CERTIFICATE

Object ES3DV3 - SN:3304

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

Calibration date: August 31, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: September 3, 2012

Calibration Laboratory of
Schmid & Partner
Engineering AG
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., 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 ES3DV3

SN:3304

Manufactured: August 27, 2010
Calibrated: August 31, 2012

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3304

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.14	1.33	1.33	± 10.1 %
DCP (mV)[B]	104.7	101.1	103.7	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.00	0.00	1.00	146.4	±3.8 %
			Y	0.00	0.00	1.00	159.8	
			Z	0.00	0.00	1.00	158.8	

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: ES3DV3 - SN:3304

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)
750	41.9	0.89	6.44	6.44	6.44	0.29	1.92	± 12.0 %
835	41.5	0.90	6.17	6.17	6.17	0.27	1.96	± 12.0 %
900	41.5	0.97	6.09	6.09	6.09	0.33	1.75	± 12.0 %
1750	40.1	1.37	5.47	5.47	5.47	0.61	1.36	± 12.0 %
1900	40.0	1.40	5.24	5.24	5.24	0.80	1.18	± 12.0 %
2100	39.8	1.49	5.24	5.24	5.24	0.80	1.16	± 12.0 %
2450	39.2	1.80	4.59	4.59	4.59	0.78	1.22	± 12.0 %
2600	39.0	1.96	4.40	4.40	4.40	0.75	1.28	± 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: ES3DV3 - SN:3304

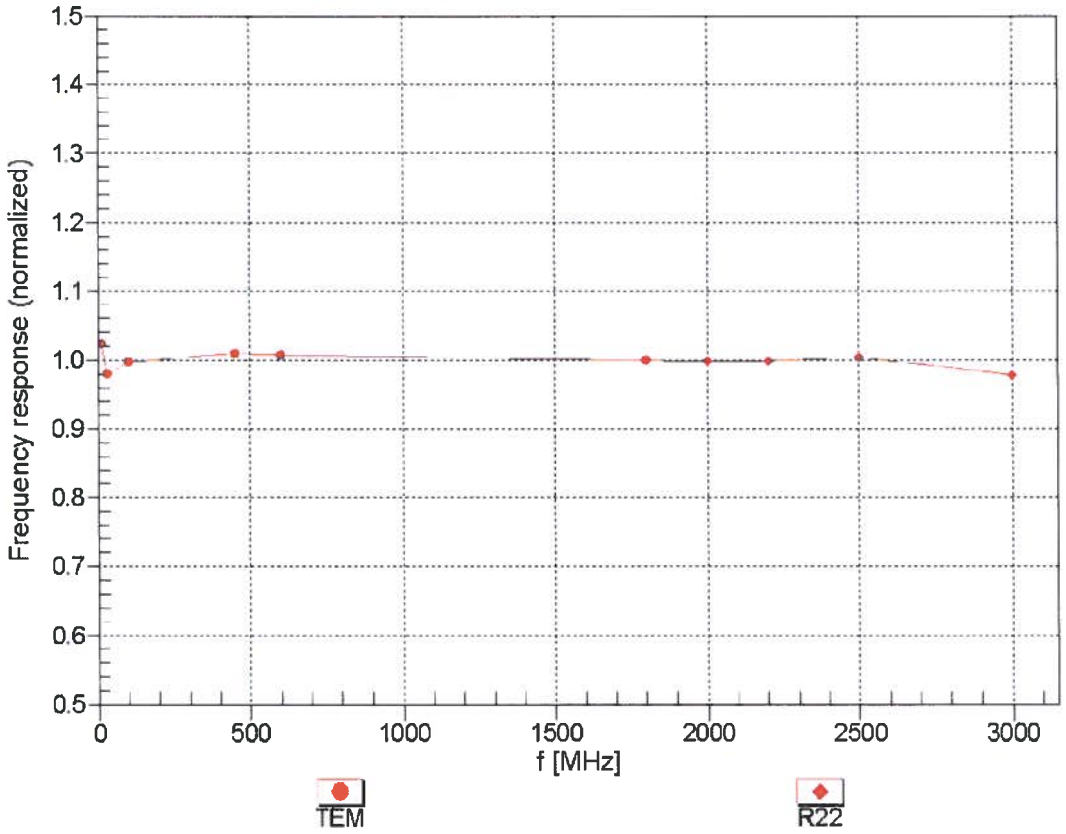
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.25	6.25	6.25	0.58	1.30	± 12.0 %
835	55.2	0.97	6.13	6.13	6.13	0.60	1.32	± 12.0 %
900	55.0	1.05	6.11	6.11	6.11	0.80	1.18	± 12.0 %
1750	53.4	1.49	5.15	5.15	5.15	0.45	1.78	± 12.0 %
1900	53.3	1.52	4.88	4.88	4.88	0.70	1.35	± 12.0 %
2100	53.2	1.62	4.94	4.94	4.94	0.64	1.43	± 12.0 %
2450	52.7	1.95	4.32	4.32	4.32	0.74	1.09	± 12.0 %
2600	52.5	2.16	4.16	4.16	4.16	0.68	0.99	± 12.0 %

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

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

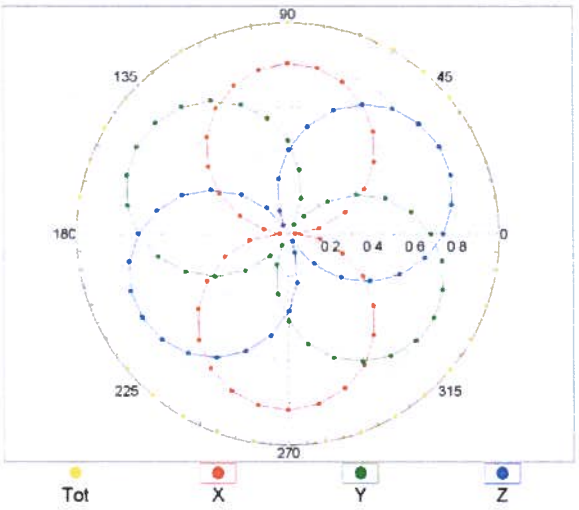
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



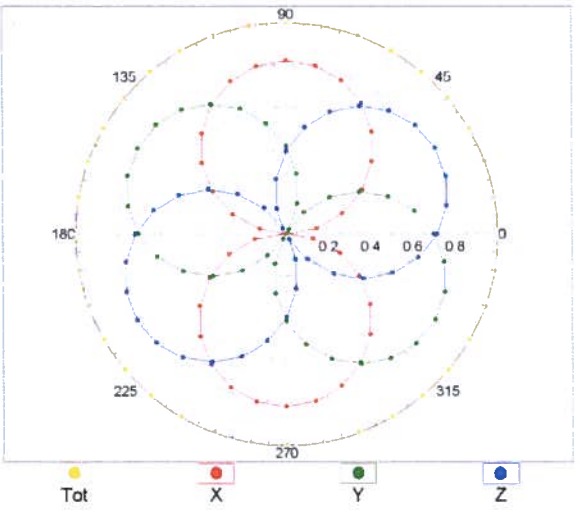
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

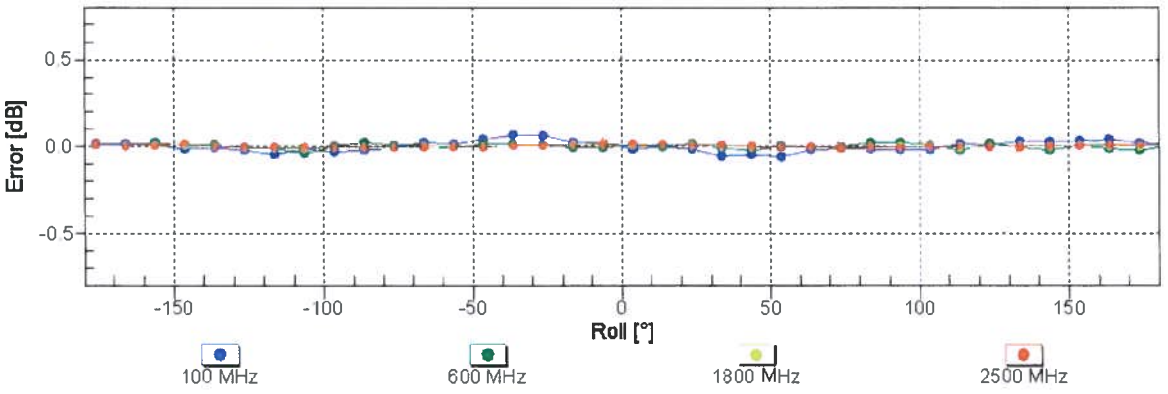
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



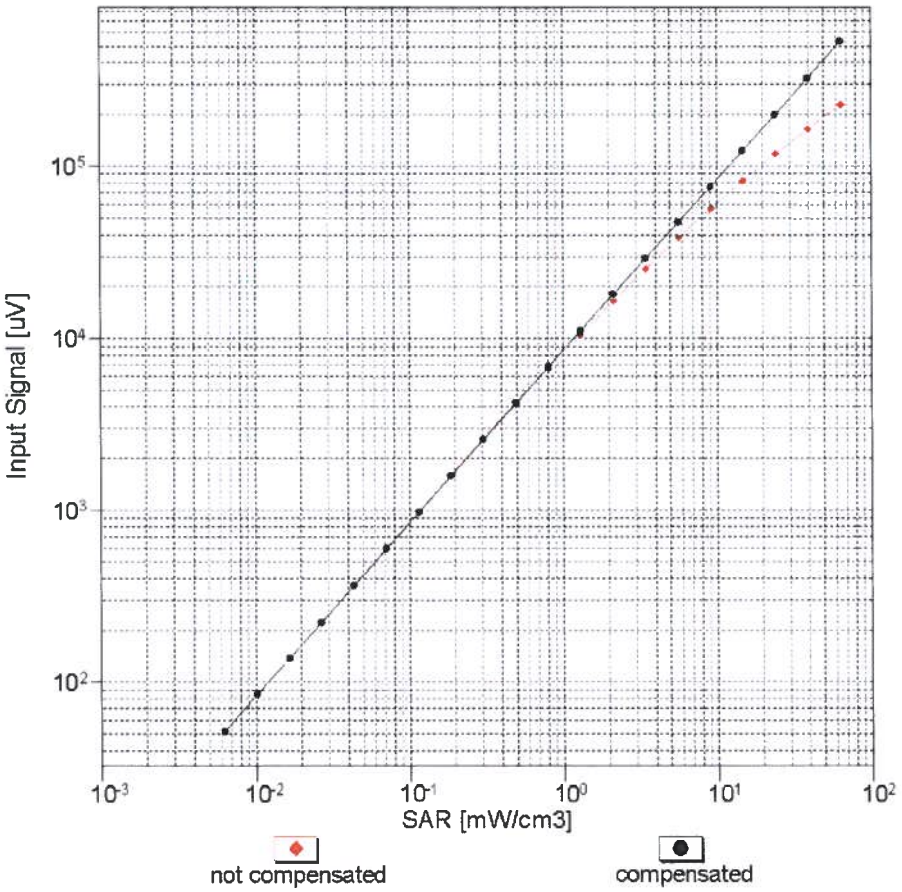
f=1800 MHz,R22

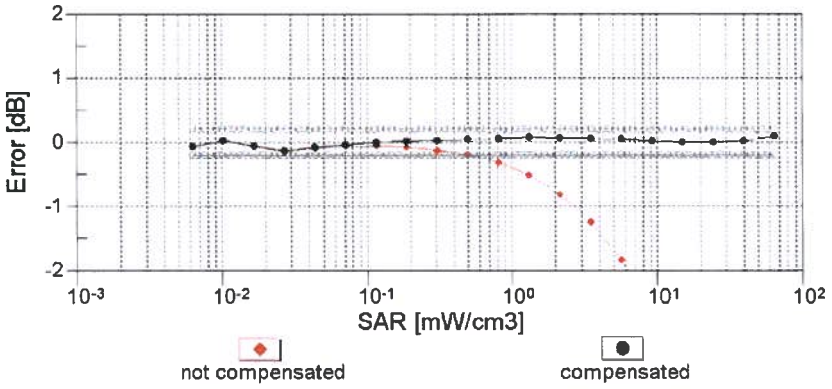




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

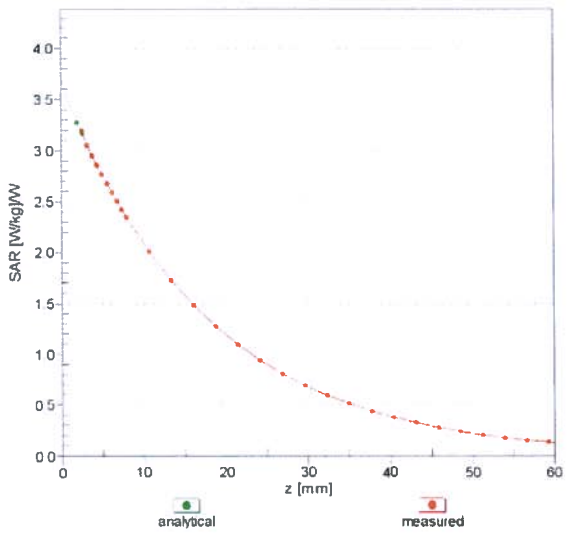




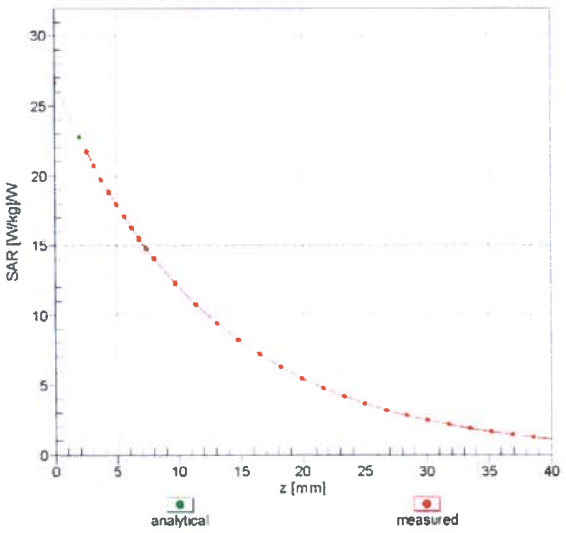
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

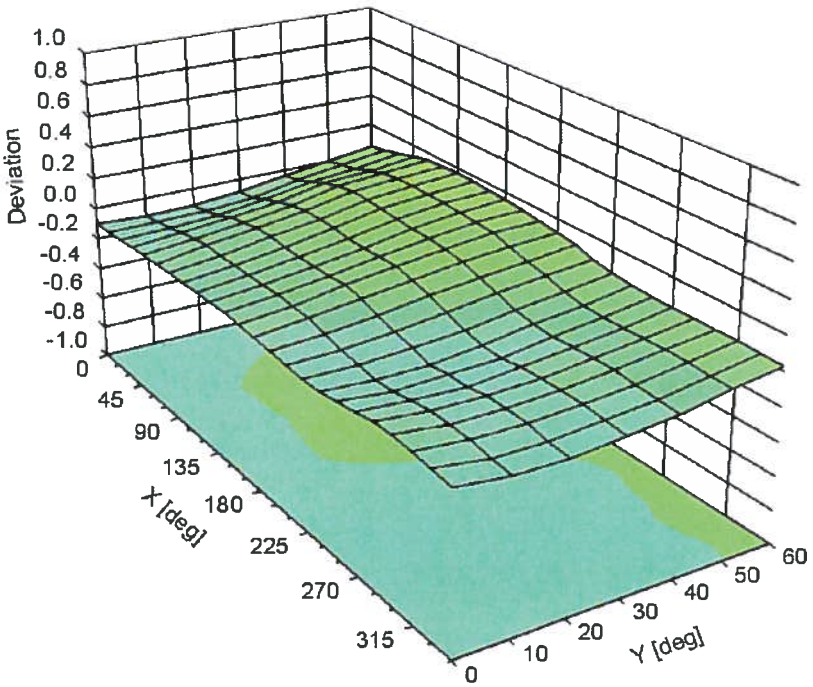


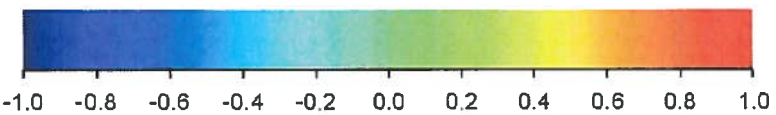
f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3304

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	33.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

Check by [signature] DATE: 7-August 2012

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

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

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

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

CALIBRATION CERTIFICATE

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

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

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

Issued: August 16, 2012

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

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

Head TSL parameters

The following parameters and calculations were applied.

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

SAR result with Head TSL

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

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

Body TSL parameters

The following parameters and calculations were applied.

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

SAR result with Body TSL

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

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

Appendix

Antenna Parameters with Head TSL

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

Antenna Parameters with Body TSL

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

General Antenna Parameters and Design

Electrical Delay (one direction)	1.404 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 26, 1998

DASY5 Validation Report for Head TSL

Date: 16.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

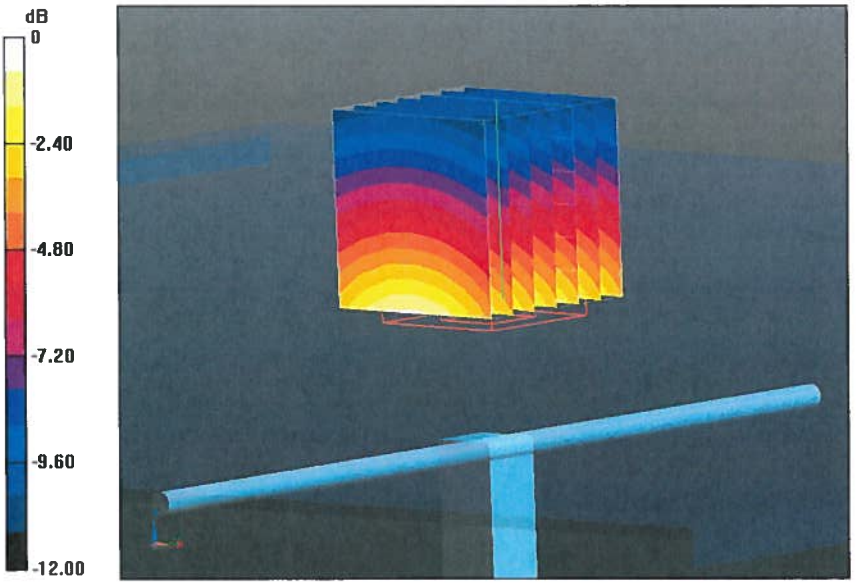
Communication System: CW; Frequency: 900 MHz
Medium parameters used: f = 900 MHz; σ = 0.96 mho/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

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

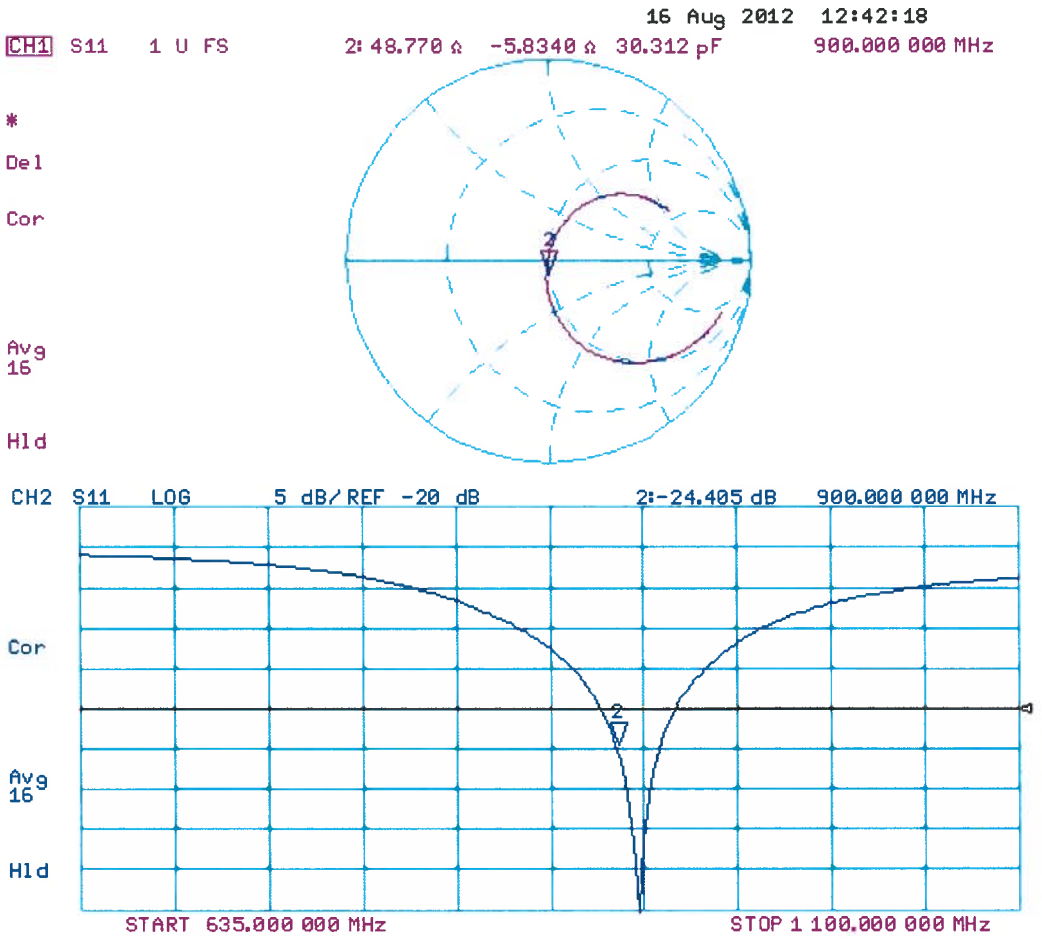
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

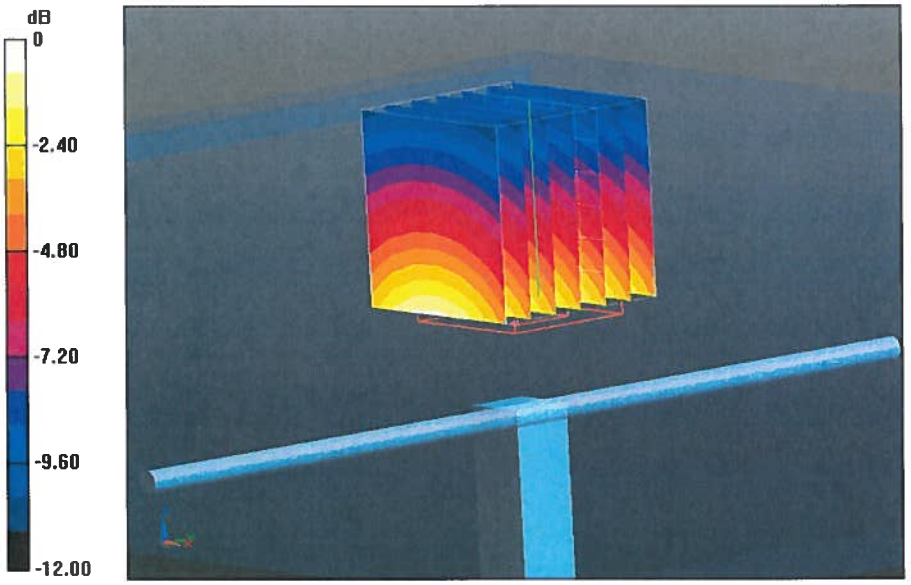
Communication System: CW; Frequency: 900 MHz
Medium parameters used: f = 900 MHz; σ = 1.06 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

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

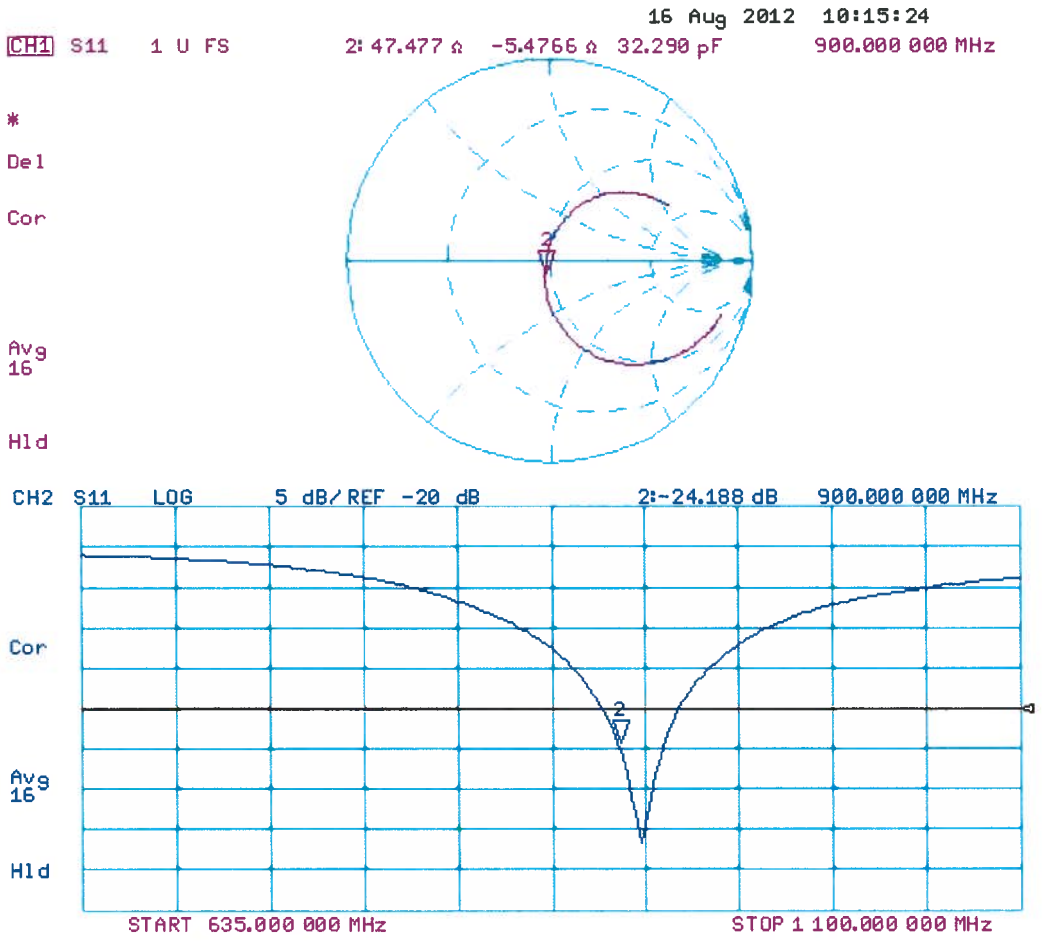
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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



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

Impedance Measurement Plot for Body TSL



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

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

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: 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

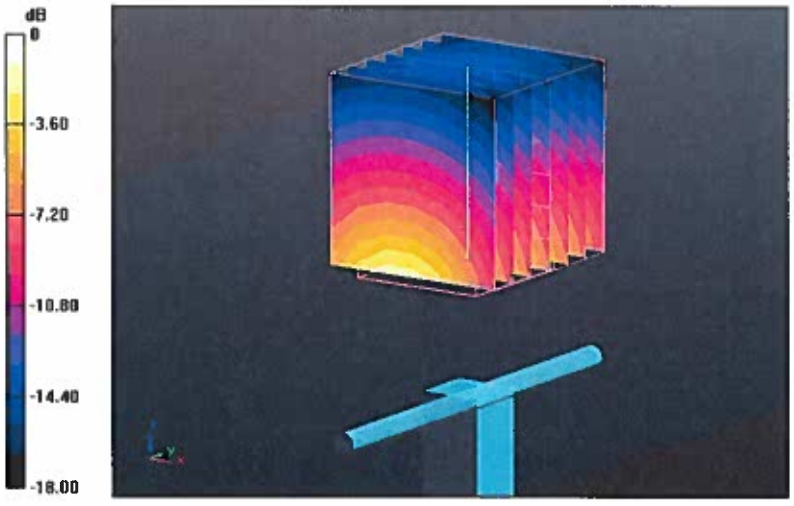
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:540

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:

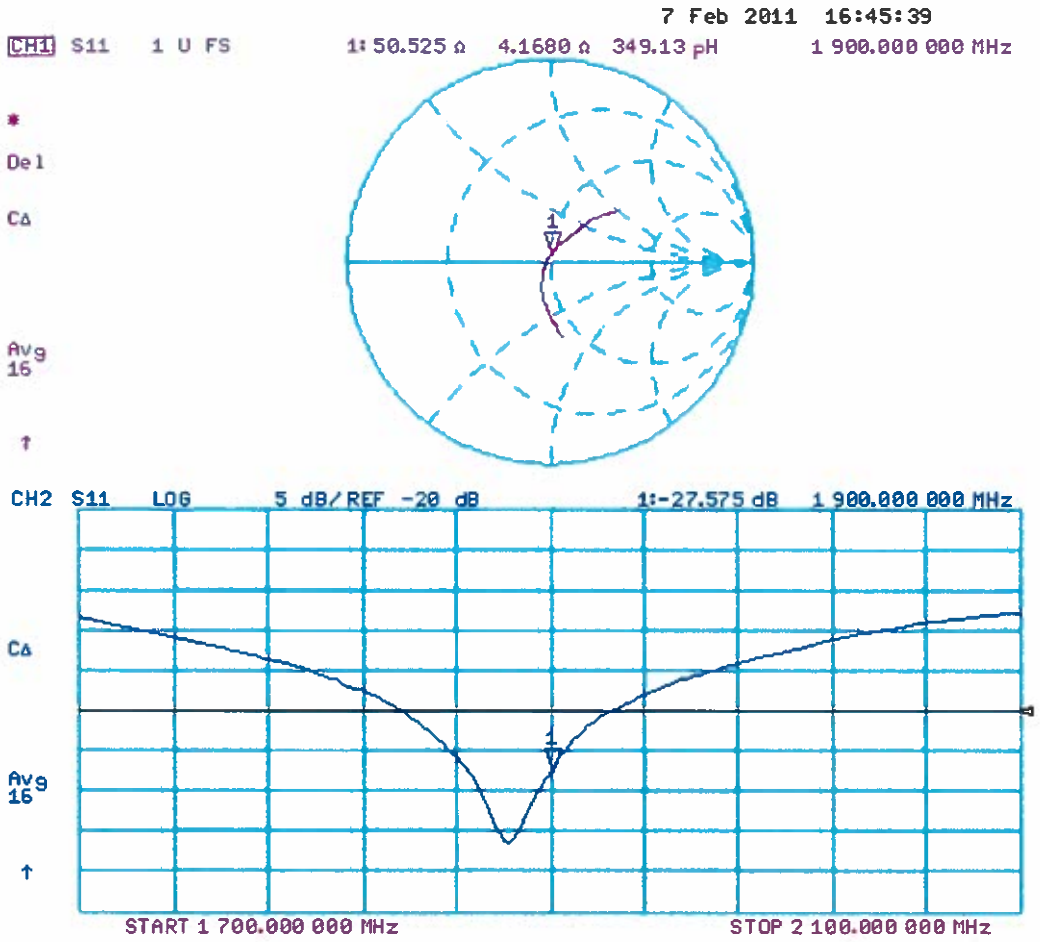
- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing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

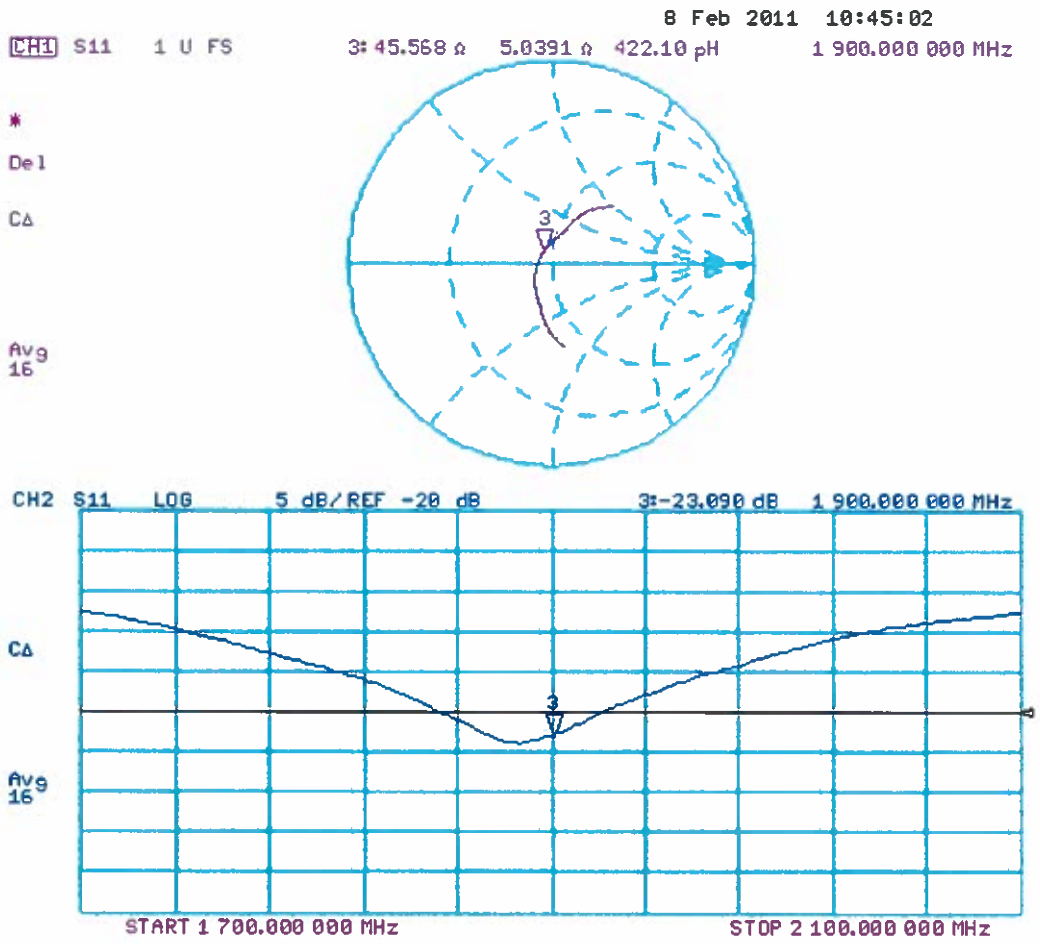
DASY5 Configuration:

- 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 AB 21/02/2011

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

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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

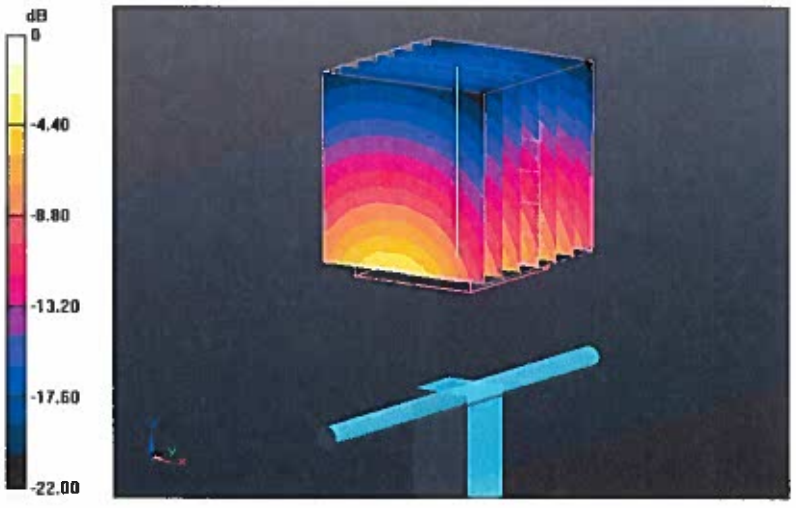
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:725

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:

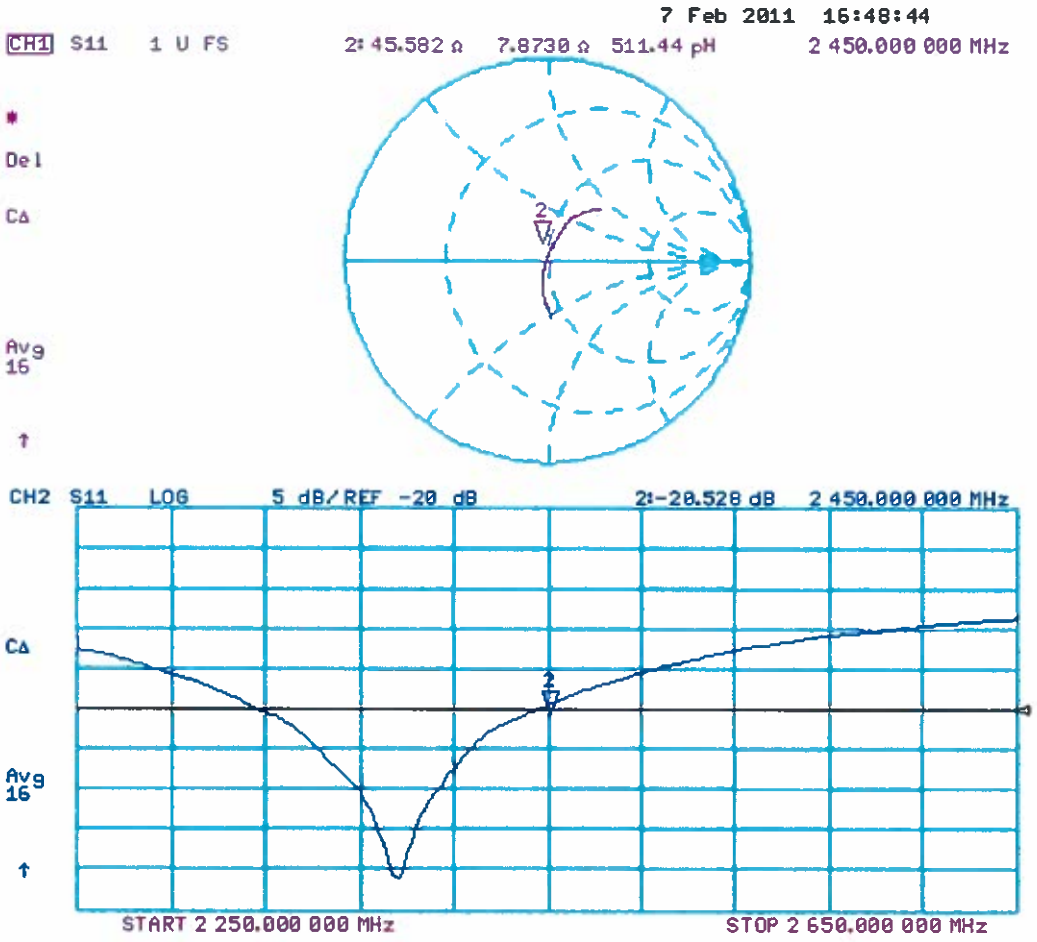
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing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

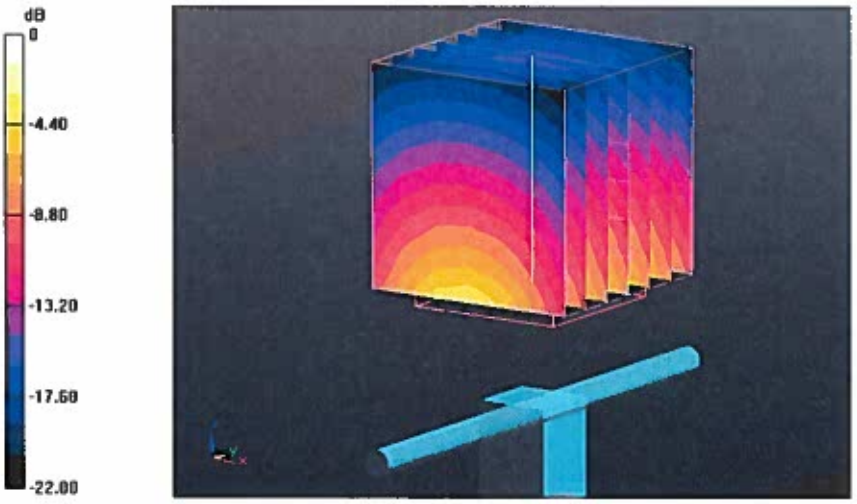
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:725

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:

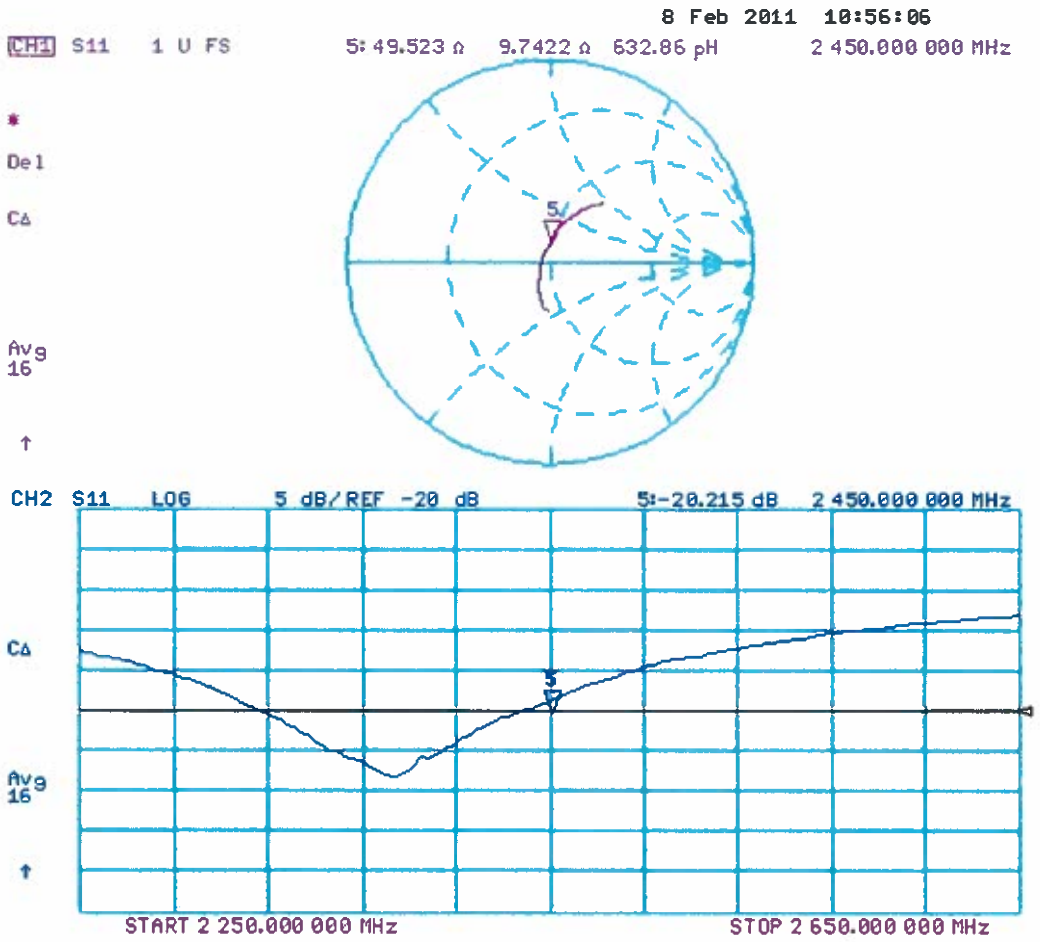
- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing 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 [illegible] 21/02/2011

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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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)

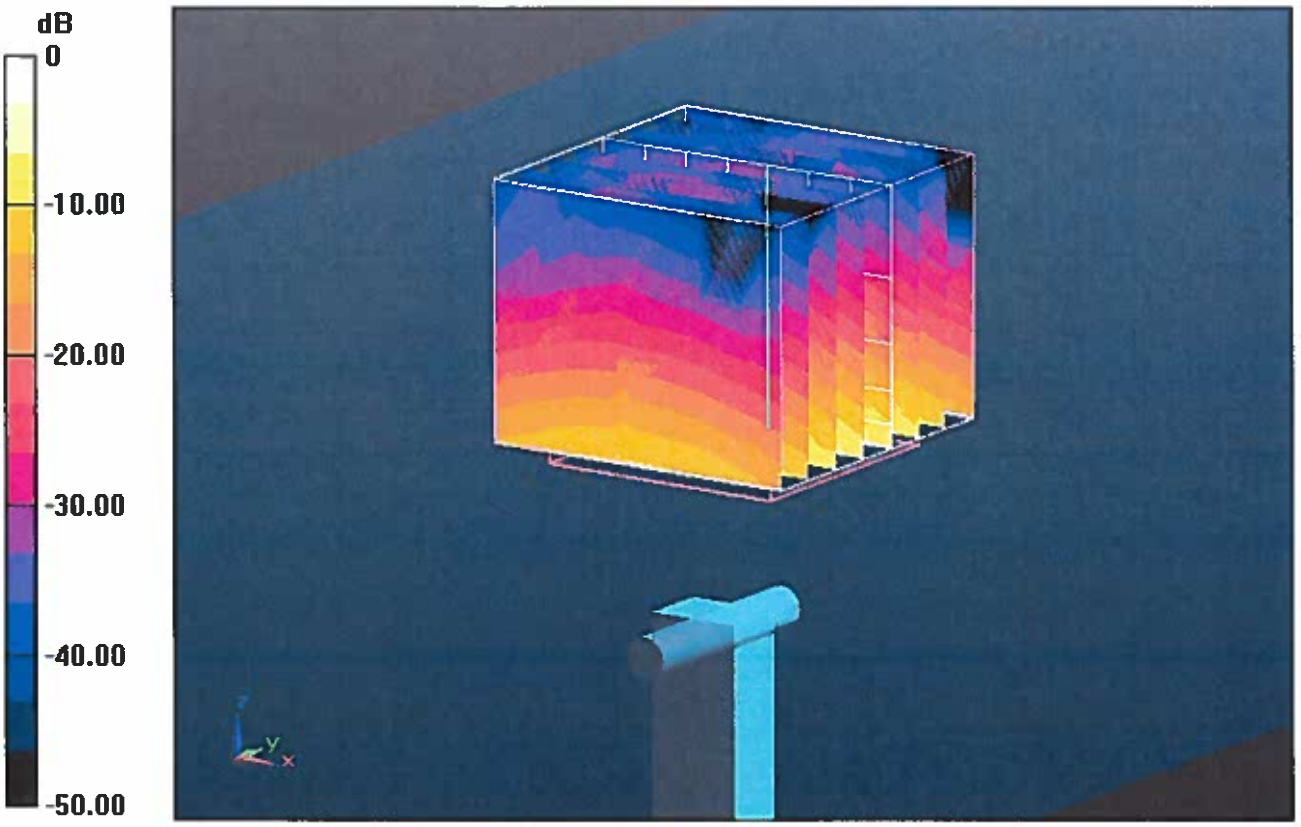
DASY5 Configuration:

- 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

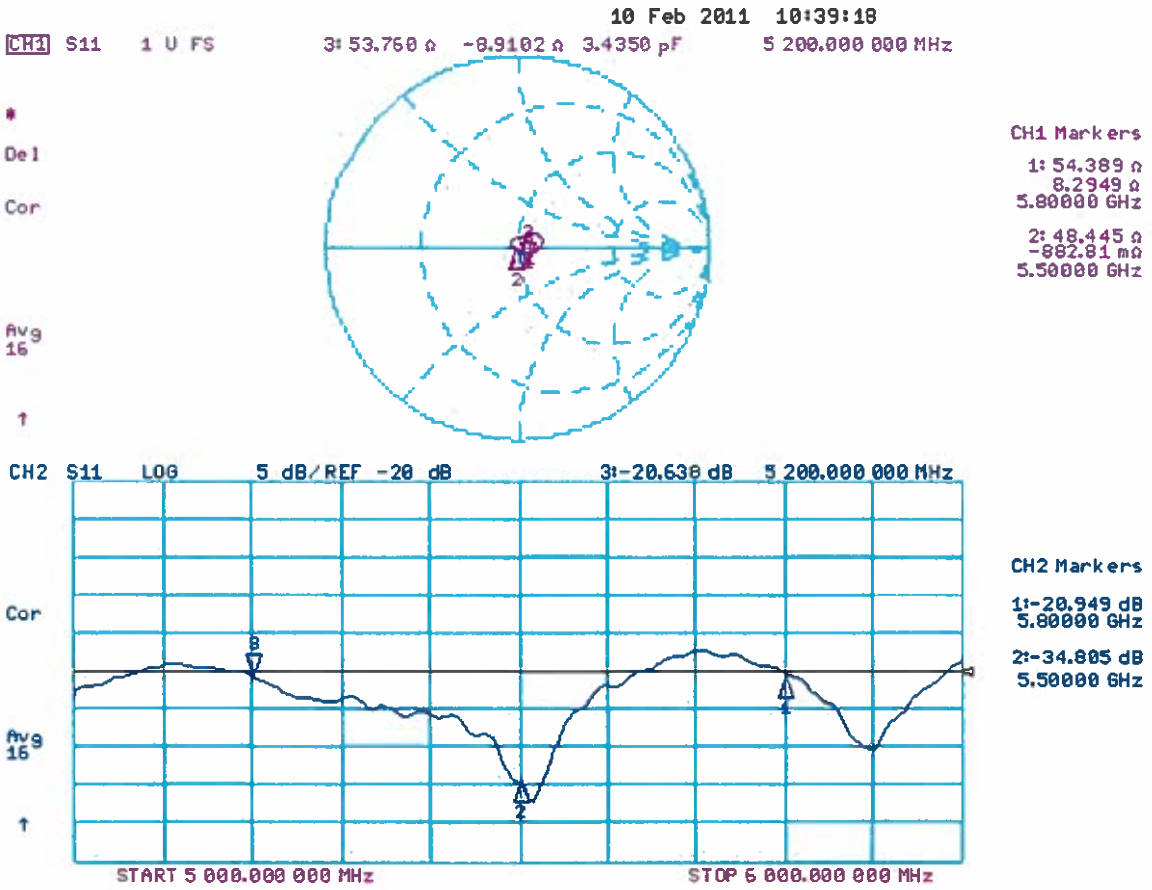
Pin=100mW, d=10mm, f=5500 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 60.866 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 35.356 W/kg
SAR(1 g) = 8.35 mW/g; SAR(10 g) = 2.3 mW/g
Maximum value of SAR (measured) = 16.244 mW/g

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
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_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)

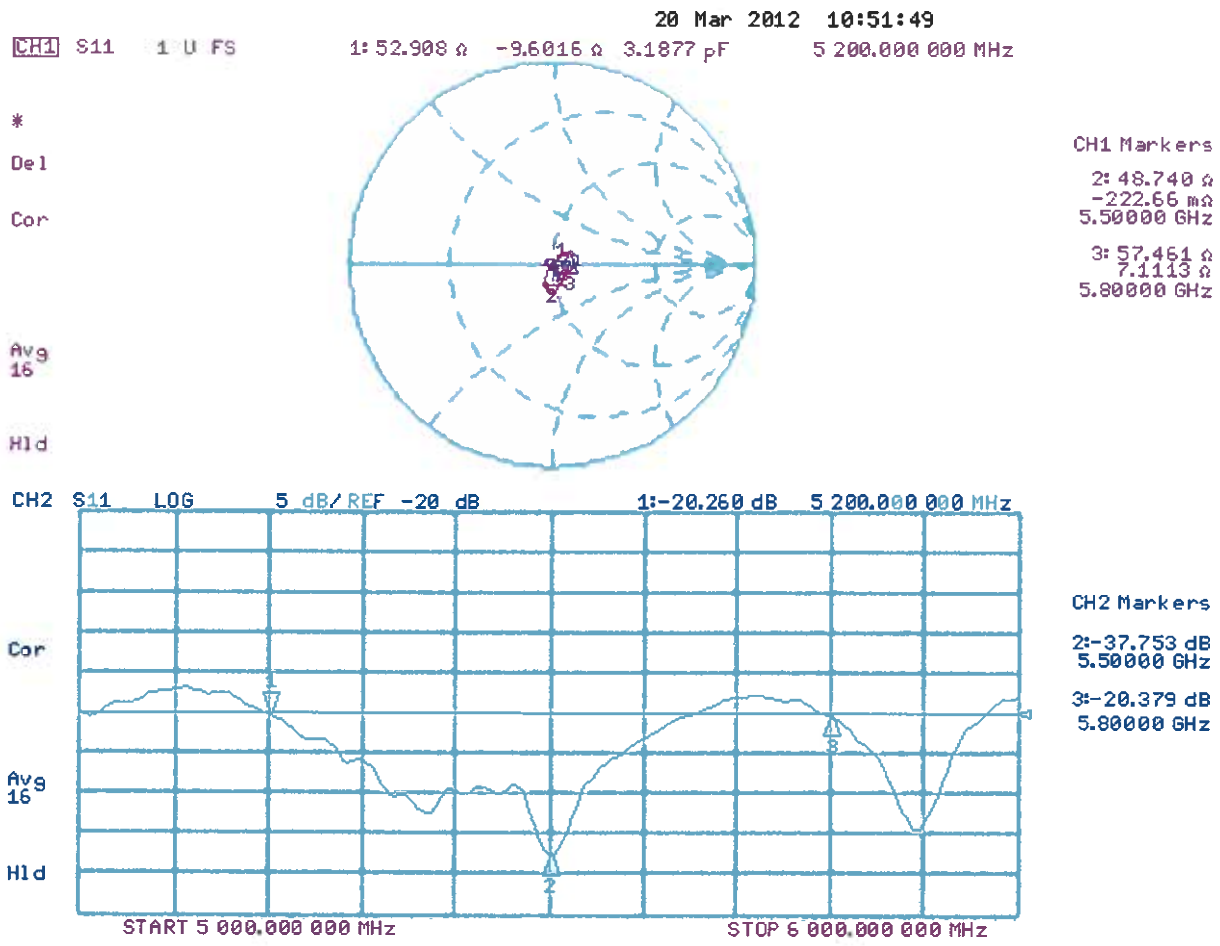
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.845 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 29.2070
SAR(1 g) = 7.88 mW/g; SAR(10 g) = 2.26 mW/g
Maximum value of SAR (measured)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

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.