




SAR TEST REPORT

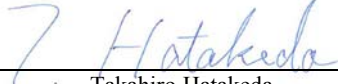
Test Report No. : 33AE0113-HO-B-R1

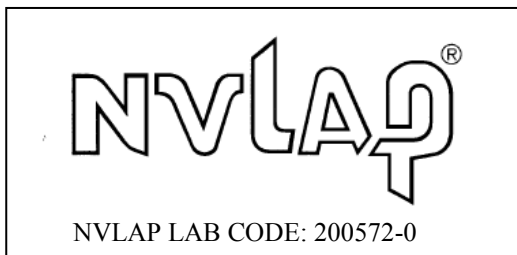
Applicant : SAMSUNG ELECTRONICS CO., LTD.
Type of Equipment : GPRS850/1900, EDGE850/1900, WCDMA2, WCDMA4, WCDMA5, LTE4, LTE17 Tablet with 802.11bgn, BT(EDR, LE)
Model No. : SGH-T779
FCC ID : A3LSGHT779
Test regulation : FCC47CFR 2.1093
FCC OET Bulletin 65, Supplement C (Edition 01-01)
* This report only includes test result of added WCDMA Band IV.
Refer to UL Japan Test report No. 32JE0205-HO-H (FCC ID: A3LSGHI497) for test results other than WCDMA Band IV.
Test Result : **Complied**
WCDMA band IV Body : 0.813W/kg

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This report is a revised version of 33AE0113-HO-B. 33AE0113-HO-B is replaced with this report.

Date of test: August 27, 2012

Representative test engineer: 
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UL Verification Service

Approved by : 
Takahiro Hatakeda
Leader of WiSE Japan
UL Verification Service



This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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SECTION 1: Customer information

Company Name	SAMSUNG ELECTRONICS CO., LTD.
Address	416, MAETAN 3-DONG, YEONGTONG-GU SUWON-CITY, GYEONGGI-DO 443-742, SOUTH KOREA

SECTION 2: Equipment under test (E.U.T.)**2.1 Identification of E.U.T.**

Type of EUT	GPRS850/1900, EDGE850/1900, WCDMA2, WCDMA4, WCDMA5, LTE4, LTE17 Tablet with 802.11bgn, BT(EDR, LE)
Model No.	SGH-T779
Serial No.	354414050001143, 354414050001150
Rating	DC5.0V (USB Power Supply) Li-ion Battery (M/N; SP3676B1A(1S2P)) DC3.7V/7000mAh, 25.9Wh
Option Battery	N/A
Body-worn Accessory	Ear phone (typical)
Device category	Portable
Antenna to antenna separation distance	The shortest distance is 154mm from WWAN antenna to WLAN/BT.
Simultaneous transmission	WWAN can transmit simultaneously with WLAN WWAN can transmit simultaneously with Bluetooth WLAN cannot transmit simultaneously with Bluetooth

2.2 Product description

*The EUT is a variant model of model No.SGH-I497 (FCC ID: A3LSGHI497), and the hardware is identical between two models.

The only difference is adding in the WCDMA Band 4, enabled by software.

This report includes the test result for WCDMA Band 4 only.

Radio Specification

Bluetooth

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS
Bandwidth & Channel spacing	1MHz & 1MHz
Antenna Type	PIFA
Antenna Gain	-4.8 dBi (MAX)

Low Energy

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	DSSS, FHSS
Bandwidth & Channel spacing	1MHz & 2MHz
Antenna Type	PIFA
Antenna Gain	-4.8 dBi (MAX)

WLAN (IEEE802.11b/g/n-20)

Equipment Type	Transceiver
Frequency of Operation	2412-2462MHz
Type of Modulation	DSSS, OFDM
Bandwidth & Channel spacing	20MHz & 5MHz
Antenna Type	PIFA
Antenna Gain	-4.8 dBi (MAX)

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GSM

Equipment Type	Transceiver
Frequency of Operation	[Up Link] GSM850: 824 – 849MHz PCS: 1850 – 1910MHz [Down Link] GSM850: 869 – 894MHz PCS: 1930 – 1990MHz
Type of Modulation	GMSK , 8PSK
Emission Designator	GSM850: 249KGXW, 248KG7W PCS: 248KGXW, 248KG7W
Antenna Type	PIFA
Antenna Gain	GSM850: 824-849MHz: -5.73dBi (MAX) 869-894MHz: -5.83dBi (MAX) PCS: 1850-1910MHz: -5.62dBi (MAX) 1930-1990MHz: -5.51dBi (MAX)

W-CDMA

Equipment Type	Transceiver
Frequency of Operation	[Up Link] Band V: 824 – 849MHz Band IV: 1710-1755MHz Band II: 1850 – 1910MHz [Down Link] Band V: 869 – 894MHz Band IV: 2110-2155MHz Band II: 1930 – 1990MHz
Type of Modulation	QPSK
Emission Designator	Band V: 4M16F9W Band II: 4M14F9W Band IV: 4M16F9W
Antenna Type	PIFA
Antenna Gain	Band V: 824-849MHz: -5.73dBi (MAX) 869-894MHz: -5.83dBi (MAX) Band IV: 1710-1755MHz: -6.64dBi (MAX) 2110-2155MHz: -6.78dBi (MAX) Band II: 1850-1910MHz: -5.62dBi (MAX) 1930-1900MHz: -5.51dBi (MAX)

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LTE

Equipment Type	Transceiver
Frequency of Operation	[Up Link] Band IV: 1710 – 1755MHz Band X VII: 704 – 716MHz [Down Link] Band IV: 2110 – 2155MHz Band X VII: 734 – 746MHz
Type of Modulation	QPSK, 16QAM
Emission Designator	Band IV: 4M53G7D, 4M52W7D, 8M97G7D, 8M96W7D, 13M5G7D, 13M5W7D, 17M9G7D, 17M9W7D Band X VII: 4M53G7D, 4M51W7D, 8M96G7D, 8M98W7D
Antenna Type	PIFA
Antenna Gain	Band IV: 1710-1755MHz: -5.57dBi (MAX) 2110-2155MHz: -3.86dBi (MAX) Band X VII: 704-716MHz: -5.95dBi (MAX) 734-746MHz: -4.23dBi (MAX)

SECTION 3 : Test standard information

3.1 Test Specification

Title : **Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01):**

Supplement C (Edition 01-01) - Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions
OET Bulletin 65 (Edition 97-01) - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

: **IEEE Std 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 Supplement C

In additions;

- KDB450824 D01** SAR Prob Cal and Ver Meas v01r01
- KDB450824 D01** Dipole SAR Validation Verification v01
- KDB447498D01(v04)** Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
- KDB447498D02(v02)** SAR Measurement Procedures for USB Dongle Transmitters
- KDB648474D01** SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas
- KDB941225D01(v02)** SAR Measurement Procedures for 3G Devices
- KDB941225D02(v02v01)** 3GPP R6 HSPA and R7 HSPA+ SAR Guidance
- KDB941225D03(v01)** Recommended SAR Test Reduction Procedures for GSM/GPRS/EDGE
- KDB941225D04(v01)** Evaluating SAR for GSM/(E)GPRS Dual Transfer Mode
- KDB941225D05(v01)** SAR for LTE Devices
- KDB941225D06(v01)** SAR test procedures for devices incorporating SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities (Hot Spot SAR)
- KDB941225D07(v01)** SAR Evaluation Procedures for UMPC Mini-Tablet Devices
- KDB 616217 D01(v01r01)** SAR Evaluation Considerations for Laptop Computer with antennas Built-in on Display Screen
- KDB 616217 D03(v01)** SAR Evaluation Considerations for Laptop/Notebook/Netbook and Tablet
- KDB865664** SAR Measurement Requirements for 3 to 6 GHz
- KDB248227(rev.1.2)** SAR Measurement Procedures for 802.11a/b/g Transmitters

Reference

- [1]ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
- [2]SPEAG uncertainty document (AN 15-7/AN19-17) for DASY 5 System from SPEAG (Shimid & Partner Engineering AG).

3.2 Procedure

Transmitter	WWAN
Test Procedure	FCC OET BULLETIN 65, SUPPLEMENT C SAR
Category	FCC47CFR 2.1093
Note: UL Japan, Inc. 's SAR Work Procedures 13-EM-W0429 and 13-EM-W0430	

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3.3 Exposure limit

(A) Limits for Occupational/Controlled Exposure (W/kg)

Spatial Average (averaged over the whole body)	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.4	8.0	20.0

(B) Limits for General population/Uncontrolled Exposure (W/kg)

Spatial Average (averaged over the whole body)	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.08	1.6	4.0

Occupational/Controlled Environments: are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

General Population/Uncontrolled Environments: are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

**NOTE:GENERAL POPULATION/UNCONTROLLED EXPOSURE
SPATIAL PEAK(averaged over any 1g of tissue) LIMIT
1.6 W/kg**

3.4 Test Location

*Shielded room for SAR testing
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SECTION 4 : Test result

4.1 Stand-alone SAR result

No.	Capable Tx configurations		Head SAR	Body SAR
1	WWAN	AMR/12.2kRMC : Band IV	No*1	-
2		12.2kRMC,HSPA: Band IV	No*1	Yes

Note

*1 The VOIP mode support but has no acoustic output in the phone.

Mode	1g Head SAR [W/kg]	1g BodySAR [W/kg]
WCDMA band IV	No	0.813

4.2 Simultaneous transmission SAR result

<Simultaneous Procedure>

This EUT has the unlicensed transmitter such as WLAN (802.11b/g/n) & Bluetooth devices besides licensed transmitter WWAN, and the following simultaneous transmission is possible.

No.	Capable Tx configurations		Head SAR	Body SAR	Note
1	WWAN+WLAN	12.2kRMC +WLAN2.4G	-	Yes	-
2	WWAN+Bluetooth		Exemption		

<WWAN + WLAN >

Simultaneous transmitter evaluation based on the KDB648474. Refer to the Section 8.

Step1	WWAN antenna is >5cm from Wireless LAN antenna			
Step2	WLAN power > 2Pref (=60/f _[GHz]).			
Step3	Stand-alone SAR for WLAN			
Step4	Simultaneous transmission is possible (WWAN + WLAN)			
Step5	\sum 1g SAR (WWAN + WLAN) < 1.6W/kg Max. SAR Measured (WWAN + WLAN) :1.516 W/kg		\sum 1g SAR(WWAN + WLAN) >1.6W/kg	
Step6	No simultaneous transmission.		Antenna pair SAR to peak SAR separation ratio<0.3	
Step7	No simultaneous transmission SAR			

*Antenna for WLAN and Bluetooth transmitting is the same and they are not transmitted simultaneously.

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SECTION 5 : Description of the operating mode**5.1 Output power operating modes**

Band	Duty cycle	Test Frequency	Mode
WCDMA IV	100%	1712.4MHz (1312ch) 1732.6MHz (1413ch) 1752.6MHz (1513ch)	12.2k RMC HSDPA HSUPA
Setting			
The communication link was set up with the Wireless Communications Test Set (Agilent). The EUT was command to operate at maximum transmit power. W-CDMA :All up bits			

5.2 Output power measurement results

Output power measurement for W-CDMA

Maximum output power for W-CDMA and HSPA was verified on the high, middle and low channels according to the procedures described in section 5.2 of 3GPP TS 34.121 and "KDB 941225 document".

The WCDMA and HSPA modes of EUT were verified each channel and "sub-tests" according to Release-6 procedures in section 5.2 of 3GPP TS 34.121.

[Rel.99]

The communication test set was using a 12.2k RMC (reference measurement channel) with TPC (transmit power control) set to all "1's" configured in Test Loop Mode 1.

[HSDPA]

The communication test set was using an FRC (Fixed reference channel) with H-set 1 and 12.2kbps RMC with TPC (transmit power control) set to all "1's". Output power was measured according requirements for HS-DPCCH Sub-test 1-4.

[HSUPA]

Maximum output power was verified on the High, Middle and Low channels according to Release 6 procedures in section 5.2 of 3GPP TS 34.121, using the appropriate RMC, FRC and E-DCH configurations. When E-DCH was active, inner loop power control with power control algorithm 2 was used to maintain E-TFCI requirements. Output power for the applicable HSPA modes was measured for E-DCH Sub-test 1-5.

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

Sub-test	β_c	β_d	β_d (SF)	$\beta_c \beta_d$	β_{HS} (Note 1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15	15/15	64	12/15	24/15	1.0	0.0
	(Note 4)	(Note 4)		(Note 4)			
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{HS} = 30/15 * \beta_c$.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and $\Delta_{NACK} = 30/15$ with $\beta_{HS} = 30/15 * \beta_c$, and $\Delta_{CQI} = 24/15$ with $\beta_{HS} = 24/15 * \beta_c$.

Note 3: CM = 1 for $\beta_c \beta_d = 12/15$, $\beta_{HS} \beta_c = 24/15$. For all other combinations of DPDCCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the $\beta_c \beta_d$ 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 $\beta_d = 15/15$.

Test Equipment Setting Summary Table

The following table is the key parameters that was configured in test equipment.

Subtest	Mode	Loopback Mode	Rel99 RMC	HSDPA FRC	HSUPA Test	Common Setting		$\beta c/\beta d$	MPR	Power Class 3 limit
						βc	βd			
	Rel99	Test Mode 1	12.2kbps RMC	-	-			8/15		24(+1.7/-3.7dB)
1	Rel6 HSDPA	Test Mode 1	12.2kbps RMC	H-Set 1 (HPSK)	-	2/15	15/15	2/15	0	24(+1.7/-3.7dB)
2	Rel6 HSDPA	Test Mode 1	12.2kbps RMC	H-Set 1 (HPSK)	-	12/15	15/15	12/15	0	24(+1.7/-3.7dB)
3	Rel6 HSDPA	Test Mode 1	12.2kbps RMC	H-Set 1 (HPSK)	-	15/15	8/15	15/8	0.5	23.5(+2.2/-3.7dB)
4	Rel6 HSDPA	Test Mode 1	12.2kbps RMC	H-Set 1 (HPSK)	-	15/15	4/15	15/4	0.5	23.5(+2.2/-3.7dB)
1	Rel6 HSUPA	Test Mode 1	12.2kbps RMC	H-Set 1 (QPSK)	HSUPA Loopback	11/15	15/15	11/15	0	24(+1.7/-3.7dB)
2	Rel6 HSUPA	Test Mode 1	12.2kbps RMC	H-Set 1 (QPSK)	HSUPA Loopback	6/15	15/15	6/15	2	22(+3.7/-3.7dB)
3	Rel6 HSUPA	Test Mode 1	12.2kbps RMC	H-Set 1 (QPSK)	HSUPA Loopback	15/15	9/15	15/9	1	23(+2.7/-3.7dB)
4	Rel6 HSUPA	Test Mode 1	12.2kbps RMC	H-Set 1 (QPSK)	HSUPA Loopback	2/15	15/15	2/15	2	22(+3.7/-3.7dB)
5	Rel6 HSUPA	Test Mode 1	12.2kbps RMC	H-Set 1 (QPSK)	HSUPA Loopback	15/15	15/15	15/15	0	24(+1.7/-3.7dB)

Subtest	HSDPA Specific Settings						
	ΔACK	$\Delta NACK$	ΔCQI	Ack-Nack repetition factor	CQI Feedback	CQI Repetition Factor	Ahs= $\beta hs/\beta c$
Rel 6 HSDPA							
1	8	8	8	3	4ms	2	30/15
2	8	8	8	3	4ms	2	30/15
3	8	8	8	3	4ms	2	30/15
4	8	8	8	3	4ms	2	30/15

Subtest	HSDPA Specific Settings							HSUPA Specific Settings			HSUPA Additional Info	
	ΔACK	$\Delta NACK$	ΔCQI	Ack-Nack repetition factor	CQI Feedback	CQI Repetition Factor	Ahs= $\beta hs/\beta c$	$\Delta E-DPCCH$	$\Delta HARQ$	AG Index	ETFCI (form TS34.121 Table C.11.1.3)	Associated Max UL Data Rate kbps
Rel 6 HSPA												
1	8	8	8	3	4ms	2	30/15	6	0	20	75	242.1
2	8	8	8	3	4ms	2	30/15	8	0	12	67	174.9
3	8	8	8	3	4ms	2	30/15	8	0	15	92	482.8
4	8	8	8	3	4ms	2	30/15	5	0	17	71	205.8
5	8	8	8	3	4ms	2	30/15	7	0	21	81	308.9

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HSUPA Reference E-TFCI Parameters

[Subtest 1, 2, 4, 5]

Information Element	Value/Remark
E-DCH info	Uplink DPCH info
- E-DPDCH info	
- Reference E-TFCIs	5 E-TFCIs
- Reference E-TFCI	11
- Reference E-TFCI PO	4
- Reference E-TFCI	67
- Reference E-TFCI PO	18
- Reference E-TFCI	71
- Reference E-TFCI PO	23
- Reference E-TFCI	75
- Reference E-TFCI PO	26
- Reference E-TFCI	81
- Reference E-TFCI PO	27

[Subtest 3]

Information Element	Value/Remark
E-DCH info	Uplink DPCH info
- E-DPDCH info	
- Reference E-TFCIs	2 E-TFCIs
- Reference E-TFCI	11
- Reference E-TFCI PO	4
- Reference E-TFCI	92
- Reference E-TFCI PO	18

WCDMA IV (Normal mode/ Power reduction mode)

WCDMA IV band								
Mode	Ch	Normal			Power reduction			
		Frequency [MHz]	Reading AVG [dBm]	Cable loss [dB]	Result [dBm]	Reading AVG [dBm]	Cable loss [dB]	Result [dBm]
RMC 12.2kbps	1312	1712.4	22.47	0.45	22.92	14.04	0.45	14.49
	1413	1732.6	22.40	0.45	22.85	14.39	0.45	14.84
	1513	1752.6	22.24	0.45	22.69	13.66	0.45	14.11
HSDPA Subtest1	1312	1712.4	21.47	0.45	21.92	12.81	0.45	13.26
	1413	1732.6	21.41	0.45	21.86	13.18	0.45	13.63
	1513	1752.6	21.34	0.45	21.79	12.40	0.45	12.85
HSDPA Subtest2	1312	1712.4	21.53	0.45	21.98	12.82	0.45	13.27
	1413	1732.6	21.42	0.45	21.87	13.22	0.45	13.67
	1513	1752.6	21.42	0.45	21.87	12.47	0.45	12.92
HSDPA Subtest3	1312	1712.4	21.01	0.45	21.46	12.35	0.45	12.80
	1413	1732.6	20.96	0.45	21.41	12.71	0.45	13.16
	1513	1752.6	20.91	0.45	21.36	11.96	0.45	12.41
HSDPA Subtest4	1312	1712.4	21.07	0.45	21.52	12.21	0.45	12.66
	1413	1732.6	20.90	0.45	21.35	12.64	0.45	13.09
	1513	1752.6	20.92	0.45	21.37	11.96	0.45	12.41
HSUPA Subtest1	1312	1712.4	20.43	0.45	20.88	11.62	0.45	12.07
	1413	1732.6	21.46	0.45	21.91	12.57	0.45	13.02
	1513	1752.6	21.25	0.45	21.70	11.17	0.45	11.62
HSUPA Subtest2	1312	1712.4	18.47	0.45	18.92	9.62	0.45	10.07
	1413	1732.6	18.53	0.45	18.98	10.08	0.45	10.53
	1513	1752.6	18.57	0.45	19.02	9.39	0.45	9.84
HSUPA Subtest3	1312	1712.4	20.46	0.45	20.91	11.62	0.45	12.07
	1413	1732.6	19.90	0.45	20.35	11.53	0.45	11.98
	1513	1752.6	19.91	0.45	20.36	10.81	0.45	11.26
HSUPA Subtest4	1312	1712.4	18.56	0.45	19.01	12.14	0.45	12.59
	1413	1732.6	18.54	0.45	18.99	12.52	0.45	12.97
	1513	1752.6	18.45	0.45	18.90	11.80	0.45	12.25
HSUPA Subtest5	1312	1712.4	21.43	0.45	21.88	12.25	0.45	12.70
	1413	1732.6	21.31	0.45	21.76	12.23	0.45	12.68
	1513	1752.6	21.21	0.45	21.66	11.76	0.45	12.21

Results = Reading + Loss

: Maximum power mode

Note: HSUPA

The enhanced power reduction may result in around 1dB of variance from the MPR target values depending on HSPA channel configuration (e.g. 34.121 subtest) and characteristics of hardware RF design.

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5.3 Detail for Power Reduction

Mode	Average power reduction results	Tolerance
	[dB]	[dB]
WCDMA band IV 12.2k RMC	9.0	9 +/-2

5.4 SAR testing operating modes

The operating mode for SAR testing was decided by the output power

SAR measurement for W-CDMA

Band	Crest factor	Mode	Test Frequency	Note
WCDMA IV	1	12.2k RMC	1712.4MHz (1312ch) 1732.6MHz (1413ch) 1752.6MHz (1513ch)	*1
Setting				
The communication link was set up with the Wireless Communications Test Set (Anritsu) The EUT was command to operate at maximum transmit power. W-CDMA :All up bits				

*1 The 12.2k RMC mode was maximum average power. The AMR/HSDPA/HSUPA SAR is not required for other mode because the maximum average output power for other mode is less than 1/4dB higher than that measured 12.2k RMC mode.

5.5 Confirmation before SAR testing

Correlation of Output Power between EMC and SAR tests

It was checked that the antenna port power was correlated within 0~+5% (FCC requirements)

5.6 Confirmation after SAR testing

It was checked that the power drift [W] is within +/-5%. The verification of power drift during the SAR test is that DASY5 system calculates the power drift by measuring the e-field at the same location at beginning and the end of the scan measurement for each test position.

DASY5 system calculation Power drift value[dB] = $20\log(E_a)/(E_b)$

Before SAR testing : E_b [V/m]

After SAR testing : E_a [V/m]

Limit of power drift[W] = +/-5%

$X[\text{dB}] = 10\log[P] = 10\log(1.05/1) = 10\log(1.05) - 10\log(1) = 0.212\text{dB}$

from E-field relations with power.

$p = E^2/\eta = E^2/$

Therefore, The correlation of power and the E-field

$X[\text{dB}] = 10\log(P) = 10\log(E)^2 = 20\log(E)$

Therefore,

The calculated power drift of DASY5 System must be the less than +/-0.212dB.

SECTION6 : Description of the Body

6.1 Specification of sensor

This EUT has two grip sensors for power reduction. These sensors detect the human skin within 10mm from the rear case and 9mm from top edge of EUT.

Sensor specification			
Position	Yes/No	Type	Distance detected
Front	No	-	-
Rear	Yes	grip	10mm
Left edge	No	-	-
Right edge	No	-	-
Top edge	Yes	grip	9mm
Bottom edge	No	-	-

6.2 Description of the Body setup

i) Procedure for SAR testing

-The tested procedure was performed according to the KDB 447498 D01 (Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies)

ii) Test mode

WCDMA band IV	Data transmission mode (12.2kRMC)
---------------	-----------------------------------

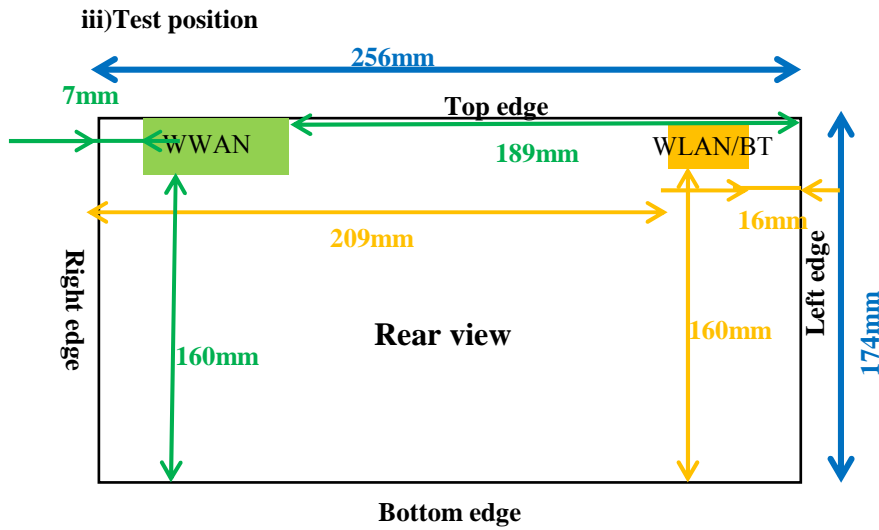
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The shortest distance of WWAN antenna to WLAN antenna: 154mm

<Antenna position>

The antennas use for WWAN and WLAN are both separate in a single fixed position. The antennas are integral part of the device. Refer to Appendix 4.

<Test position>

Test position is required to the edge within 5cm from antenna, according to the KDB 447498 D01
 Device dimensions (HxWxD):174x256x5

No.	Position	Test distance	WWAN		
			Reduction on <input checked="" type="checkbox"/> /off <input type="checkbox"/>	Tested	Antenna
1	Front	0mm	<input type="checkbox"/>	<input type="checkbox"/>	Fixed
2	Rear	0mm	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Fixed
3	Rear	10mm	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Fixed
4	Left edge	0mm	<input type="checkbox"/>	<input type="checkbox"/>	Fixed
5	Right edge	0mm	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Fixed
6	Top edge	0mm	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Fixed
7	Top edge	9mm	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Fixed
8	Bottom edge	0mm	<input type="checkbox"/>	<input type="checkbox"/>	Fixed
9	Vertex Top	45deg.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Fixed

*Rear 10mm and Top 9mm for WLAN was tested for Simultaneous transmission evaluation because this position is worst mode in WWAN mode.

SECTION 7 : Test surrounding

7.1 Measurement uncertainty

The uncertainty budget has been determined for the DASY5 measurement system according to the SPEAG documents[2] and is given in the following Table.

<WLAN 300M-3GHz>

Error Description	Uncertain value ±	Probability distribution	divisor	(ci) lg	Standard (lg)	vi or veff
Measurement System						
Probe calibration	± 6.00	Normal	1	1	± 6.00	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	0.7	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	0.7	± 3.9	∞
Boundary effects	± 1.0	Rectangular	√3	1	± 0.6	∞
Probe linearity	± 4.7	Rectangular	√3	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	√3	1	± 0.6	∞
Readout electronics	± 0.3	Normal	1	1	± 0.3	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5	∞
Integration time	± 2.6	Rectangular	√3	1	± 1.5	∞
RF ambient Noise	± 3.0	Rectangular	√3	1	± 1.7	∞
RF ambient Reflections	± 3.0	Rectangular	√3	1	± 1.7	∞
Probe Positioner	± 0.4	Rectangular	√3	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	√3	1	± 1.7	∞
Max.SAR Eval.	± 1.0	Rectangular	√3	1	± 0.6	∞
Test Sample Related						
Device positioning	± 2.9	Normal	1	1	± 2.9	7
Device holder uncertainty	± 3.6	Normal	1	1	± 3.6	5
Power drift	± 5.0	Rectangular	√3	1	± 2.9	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.64	± 1.8	∞
Liquid conductivity (meas.)	- 3.3	Rectangular	1	0.64	+ 2.1	∞
Liquid permittivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (meas.)	- 4.6	Rectangular	1	0.6	- 2.8	∞
Combined Standard Uncertainty					± 11.318	
Expanded Uncertainty (k=2)					± 22.6	

SECTION 8 : Measurement results

8.1 WCDMA Band IV Body SAR

(1)Method of measurement

<Body>

Step1. The searching for the worst position

The test was performed in mode of the maximum output power.

Step2. The changing to the channels (Low, High)

The test was performed at the worst condition of Step1 that SAR value is more than 0.8W/kg

Note:

1)The BODY SAR is not required for HSPA mode because the maximum average output power for HSPA mode is less than 1/4dB higher than that measured 12.2k RMC mode.

(2)Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.

The dielectric parameters measurement is reported in each correspondent section.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
27-Aug	25.0	53	MSL 1800	24.5	1712.4	ϵ_r	53.5	51.1	-4.4	+/-5
						σ [mho/m]	1.46	1.41	-3.3	+/-5
27-Aug	25.0	53	MSL 1800	24.5	1732.6	ϵ_r	53.5	51.0	-4.6	+/-5
						σ [mho/m]	1.48	1.43	-3.2	+/-5
27-Aug	25.0	53	MSL 1800	24.5	1752.6	ϵ_r	53.4	51.0	-4.6	+/-5
						σ [mho/m]	1.49	1.45	-2.6	+/-5

ϵ_r : Relative Permittivity / σ : Conductivity

*1 The Target value is a parameter defined in FCC OET65.

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(3)Result of Body SAR

BODY SAR MEASUREMENT RESULTS								
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			SAR(1g) [W/kg]	Note
Channel	[MHz]			Antenna	Position	Separation [mm]	Maximum value of multi-peak	
Step.1 Position searching								
1413	1732.6	12.2k RMC	Flat	Fixed	Front	-	Not required	
1413	1732.6	12.2k RMC	Flat	Fixed	Rear	10	0.791	*1
1413	1732.6	12.2k RMC	Flat	Fixed	Rear	0	0.659	*2
1413	1732.6	12.2k RMC	Flat	Fixed	Right edge	0	0.204	*1
1413	1732.6	12.2k RMC	Flat	Fixed	Left edge	-	Not required	
1413	1732.6	12.2k RMC	Flat	Fixed	Top edge	9	0.813	*1
1413	1732.6	12.2k RMC	Flat	Fixed	Top edge	0	0.476	*2
1413	1732.6	12.2k RMC	Flat	Fixed	Bottom edge	-	Not required	
Vertex position								
1413	1732.6	12.2k RMC	Flat	Fixed	Top vertex	Right 45 °	0.350	*1
Step.2 Channel change (SAR level in Step.1 > 0.8 w/kg)								
1312	1712.4	12.2k RMC	Flat	Fixed	Top edge	9	0.599	*1
1513	1752.6	12.2k RMC	Flat	Fixed	Top edge	9	0.565	*1

Note:

*1 This measurement condition is normal power (maximum power)without a power reduction function.

*2 This measurement condition has a power reduction function with distance detected.

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8.2 Simultaneous transmission evaluation for Body

Result of $\text{SUM} \Sigma \text{SAR}1\text{g}$

SUM Σ SAR1g (WCDMA Band IV+WLAN(2.4G))				
Position	Separation [mm]	Stand alone SAR(1g) [W/kg]		SUM SAR(1g)[W/kg]
		Band IV	WLAN 2.4G	WWAN(WCDMA Band IV)+ WLAN
Front	-	Not required	Not required	-
Rear	10	0.791	0.107	0.898
Rear	0	0.659	0.857	1.516
Right edge	0	0.204	Not required	-
Left edge	0	Not required	0.154	-
Top edge	9	0.813	0.068	0.881
Top edge	0	0.476	0.293	0.769
Bottom edge	-	Not required	Not required	-
Vertex	45 degree	0.350	Not required	-

: Highest SUM Σ SAR1g Body simultaneous transmissions(in SUM Σ SAR1g <1.6W/kg)

The SAR result of WLAN 2.4GHz in UL Japan Test report No. 32JE0205-HO-H (FCC ID: A3LSGHI497) was used.

SECTION 9 Test instruments

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	Power measurement	2012/02/06 * 12
MURC-02	Wireless Communication Test Set	Agilent	E5515C	GB47050683	Power measurement	2011/11/26 * 12
MPM-01	Power Meter	Agilent	E4417A	GB41290639	SAR	2012/03/05 * 12
MPSE-01	Power Sensor	Agilent	E9300B	US40010300	SAR	2012/02/29 * 12
MPSE-03	Power sensor	Agilent	E9327A	US40440576	SAR	2012/03/07 * 12
MAT-15	Attenuator(30dB)	Agilent	8498A	US40010300	SAR	2012/03/15 * 12
MSG-10	Signal Generator	Agilent	N5181A	MY47421098	SAR	2011/09/22 * 12
MRFA-12	RF Power Amplifier	MILMEGA	AS0825-65	1015249	SAR	2012/08/28 * 12
MHDC-11	Dual Directional Coupler	Hewlett Packard	778D	16605	SAR	Pre Check
MNA-01	Network Analyzer	Agilent/HP	E8358A	US41080381	SAR	2011/08/22 * 12
MDPK-01	Dielectric probe kit	Agilent	85070D	702	SAR	2010/10/25 * 36
MNCK-01	Type N Calibration Kit	Agilent	85032F	MY41495257	SAR	2011/08/12 * 12
MPB-07	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3825	SAR	2011/12/16 * 12
MDAE-01	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	509	SAR	2012/07/13 * 12
COTS-MSAR-03	Dasy5	Schmid&Partner Engineering AG	DASY52.6.1.408	-	SAR	-
COTS-MSAR-02	S-Parameter Network Analyzer	Agilent	-	-	SAR	-
MDA-06	Dipole Antenna	Schmid&Partner Engineering AG	D1800V2	2d040	SAR	2011/11/23 * 36
MPF-02	2mmOval Flat Phantom ERI 4.0	Schmid&Partner Engineering AG	QD VA 001B (ERI4.0)	1045	SAR	2012/05/08 * 12
MDH-01	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	SAR	Pre Check
MOS-26	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q29	SAR	2012/05/14 * 12
MOS-10	Digital thermometer	HANNA	Checktemp-2	MOS-10	SAR	2012/08/06 * 12
MBM-13	Barometer	Sunoh	SBR121	837	SAR	2011/03/14 * 36
MURC-03	Radio Communication Analyzer	Anritsu	MT8815B	6200711471	SAR	2011/11/26 * 12
MSL1800					Daily check	Target value \pm 5%
SAR room					Daily check	Ambient Noise<0.012W/kg

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

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APPENDIX 1 : SAR Measurement data

1. Evaluation procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the E-field at a fixed location above the ear point or central position of flat phantom was used as a reference value for assessing the power drop.

Step 2: The SAR distribution at the exposed side of head or body position was measured at a distance of each device from the inner surface of the shell. The area covered the entire dimension of the antenna of EUT and the horizontal grid spacing was 15 mm x 15 mm for below 3GHz. (or 10mm x 10mm for above 3GHz.). Based on these data, the area of the maximum absorption was determined by spline interpolation.

Step 3: Around this point found in the Step 2 (area scan), a volume of 30mm x 30mm x 30mm or more was assessed by measuring 7 x 7 x 7 points at least for below 3GHz and a volume of 28 mm x 28mm x 22.5mm or more was assessed by measuring 8 x 8 x 10 points at least for 5GHz band.

And for any secondary peaks found in the Step2 which are within 2dB of maximum peak and not with this Step3 (Zoom scan) is repeated. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

(1). The data at the surface were extrapolated, since the center of the dipoles is 1mm(EX3DV4) away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm [4]. A polynomial of the fourth order was calculated through the points in z-axes.

This polynomial was then used to evaluate the points between the surface and the probe tip.

(2). The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the "Not a knot"-condition (in x, y and z-directions) [4], [5]. The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

(3). All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the E-field at the same location as in Step 1.

2. Measurement data

i) WCDMA Band IV

WCDMA IV 12.2k RMC Rear 10mm 1732.6MHz

Communication System: WCDMA IV; Communication System Band: 1413; Frequency: 1732.6 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1732.6$ MHz; $\sigma = 1.433$ mho/m; $\epsilon_r = 51.041$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(7.87, 7.87, 7.87); Calibrated: 2011/12/16

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn509; Calibrated: 2011/07/20

Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx

Measurement SW: DASY52, Version 52.8 (0);

Area Scan 2 (61x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.105 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.155 V/m; Power Drift = 0.11 dB

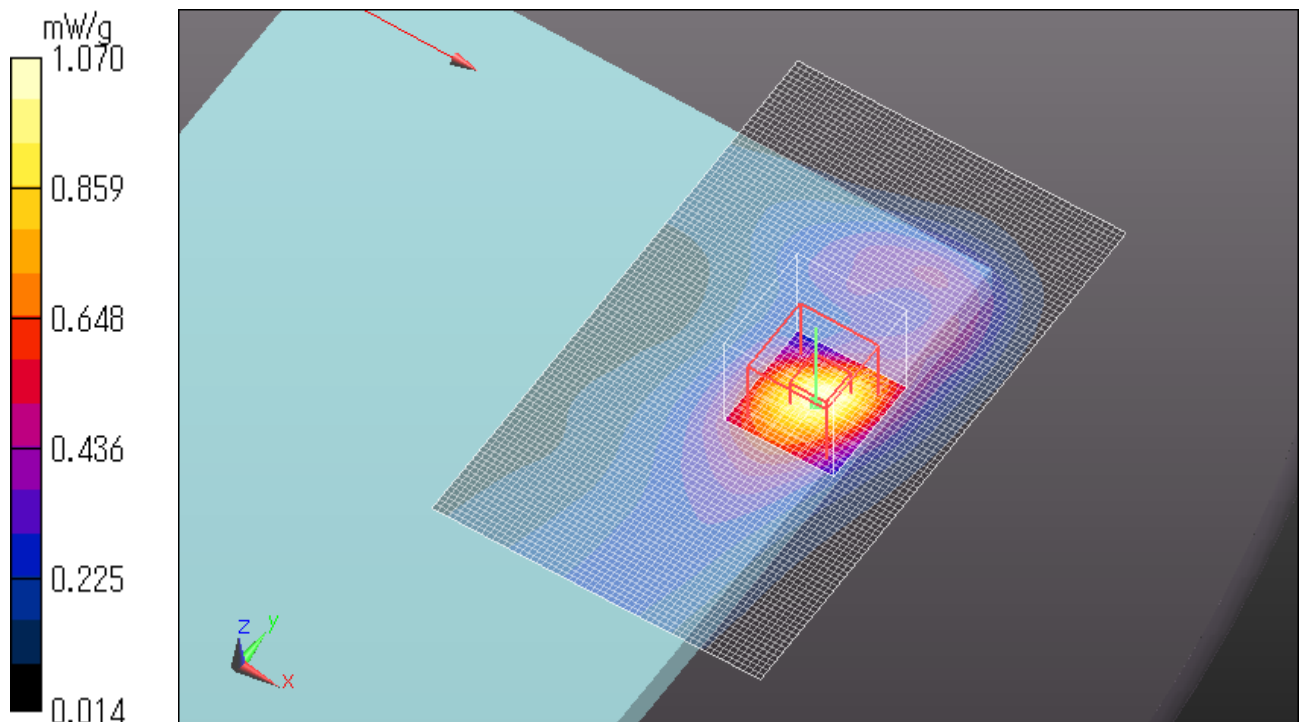
Peak SAR (extrapolated) = 1.3500

SAR(1 g) = 0.791 mW/g; SAR(10 g) = 0.444 mW/g

Maximum value of SAR (measured) = 1.070 mW/g

Date: 2012/08/27

Ambient Temp. : 25.0 degree.C. Liquid Temp.; 24.5 degree.C.



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WCDMA IV 12.2k RMC Rear 0mm 1732.6MHz

Communication System: WCDMA IV; Communication System Band: 1413; Frequency: 1732.6 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1732.6$ MHz; $\sigma = 1.433$ mho/m; $\epsilon_r = 51.041$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(7.87, 7.87, 7.87); Calibrated: 2011/12/16

Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn509; Calibrated: 2011/07/20

Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx

Measurement SW: DASY52, Version 52.8 (0);

Area Scan 2 (61x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.967 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.417 V/m; Power Drift = 0.13 dB

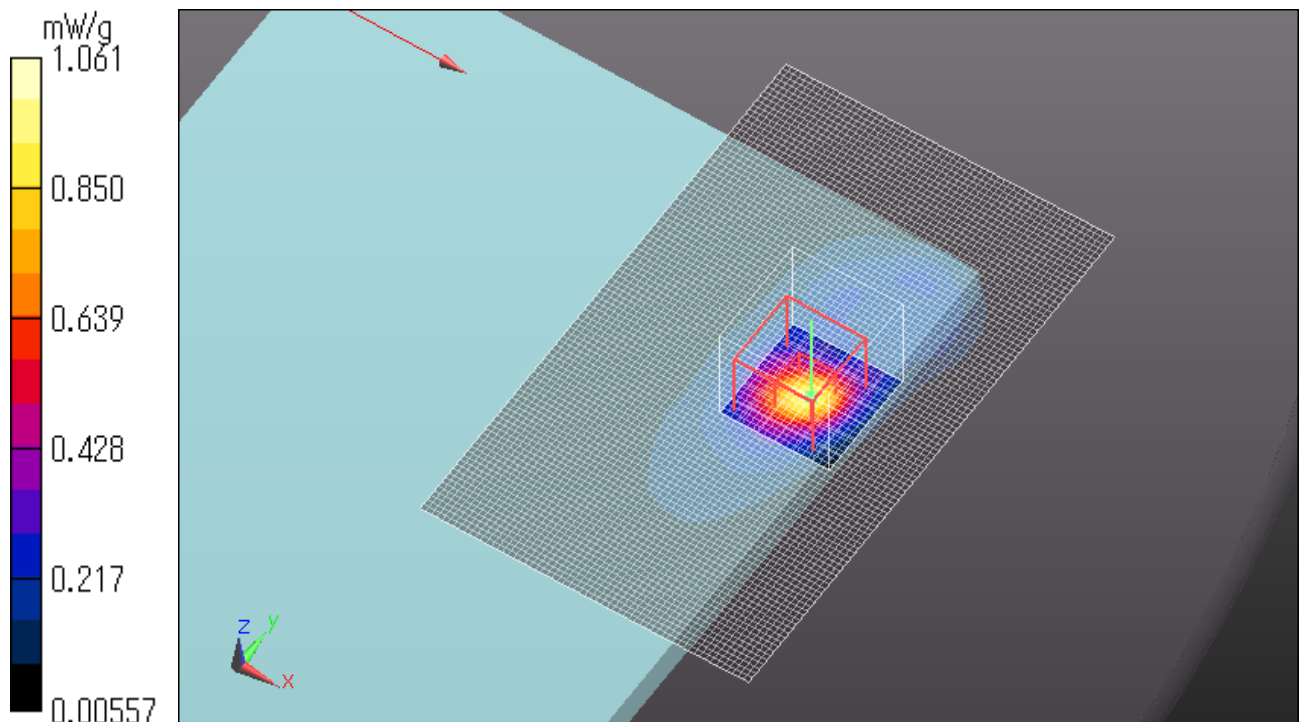
Peak SAR (extrapolated) = 1.4790

SAR(1 g) = 0.659 mW/g; SAR(10 g) = 0.289 mW/g

Maximum value of SAR (measured) = 1.061 mW/g

Date: 2012/08/27

Ambient Temp. : 25.0 degree.C. Liquid Temp.; 24.5 degree.C.



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WCDMA IV 12.2k RMC Right edge 0mm 1732.6MHz

Communication System: WCDMA IV; Communication System Band: 1413; Frequency: 1732.6 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1732.6$ MHz; $\sigma = 1.433$ mho/m; $\epsilon_r = 51.041$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(7.87, 7.87, 7.87); Calibrated: 2011/12/16

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn509; Calibrated: 2011/07/20

Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx

Measurement SW: DASYS2, Version 52.8 (0);

Area Scan 2 (61x131x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.264 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.844 V/m; Power Drift = -0.19 dB

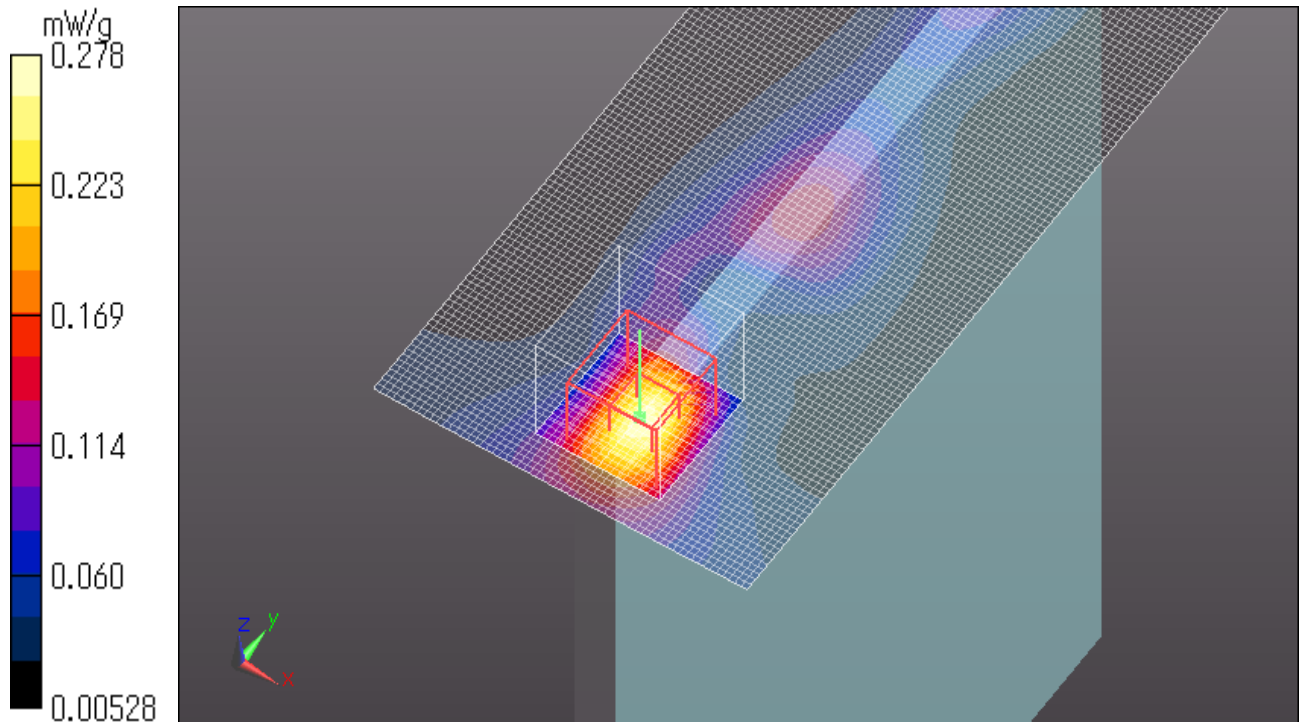
Peak SAR (extrapolated) = 0.3480

SAR(1 g) = 0.204 mW/g; SAR(10 g) = 0.112 mW/g

Maximum value of SAR (measured) = 0.278 mW/g

Date: 2012/08/27

Ambient Temp. : 25.0 degree.C. Liquid Temp.; 24.5 degree.C.



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WCDMA IV 12.2k RMC Top edge 9mm 1732.6MHz

Communication System: WCDMA IV; Communication System Band: 1413; Frequency: 1732.6 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1732.6$ MHz; $\sigma = 1.433$ mho/m; $\epsilon_r = 51.041$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(7.87, 7.87, 7.87); Calibrated: 2011/12/16

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn509; Calibrated: 2011/07/20

Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx

Measurement SW: DASYS2, Version 52.8 (0);

Area Scan 2 (61x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.047 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 26.944 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 1.2780

SAR(1 g) = 0.813 mW/g; SAR(10 g) = 0.487 mW/g

Maximum value of SAR (measured) = 1.067 mW/g

Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 26.944 V/m; Power Drift = -0.10 dB

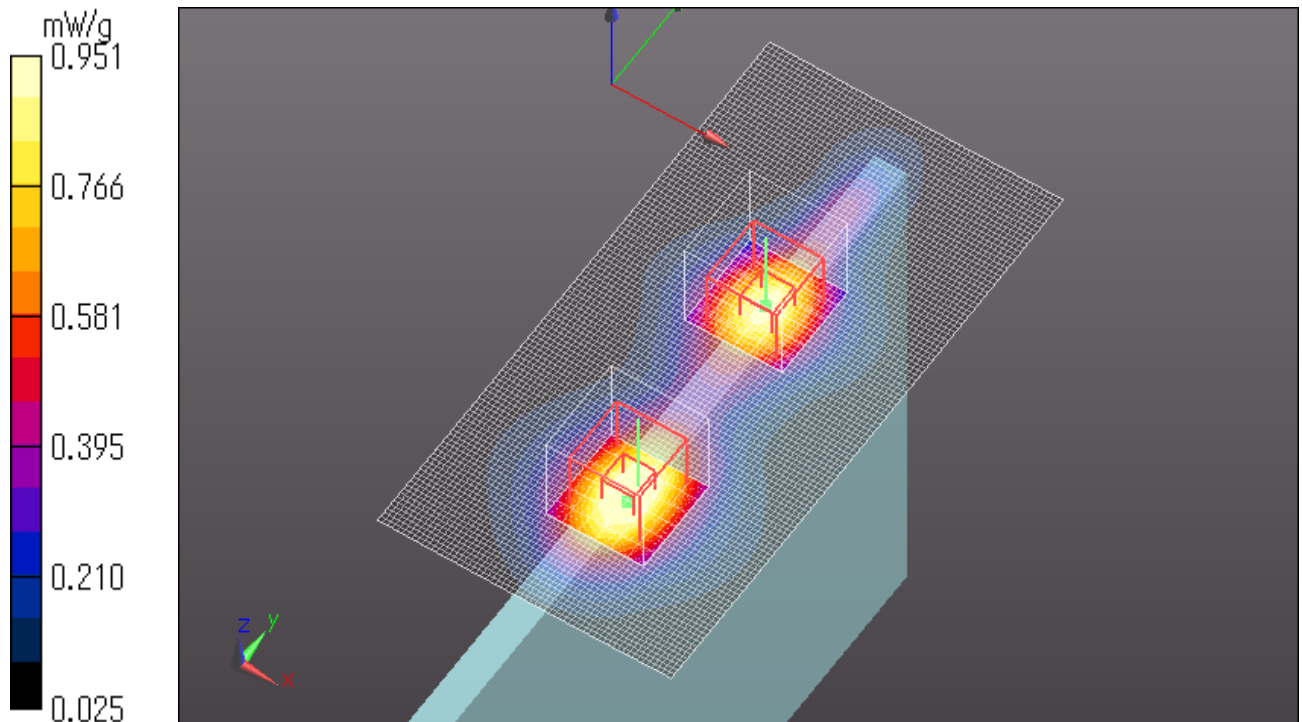
Peak SAR (extrapolated) = 1.1260

SAR(1 g) = 0.727 mW/g; SAR(10 g) = 0.424 mW/g

Maximum value of SAR (measured) = 0.951 mW/g

Date: 2012/08/27

Ambient Temp. : 25.0 degree.C. Liquid Temp.; 24.5 degree.C.



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WCDMA IV 12.2k RMC Top edge 9mm 1732.6MHz

Communication System: WCDMA IV; Communication System Band: 1413; Frequency: 1732.6 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1732.6$ MHz; $\sigma = 1.433$ mho/m; $\epsilon_r = 51.041$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(7.87, 7.87, 7.87); Calibrated: 2011/12/16

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn509; Calibrated: 2011/07/20

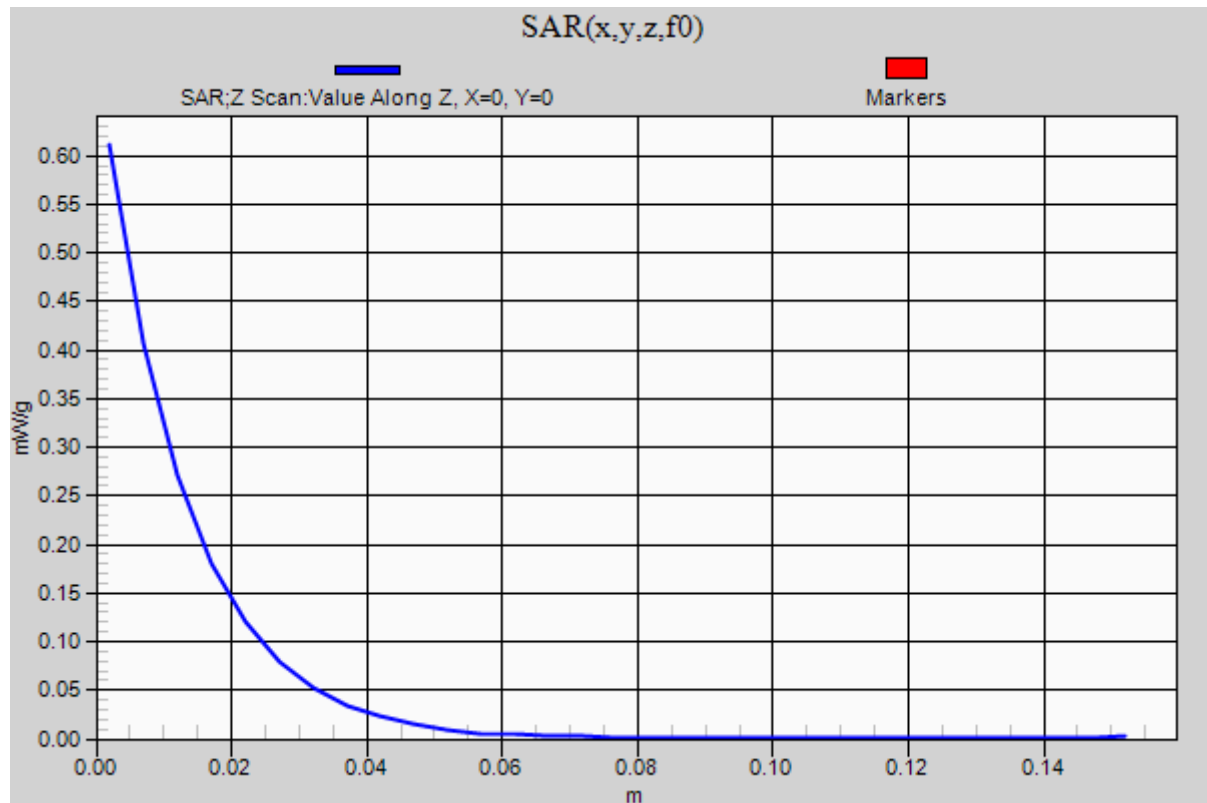
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx

Measurement SW: DASYS2, Version 52.8 (0);

Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.611 mW/g

Date: 2012/08/27

Ambient Temp. : 25.0 degree.C. Liquid Temp.; 24.5 degree.C.



UL Japan, Inc.

Head Office EMC Lab.

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WCDMA IV 12.2k RMC Top edge 0mm 1732.6MHz

Communication System: WCDMA IV; Communication System Band: 1413; Frequency: 1732.6 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1732.6$ MHz; $\sigma = 1.433$ mho/m; $\epsilon_r = 51.041$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(7.87, 7.87, 7.87); Calibrated: 2011/12/16

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn509; Calibrated: 2011/07/20

Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx

Measurement SW: DASYS2, Version 52.8 (0);

Area Scan 2 (61x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.718 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 16.216 V/m; Power Drift = -0.20 dB

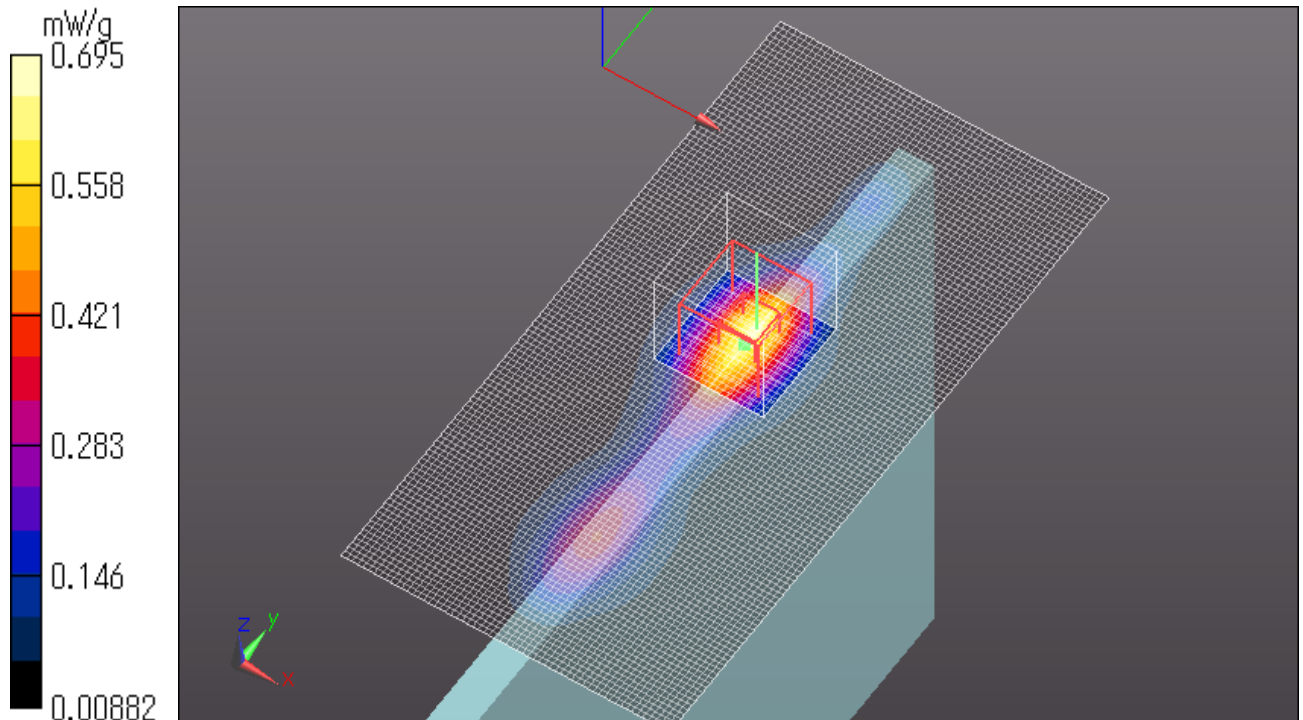
Peak SAR (extrapolated) = 0.8560

SAR(1 g) = 0.476 mW/g; SAR(10 g) = 0.248 mW/g

Maximum value of SAR (measured) = 0.695 mW/g

Date: 2012/08/27

Ambient Temp. : 25.0 degree.C. Liquid Temp.; 24.5 degree.C.



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WCDMA IV 12.2k RMC Top vertex Right 45 degree 0mm 1732.6MHz

Communication System: WCDMA IV; Communication System Band: 1413; Frequency: 1732.6 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1732.6$ MHz; $\sigma = 1.433$ mho/m; $\epsilon_r = 51.041$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(7.87, 7.87, 7.87); Calibrated: 2011/12/16

Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn509; Calibrated: 2011/07/20

Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx

Measurement SW: DASYS2, Version 52.8 (0);

Area Scan (61x131x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.473 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.154 V/m; Power Drift = -0.12 dB

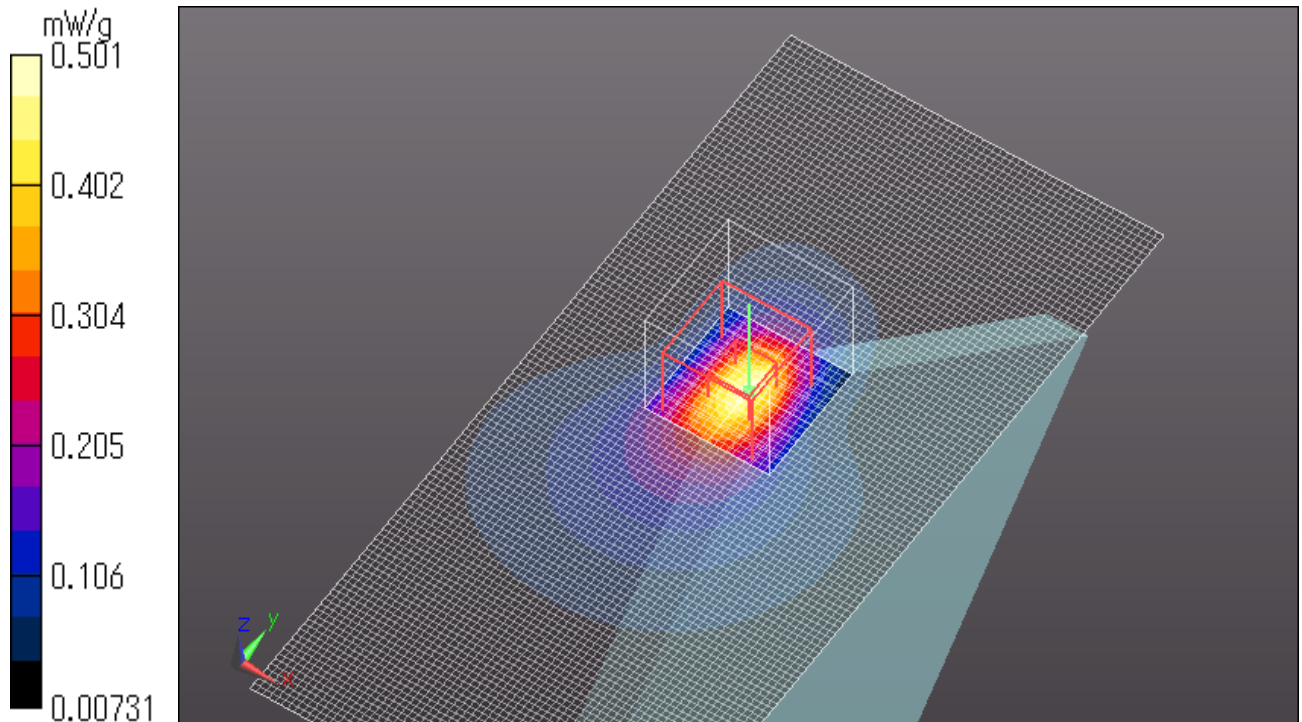
Peak SAR (extrapolated) = 0.6230

SAR(1 g) = 0.350 mW/g; SAR(10 g) = 0.180 mW/g

Maximum value of SAR (measured) = 0.501 mW/g

Date: 2012/08/27

Ambient Temp. : 25.0 degree.C. Liquid Temp.; 24.5 degree.C.



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WCDMA IV 12.2k RMC Top edge 9mm 1712.4MHz

Communication System: WCDMA IV; Communication System Band: 1413; Frequency: 1712.4 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1712.4$ MHz; $\sigma = 1.412$ mho/m; $\epsilon_r = 51.131$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(7.87, 7.87, 7.87); Calibrated: 2011/12/16

Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn509; Calibrated: 2011/07/20

Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx

Measurement SW: DASYS2, Version 52.8 (0);

Area Scan 2 (61x121x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.770 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.642 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.9200

SAR(1 g) = 0.599 mW/g; SAR(10 g) = 0.364 mW/g

Maximum value of SAR (measured) = 0.773 mW/g

Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.642 V/m; Power Drift = 0.04 dB

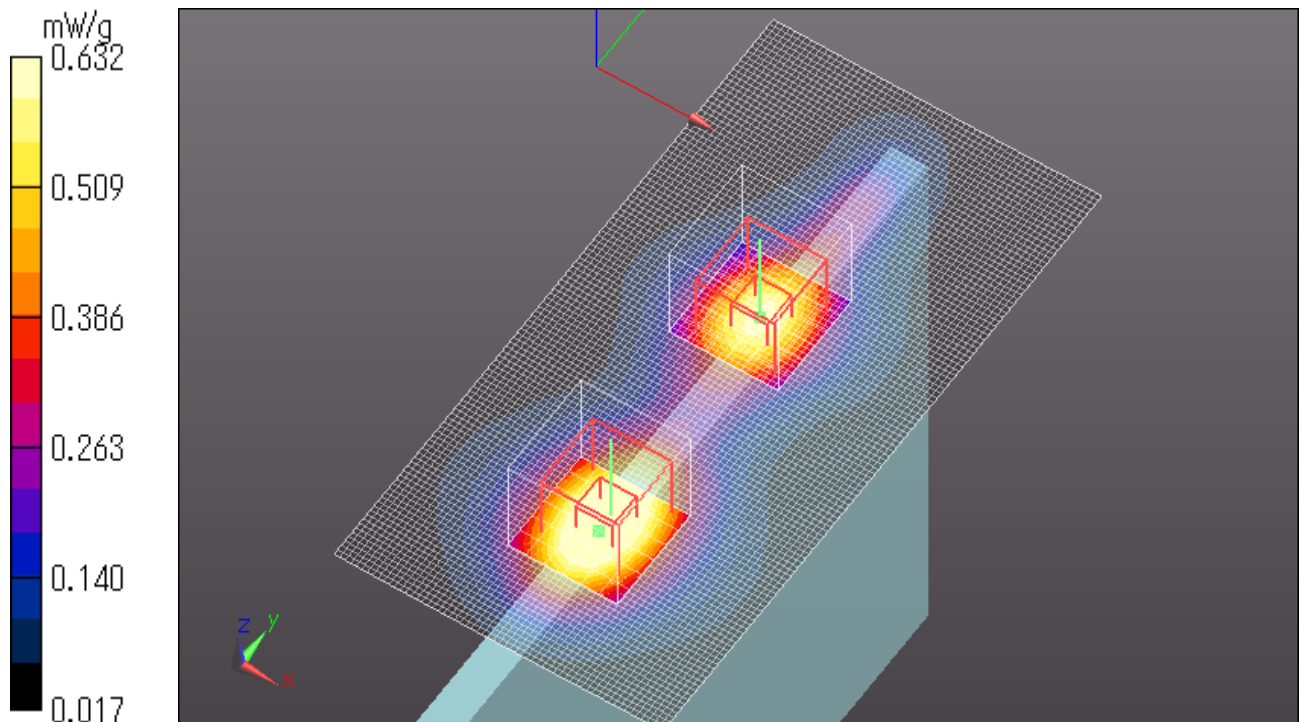
Peak SAR (extrapolated) = 0.7440

SAR(1 g) = 0.486 mW/g; SAR(10 g) = 0.288 mW/g

Maximum value of SAR (measured) = 0.632 mW/g

Date: 2012/08/27

Ambient Temp. : 25.0 degree.C. Liquid Temp.; 24.5 degree.C.



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WCDMA IV 12.2k RMC Top edge 9mm 1752.6MHz

Communication System: WCDMA IV; Communication System Band: 1413; Frequency: 1752.6 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1752.6$ MHz; $\sigma = 1.452$ mho/m; $\epsilon_r = 50.961$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration

Probe: EX3DV4 - SN3825; ConvF(7.87, 7.87, 7.87); Calibrated: 2011/12/16

Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)

Electronics: DAE4 Sn509; Calibrated: 2011/07/20

Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx

Measurement SW: DASYS2, Version 52.8 (0);

Area Scan 2 (61x121x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.745 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 22.834 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.8730

SAR(1 g) = 0.565 mW/g; SAR(10 g) = 0.341 mW/g

Maximum value of SAR (measured) = 0.734 mW/g

Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 22.834 V/m; Power Drift = 0.03 dB

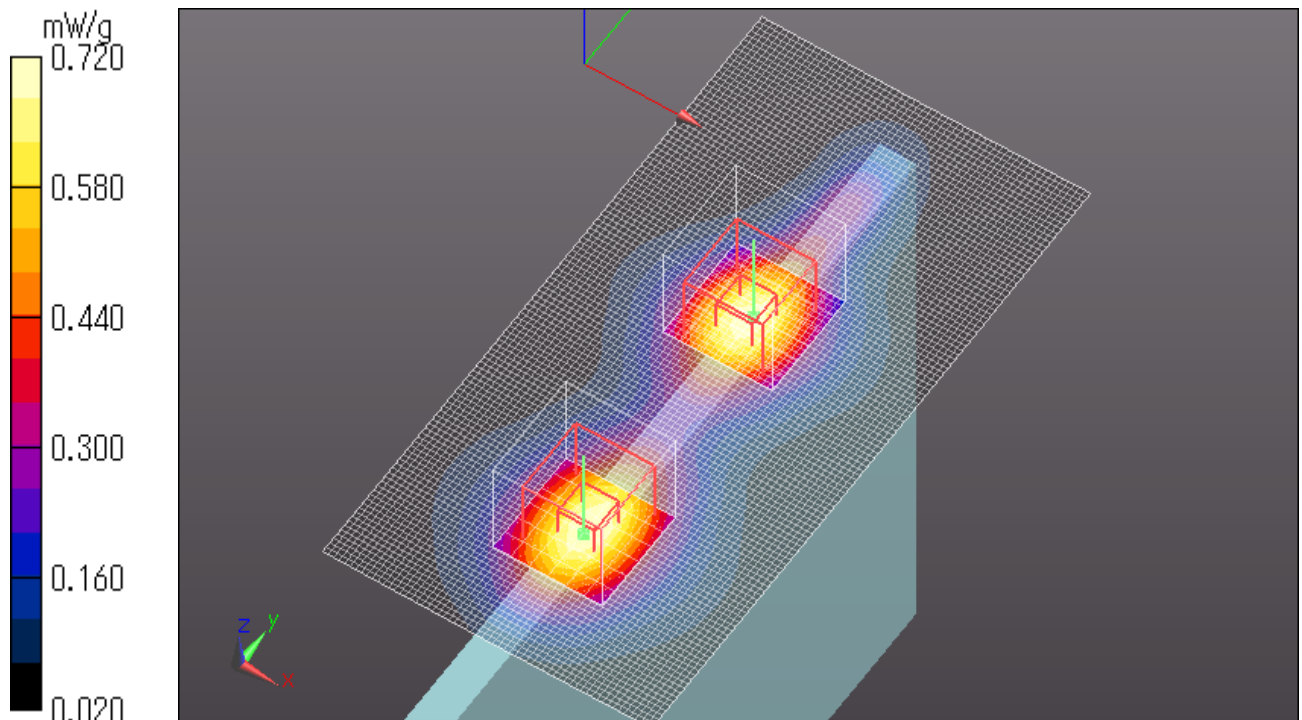
Peak SAR (extrapolated) = 0.8560

SAR(1 g) = 0.553 mW/g; SAR(10 g) = 0.325 mW/g

Maximum value of SAR (measured) = 0.720 mW/g

Date: 2012/08/27

Ambient Temp. : 25.0 degree.C. Liquid Temp.; 24.5 degree.C.



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APPENDIX 2 : System Validation

System validation result for Body1800MHz

Simulated Tissue Liquid Parameter confirmation

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
27-Aug	25.0	53	MSL 1800	24.5	1800	ϵ_r	53.3	50.8	-4.7	+/-5
						σ [mho/m]	1.52	1.50	-1.3	+/-5

ϵ_r : Relative Permittivity / σ : Conductivity

*1 The Target value is a parameter defined in FCC OET 65 .

Simulated Tissue Liquid Parameter confirmation (for calibration by manufacture)

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*2	Measured	Deviation [%]	Limit*3 [%]
27-Aug	25.0	53	MSL 1800	24.5	1800	ϵ_r	52.9	50.8	-4.0	+/-6
						σ [mho/m]	1.45	1.50	3.4	+/-6

ϵ_r : Relative Permittivity / σ : Conductivity

*2 The target value is the calibrated dipole Body TSL parameters.

(D1800V2 SN:2d04, Measured Body TSL parameters)

*3 The limit is for deviation provided by manufacture.

System validation result (for calibration by manufacture)

SYSTEM VALIDATION							
Date	Frequency [MHz]	SAR 1g [W/kg]			Target 1W *4	Deviation	Limit
		Forward Power 250mW	Conversion 1W				
		Measured	Calculation				
27-Aug	1800.00	9.50	38.00		37.36	1.7	+/-10

*4The target value is the parameter defined in 1g SAR (normalizes to 1W) in manufacturer calibrated dipole (D1800V2 SN:2d04)

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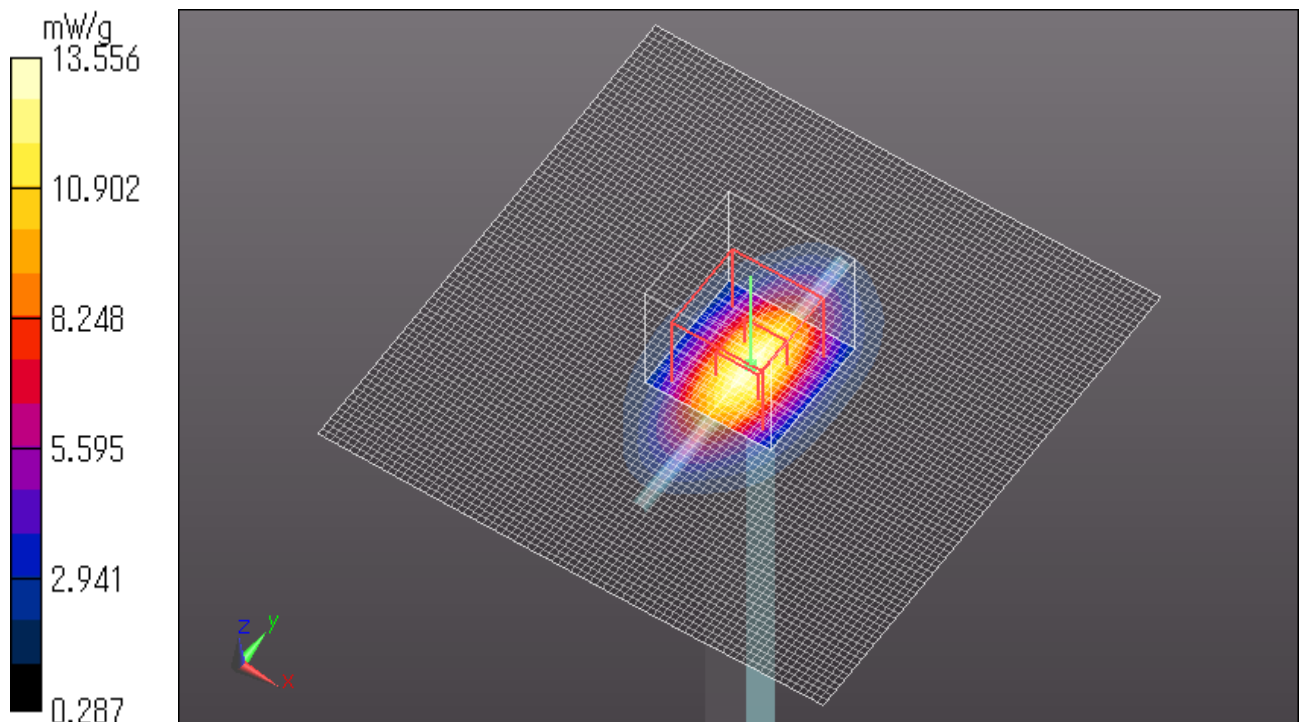
Body1800MHz System Validation DATA / Dipole1800MHz / Forward Conducted Power : 250mW

Communication System: CW; Communication System Band: D1800 (1800.0 MHz); Frequency: 1800 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1800$ MHz; $\sigma = 1.503$ mho/m; $\epsilon_r = 50.786$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration
Probe: EX3DV4 - SN3825; ConvF(7.69, 7.69, 7.69); Calibrated: 2011/12/16
Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn509; Calibrated: 2011/07/20
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
Measurement SW: DASY52, Version 52.8 (0);

Area Scan 2 (81x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 13.305 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.467 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 16.9830
SAR(1 g) = 9.5 mW/g; SAR(10 g) = 4.99 mW/g
Maximum value of SAR (measured) = 13.556 mW/g

Date: 2012/08/27
Ambient Temp. : 25.0 degree.C. Liquid Temp.; 24.5 degree.C.



1. System Validation Dipole (D1800V2,S/N: 2d04)

**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 **UL Japan (PTT)**

Certificate No: **D1800V2-2d040_Dec10**

CALIBRATION CERTIFICATE

Object **D1800V2 - SN: 2d040**

Calibration procedure(s) **QA CAL-05.v7
Calibration procedure for dipole validation kits**

Calibration date: **December 09, 2010**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-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

Calibrated by: **Dimce Iliev** (Name) / **Laboratory Technician** (Function) / *[Signature]* (Signature)

Approved by: **Katja Pokovic** (Name) / **Technical Manager** (Function) / *[Signature]* (Signature)

Issued: December 14, 2010

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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**

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:

- 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
- 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
- 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:

- 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.

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Measurement Conditions

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

DASY Version	DASY5	V52.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.6 ± 6 %	1.35 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	9.60 mW / g
SAR normalized	normalized to 1W	38.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	39.3 mW /g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.04 mW / g
SAR normalized	normalized to 1W	20.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	20.4 mW /g ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(21.2 ± 0.2) °C	52.9 ± 6 %	1.45 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	9.34 mW / g
SAR normalized	normalized to 1W	37.4 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	38.4 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.98 mW / g
SAR normalized	normalized to 1W	19.9 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.2 mW / g ± 16.5 % (k=2)

Appendix**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	48.8 Ω - 1.9 j Ω
Return Loss	- 33.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.4 Ω - 2.2 j Ω
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.205 ns
----------------------------------	----------

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

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

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 27, 2002

DASY5 Validation Report for Head TSL

Date/Time: 07.12.2010 12:17:06

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d040

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: HSL U12 BB

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.34$ mho/m; $\epsilon_r = 39.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

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

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement

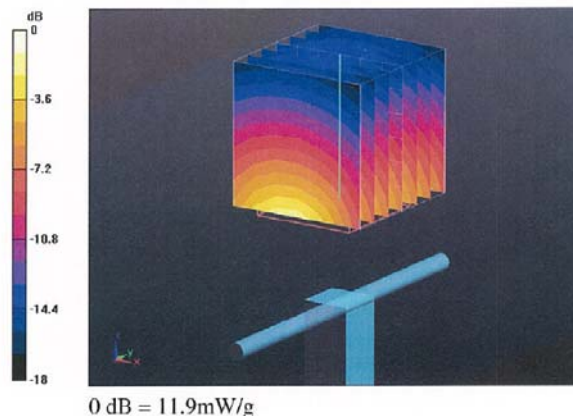
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.8 V/m; Power Drift = 0.039 dB

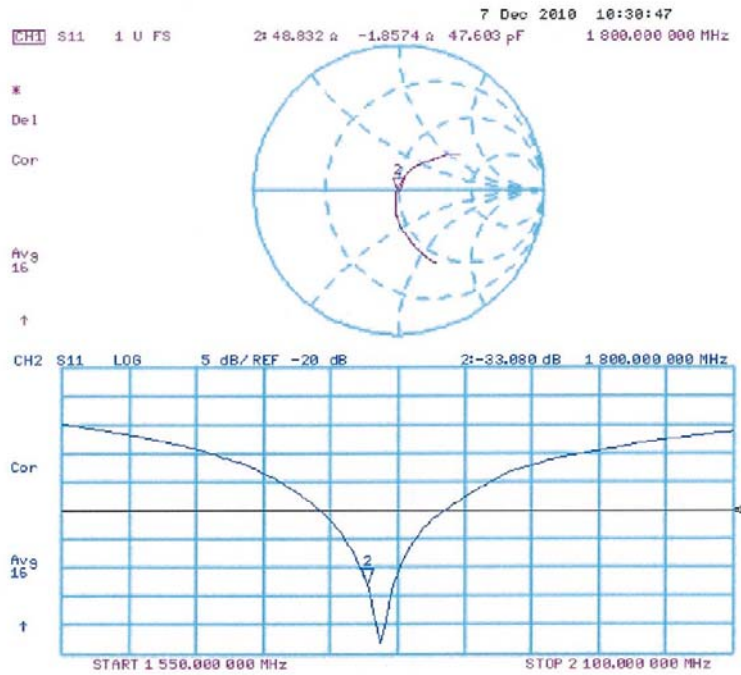
Peak SAR (extrapolated) = 17.5 W/kg

SAR(1 g) = 9.6 mW/g; SAR(10 g) = 5.04 mW/g

Maximum value of SAR (measured) = 11.9 mW/g



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 09.12.2010 11:14:21

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:2d040

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: MSL U12 BB

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 53.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

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

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement

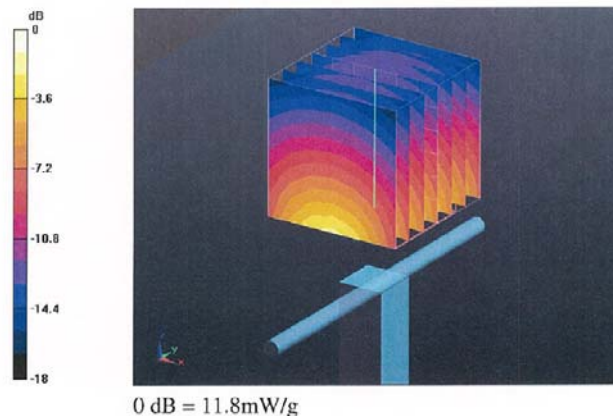
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.6 V/m; Power Drift = -0.025 dB

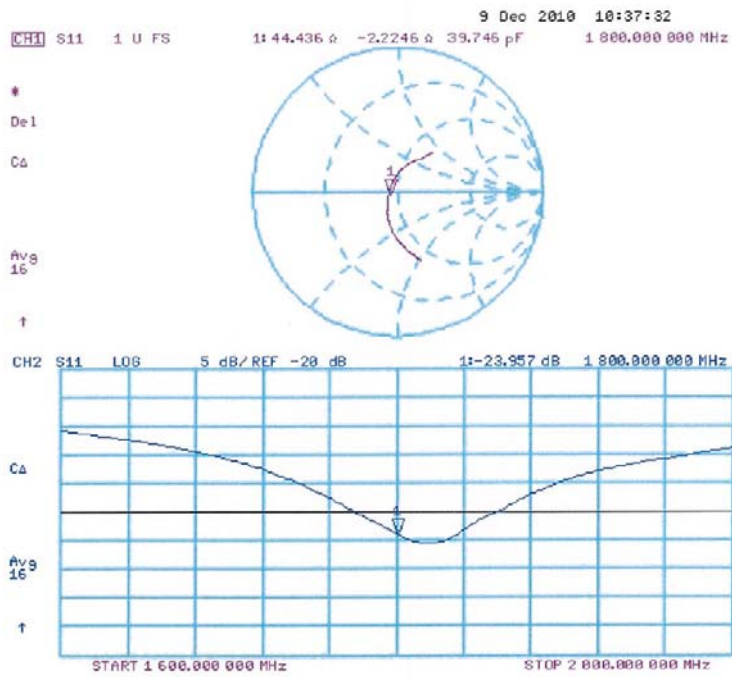
Peak SAR (extrapolated) = 16 W/kg

SAR(1 g) = 9.34 mW/g; SAR(10 g) = 4.98 mW/g

Maximum value of SAR (measured) = 11.8 mW/g



Impedance Measurement Plot for Body TSL



D1800V2 Calibration for Impedance and Return-loss

1. Test environment

Date	November 23, 2011		
Ambient Temperature	24.0 deg.C	Relative humidity	45%RH

2. Equipment used

Control No.	Instrument	Manufacturer	Model No	Serial No	Calibration Date * Interval(month)
MNA-01	Network Analyzer	Agilent/HP	E8358A	US41080381	2011/08/22 * 12
MNCK-01	Type N Calibration Kit	Agilent	85032F	MY41495257	2011/08/12 * 12
EST-46	3.5mm Calibration Kit	Agilent	85052D	MY43252869	2011/06/13 * 12
MDA-06	Dipole Antenna	Schmid&Partner Engineering AG	D1800V2	2d040	2010/12/09 * 36
MPF-01	Flat Phantom	Schmid&Partner Engineering AG	2.0mm Flat Phantom V4.3L	1005	2011/04/01 * 12
MOS-24	Thermo-Hygrometer	Custom	CTH-201	0005	2011/02/23 * 12
HSL1800					Daily check
MSL1800					Daily check
SAR room					Daily check

3. Test Result

Impedance, Transformed to feed point	Head	Deviation	Tolerance	Result
Calibration (SPEAG) 2010/12/09	48.8 Ω-1.9jΩ	-	-	-
Calibration(ULJ)2011/11/23	46.56Ω+1.518jΩ	0.38Ω-0.65jΩ	+/-5Ω+/-5jΩ	Complied

Return loss	Head	Deviation	Tolerance	Result
Calibration (SPEAG) 2010/12/09	-33.1dB	-	-	-
Calibration(ULJ)2011/11/23	-28.18dB	4.92dB	33.1 *+/-20%	Complied

Impedance, Transformed to feed point	Body	Deviation	Tolerance	Result
Calibration (SPEAG) 2010/12/09	44.4 Ω-2.2jΩ	-	-	-
Calibration(ULJ)2011/11/23	43.22Ω+0.895jΩ	-1.18Ω+3.095jΩ	+/-5Ω+/-5jΩ	Complied

Return loss	Body	Deviation	Tolerance	Result
Calibration (SPEAG) 2010/12/09	-24.0dB	-	-	-
Calibration(ULJ)2011/11/23	-22.69dB	1.31dB	24*+/-20%	Complied

*Tolerance : According to the KDB450824D02

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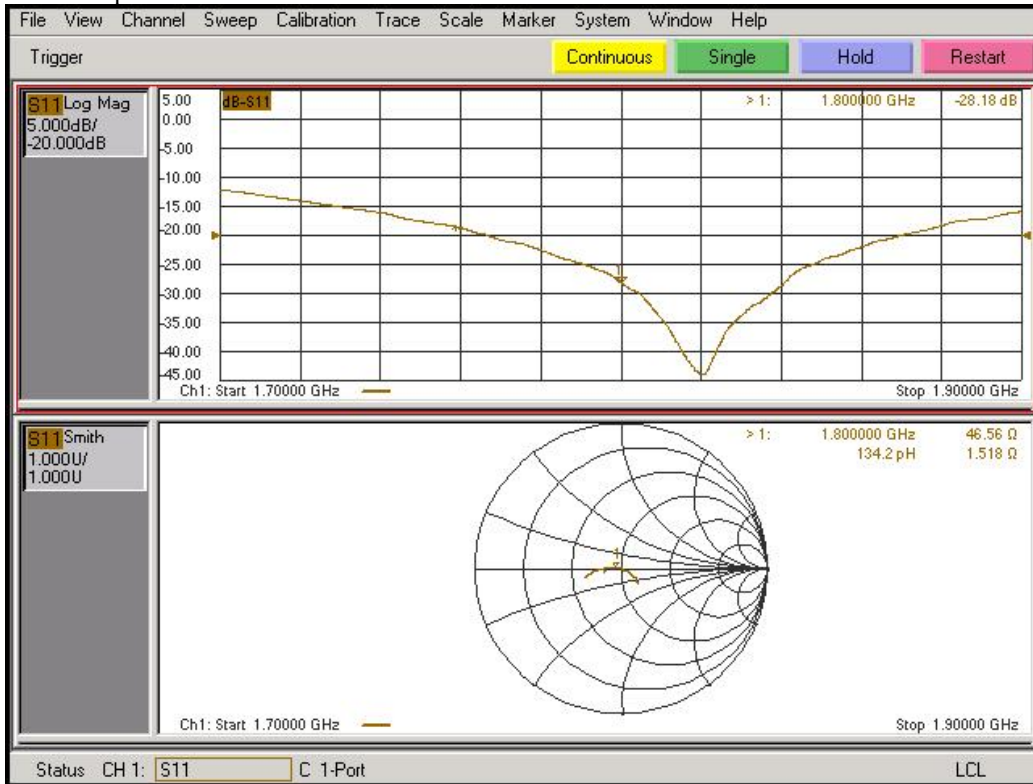
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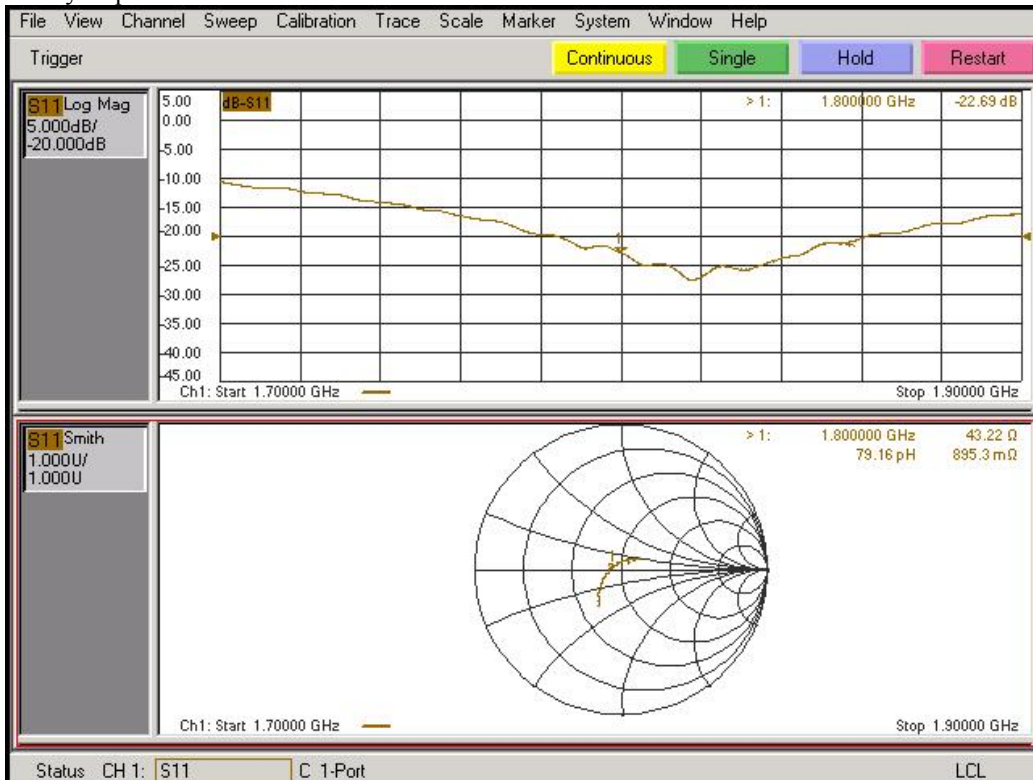
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Measurement Plots

<Head Liquid>



<Body Liquid>



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2. Validation uncertainty

The uncertainty budget has been determined for the DASY5 measurement system according to the SPEAG documents[2] and is given in the following Table.

Error Description	Uncertainty value \pm %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	± 6.55	Normal	1	1	± 6.55	∞
Axial isotropy of the probe	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Spherical isotropy of the probe	± 9.6	Rectangular	0	0	0	∞
Boundary effects	± 1.0	Rectangular	$\sqrt{3}$	1	± 1.2	∞
Probe linearity	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	$\sqrt{3}$	1	± 0.6	∞
Readout electronics	± 0.3	Normal	1	1	± 0.3	∞
Response time	0	Rectangular	$\sqrt{3}$	1	0	∞
Integration time	0	Rectangular	$\sqrt{3}$	1	0	∞
RF ambient Noise	± 1.0	Rectangular	$\sqrt{3}$	1	± 1.7	∞
RF ambient Reflections	± 1.0	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Probe Positioner	± 0.8	Rectangular	$\sqrt{3}$	1	± 0.5	∞
Probe positioning	± 6.7	Rectangular	$\sqrt{3}$	1	± 3.9	∞
Algorithms for Max.SAR Eval.	± 2.0	Rectangular	$\sqrt{3}$	1	± 1.2	∞
Dipole						
Deviation of exp.dipole	± 5.5	Rectangular	$\sqrt{3}$	1	± 3.2	∞
Dipole Axis to Liquid Distance	± 2.0	Rectangular	$\sqrt{3}$	1	± 1.2	∞
Input power and SAR drift meas.	± 3.4	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	$\sqrt{3}$	1	± 2.3	∞
SAR correction	± 1.9	Rectangular	$\sqrt{3}$	1	± 1.1	
Liquid conductivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.78	± 2.3	∞
Liquid conductivity (meas.)	± 5.0	Rectangular	1	0.26	± 1.3	∞
Liquid permittivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.78	± 2.3	∞
Liquid permittivity (meas.)	± 5.0	Rectangular	1	0.23	± 1.2	∞
Combined Standard Uncertainty					± 11.01	
Expanded Uncertainty (k=2)					± 22.02	

Note: This uncertainty budget for validation is worst-case.

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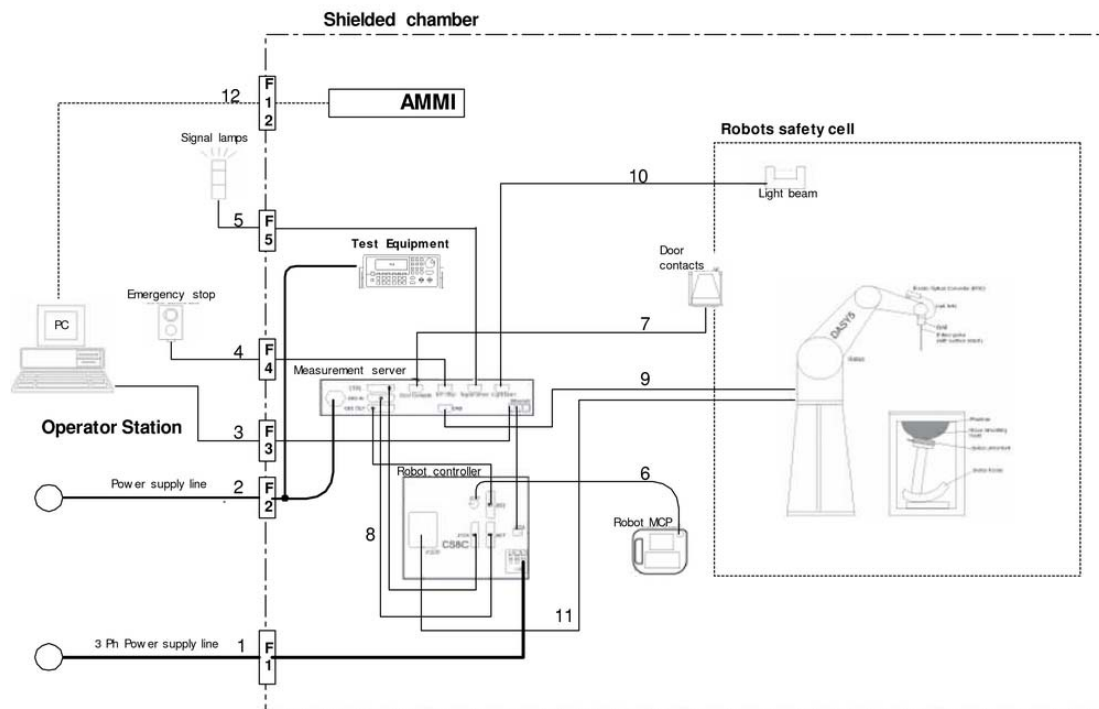
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APPENDIX 3 : System specifications

1. Configuration and peripherals



The DASYS system for performing compliance tests consist of the following items:

- a) A standard high precision 6-axis robot (Stäubli RX family) with controller and software.
An arm extension for accommodating the data acquisition electronics (DAE).
- b) An isotropic field probe optimized and calibrated for the targeted measurement.
- c) A data acquisition electronic (DAE), which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- d) The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection.
The EOC is connected to the measurement server.
- e) The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- f) The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- g) A computer running WinXP and the DASYS software.
- h) Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.
- i) The phantom, the device holder and other accessories according to the targeted measurement.

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2. Specifications

a) Robot TX60L

Number of Axes	:	6
Nominal Load	:	2 kg
Maximum Load	:	5kg
Reach	:	920mm
Repeatability	:	+/-0.03mm
Control Unit	:	CS8c
Programming Language	:	VAL3
Weight	:	52.2kg
Manufacture	:	Stäubli Robotics

b) E-Field Probe

Model	:	EX3DV4
Serial No.	:	3825
Construction	:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)
Frequency	:	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	:	+/-0.3 dB in HSL (rotation around probe axis) +/-0.5 dB in tissue material (rotation normal probe axis)
Dynamic Range	:	10uW/g to > 100 mW/g; Linearity +/-0.2 dB(noise: typically < 1uW/g)
Dimensions	:	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	:	Highprecision dosimetric measurement in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6GHz with precision of better 30%.
Manufacture	:	Schimid & Partner Engineering AG



EX3DV4 E-field Probe

Model	:	ET3DV6
Serial No.	:	1685
Construction	:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)
Frequency	:	10 MHz to 2.3 GHz Linearity: ± 0.2 dB (30 MHz to 2.3 GHz)
Directivity	:	+/-0.2 dB in HSL (rotation around probe axis) +/-0.4 dB in tissue material (rotation normal probe axis)
Dynamic Range	:	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB
Optical Surface Detection	:	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions	:	Overall length: 337 mm (Tip: 16 mm) Tip diameter: 6.8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.7 mm
Application	:	General dosimetric measurements up to 2.3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms
Manufacture	:	Schimid & Partner Engineering AG



ET3DV6 E-field Probe

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c)Data Acquisition Electronic (DAE4)

Features	:	Signal amplifier, multiplexer, A/D converter and control logic Serial optical link for communication with DASY5 embedded system (fully remote controlled) Two step probe touch detector for mechanical surface detection and emergency robot stop
Measurement Range	:	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset voltage	:	< 5 μ V (with auto zero)
Input Resistance	:	200 M Ω
Input Bias Current	:	< 50 fA
Battery Power	:	> 10 h of operation (with two 9.6 V NiMH accus)
Dimension	:	60 x 60 x 68 mm
Manufacture	:	Schimid & Partner Engineering AG

d)Electro-Optic Converter (EOC)

Version	:	EOC 61
Description	:	for TX60 robot arm, including proximity sensor
Manufacture	:	Schimid & Partner Engineering AG

e)DASY5 Measurement server

Features	:	Intel ULV Celeron 400MHz 128MB chip disk and 128MB RAM 16 Bit A/D converter for surface detection system Vacuum Fluorescent Display Robot Interface Serial link to DAE (with watchdog supervision) Door contact port (Possibility to connect a light curtain) Emergency stop port (to connect the remote control) Signal lamps port Light beam port Three Ethernet connection ports Two USB 2.0 Ports Two serial links Expansion port for future applications
Dimensions (L x W x H)	:	440 x 241 x 89 mm
Manufacture	:	Schimid & Partner Engineering AG

f) Light Beam Switches

Version	:	LB5
Dimensions (L x H)	:	110 x 80 mm
Thickness	:	12 mm
Beam-length	:	80 mm
Manufacture	:	Schimid & Partner Engineering AG

g)Software

Item	:	Dosimetric Assesment System DASY5
Type No.	:	SD 000 401A, SD 000 402A
Software version No.	:	DASY52, Version 52.6 (1)
Manufacture / Origin	:	Schimid & Partner Engineering AG

h)Robot Controll Unit

Weight	:	70 Kg
AC Input Voltage	:	selectable
Manufacturer	:	Stäubli Robotics

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i)Phantom and Device Holder**Phantom**

Type	:	SAM Twin Phantom V4.0
Description	:	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.
Material	:	Vinylester, glass fiber reinforced (VE-GF)
Shell Material	:	Fiberglass
Thickness	:	2.0 +/-0.2 mm
Dimensions	:	Length: 1000 mm Width: 500 mm Height: adjustable feet
Volume	:	Approx. 25 liters
Manufacture	:	Schimid & Partner Engineering AG

Type	:	2mm Flat phantom ERI4.0
Description	:	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is supported by software version DASY4.5 and higher and is compatible with all SPEAG dosimetric probes and dipoles.
Material	:	Vinylester, glass fiber reinforced (VE-GF)
Shell Thickness	:	2.0 ± 0.2 mm (sagging: <1%)
Filling Volume	:	approx. 30 liters
Dimensions	:	Major ellipse axis: 600 mm Minor axis: 400 mm
Manufacture	:	Schimid & Partner Engineering AG

Device Holder

In combination with the Twin SAM Phantom V4.0/V4.0c or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).

Material	:	POM
-----------------	---	-----

Laptio Extensions kit

Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin-SAM, ELI4 Phantoms.

Material	:	POM, Acrylic glass, Foam
-----------------	---	--------------------------

Urethane

For this measurement, the urethane foam was used as device holder.

j) Simulated Tissues (Liquid)

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Mixture (%)	Frequency (MHz)									
	450		900		1800		1950		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.91	46.21	40.29	50.75	55.24	70.17	55.41	69.79	55.0	68.64
Sugar	56.93	51.17	57.90	48.21	-	-	-	-	-	-
Cellulose	0.25	0.18	0.24	0.00	-	-	-	-	-	-
Salt (NaCl)	3.79	2.34	1.38	0.94	0.31	0.39	0.08	0.2	-	-
Preventol	0.12	0.08	0.18	0.10	-	-	-	-	-	-
DGMBE	-	-	-	-	44.45	29.44	44.51	30.0	45.0	31.37
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Note: DGMBE (Diethylenglycol-monobuthyl ether)

The test frequency of 1700MHz to 1800 MHz is using the simulated tissue (liquid) of 1800MHz.

Mixture (%)	Frequency(MHz)
	750
Tissue Type	Head and Body
Water	35-58%
Sugar	40-60%
Cellulose	<0.3%
Salt (NaCl)	0-6%
Preventol	0.1-0.7%
DGMBE	-

Decision on Simulated Tissues of 750MHz

In the current standards (e.g., IEC62209-2, IEEE P1528, OET 65 Supplement C), the dielectric parameters suggested for head and body tissue simulating liquid are given at 450MHz and 835MHz. As an intermediate solution, dielectric parameters for the frequencies between 450 to 835MHz were obtained using linear interpolation. Therefore the dielectric parameter of 750MHz(The frequency for the validation) was decided as following.

f (MHz)	Head Tissue		Body Tissue		Reference
	ϵ_r	σ [mho/m]	ϵ_r	σ [mho/m]	
450	43.5	0.87	56.7	0.94	Standard
750	41.94	0.89	55.5	0.96	Interpolated
835	41.5	0.9	55.2	0.97	Standard

Standard and interpolated dielectric parameters for head and body tissue simulating liquid in the frequency range 450 to 835MHz.

Mixture (%)	Frequency(MHz)	
	5800	
Tissue Type	Head	Body
Water	64.0	78.0
Mineral Oil	18.0	11.0
Emulsifiers	15.0	9.0
Additives and salt	3.0	2.0

Decision on Simulated Tissues of 5GHz band

In the current standards (e.g., IEC62209-2, IEEE P1528, OET 65 Supplement C), the dielectric parameters suggested for head and body tissue simulating liquid are given at 3000MHz and 5800MHz. As an intermediate solution, dielectric parameters for the frequencies between 5000to 5800 MHz were obtained using linear interpolation.

Therefore the dielectric parameters of 5200MHz,5300MHz,5600MHz and 5500MHz(The frequency for the validation) were decided as following.

f (MHz)	Head Tissue		Body Tissue		Reference
	ϵ_r	σ [mho/m]	ϵ_r	σ [mho/m]	
3000	38.5	2.40	52.0	2.73	Standard
5800	35.3	5.27	48.2	6.00	Standard
5000	36.2	4.45	49.3	5.07	Interpolated
5100	36.1	4.55	49.1	5.18	Interpolated
5200	36.0	4.66	49.0	5.30	Interpolated
5300	35.9	4.76	48.9	5.42	Interpolated
5400	35.8	4.86	48.7	5.53	Interpolated
5500	35.6	4.96	48.6	5.65	Interpolated
5600	35.5	5.07	48.5	5.77	Interpolated
5700	35.4	5.17	48.3	5.88	Interpolated

Standard and interpolated dielectric parameters for head and body tissue simulating liquid in the frequency range 3000 to 5800MHz.

3. Dosimetric E-Field Probe Calibration (EX3DV4, S/N: 3825)

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



S Schweizerischer Kalibrierdienst
S 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 **UL Japan (PTT)**

Certificate No: **EX3-3825 Dec11**

CALIBRATION CERTIFICATE

Object: **EX3DV4 - SN:3825**

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: **December 16, 2011**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check 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:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: December 16, 2011

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

**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**

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
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,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:

- 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
- 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:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,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.
- DCP_{x,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
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,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 NORM_{x,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.

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EX3DV4 – SN:3825

December 16, 2011

Probe EX3DV4

SN:3825

Manufactured: September 6, 2011
Calibrated: December 16, 2011

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

EX3DV4- SN:3825

December 16, 2011

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3825**Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.43	0.39	0.43	± 10.1 %
DCP (mV) ^B	100.7	103.5	99.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^C (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	144.3	±3.0 %
			Y	0.00	0.00	1.00	133.8	
			Z	0.00	0.00	1.00	109.4	

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

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^C Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

EX3DV4-- SN:3825

December 16, 2011

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3825**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	9.80	9.80	9.80	0.13	1.55	± 12.0 %
835	41.5	0.90	9.39	9.39	9.39	0.16	1.39	± 12.0 %
900	41.5	0.97	9.22	9.22	9.22	0.15	1.32	± 12.0 %
1750	40.1	1.37	8.85	8.85	8.85	0.18	1.36	± 12.0 %
1810	40.0	1.40	8.55	8.55	8.55	0.13	1.77	± 12.0 %
1900	40.0	1.40	8.43	8.43	8.43	0.17	1.23	± 12.0 %
2000	40.0	1.40	8.27	8.27	8.27	0.43	0.79	± 12.0 %
2450	39.2	1.80	7.44	7.44	7.44	0.24	1.23	± 12.0 %
2600	39.0	1.96	7.21	7.21	7.21	0.29	0.95	± 12.0 %
5200	36.0	4.66	5.35	5.35	5.35	0.30	1.80	± 13.1 %
5300	35.9	4.76	5.08	5.08	5.08	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.68	4.68	4.68	0.42	1.80	± 13.1 %
5600	35.5	5.07	4.38	4.38	4.38	0.45	1.80	± 13.1 %
5800	35.3	5.27	4.48	4.48	4.48	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.

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DASY/EASY - Parameters of Probe: EX3DV4 - SN:3825

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	9.77	9.77	9.77	0.26	1.05	± 12.0 %
835	55.2	0.97	9.61	9.61	9.61	0.24	1.13	± 12.0 %
900	55.0	1.05	9.42	9.42	9.42	0.20	1.30	± 12.0 %
1750	53.4	1.49	7.87	7.87	7.87	0.10	2.72	± 12.0 %
1810	53.3	1.52	7.69	7.69	7.69	0.11	2.21	± 12.0 %
1900	53.3	1.52	7.48	7.48	7.48	0.10	1.76	± 12.0 %
2000	53.3	1.52	7.64	7.64	7.64	0.21	1.11	± 12.0 %
2450	52.7	1.95	7.23	7.23	7.23	0.78	0.50	± 12.0 %
2600	52.5	2.16	7.14	7.14	7.14	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.45	4.45	4.45	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.22	4.22	4.22	0.50	1.90	± 13.1 %
5500	48.6	5.65	3.76	3.76	3.76	0.55	1.90	± 13.1 %
5600	48.5	5.77	3.59	3.59	3.59	0.60	1.90	± 13.1 %
5800	48.2	6.00	4.07	4.07	4.07	0.55	1.90	± 13.1 %

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

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

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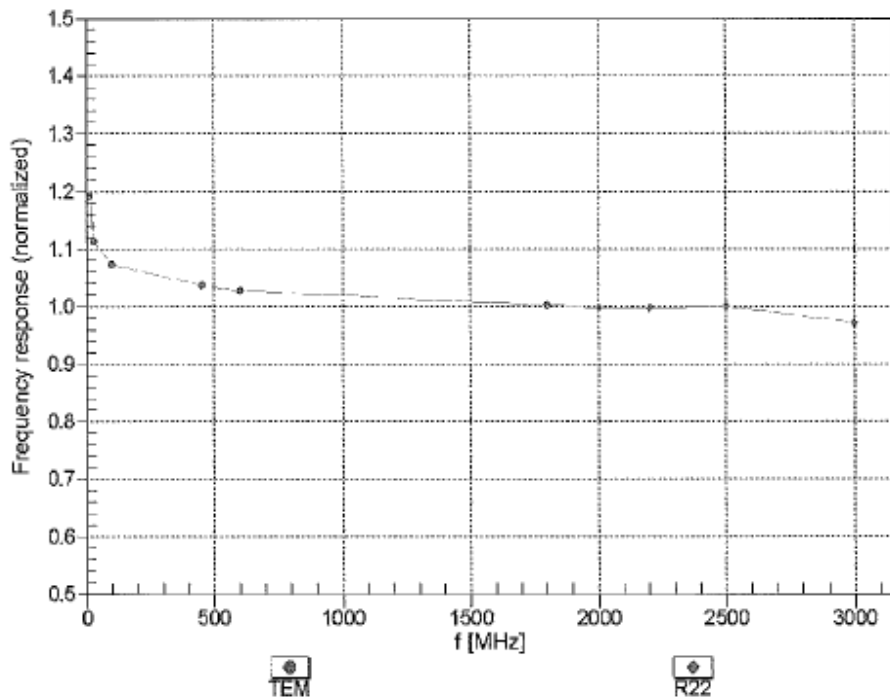
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Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)

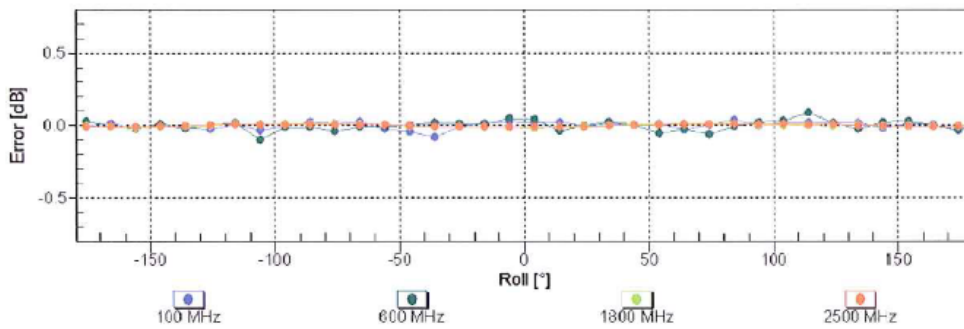
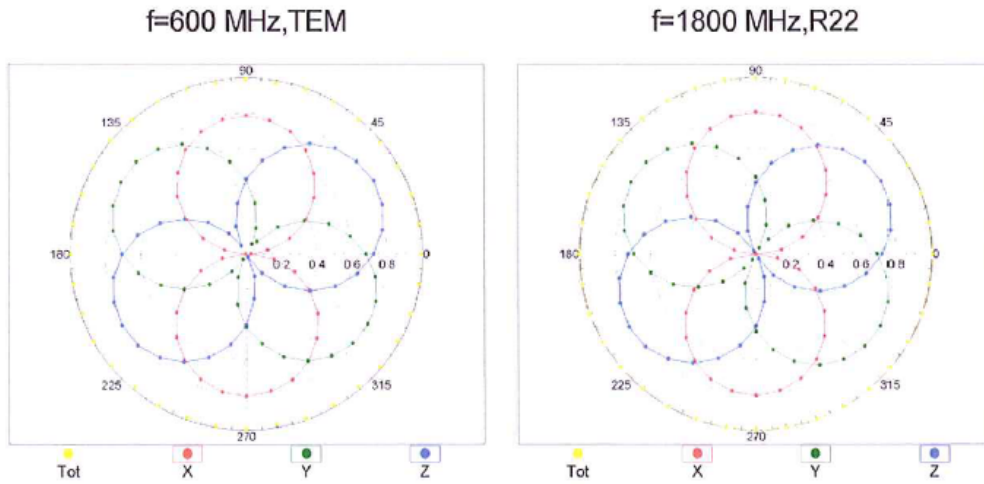


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

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Receiving Pattern (ϕ), $\theta = 0^\circ$

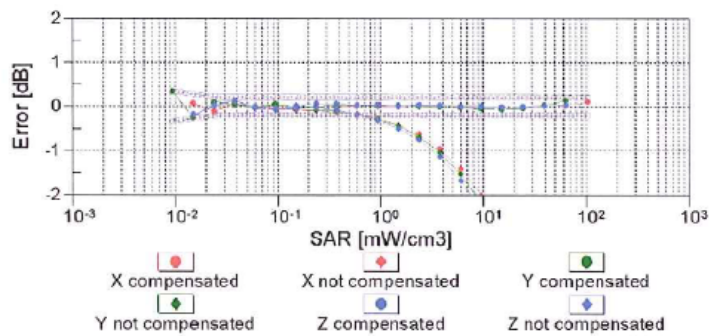
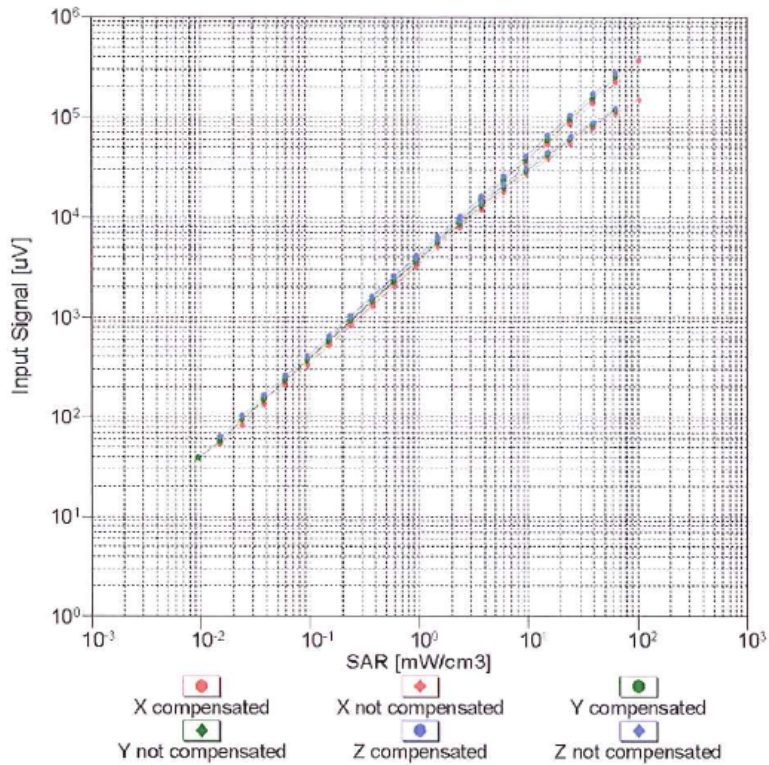


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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

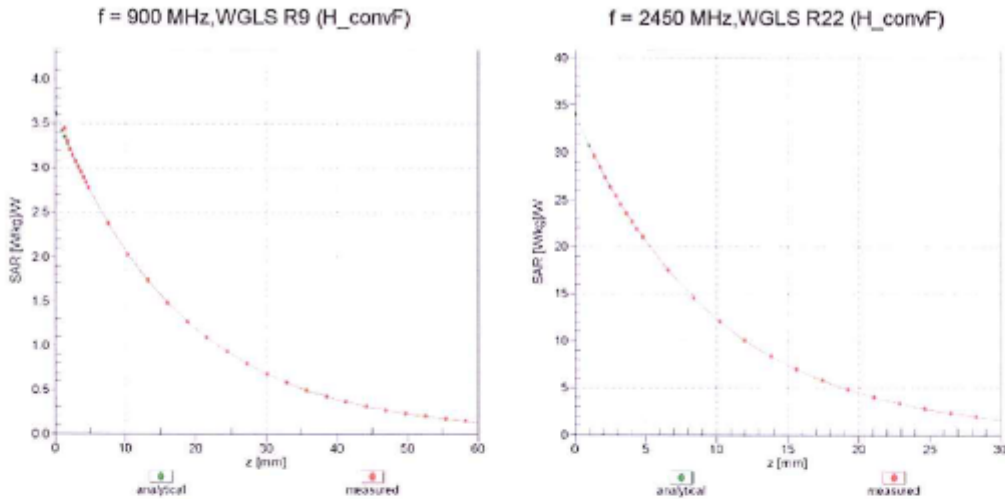


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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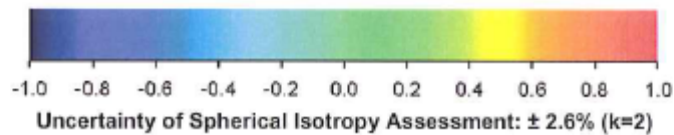
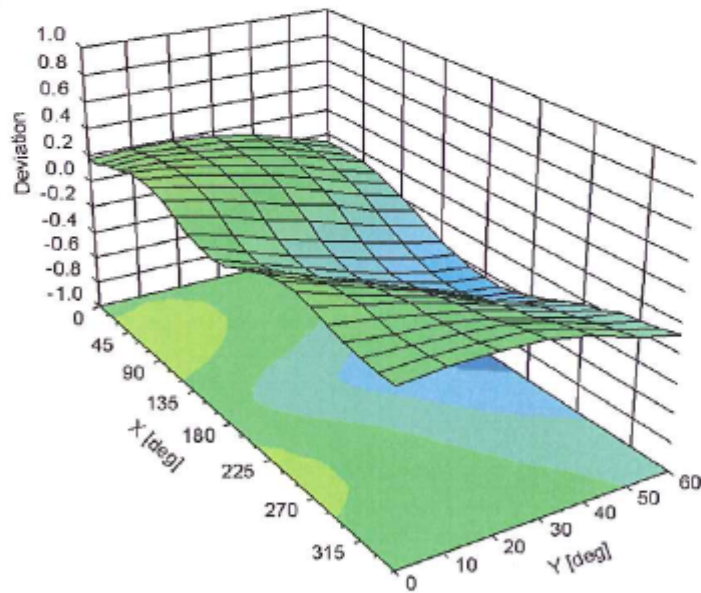
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Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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DASY/EASY - Parameters of Probe: EX3DV4 - SN:3825

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

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