SAR TEST REPORT

Test Report No. : 26BE0183-HO-E-3

Applicant	:	**DENSO WAVE INCORPORATED**
Type of Equipment	:	**Wireless LAN Module**
Model No.	:	**WM-G-MR-01**
FCC ID	:	**PZWWMGMR01**
Test standard	:	**FCC47CFR 2.1093** **FCC OET Bulletin 65, Supplement C**
Test Result	:	**Complied**

Max. SAR Measured(IEEE802.11b/g) : **1.49W/kg (Body, 2412MHz)**

1. This test report shall not be reproduced except full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with the above standard. We hereby certify that the data contain a true representation of the SAR profile.
4. The test results in this test report are traceable to the national or international standards.

Date of test : May 24,30-31, 2006

Tested by :

Miyo Ikuta
EMC Services

Approved by :

Hironobu Shimoji
Group Leader of EMC Services

NVLAP LAB CODE: 200572-0

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://ulapex.jp/emc/nvlap.htm

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SECTION 1: Client information

Company Name	:	DENSO WAVE INCORPORATED
Address	:	1-1, Showa-cho, Kariya-shi, Aichi-ken, 448-8661 Japan
Telephone Number	:	+81-566-61-3811
Facsimile Number	:	+81-566-25-4741
Contact Person	:	Yasuhito Imai and Tadao Oshima

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	Wireless LAN Module
Model No.	:	WM-G-MR-01
Serial No.	:	63802482
Country of Manufacture	:	Japan
Receipt Date of Sample	:	May 23,2006
Condition of EUT	:	Production model
Modification of EUT	:	No modification by the test lab

2.2 Product Description

Model No: WM-G-MR-01 is the Wireless LAN Module.

Clock frequency	40MHz +/- 25ppm
Feature of EUT	EUT is Wireless LAN installed with IEEE802.11b/g in the Barcode Handy Terminal (Made by DENSO WAVE INCORPORATED)

Equipment Type	Transceiver
Frequency of Operation	2412-2462MHz
Bandwidth & Channel spacing	26MHz & 5MHz/CH
Type of Modulation	DSSS,OFDM
Antenna Type	Inverted-F type multi-layer antenna
Antenna Connector Type	SMT connector
Antenna Gain	2.02dBi max
ITU code	D1D(DSSS),G1D(OFDM)
Power Supply	DC 3.3V – 3.6V
Operating temperature range	-5 deg.C. to + 50 deg.C.

2.3 Host device

The EUT was manufactured by DENSO WAVE and will be installed into only Bar-code Handy Terminal which is manufactured by DENSO WAVE.

Information of host deveice

Type of Equipment : Bar-code Handy Terminal
Model No. : BHT-420BW-CE
Serial No. : 5496310346600007
Manufacture : DENSO WAVE
The shortest distance between surface of host device and antenna : 3.8mm
Position of Antenna : See APPENDIX 1.

SECTION 3 : Test standard information

3.1 Requirements for compliance testing defined by the FCC

The US Federal Communications Commission has released the report and order “Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at
maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

1 Specific Absorption Rate (SAR) is a measure of the rate of energy absorption due to exposure to an RF transmitting source (wireless portable device).
2 IEEE/ANSI Std. C95.1-1992 limits are used to determine compliance with FCC ET Docket 93-62.

3.2 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

SECTION 4 : Test result

4.1 Result of Max. SAR value

Max SAR Measured (IEEE 802.11b/g) : 1.49 W/kg

4.2 Test location

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SECTION 5 : Operation of E.U.T. during testing

5.1 Test mode

The test mode for SAR testing was impossible in the Barcode Handy Terminal as stand-alone.
Therefore,the SAR testing was performed in the Barcode Handy Terminal communicating with the specific access point.
The control of test mode of EMC and the SAR is different because the EMC testing was performed with the EUT controlled by PC (duty factor 100%).
Therefore, the correlation of EMC power and SAR power and the verification of duty factor were performed.
The correlation of power is shown in Clause 5.2 ,7.1 and 7.2.
The verification of the duty factor was shown in Clause 7.3.

As a reference, the additional test was performed with the EUT controlled by PC (duty factor 100%).
The reference test data is shown in Appendix 4.

5.2 Confirmation before / after SAR testing

(i)Correlation of EMC power and SAR power

It was checked that the EIRP power is correlated within 0~+5% (FCC requirements) at EMC test (May 24,2006).

- EMC and SAR tests are performed with the same test sample under the same condition.
- EMC and SAR tests are performed at the same laboratory.
- The test mode setting is simple, and there is no possibility that the power (value) is changed by the wrong setting.

The result is shown in Clause 7.1.

(ii)Correlation of controlled by PC and by BHT (Bar code Handy Terminal)

It was checked that the antenna port power calculated from the EIRP power and the difference was within 3dB.
-The test of EIRP power was performed with the EUT contorolled by BHT.
-The test of antenna port power was performed with the EUT contorolled by PC.
The result is shown in Clause 7.2.

(iii)Duty factor verifications

Crest factor determing

Crest factor was calculated by the duty factor measured at each data rate.
The duty factor was calculated according to the following equation:

Duty factor = on time / 1 cycle (on+off time)

The result of duty factor is shown in Clause 7.3.

5.3 Operating modes for SAR testing

Setting of EUT
This EUT has IEEE.802.11b/g.
The setting of channel and data rate of the EUT can be determined by the access point.
The EUT has the same channel and data rate by setting of the access point.

1. IEEE 802.11b mode
Tx frequency band : 2412-2462MHz
Channel : 1ch(2412MHz),6ch(2437MHz),11ch(2462MHz)
Modulation : DSSS (DBPSK,DQPSK,CCK)
Crest factor* : 1(DBPSK),1.4(CCK)

Remark* : Crest factor decision in SAR testing

Modulation	DBPSK (1Mbps)	CCK (11Mbps)
DutyCycle[%]	97.41	73.5
Crestfactor	1.0	1.4

2. IEEE 802.11g mode
Tx frequency band : 2412-2462MHz
Channel : 1ch(2412MHz),6ch(2437MHz),11ch(2462MHz)
Modulation : OFDM (BPSK, QPSK, 16QAM, 64QAM)
Crest factor* : 1.1 (BPSK),1.5(QPSK),2.8 (16QAM),5.3(64QAM)

Remark* : Crest factor decision in SAR testing

Modulation	BPSK (6Mbps)	QPSK (12MBps)	16QAM (24Mbps)	64QAM (48Mbps)
DutyCycle[%]	91.41	65.86	36.09	19.03
Crestfactor	1.1	1.5	2.8	5.3

1. SAR Measurement (Radiated power is always monitored by Spectrum Analyzer.)

IEEE 802.11b

Step1. The seachinng for the modulation.
The CCK (11Mbps) of the highest average power(EIRP) and the DBPSK (1Mbps) of the highest duty factor were compared

Step2. The searching for the worst position
This test was performed at the worst modulation of Step1.

Step3. The changing to the Low and High channels
This test was performed at the worst conditions of Step 2.

IEEE 802.11g

Step4. The seachinng for the modulation.
The data rate in the higher average power (EIRP) of each modulation was decided, then the worst modulation was searched in the SAR testing.

Step5. The searching for the worst position
This test was performed at the worst modulation of Step4.

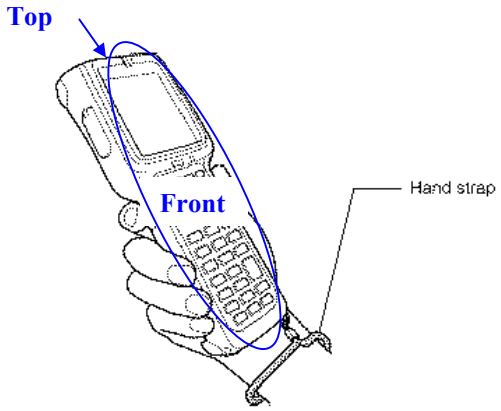
Step6. The changing to the Low and High channels
This test was performed at the worst conditions of Step 5.

Change distance between EUT and SAM Twin Phantom

Step7. The measurement was performed with the distance, 5mm,10mm and 15mm to check if the shortest distance may not have the worst value at the conditions of the highest SAR value. As a result, the shortest distance had the worst value

5.4 Test setup of EUT

When users operate the BHT, users put their hand trough the hand strap and hold the BHT as shown below.



In order to assume this situation, we performed the test at the following positions. Please refer to "APPENDIX 1" for more details. We tested "front" sides as reference data although they are not considered as conditions to be used.

1.Top(Separation 2mm)*[1] : The test was performed in the separation of 2mm between top edge of the BHT and flat sections of the SAM Twin Phantom

2.Front *[2] : The test was performed in touch with front face of the BHT to the flat section of SAM Twin Phantom.

3.Back : The test was performed in touch with back face of the BHT to the flat section of SAM Twin Phantom.

4.Right side : The test was performed in touch with right side of the BHT to the flat section of SAM Twin Phantom.

5.Left side : The test was performed in touch with left side of the BHT to the flat section of SAM Twin Phantom.

6.Top (Separation 5mm) : The test was performed in the separation of 5mm between BHT and flat sections of the SAM Twin Phantom

7.Top (Separation 10mm) : The test was performed in the separation of 10mm between BHT and flat sections of the SAM Twin Phantom

8.Top (Separation 15mm) : The test was performed in the separation of 15mm between BHT and flat sections of the SAM Twin Phantom.

*[1] Remark:The top edge is considered a reasonable use position no closer than 2mm based on the intended use of the device per the instructions.The test was performed in the 2mm separation is based on a worst case use even though it is unlikely the user will be operating the device 180 degrees rotated from the body.

*[2] Remark: The front is reference data since even if someone were to support the BHT on the lap, with the keys and display facing the lap then it would not be useable.

SECTION 6 : Test surrounding

6.1 Measurement uncertainty

The uncertainty budget has been determined for the DASY4 measurement system according to the SPEAG documents [6][7] and is given in the following Table.

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±4.8	Normal	1	1	±4.8	∞
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	±1.0	Normal	1	1	±1.0	∞
Response time	±0.8	Rectangular	√3	1	±0.5	∞
Integration time	±2.6	Rectangular	√3	1	±1.5	∞
RF ambient Noize	±3.0	Rectangular	√3	1	±1.7	∞
RF ambient Reflections	±3.0	Rectangular	√3	1	±1.7	∞
Mech. constraints of robot	±0.4	Rectangular	√3	1	±0.2	∞
Probe positioning	±2.9	Rectangular	√3	1	±1.7	∞
Extrap. and integration	±1.0	Rectangular	√3	1	±0.6	∞
Test Sample Related						
Device positioning	±2.9	Normal	1	1	±2.9	20
Device holder uncertainty	±3.6	Normal	1	1	±3.6	7
Power drift	±10.0	Rectangular	√3	1	±4.8	∞
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.)	±5.0	Normal	1	0.64	±3.2	∞
Liquid permittivity (target)	±5.0	Rectangular	√3	0.6	±1.7	∞
Liquid permittivity (meas.)	±5.0	Normal	1	0.6	±3.0	∞
Combined Standard Uncertainty					**±11.73**	
Expanded Uncertainty (k=2)					**±23.5**	

SECTION 7 : Results of confirmation before / after SAR testing

7.1 Correlation of EMC power and SAR power

The EIRP power was correlated within 0~+5% at EMC test.

7.1.1 EIRP measurement method

The Output power (EIRP) has been measured in a Semi Anechoic Chamber with a ground plane and at a distance of 3m.
The heighest of the measuring varied between 1 and 4m and EUT was roated a full revolution in order to obtain the maximum value of the output power.
The measurements were performed for both vertical and horizontal antenna polarzation with the Spectrum Analyzer.

(i)Spectrum Analyzer setting

Peak measurement procedure
Function of spectrum analyzer : Band-power
Center frequency : equal to the signal source
Resolution BW : 1MHz
Video BW : 3MHz
Detector mode : Peak or Average
Band span : 40MHz
Trace : Max hold

(ii)Calculation of result

E-field [dBμV/m]= Reading (S/A) + Factor (Measurement equipment)
E-field [dBμV/m] was converted into E[V/m]
EIRP[dBm] = $10\log[((E*d)^2/30G)*10^3]$; d= 3[m], G =1.59

[Before SAR testing]

This data is reference data for EMC test. (Report No. 26BE0183-HO-A-1)

Test Date : May 24,2006

Result of EIRP (Peak power)

	DATA rate	Lch		Mch		Hch	
	[Mbps]	Peak [dBuV]	EIRP[dBm]	Peak[dBuV]	EIRP[dBm]	Peak[dBuV]	EIRP[dBm]
11b	1	116.5	19.68	117.6	20.78	117.2	20.38
	2	-	-	117.9	21.08	-	-
	5.5	-	-	118.8	21.98	-	-
	11	119.6	22.78	120.7	23.88	120.9	24.08
11g	6	119.7	22.88	120.8	23.98	119.7	22.88
	9	-	-	120.7	23.88	-	-
	12	-	-	120.6	23.78	-	-
	18	-	-	120.1	23.28	-	-
	24	-	-	120.5	23.68	-	-
	36	-	-	119.9	23.08	-	-
	48	-	-	119.8	22.98	-	-
	54	117.7	20.88	119.8	22.98	119.6	22.78

Result of EIRP (Average power)

	DATA rate	Lch		Mch		Hch	
	[Mbps]	AVG [dBuV]	EIRP[dBm]	AVG[dBuV]	EIRP[dBm]	AVG[dBuV]	EIRP[dBm]
11b	1	114.0	17.18	115.5	18.68	115.9	19.08
	2	-	-	116.0	19.18	-	-
	5.5	-	-	117.9	21.08	-	-
	11	117.1	20.28	118.3	21.48	118.5	21.68
11g	6	116.2	19.38	117.1	20.28	117.4	20.58
	9	-	-	117.0	20.18	-	-
	12	-	-	117.0	20.18	-	-
	18	-	-	116.6	19.78	-	-
	24	-	-	116.9	20.08	-	-
	36	-	-	116.8	19.98	-	-
	48	-	-	116.0	19.12	-	-
	54	114.1	17.28	115.8	18.98	115.9	19.08

[After SAR testing]

Test Date : May 30,2006

Result of EIRP (Peak power)

	DATA rate	Lch		Mch		Hch	
	[Mbps]	Peak [dBuV]	EIRP[dBm]	Peak[dBuV]	EIRP[dBm]	Peak[dBuV]	EIRP[dBm]
11b	1	116.5	19.68	117.6	20.78	117.2	20.38
	11	119.6	22.78	120.8	23.98	120.9	24.08
11g	6	119.7	22.88	120.8	23.98	119.8	22.98
	12	-	-	120.7	23.88	-	-
	24	-	-	120.6	23.78	-	-
	48	-	-	120.0	23.18	-	-

Result of EIRP (Average power)

	DATA rate	Lch		Mch		Hch	
	[Mbps]	AVG [dBuV]	EIRP[dBm]	AVG [dBuV]	EIRP[dBm]	AVG [dBuV]	EIRP[dBm]
11b	1	114.2	17.38	115.6	18.78	115.9	19.08
	11	-	-	118.4	21.58	-	-
11g	6	116.4	19.58	117.1	20.28	117.6	20.78
	12	-	-	117.0	20.18	-	-
	24	-	-	117.0	20.18	-	-
	48	-	-	116.1	19.28	-	-

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7.2 Correlation of controlled by PC and by BHT (Bar-code Handy Terminal)

Antenna gain : 2.02dBi
Max.EIRP : 24.08dBm (11b 11Mbps 11ch)
Max.conducted power of antenna port : 20.45dBm*(11b 11Mbps 11ch)

Testing method	Power [dBm] Measurement	Antenna Gain [dBi]	Antenna port power [dBm]
Antenna port	20.45	-	20.45
Radiation	24.08	2.02	22.06

Remark*: This data is conducted antenna port power of EMC test. (Report No. 26BE0183-HO-A-1)
The test was measured in the EUT with duty factor 100 % by the PC control.

Test Date : May 24, 2006

[IEEE802.11b : Antenna Port by the data rate]

Ch	Modulation (Data rate [bps])	PK Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
6	DBPSK (1Mbps)	7.13	1.30	10.00	18.43	69.66
6	DQPSK(2Mbps)	7.27	1.30	10.00	18.57	71.94
6	CCK(5.5Mbps)	8.08	1.30	10.00	19.38	86.70
6	CCK(11Mbps)	8.35	1.30	10.00	19.65	92.26

[IEEE802.11b : Antenna Port (11Mbps)]

Ch	Freq. [MHz]	PK Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
1	2412.0	8.16	1.30	10.00	19.46	88.31
6	2437.0	8.35	1.30	10.00	19.65	92.26
11	2462.0	9.15	1.30	10.00	20.45	110.92

[IEEE802.11g : Antenna Port (by the data rate)]

Ch	Modulation (Data rate [bps])	PK Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
6	BPSK (6Mbps)	5.11	1.30	10.00	16.41	43.75
6	BPSK (9Mbps)	5.07	1.30	10.00	16.37	43.35
6	QPSK (12Mbps)	5.20	1.30	10.00	16.50	44.67
6	QPSK (18Mbps)	6.03	1.30	10.00	17.33	54.08
6	16QAM(24Mbps)	6.45	1.30	10.00	17.75	59.57
6	16QAM(36Mbps)	6.95	1.30	10.00	18.25	66.83
6	64QAM(48Mbps)	7.18	1.30	10.00	18.48	70.47
6	64QAM(54Mbps)	7.70	1.30	10.00	19.00	79.43

[IEEE802.11g : Antenna Port (54Mbps)]

Ch	Freq. [MHz]	PK Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
1	2412.0	5.17	1.30	10.00	16.47	44.36
6	2437.0	7.70	1.30	10.00	19.00	79.43
11	2462.0	6.42	1.30	10.00	17.72	59.16

Result = Reading + Cable Loss (supplied by customer) + Attenuator

7.3 Duty factor verification

Crest factor determing

*Explanation to the transmitting duty being maximum

-In the test mode, data packet of 1472 bytes is transmitted repeatedly from BHT(Bar code Handy Terminal) by UDP. (User Datagram Protocol)1472 bytes data is transmitted from BHT to AP(Access point), and it transmits ACK back from AP to BHT repeatedly.

-BHT-400BW series [including BHT-420BW-CE] support TCP (Transmission Control Protocol) and UDP (User Datagram Protocol) as transport layer protocol. In comparison with UDP, control packet of TCP is greater; and thus data transmitting speed of TCP is slower than that of UDP. Therefore, transmitting duty of UDP is greater than that of TCP.

-As stated above, it is a repetition of data transmission from BHT and ACK transmission from AP, so simply, greater the data volume transmitted from BHT gets, greater the transmitting duty becomes. However, when the data exceeds over 1473 bytes, it transmits packets in multiple pieces; therefore, it transmits 1472 bytes, that is right before packet partitioning.

Greater the transferring rate gets, less the transmitting duty becomes. In wireless, communication is possible at maximum of 54Mbps, but that is the reason why the processing capacity of BHT is not able to.

The setting of channel and data rate of the EUT can be determined by the AP.
The EUT has the same channel and data rate by setting those of the AP.

11b		
DATA rate [Mbps]	Duty [%]	Crest factor for SAR
1	97.41	1.0
2	96.53	N/A*
5.5	92.46	N/A*
11	73.5	1.4

11g		
DATA rate [Mbps]	Duty [%]	Crest factor for SAR
6	91.41	1.1
9	83.33	N/A*
12	65.86	1.5
18	46.5	N/A*
24	36.09	2.8
36	23.96	N/A*
48	19.03	5.3
54	18.83	N/A*

*Reference: SAR test was not performed at the data rate.

SECTION 8 : Measurement results

8.1 SAR measurement results

All of power drifts were within ±10%.
The measurement data is put on "APPENDIX 3".

8.1.1 Body 2450MHz SAR of antenna of 11b/g

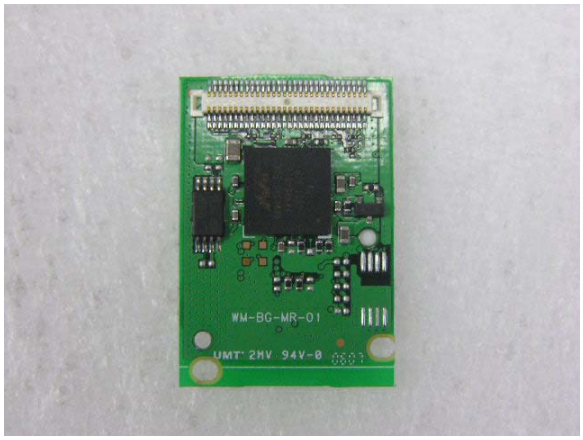
Liquid Depth (cm)	:	**15.0**	Model	:	**WM-G-MR-01**
Parameters	:	**ε_r =50.1 σ =2.01**	Serial No.	:	**63802482**
Ambient temperature (deg.c.)	:	**25.0**	Modulation	:	**DSSS, OFDM**
Relative Humidity (%)	:	**54**	Crest factor	:	**See clause 5.3**
Date	:	**May 30, 2006**	Measured By	:	**Miyo Ikuta**

SAR MEASUREMENT RESULTS									
Frequency			Modulation (Data rate[bps])	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Mode	ch	[MHz]		Antenna	Position	Separation [mm]	Before	After	Maximum value of
11b	**Step 1 Modulation search**								
	6	2437	DBPSK(1Mbps)	Fixed	Top	2	24.2	24.2	**1.40**
	6	2437	CCK(11Mbps)	Fixed	Top	2	24.2	24.2	**1.37**
	Step 2 Position search								
	6	2437	DBPSK(1Mbps)	Fixed	Front	0	24.2	24.2	**0.140**
	6	2437	DBPSK(1Mbps)	Fixed	Back	0	24.2	24.2	**0.022**
	6	2437	DBPSK(1Mbps)	Fixed	Right Side	0	24.2	24.2	**0.058**
	6	2437	DBPSK(1Mbps)	Fixed	Left Side	0	24.2	24.2	**0.044**
	Step 3 Frequency Change								
	1	2412	DBPSK(1Mbps)	Fixed	Top	2	24.2	24.2	**1.49**
	11	2462	DBPSK(1Mbps)	Fixed	Top	2	24.2	24.2	**1.47**
11g	**Step 4 Modulation search**								
	6	2437	BPSK(6Mbps)	Fixed	Top	2	24.4	24.4	**1.14**
	6	2437	QPSK(12Mbps)	Fixed	Top	2	24.4	24.4	**0.550**
	6	2437	16QAM(24Mbps	Fixed	Top	2	24.4	24.3	**0.447**
	6	2437	64QAM(48Mbps	Fixed	Top	2	24.3	24.3	**0.210**
	Step 5 Position search								
	6	2437	BPSK(6Mbps)	Fixed	Front	0	24.3	24.4	**0.089**
	6	2437	BPSK(6Mbps)	Fixed	Back	0	24.3	24.3	**0.013**
	6	2437	BPSK(6Mbps)	Fixed	Right Side	0	24.3	24.3	**0.034**
	6	2437	BPSK(6Mbps)	Fixed	Left Side	0	24.3	24.3	**0.026**
	Step 6 Frequency Change								
	1	2412	BPSK(6Mbps)	Fixed	Top	2	24.3	24.3	**1.23**
	11	2462	BPSK(6Mbps)	Fixed	Top	2	24.3	24.3	**1.25**
	Step 7 Change distance between EUT and SAM phantom								
	1	2412	DBPSK(1Mbps)	Fixed	Top	5	24.2	24.2	**0.737**
	1	2412	DBPSK(1Mbps)	Fixed	Top	10	24.2	24.2	**0.389**
	1	2412	DBPSK(1Mbps)	Fixed	Top	15	24.2	24.2	**0.175**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population							**Body SAR : 1.6 W/kg (averaged over 1 gram)**		

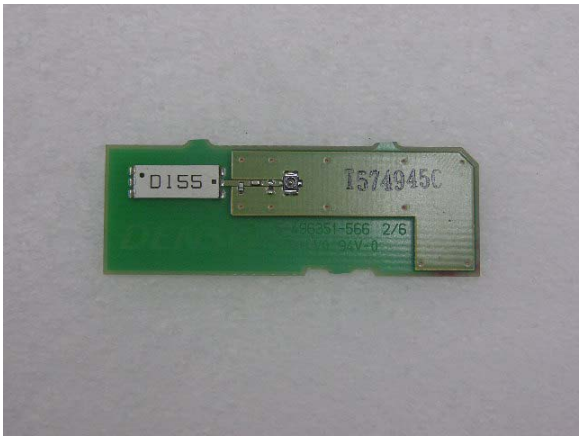
APPENDIX 1 : Photographs of test setup

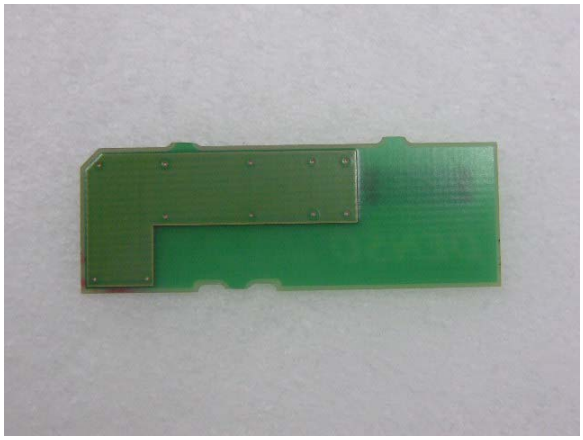
1. Photograph of EUT

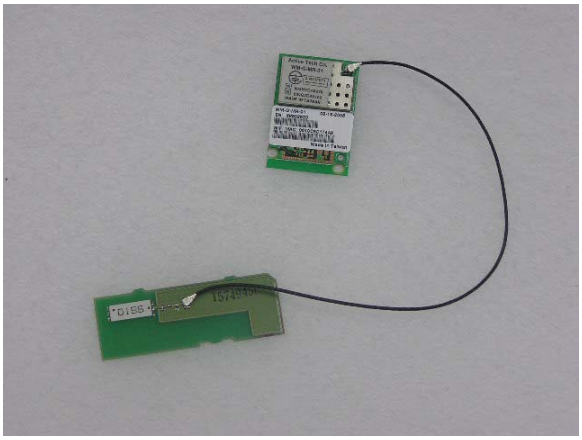
Module



Antenna







2. Photograph of host device

Top

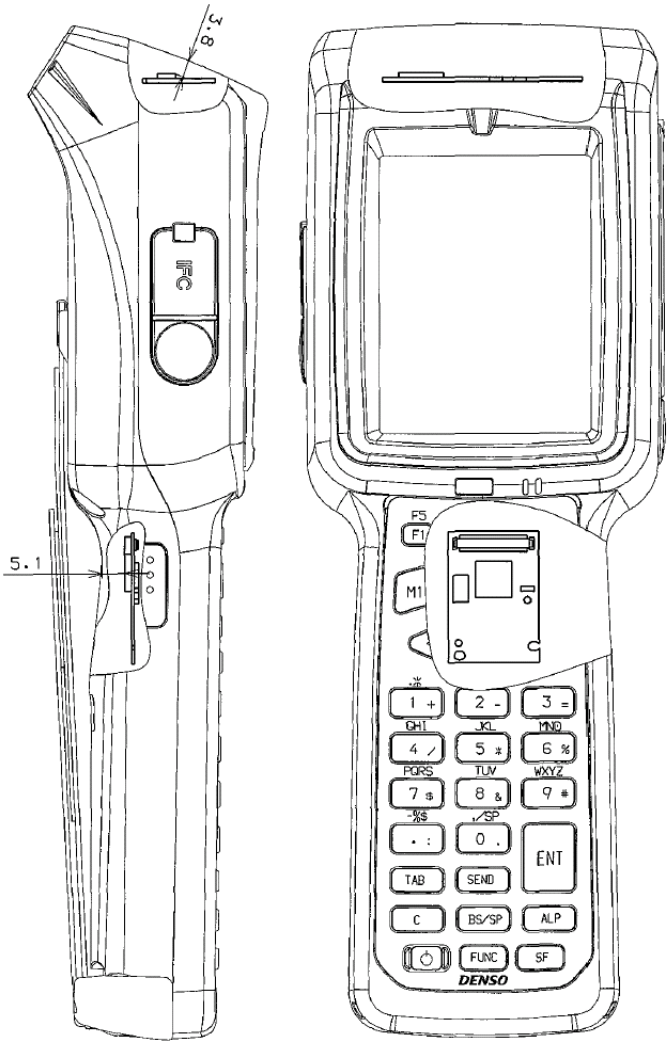
Right Side

Front

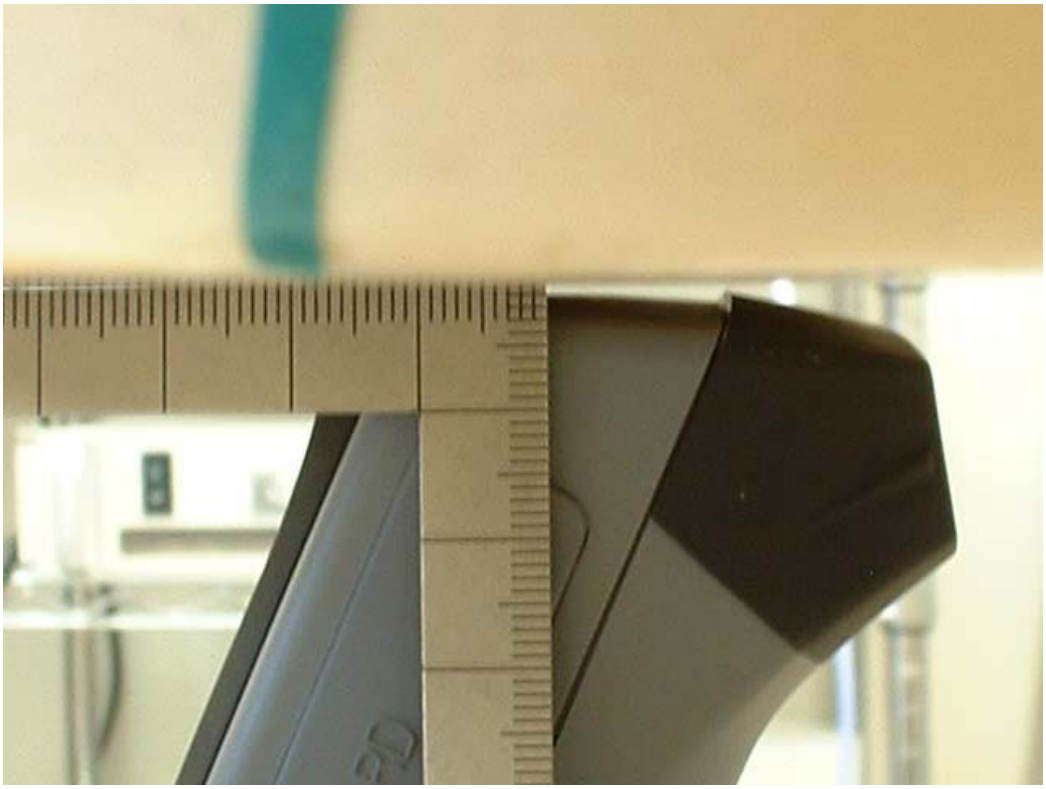
Left Side

Back

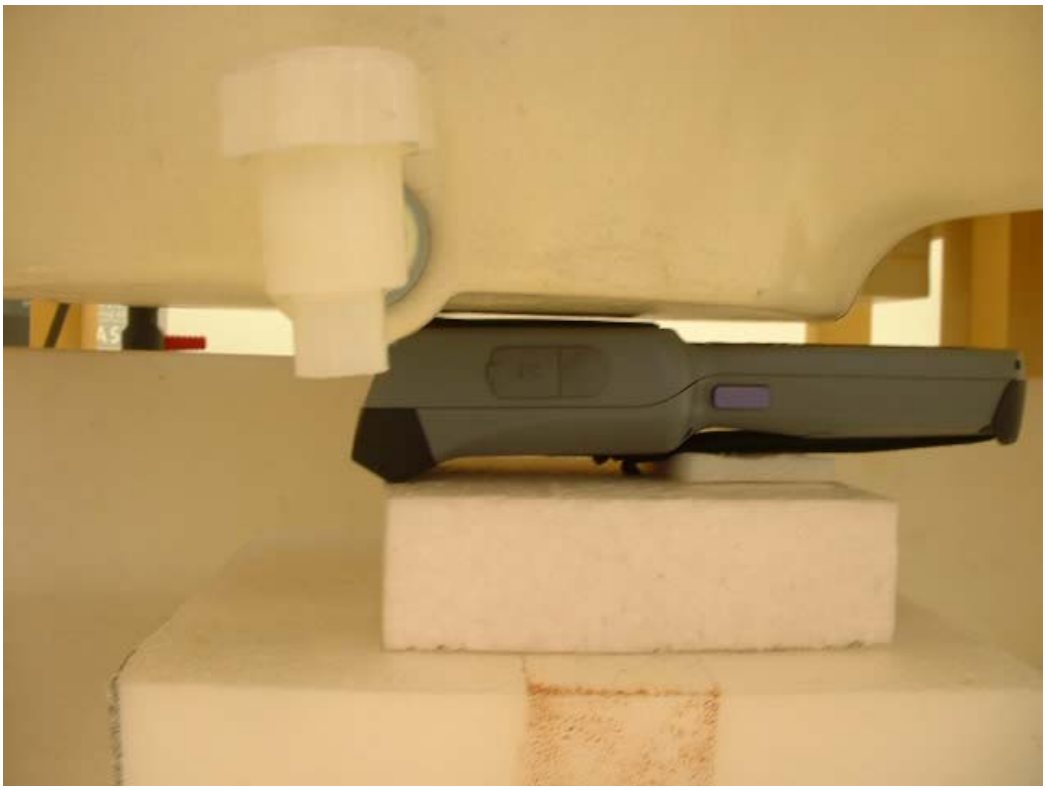
3. Antenna Location



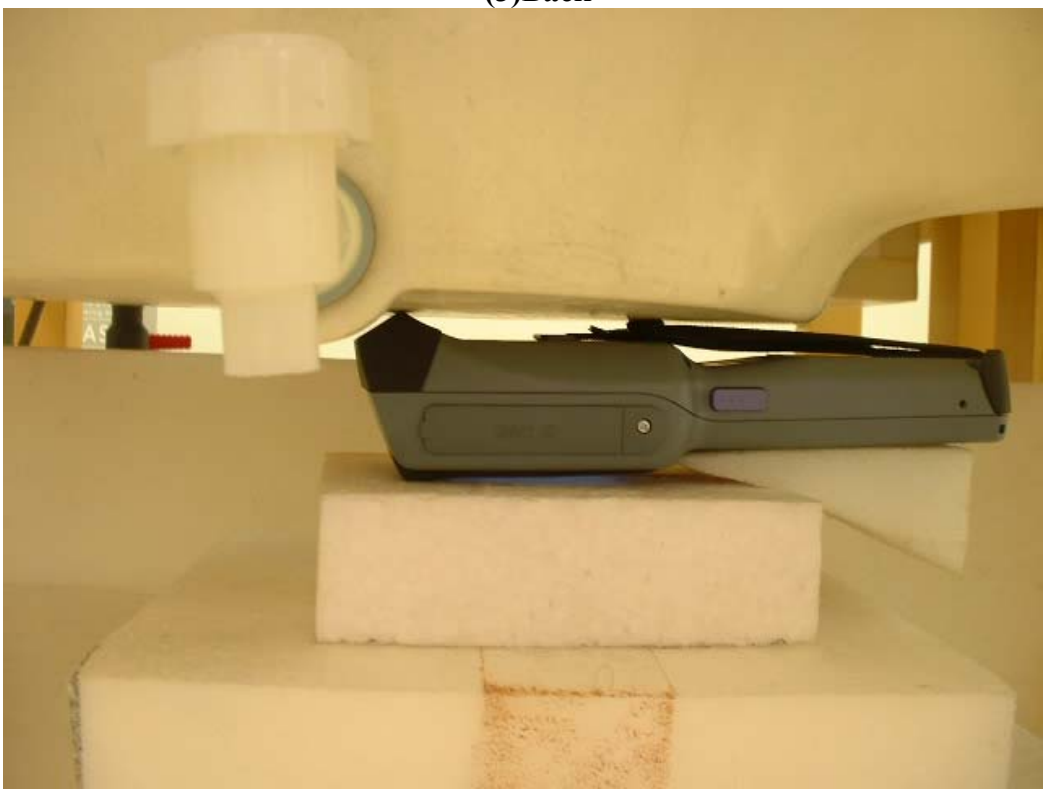
(1) Top 2mm



(2)Front



(3)Back



(4) Right side

(5) Left Side

(6)Top(5mm)

(7) Top (10mm)

(8)Top (15mm)

APPENDIX 2 : Test instruments

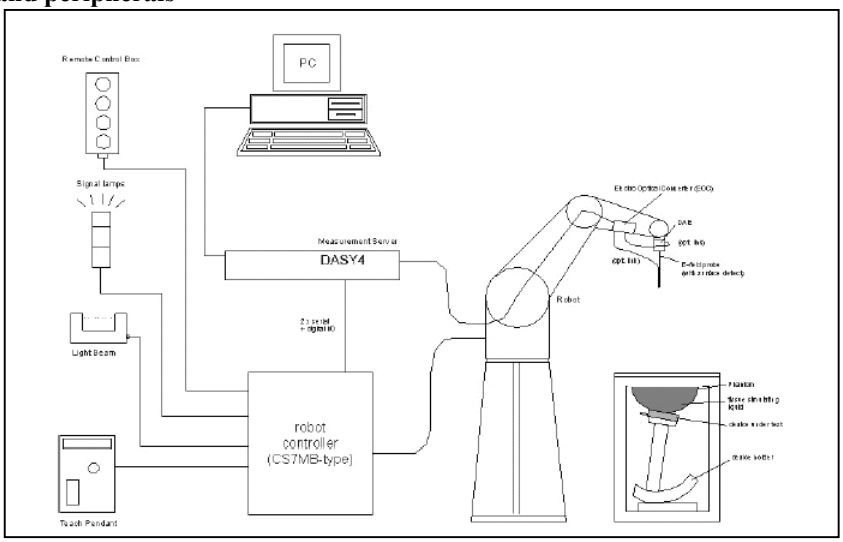
1. Equipment used

Name of Equipment	Manufacture	Model number	Serial number	Calibration	
				Last Cal	due date
Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	DA-10005	2006/03/03	2007/03/02
Horn Antenna	Schwarzbeck	BBHA9120D	258	2006/01/09	2007/01/08
Microwave Cable	Suhner	SUCOFLEX104	174274(1m) / 250653(5m)	2006/04/15	2007/04/14
MicroWave System Amplifier	Agilent	83017A	MY39500779	2006/03/27	2007/03/26
Spectrum Analyzer	Agilent	E4448A	US44300523	2006/06/02	2007/06/01
Spectrum Analyzer	Agilent	E4408B	MY45106766	2006/03/24	2007/03/23
Power Meter	Agilent	E4417A	GB41290639	2005/11/09	2006/11/08
Power Sensor	Agilent	E9300B	US40010300	2005/11/28	2006/11/27
Power Sensor	Agilent	E9327A	US40440576	2005/11/23	2006/11/22
Attenuator(30dB)	Agilent	US40010300	08498-60012	2005/12/16	2006/12/15
Signal Genelator	Rohde & Schwarz	SMR40	100023	2006/01/05	2007/01/04
Pre Amplifier	TSJ	TCBP0206	N/A	2006/03/11	2007/03/10
Dual Directional Coupler	-	Narda	03702	N/A	N/A
Network Analyzer	Agilent/HP	E8358A	US41080381	2006/02/10	2009/02/09
Dosimetric E-Field Probe	Schmid&Partner Engineering AG	ET3DV6	1700	2006/04/28	2007/04/27
Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE3	518	2005/08/31	2006/08/30
SAR measurement System	Schmid&Partner Engineering AG	DASY4	I021834	N/A	N/A
Dipole Antenna	Schmid&Partner Engineering AG	D2450V2	713	2005/09/02	2007/09/01
SAM Twin Phantom	Schmid&Partner Engineering AG	SAM Twin Phantom V4.0	1196	N/A	N/A
Digtal thermometer	HANNA	Checktemp-2	MOS-10	2005/03/07	2007/03/06
Thermo-Hygrometer	Custom	CTH-190	810201	2006/04/25	2008/04/24
Attenuator(10dB)(above 1GHz)	Orient Microwave	BX10-0476-00	-	2006/03/18	2007/03/17
Access point	CISCO	AIR-AP1131G-J-kg	FHK0907C03L	N/A	N/A
Head 2450MHz	N/A	N/A	N/A	Daily check Target value ± 5%	
Body 2450MHz	N/A	N/A	N/A	Daily check Target value ± 5%	
SAR room	-	-	-	Daily check Ambient Noise <0.012W/kg	

2. Dosimetry assessment setup

These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9 m), which positions the probes with a positional repeatability of better than +/- 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the dosimetry probe ET3DV6, SN: 1700 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [2] with accuracy of better than +/-10%. The spherical isotropy was evaluated with the procedure described in [3] and found to be better than +/-0.25 dB. The phantom used was the
SAM Twin Phantom as described in FCC supplement C, IEEE P1528 and CENELEC EN50361.

3. Configuration and peripherals



The DASY4 system for performing compliance tests consist of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software.
   An arm extension for accommodating the data acquisition electronics (DAE).

2. A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

3. 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.

4. 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.

5. 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.

6. A probe alignment unit which improves the (absolute) accuracy of the probe positioning.

7. A computer operating Windows 2000.

8. DASY4 software.

9. Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.

10. The SAM twin phantom enabling testing left-hand and right-hand usage.

11. The device holder for handheld mobile phones.

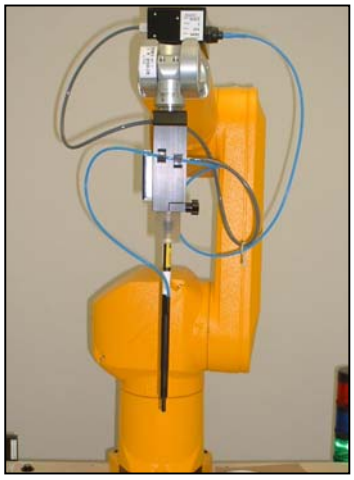
12. Tissue simulating liquid mixed according to the given recipes.

13. Validation dipole kits allowing to validate the proper functioning of the system.

4. System components

4.2.1 ET3DV6 Probe Specification

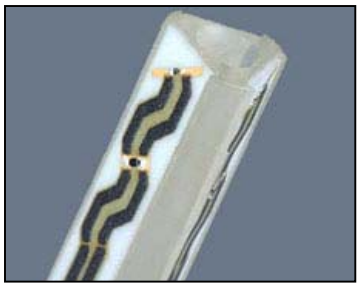
Construction:
Symmetrical design with triangular core
Built-in optical fiber for surface detection System
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)



Calibration (S/N1700):
Basic Broad Band calibration in air from 10 MHz to 2.5 GHz
In brain and muscle simulating tissue at
Frequencies of 900 MHz, 1640 MHz, 1810MHz, 1950MHz and 2450MHz
(Head and Body)

Frequency:
10 MHz to 3GHz; Linearity: +/-0.2 dB
(30 MHz to 3 GHz)

Directivity:
+/-0.2 dB in brain tissue (rotation around probe axis)
+/-0.4 dB in brain tissue (rotation normal probe axis)



ET3DV6 E-field Probe

Dynamic Range:
5 mW/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.

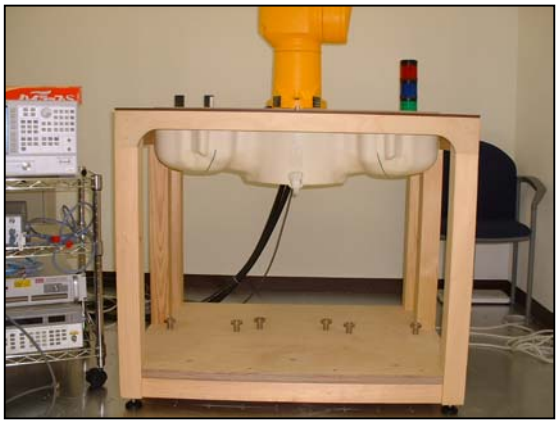
Dimensions:
Overall length: 330 mm (Tip: 16 mm)
Tip length: 16 mm
Body diameter: 12 mm (Body: 12 mm)

Tip diameter: 6.8 mm
Distance from probe tip to dipole centers: 2.7 mm

Application:
General dosimetric up to 3 GHz
Compliance tests of mobile phones
Fast automatic scanning in arbitrary phantoms

SAM Twin Phantom

Construction:
The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC EN 50361 and IEC 62209. 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 manually teaching three points with the robot.
Shell Thickness:
2 +/-0.2 mm
Filling Volume:
Approx. 25 liters
Dimensions:
(H x L x W): 810 x 1000 x 500 mm



SAM Twin Phantom

Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device enables the rotation of the mounted transmitter
in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head,flat phantom).
* Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations.
To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Device holder couldn't be used at this SAR measurement.

Device Holder

5. Test system specifications

Robot RX60L

Number of Axes	:	6
Payload	:	1.6 kg
Reach	:	800mm
Repeatability	:	+/-0.025mm
Control Unit	:	CS7M
Programming Language	:	V+
Manuafacture	:	Stäubli Unimation Corp. Robot Model: RX60

DASY4 Measurement server

Features	:	166MHz low power Pentium MMX 32MB chipdisk and 64MB RAM Serial link to DAE (with watchdog supervision) 16 Bit A/D converter for surface detection system Two serial links to robot (one for real-time communication which is supervised by watchdog) Ethernet link to PC (with watchdog supervision) Emergency stop relay for robot safety chainTwo expansion slots for future applications
Manufacture	:	Schimid & Partner Engineering AG

Data Acquisition Electronic (DAE)

Features	:	Signal amplifier, multiplexer, A/D converter and control logic Serial optical link for communication with DASY4 embedded system (fully remote controlled) 2 step probe touch detector for mechanical surface detection and emergency robot stop (not in -R version)
Measurement Range	:	1 µV to > 200 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset voltage	:	< 1 µV (with auto zero)
Input Resistance	:	200 MΩ
Battery Power	:	> 10 h of operation (with two 9 V battery)
Dimension	:	60 x 60 x 68 mm
Manufacture	:	Schimid & Partner Engineering AG

Software

Item	:	Dosimetric Assesment System DASY4
Type No.	:	SD 000 401A, SD 000 402A
Software version No.	:	4.6
Manufacture / Origin	:	Schimid & Partner Engineering AG

E-Field Probe

Model	:	ET3DV6
Serial No.	:	1700
Construction	:	Symmetrical design with triangular core
Frequency	:	10 MHz to 6 GHz
Linearity	:	+/-0.2 dB (30 MHz to 3 GHz)
Manufacture	:	Schimid & Partner Engineering AG
Conversion Factor of probe	:	Head Conv F at 11b/g & BT (2.45GHz) : 4.6(Head), 4.22(Body)

Phantom

Type	:	SAM Twin Phantom V4.0
Shell Material	:	Fiberglass
Thickness	:	2.0 +/-0.2 mm
Volume	:	Approx. 25 liters
Manufacture	:	Schimid & Partner Engineering AG

6. Simulated tissues composition of 2450MHz

Ingredient	MIXTURE(%)	
	Head 2450MHz	Muscle 2450MHz
Water	45.0	69.83
DGMBE	55.0	30.2

Note:DGMBE(Diethylenglycol-monobuthyl ether)

7. Validation measurement

7-a Simulated tissue liquid parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.
The dielectric parameters measurement are reported in each correspondent section.

7-b Head 2450 MHz

Type of liquid : **Head 2450 MHz**
Ambient temperature (deg.c.) : **25.0**
Relative Humidity (%) : **54**
Liquid depth (cm) : **15.0**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
		Before	After					
30-May	2450	23.2	23.2	Relative Permittivity εr	39.2	37.3	-4.8	+/-5
				Coductivity σ [mho/m]	1.80	1.87	3.9	+/-5

7-c Muscle 2450 MHz

Type of liquid : **Head 2450 MHz**
Ambient temperature (deg.c.) : **25.0**
Relative Humidity (%) : **54**
Liquid depth (cm) : **15.0**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
		Before	After					
30-May	2450	24.2	24.2	Relative Permittivity εr	52.7	50.1	-4.9	+/-5
				Coductivity σ [mho/m]	1.95	2.01	3.1	+/-5

8. System validation data

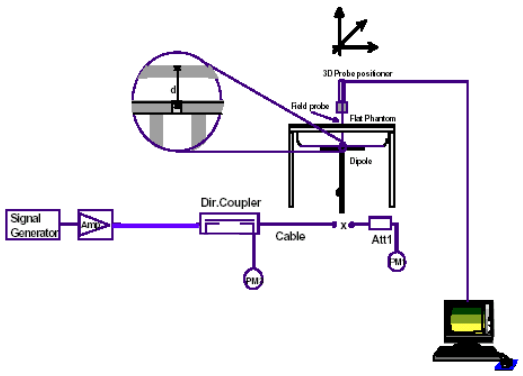
Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of +/-10%. The validation results are in the table below.
Please refer to "10. Validation measurement data".

System validation of 2450MHz

Type of liquid : **Head 2450 MHz**
Ambient temperature (deg.c.) : **25.0**
Relative Humidity (%) : **54**
Liquid depth (cm) : **15.0**
Dipole : **D2450V2 SN:713**
Power : **250mW**

SYSTEM PERFORMANCE CHECK										
Date	Liquid (HEAD 2450MHz)						System dipole validation target & measured			
	Liquid Temp [deg.c.]		Relative Permittivity εr		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
	Before	After	Target	Measured	Target	Measured	Target	Measured		
30-May	23.2	23.2	39.2	37.3	1.80	1.87	13.1	14.0	6.9	+/-10

Note: Please refer to Attachment for the result representation in plot format



2450MHz System performance check setup

Test system for the system performance check setup diagram

9. Validation uncertainty

The uncertainty budget has been determined for the DASY4 measurement system according to the SPEAG documents[6][7] and is given in the following Table.

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±4.8	Normal	1	1	±4.8	∞
Axial isotropy of the probe	±4.7	Rectangular	√3	1	±2.7	∞
Spherical isotropy of the probe	±9.6	Rectangular	√3	0	0	∞
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	±1.0	Normal	1	1	±1.0	∞
Response time	0	Rectangular	√3	1	0	∞
Integration time	0	Rectangular	√3	1	0	∞
RF ambient Noize	±3.0	Rectangular	√3	1	±1.7	∞
RF ambient Reflections	±3.0	Rectangular	√3	1	±1.7	∞
Mech. constraints of robot	±0.4	Rectangular	√3	1	±0.2	∞
Probe positioning	±2.9	Rectangular	√3	1	±1.7	∞
Extrap. and integration	±1.0	Rectangular	√3	1	±0.6	∞
Dipole						
Dipole Axis to Liquid Distance	±2.0	Rectangular	√3	1	±1.2	∞
Input power and SAR drift meas.	±4.7	Rectangular	√3	1	±2.7	∞
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.)	±5.0	Normal	1	0.64	±3.2	∞
Liquid permittivity (target)	±5.0	Rectangular	√3	0.6	±1.7	∞
Liquid permittivity (meas.)	±5.0	Normal	1	0.6	±3.0	∞
Combined Standard Uncertainty					**±9.370**	
Expanded Uncertainty (k=2)					**±18.740**	

10. Validation measurement data

System Validation / Dipole 2450 MHz / Forward Conducted Power : 250mW

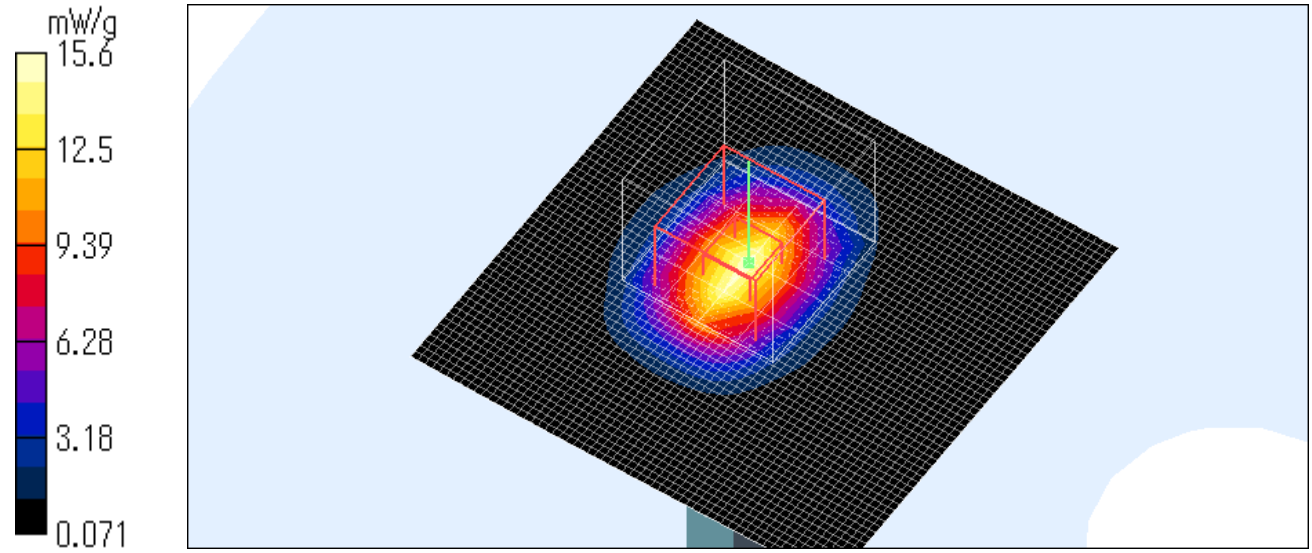
Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:713
Communication System: CW; Frequency: 2450 MHz Crest factor:1
Medium parameters used: f = 2450 MHz; σ = 1.87 mho/m; ε_r = 37.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.6, 4.6, 4.6); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 19.0 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 94.3 V/m; Power Drift = 0.040 dB
Peak SAR (extrapolated) = 30.9 W/kg
SAR(1 g) = 14 mW/g; SAR(10 g) = 6.39 mW/g
Maximum value of SAR (measured) = 15.6 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0 degree.C.
Liquid Temperature = Before 23.2 degree C. , After 23.2 degree C.



11. System Validation Dipole (D2450V2,S/N: 713)

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

Accreditation No.: SCS 108

Client **UL A-pex (MTT)** **Certificate No: D2450V2-713_Sep05**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 713
Calibration procedure(s)	QA CAL-05.v6 Calibration procedure for dipole validation kits
Calibration date:	September 2, 2005
Condition of the calibrated item	In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E442	GB37480704	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Power sensor HP 8481A	US37292783	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Reference 20 dB Attenuator	SN: 5086 (20g)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference 10 dB Attenuator	SN: 5047.2 (10r)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference Probe ES3DV2	SN 3025	29-Oct-04 (SPEAG, No. ES3-3025_Oct04)	Oct-05
DAE4	SN 601	07-Jan-05 (SPEAG, No. DAE4-601_Jan05)	Jan-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-03)	In house check: Oct-05
RF generator R&S SML-03	100698	27-Mar-02 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov-05

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	M. Meili
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 2, 2005

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

Calibration Laboratory of
Schmid & Partner
Engineering AG
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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY4	V4.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Area Scan resolution	dx, dy = 15 mm	
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	38.5 ± 6 %	1.73 mho/m ± 6 %
Head TSL temperature during test	(21.6 ± 0.2) °C	38.4 ± 6 %	1.75 mho/m ± 6 %

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	condition	
SAR measured	250 mW input power	13.2 mW / g
SAR normalized	normalized to 1W	52.8 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**53.2 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.19 mW / g
SAR normalized	normalized to 1W	24.8 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**24.9 mW / g ± 16.5 % (k=2)**

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

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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	52.5 ± 6 %	2.03 mho/m ± 6 %
Body TSL temperature during test	(21.8 ± 0.2) °C	52.5 ± 6 %	2.04 mho/m ± 6 %

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	250 mW input power	13.5 mW / g
SAR normalized	normalized to 1W	54.0 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**52.8 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.25 mW / g
SAR normalized	normalized to 1W	25.0 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**24.4 mW / g ± 16.5 % (k=2)**

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

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.7 Ω + 3.7 jΩ
Return Loss	-28.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.6 Ω + 4.8 jΩ
Return Loss	- 25.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.161 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 5, 2002

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DASY4 Validation Report for Head TSL

Date/Time: 02.09.2005 10:54:01

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN713

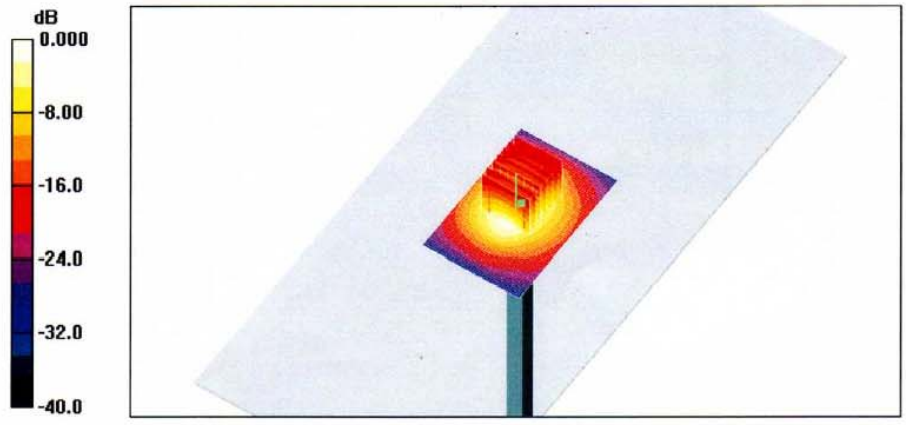
Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U10 BB;
Medium parameters used: f = 2450 MHz; σ = 1.75 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.4, 4.4, 4.4); Calibrated: 29.10.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 22.07.2004
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA
- Measurement SW: DASY4, V4.6 Build 13; Postprocessing SW: SEMCAD, V1.8 Build 156

Pin = 250 mW; d = 10 mm/Area Scan (41x61x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 16.7 mW/g

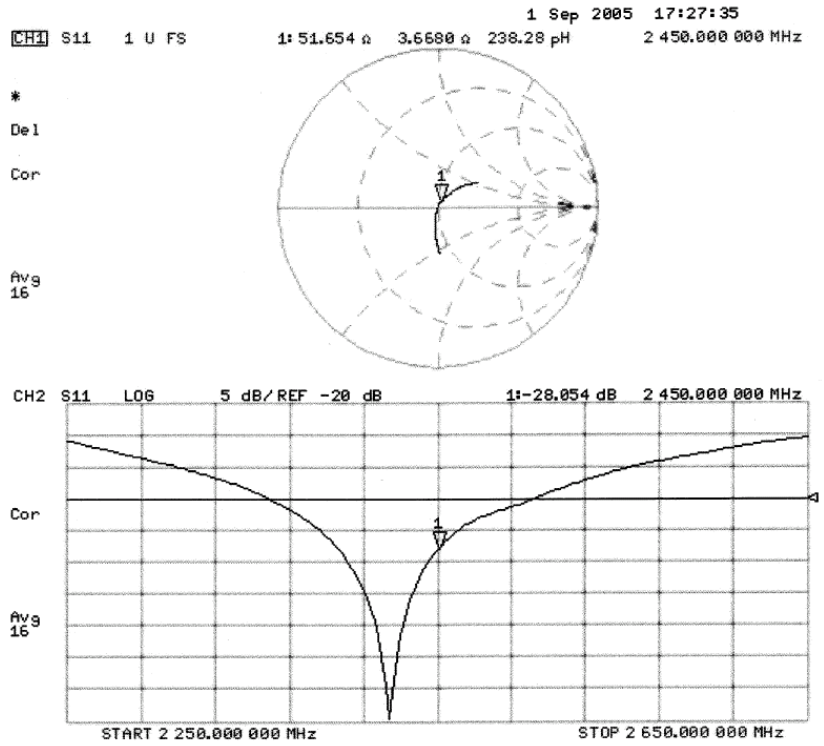
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.8 V/m; Power Drift = 0.035 dB
Peak SAR (extrapolated) = 27.1 W/kg
SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.19 mW/g
Maximum value of SAR (measured) = 15.0 mW/g



0 dB = 15.0mW/g

Certificate No: D2450V2-713_Sep05 Page 6 of 9

Impedance Measurement Plot for Head TSL



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DASY4 Validation Report for Body TSL

Date/Time: 02.09.2005 12:04:42

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN713

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL 2450;
Medium parameters used: f = 2450 MHz; σ = 2.04 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

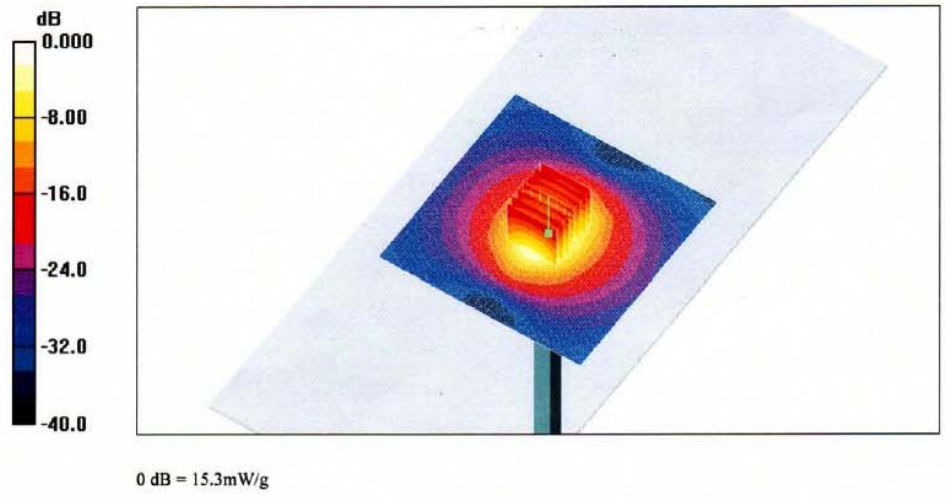
- Probe: ES3DV2 - SN3025; ConvF(4.13, 4.13, 4.13); Calibrated: 29.10.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 22.07.2004
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA
- Measurement SW: DASY4, V4.6 Build 13; Postprocessing SW: SEMCAD, V1.8 Build 156

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1):

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 15.3 mW/g

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.3 V/m; Power Drift = -0.062 dB
Peak SAR (extrapolated) = 27.6 W/kg
SAR(1 g) = 13.5 mW/g; SAR(10 g) = 6.25 mW/g
Maximum value of SAR (measured) = 15.3 mW/g



0 dB = 15.3mW/g

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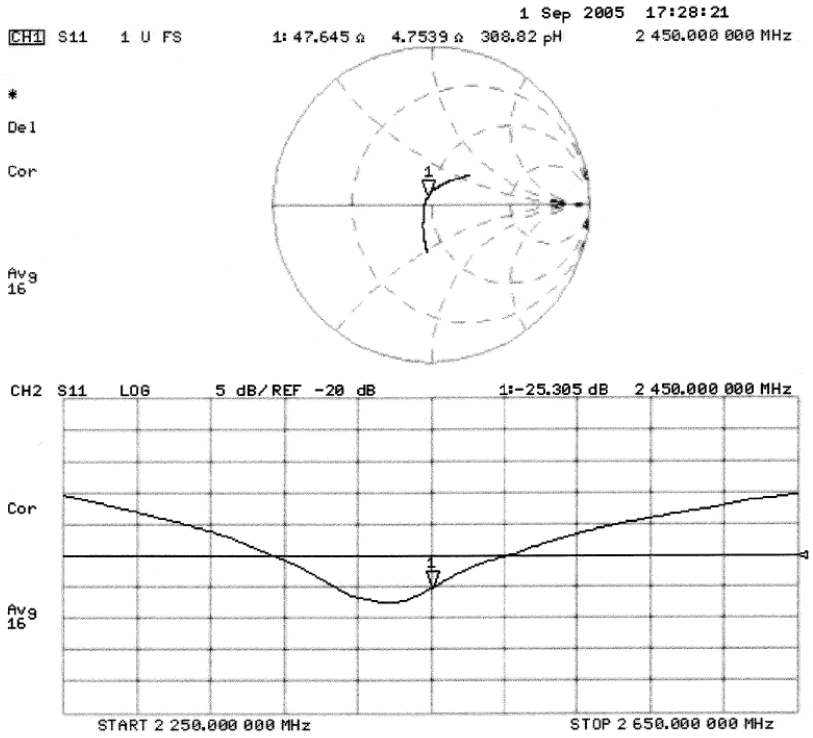
Impedance Measurement Plot for Body TSL



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12. Dosimetric E-Field Probe Calibration (ET3DV6,S/N: 1700)

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Accreditation No.: SCS 108

Client MTT

Certificate No: ET3-1700_Apr06

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN: 1700
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes
Calibration date:	April 28, 2006
Condition of the calibrated item	In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	11-Aug-05 (METAS, No. 251-00499)	Aug-06
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	11-Aug-05 (METAS, No. 251-00500)	Aug-06
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	2-Feb-06 (SPEAG, No. DAE4-654_Feb06)	Feb-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov 06

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: April 28, 2006

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

Certificate No: ET3-1700_Apr06 Page 1 of 9

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Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
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) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

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 effect 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 (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ET3DV6

SN:1700

Manufactured:	June 24, 2002
Last calibrated:	October 28, 2004
Recalibrated:	April 28, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

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ET3DV6 SN:1700 **April 28, 2006**

DASY - Parameters of Probe: ET3DV6 SN:1700

Sensitivity in Free Space[A] Diode Compression[B]

NormX	**1.46** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**95** mV
NormY	**1.86** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**95** mV
NormZ	**1.38** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**95** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL **900 MHz** **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	7.2	4.0
SAR_{be} [%]	With Correction Algorithm	0.0	0.1

TSL **1810 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	6.7	3.9
SAR_{be} [%]	With Correction Algorithm	0.1	0.3

Sensor Offset

Probe Tip to Sensor Center	**2.7** mm

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

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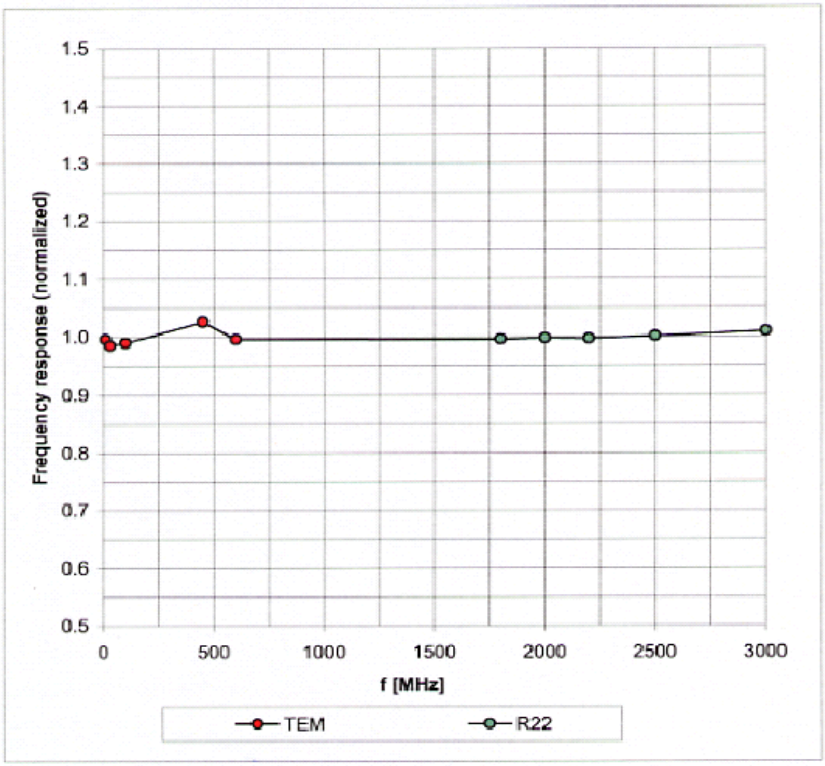
ET3DV6 SN:1700 April 28, 2006

Frequency Response of E-Field

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



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

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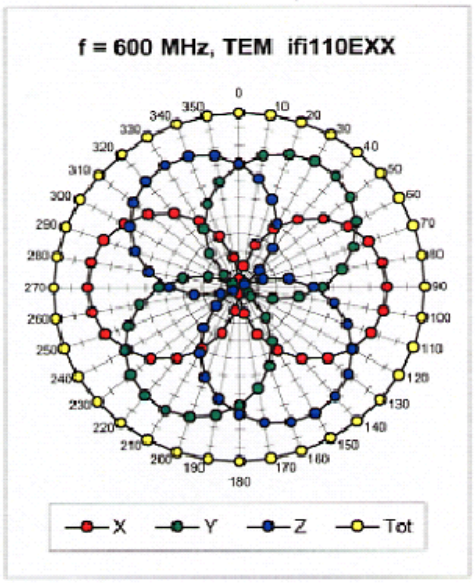
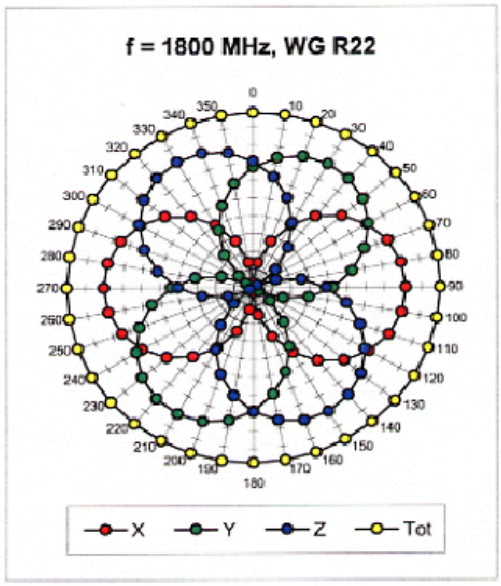
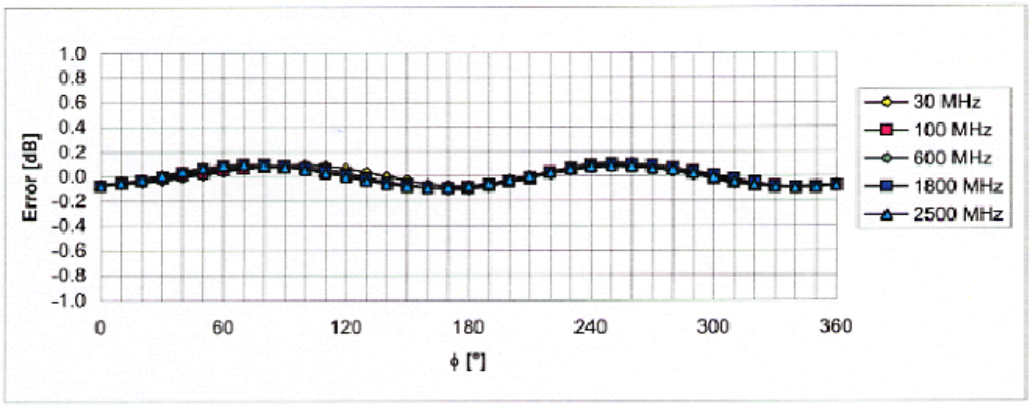
Receiving Pattern (ϕ), ϑ = 0°







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

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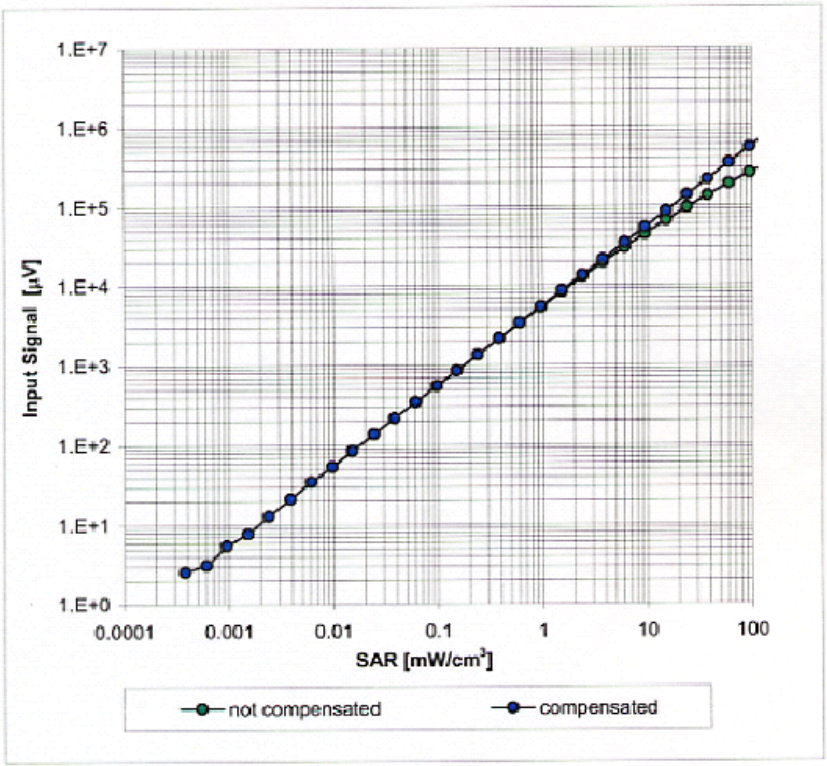
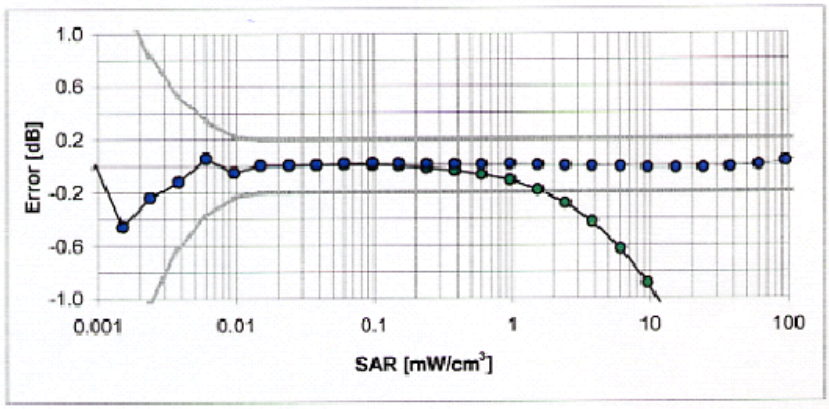
ET3DV6 SN:1700 April 28, 2006

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)



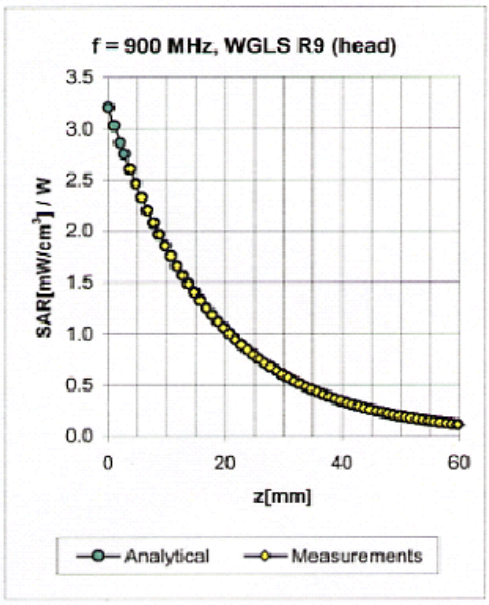


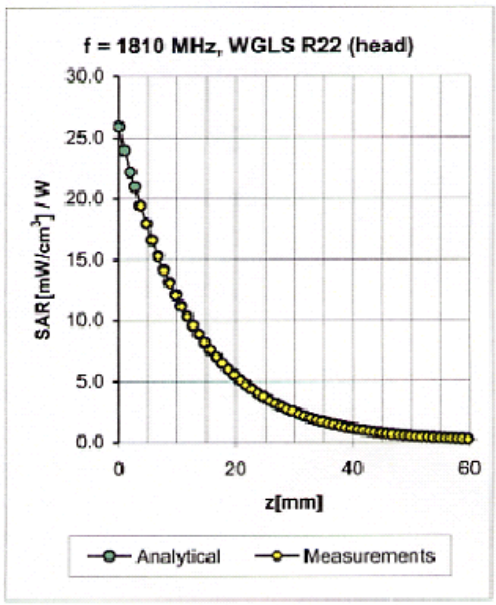
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Certificate No: ET3-1700_Apr06 Page 7 of 9

ET3DV6 SN:1700 April 28, 2006

Conversion Factor Assessment





f [MHz]	Validity [MHz][c]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.51	1.83	6.71 ± 11.0% (k=2)
1640	± 50 / ± 100	Head	40.3 ± 5%	1.29 ± 5%	0.45	2.78	5.76 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.39	2.95	5.35 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.48	2.61	4.93 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.48	2.37	4.60 ± 11.8% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.44	2.07	6.63 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.43	2.13	6.38 ± 11.0% (k=2)
1640	± 50 / ± 100	Body	53.8 ± 5%	1.40 ± 5%	0.45	2.86	5.16 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.55	2.54	4.85 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.68	2.20	4.63 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.46	2.03	4.22 ± 11.8% (k=2)

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

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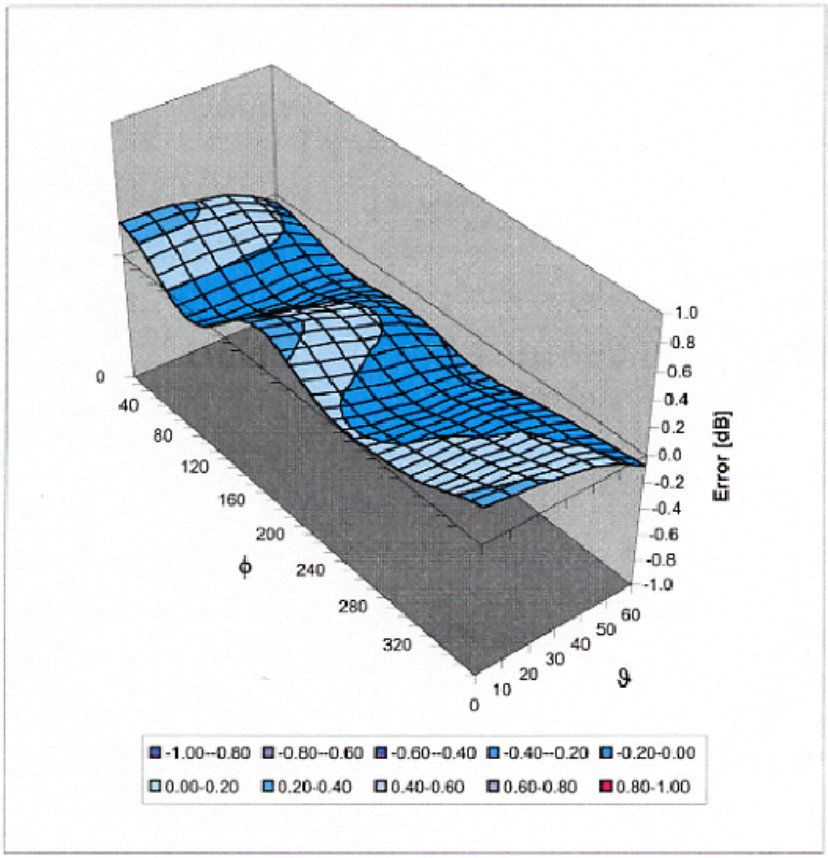
ET3DV6 SN:1700 April 28, 2006

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

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13. References

[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] Katja Pokovic, Thomas Schmid, and Niels Kuster, "Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM '97, Dubrovnik, October 15-17, 1997, pp. 120-124.
[3] Katja Pokovic, Thomas Schmid, and Niels Kuster, "E-_field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23-25 June, 1996, pp.172-175.
[4] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.
[5] W. H. Press, S. A. Teukolsky,W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992.
[6]SPEAG uncertainty document for DASY 4 System from SPEAG (Shimid & Partner Engineering AG).
[7]SPEAG uncertainty document for "the 5-6GHz Extension" from SPEAG (Shimid & Partner Engineering AG).

APPENDIX 3 : 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 [15mm x 15mm]. 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 32mm x 32mm x 30mm was assessed by measuring 5 x 5 x 7 points. 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 2.7 mm 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 / Body

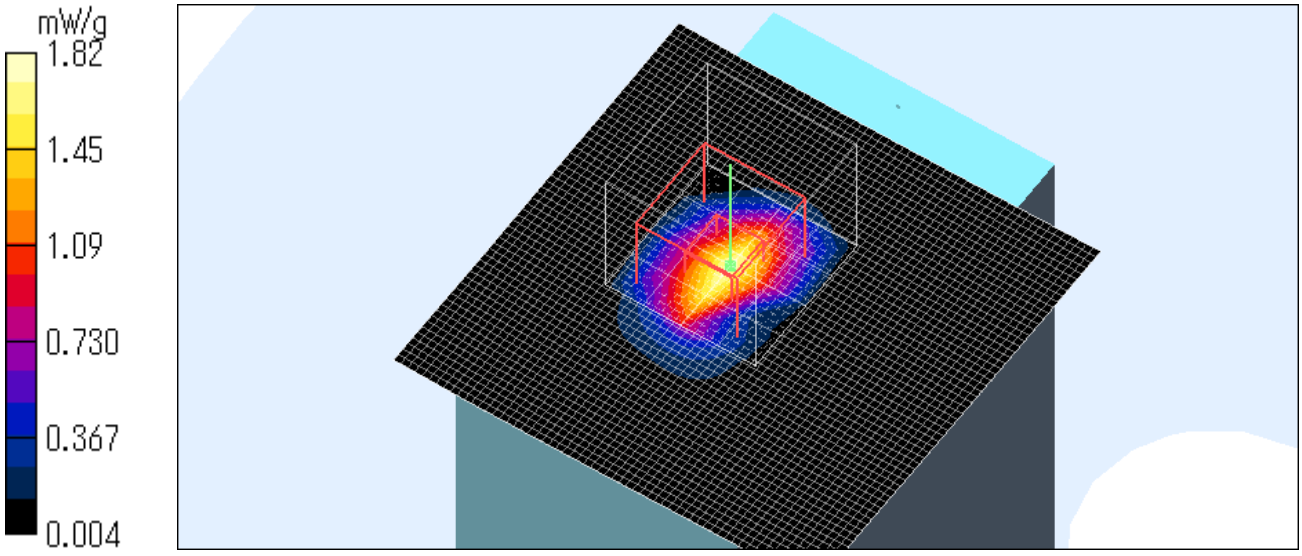
WM-G-MR-01 / Body / Top 2mm / 2437MHz /11b DBPSK (1Mbps)

Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.53 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.8 V/m; Power Drift = -0.250 dB
Peak SAR (extrapolated) = 2.99 W/kg
SAR(1 g) = 1.4 mW/g; SAR(10 g) = 0.561 mW/g
Maximum value of SAR (measured) = 1.82 mW/g
Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.



WM-G-MR-01 / Body / Top 2mm / 2437MHz /11b CCK (11Mbps)

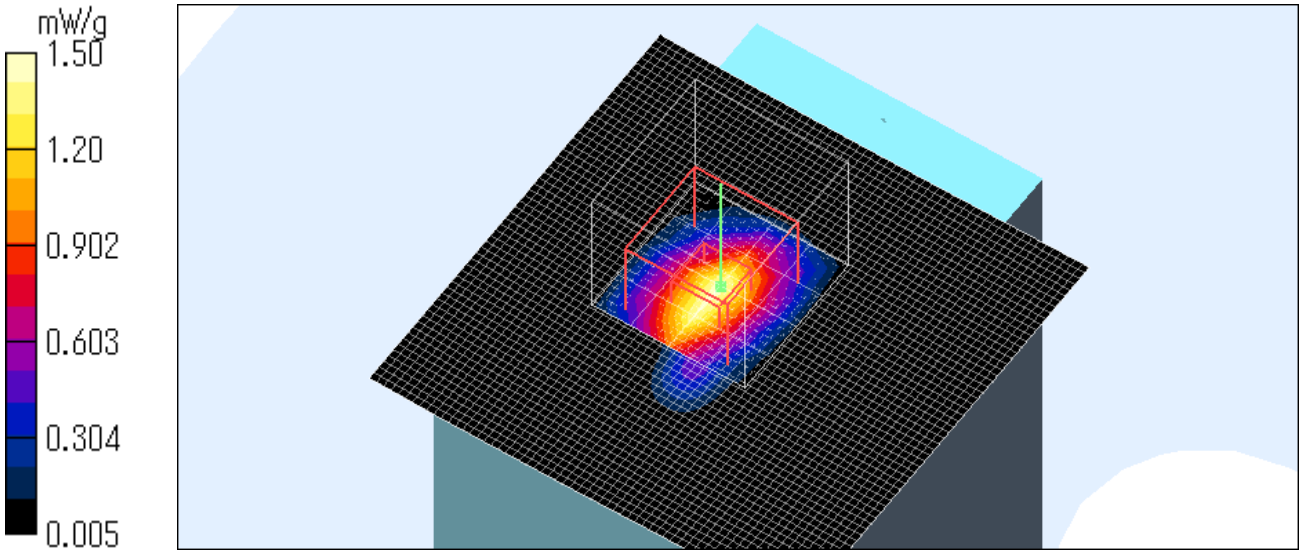
Crest factor: 1.4
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.03 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.3 V/m; Power Drift = 0.281 dB
Peak SAR (extrapolated) = 3.38 W/kg
SAR(1 g) = 1.37 mW/g; SAR(10 g) = 0.556 mW/g
Maximum value of SAR (measured) = 1.50 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.



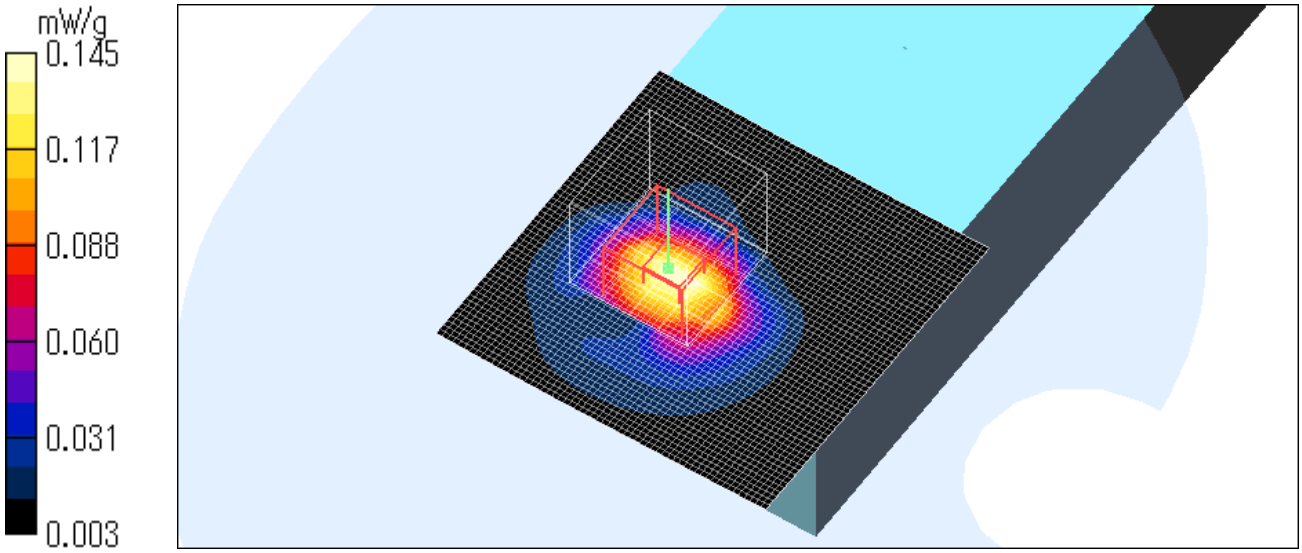
WM-G-MR-01 / Body / Front / 2437MHz /11b DBPSK (1Mbps)

Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.146 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.71 V/m; Power Drift = -0.053 dB
Peak SAR (extrapolated) = 0.309 W/kg
SAR(1 g) = 0.140 mW/g; SAR(10 g) = 0.070 mW/g
Maximum value of SAR (measured) = 0.145 mW/g
Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.



WM-G-MR-01 / Body / Back / 2437MHz /11b DBPSK (1Mbps)

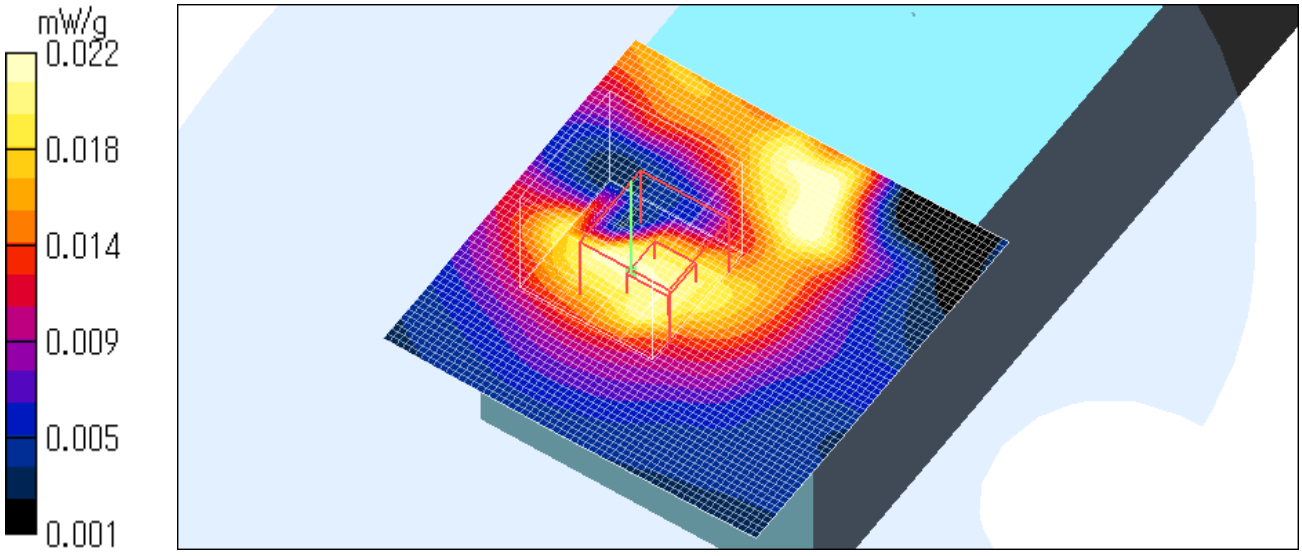
Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.024 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.23 V/m; Power Drift = -0.243 dB
Peak SAR (extrapolated) = 0.052 W/kg
SAR(1 g) = 0.022 mW/g; SAR(10 g) = 0.011 mW/g

Maximum value of SAR (measured) = 0.022 mW/g
Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.



Remark: The data of "Back"is for the test in order to decide the worst position. The data is very close to the ambient noise level (0.012 W/kg) and its value is very low level compared to other positions.
There is no affection for the maximum SAR value.

WM-G-MR-01 / Body / Right side / 2437MHz /11b DBPSK (1Mbps)

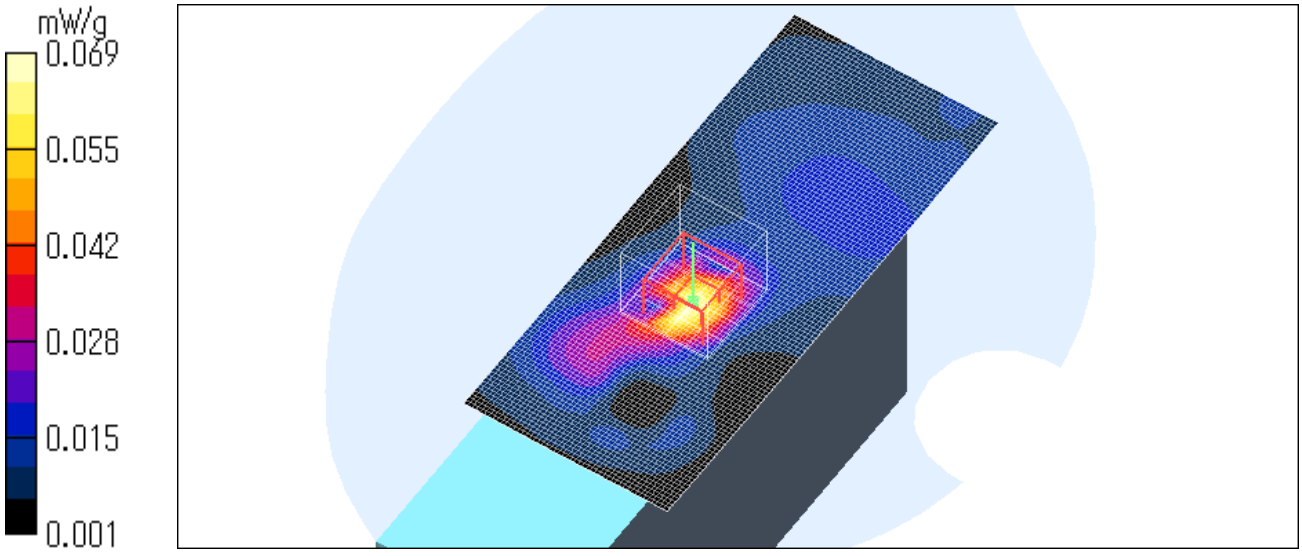
Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (51x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.067 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.67 V/m; Power Drift = -0.212 dB
Peak SAR (extrapolated) = 0.106 W/kg
SAR(1 g) = 0.058 mW/g; SAR(10 g) = 0.030 mW/g
Maximum value of SAR (measured) = 0.069 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.



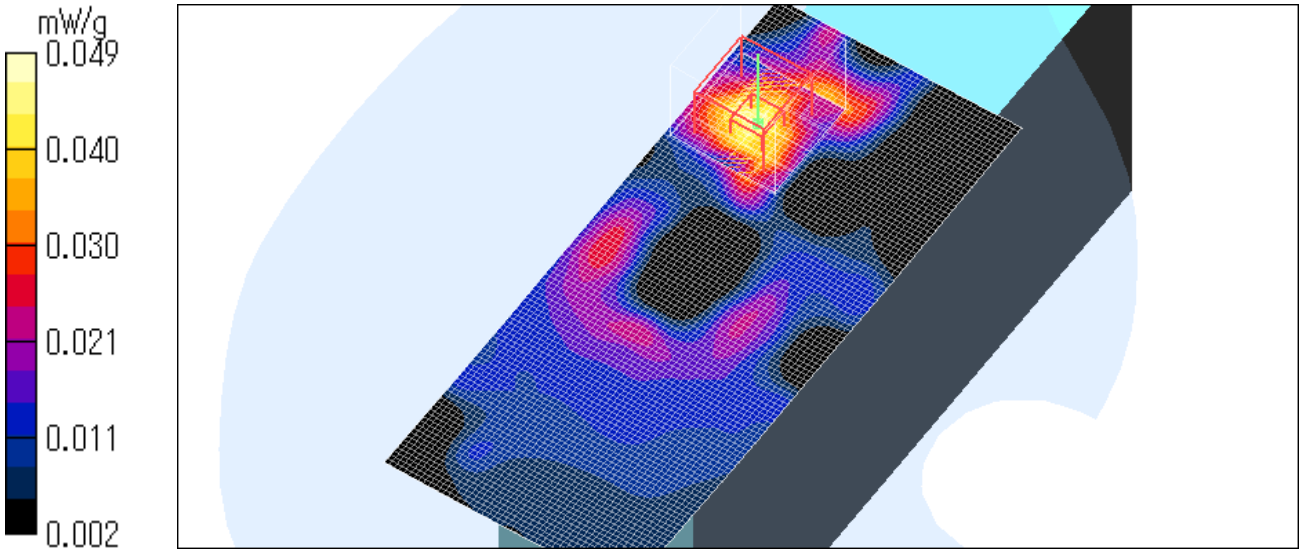
WM-G-MR-01 / Body / Left side / 2437MHz /11b DBPSK (1Mbps)

Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160
Area Scan (51x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.049 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.75 V/m; Power Drift = -0.003 dB
Peak SAR (extrapolated) = 0.091 W/kg
SAR(1 g) = 0.044 mW/g; SAR(10 g) = 0.022 mW/g
Maximum value of SAR (measured) = 0.049 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.1degree C. , After 24.1 degree C.



WM-G-MR-01 / Body / Top 2mm / 2412MHz /11b DBPSK (1Mbps)

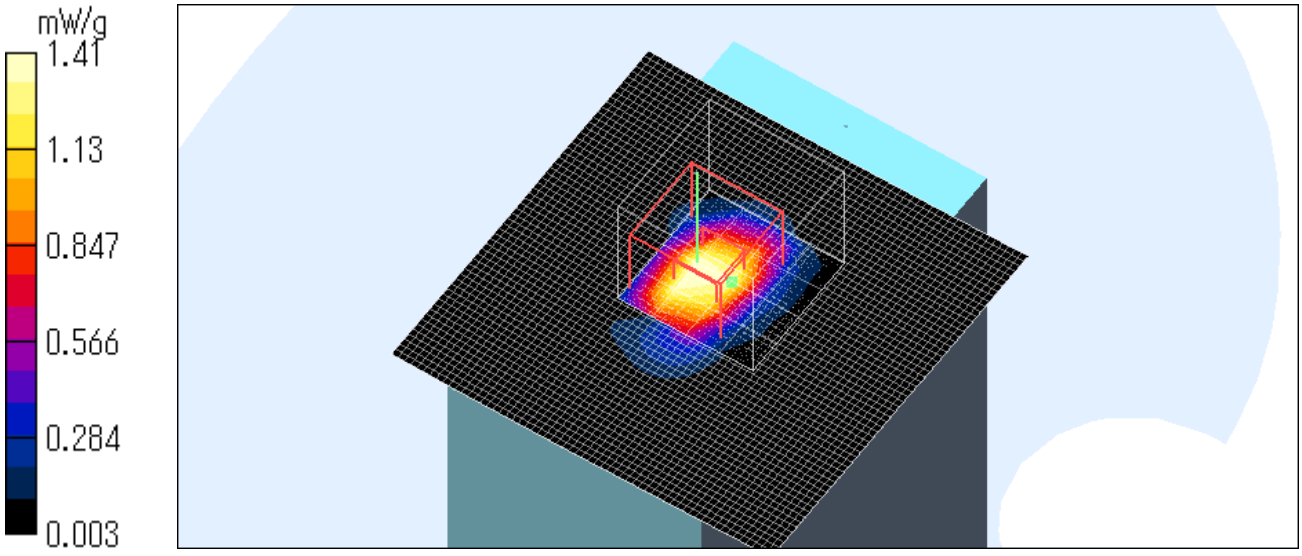
Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; εr = 50.1; ρ = 1000 kg/m3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.21 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.0 V/m; Power Drift = -0.194 dB
Peak SAR (extrapolated) = 4.40 W/kg
SAR(1 g) = 1.49 mW/g; SAR(10 g) = 0.598 mW/g
Maximum value of SAR (measured) = 1.41 mW/g

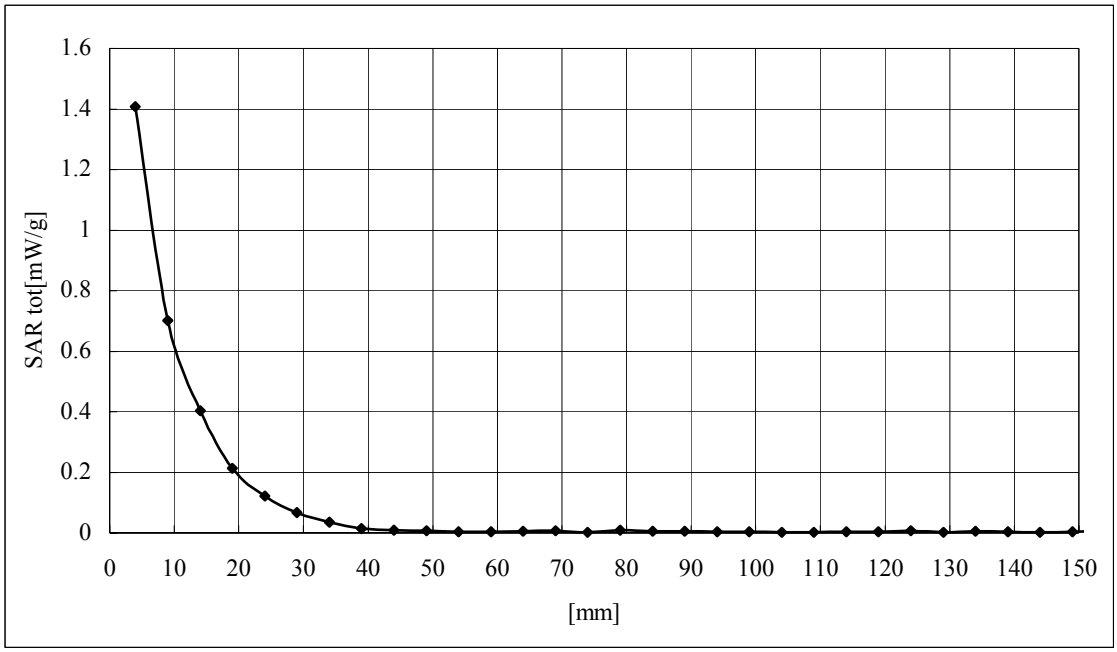
Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.



Z-axis scan at max SAR location

WM-G-MR-01 / Body / Top 2mm / 2412MHz /11b DBPSK (1Mbps)
Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; εr = 50.1; ρ = 1000 kg/m3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160



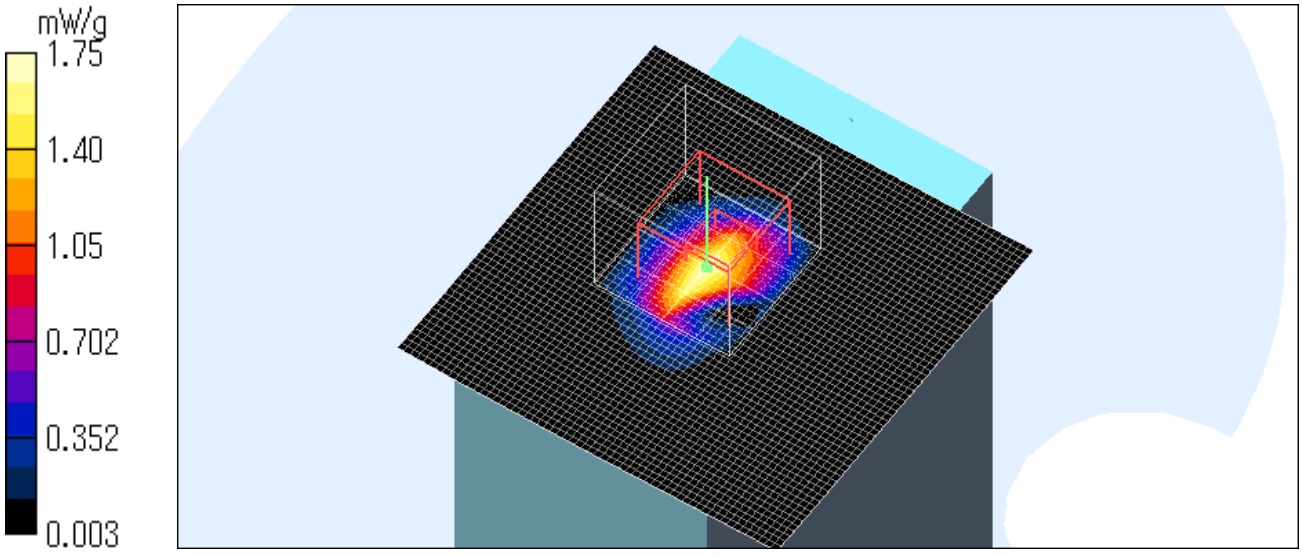
WM-G-MR-01 / Body / Top 2mm / 2462MHz /11b DBPSK (1Mbps)

Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.44 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 31.0 V/m; Power Drift = 0.013 dB
Peak SAR (extrapolated) = 4.45 W/kg
SAR(1 g) = 1.47 mW/g; SAR(10 g) = 0.552 mW/g
Maximum value of SAR (measured) = 1.75 mW/g
Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.



WM-G-MR-01 / Body / Top 2mm / 2437MHz /11g BPSK (6Mbps)

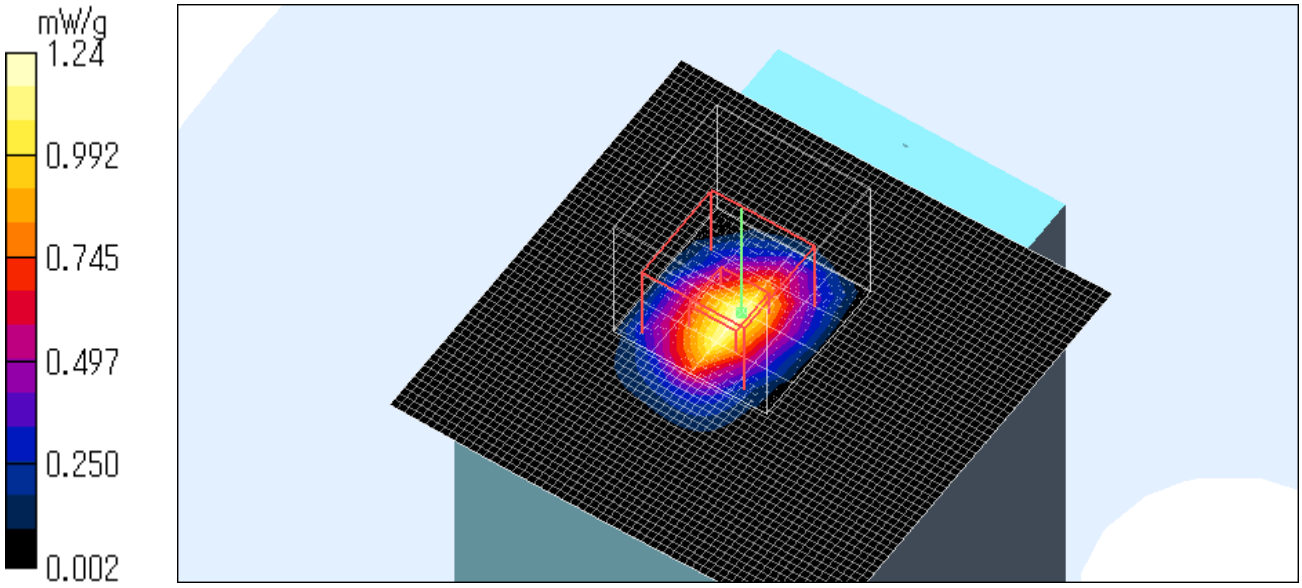
Crest factor: 1.1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.32 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.7 V/m; Power Drift = -0.227 dB
Peak SAR (extrapolated) = 2.93 W/kg
SAR(1 g) = 1.14 mW/g; SAR(10 g) = 0.465 mW/g
Maximum value of SAR (measured) = 1.24 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.4 degree C. , After 24.4 degree C.



WM-G-MR-01 / Body / Top 2mm / 2437MHz /11g QPSK (12Mbps)

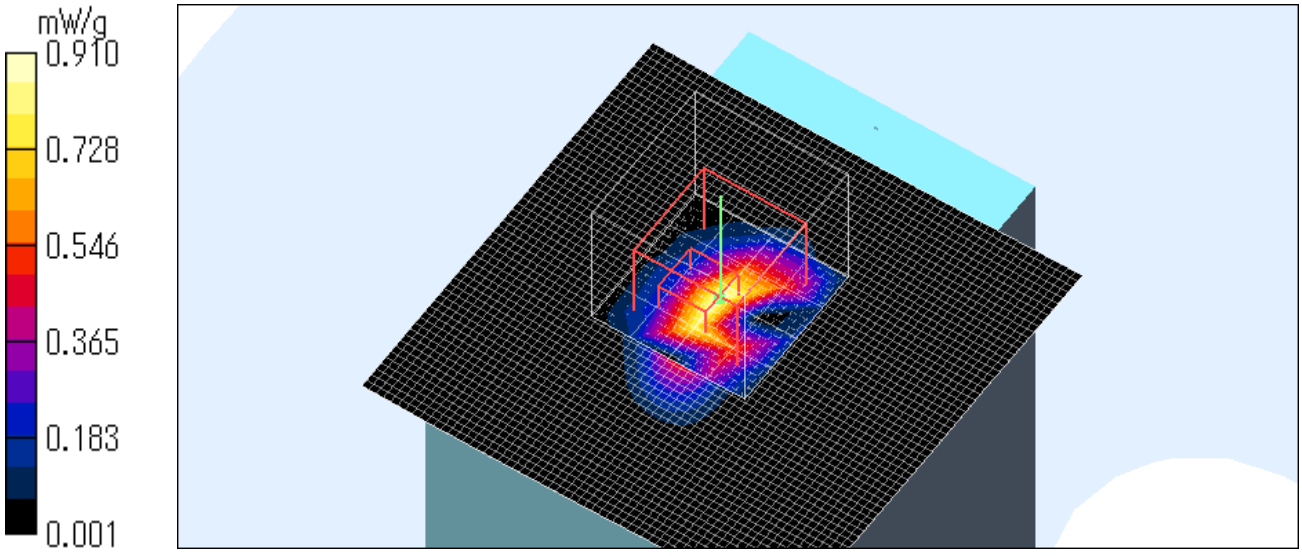
Crest factor: 1.5
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.40 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.1 V/m; Power Drift = 0.290 dB
Peak SAR (extrapolated) = 1.09 W/kg
SAR(1 g) = 0.550 mW/g; SAR(10 g) = 0.209 mW/g
Maximum value of SAR (measured) = 0.910 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.4 degree C. , After 24.4 degree C.



WM-G-MR-01 / Body / Top 2mm / 2437MHz /11g 16QAM(24Mbps)

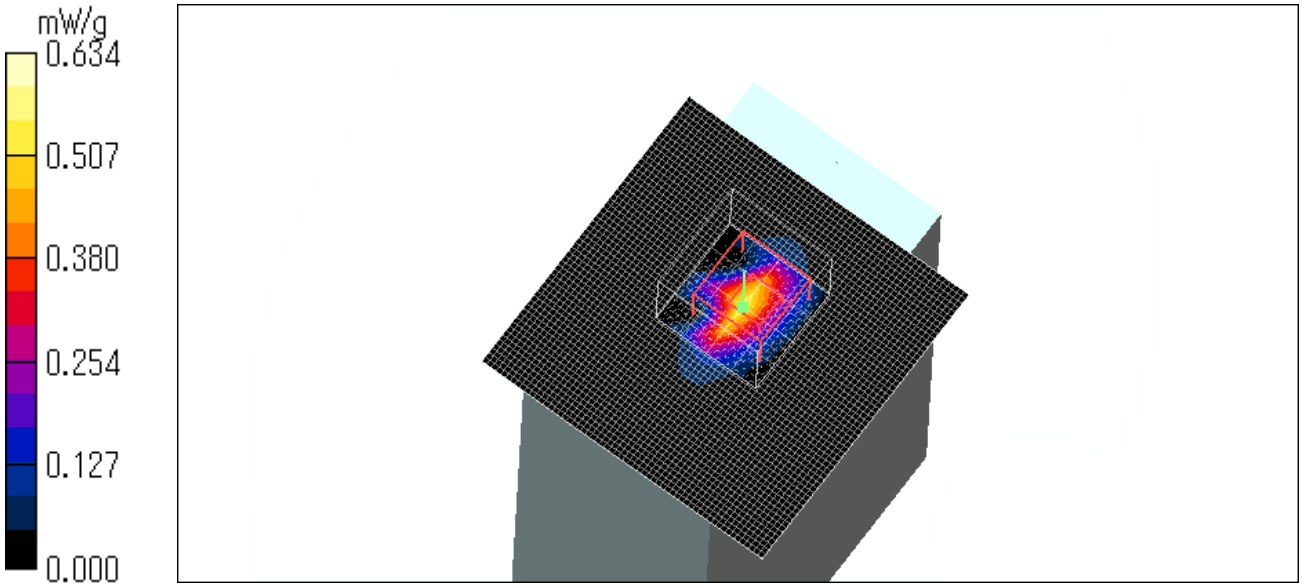
Crest factor: 2.8
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical Surface Detection)Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.634 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.1 V/m; Power Drift = 0.246 dB
Peak SAR (extrapolated) = 1.41 W/kg
SAR(1 g) = 0.447 mW/g; SAR(10 g) = 0.152 mW/g
Maximum value of SAR (measured) = 0.571 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.4 degree C. , After 24.3degree C.



WM-G-MR-01 / Body / Top 2mm / 2437MHz /11g 64QAM (48Mbps)

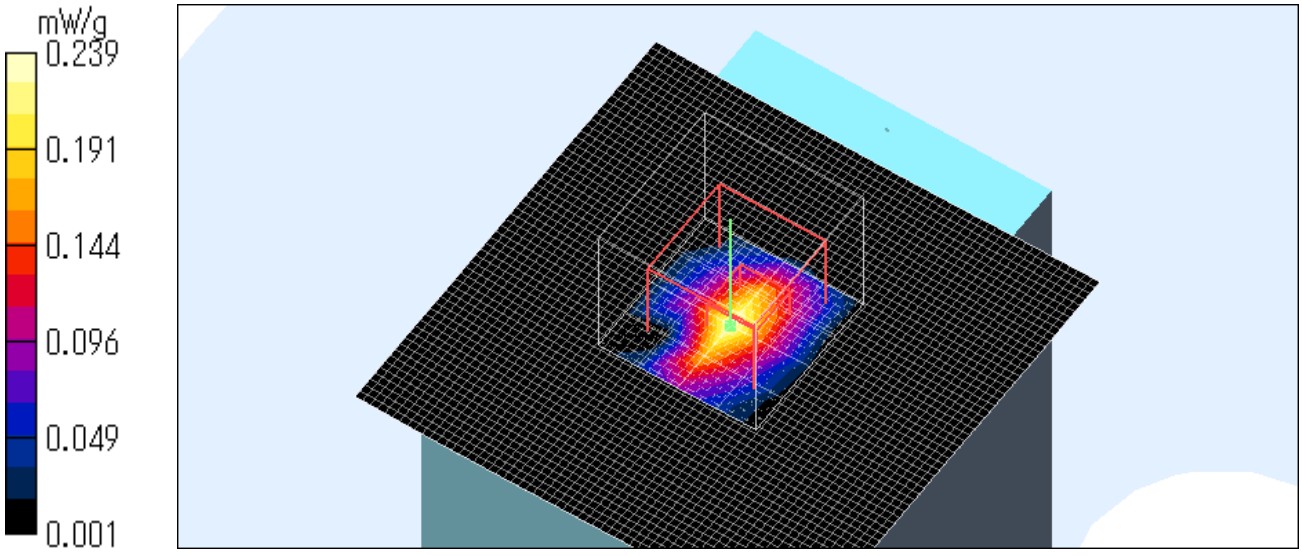
Crest factor: 5.3
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.263 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.57 V/m; Power Drift = 0.209 dB
Peak SAR (extrapolated) = 0.588 W/kg
SAR(1 g) = 0.210 mW/g; SAR(10 g) = 0.074 mW/g
Maximum value of SAR (measured) = 0.239 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.3 degree C. , After 24.3 degree C.



WM-G-MR-01 / Body / Front / 2437MHz /11g BPSK (6Mbps)

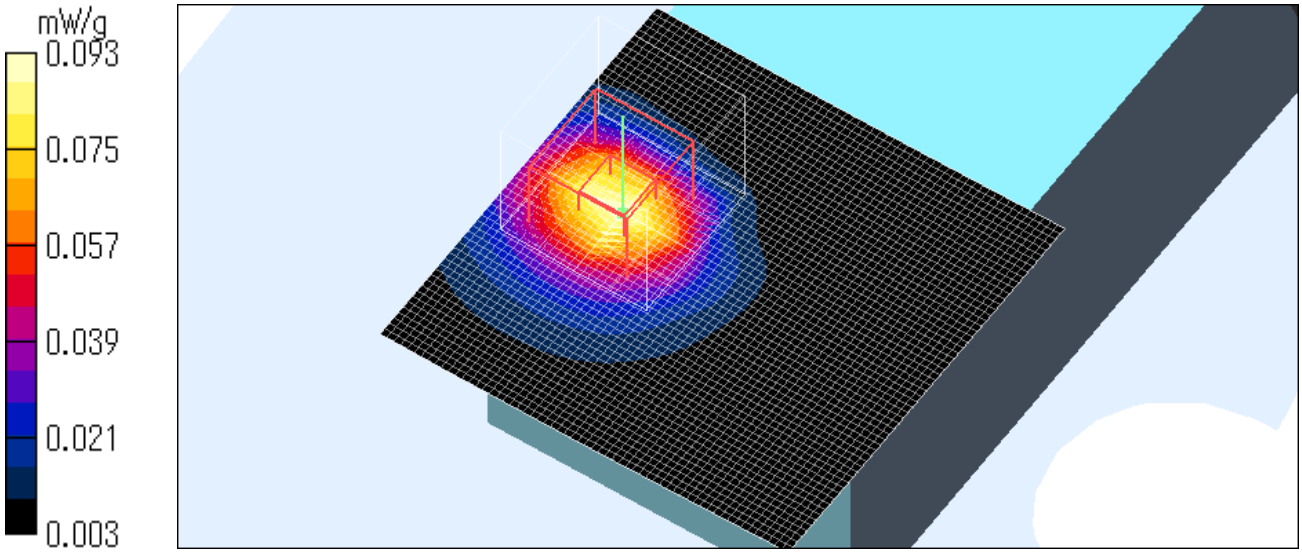
Crest factor: 1.1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.098 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.98 V/m; Power Drift = -0.149 dB
Peak SAR (extrapolated) = 0.194 W/kg
SAR(1 g) = 0.089 mW/g; SAR(10 g) = 0.046 mW/g
Maximum value of SAR (measured) = 0.093 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.3 degree C. , After 24.4 degree C.



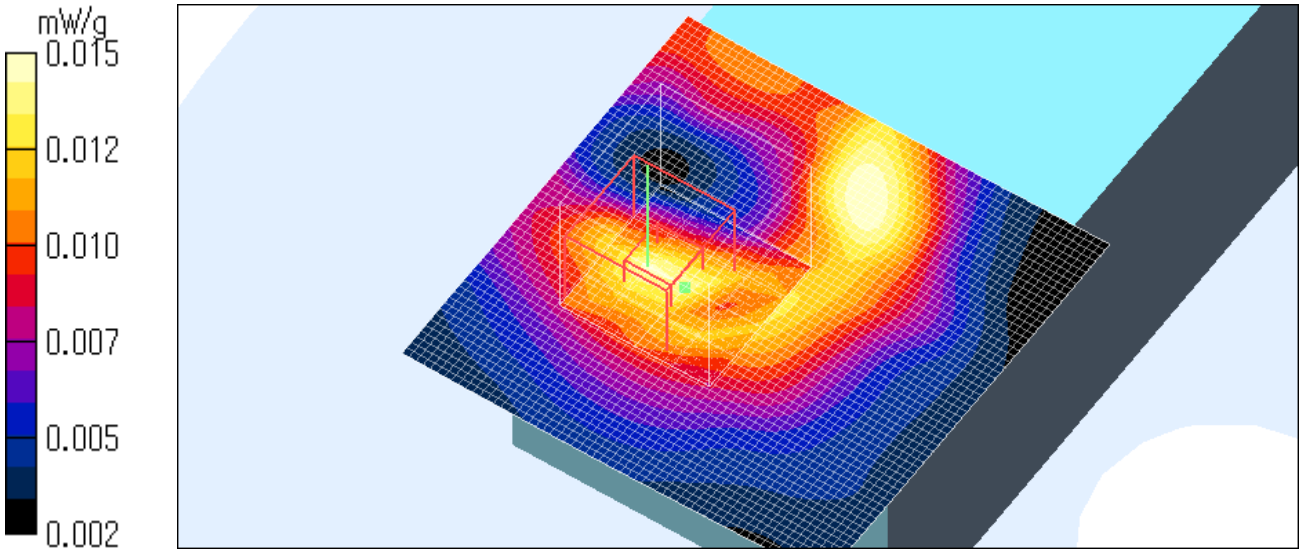
WM-G-MR-01 / Body / Back / 2437MHz /11g BPSK (6Mbps)

Crest factor: 1.1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.015 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.46 V/m; Power Drift = -0.205 dB
Peak SAR (extrapolated) = 0.026 W/kg
SAR(1 g) = 0.013 mW/g; SAR(10 g) = 0.00658 mW/g
Maximum value of SAR (measured) = 0.015 mW/g
Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.3 degree C. , After 24.3 degree C.



Remark:The data of "Back"is for the test in order to decide the worst position. The data is very close to the ambient noise level (0.012 W/kg) and its value is very low level compared to other positions.
There is no affection for the maximum SAR value.

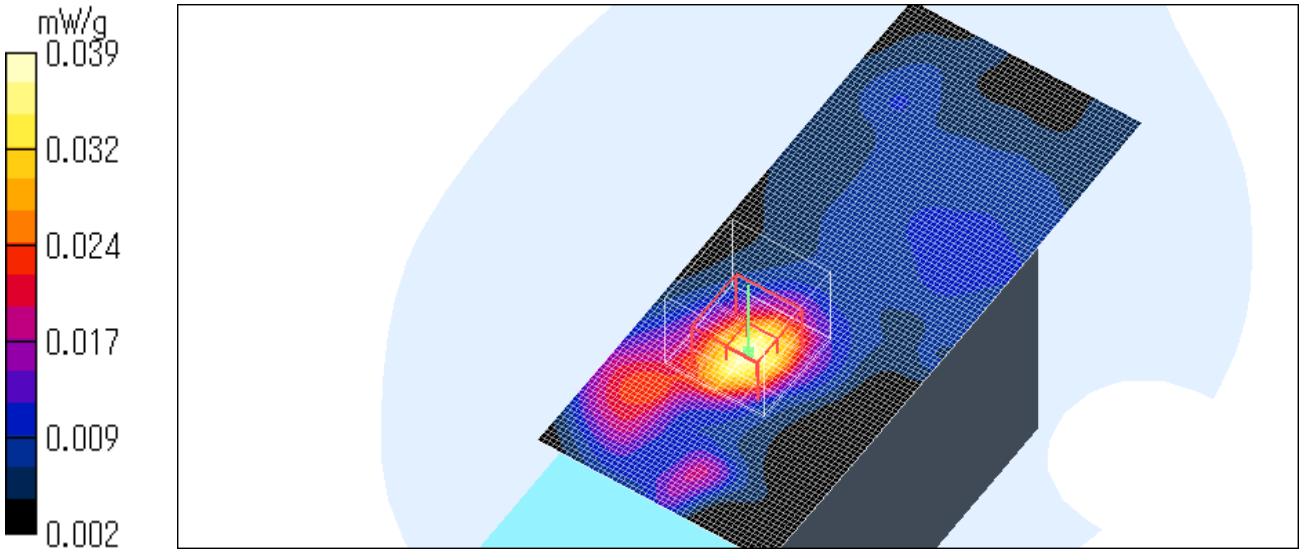
WM-G-MR-01 / Body / Right side / 2437MHz /11g BPSK (6Mbps)

Crest factor: 1.1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (51x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.039 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.09 V/m; Power Drift = -0.194 dB
Peak SAR (extrapolated) = 0.056 W/kg
SAR(1 g) = 0.034 mW/g; SAR(10 g) = 0.019 mW/g
Maximum value of SAR (measured) = 0.039 mW/g
Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.3 degree C. , After 24.3degree C.



WM-G-MR-01 / Body / Left side / 2437MHz /11g BPSK (6Mbps)

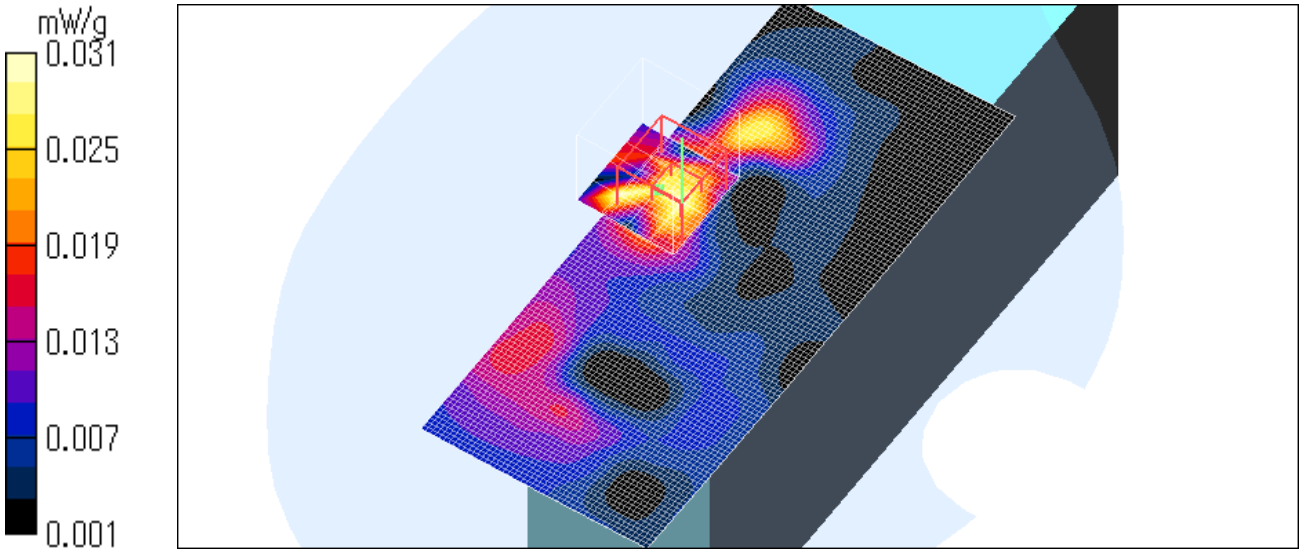
Crest factor: 1.1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (51x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.041 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.53 V/m; Power Drift = 0.252 dB
Peak SAR (extrapolated) = 0.041 W/kg
SAR(1 g) = 0.026 mW/g; SAR(10 g) = 0.011 mW/g
Maximum value of SAR (measured) = 0.031 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.3 degree C. , After 24.3 degree C.



WM-G-MR-01 / Body / Top 2mm / 2412MHz /11g BPSK (6Mbps)

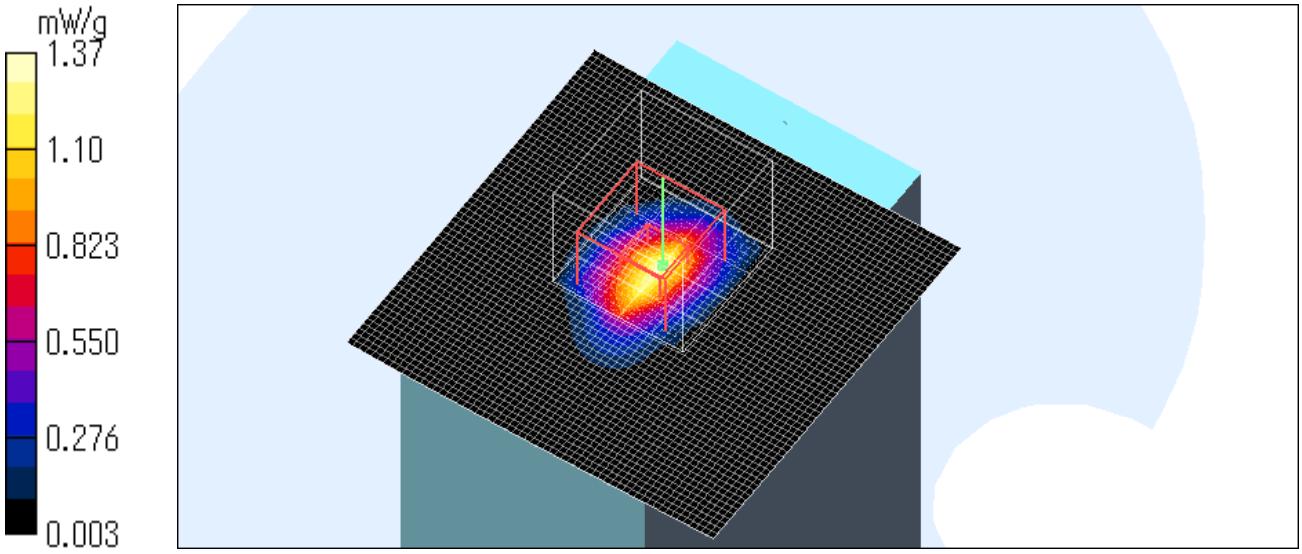
Crest factor: 1.1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.74 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.7 V/m; Power Drift = -0.265 dB
Peak SAR (extrapolated) = 3.19 W/kg
SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.491 mW/g
Maximum value of SAR (measured) = 1.37 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.3 degree C. , After 24.3 degree C.



WM-G-MR-01 / Body / Top 2mm / 2462MHz /11g BPSK (6Mbps)

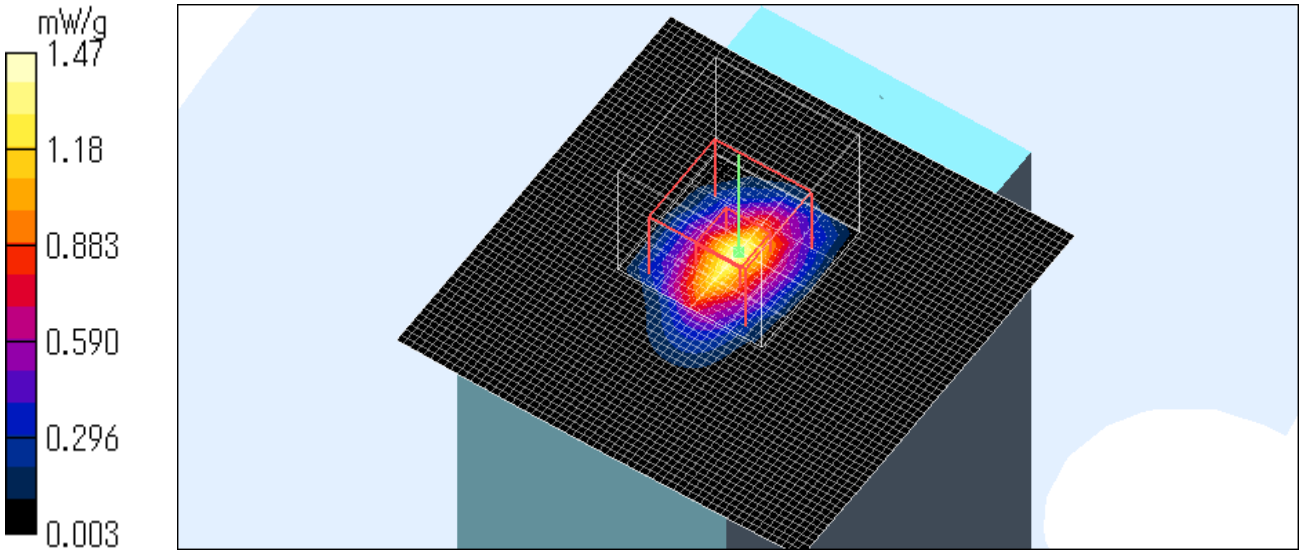
Crest factor: 1.1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.83 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.7 V/m; Power Drift = -0.065 dB
Peak SAR (extrapolated) = 3.39 W/kg
SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.490 mW/g
Maximum value of SAR (measured) = 1.47 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.3 degree C. , After 24.3 degree C.



WM-G-MR-01 / Body / Top 5mm / 2437MHz /11b DBPSK (1Mbps)

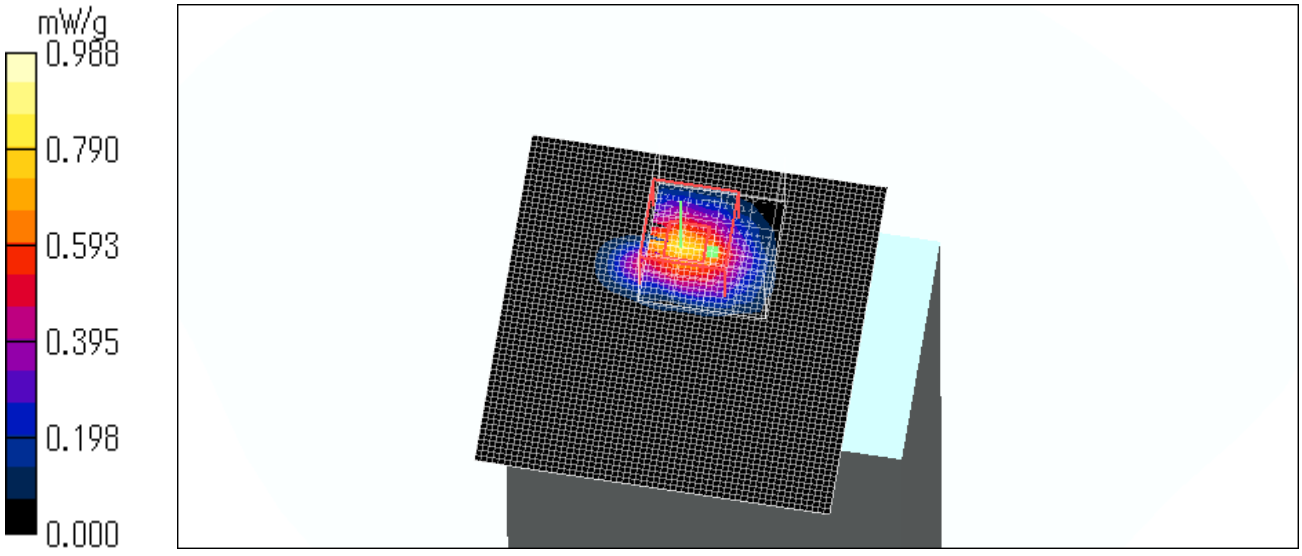
Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.988 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.51 V/m; Power Drift = -0.148 dB
Peak SAR (extrapolated) = 1.55 W/kg
SAR(1 g) = 0.737 mW/g; SAR(10 g) = 0.305 mW/g
Maximum value of SAR (measured) = 0.822 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.



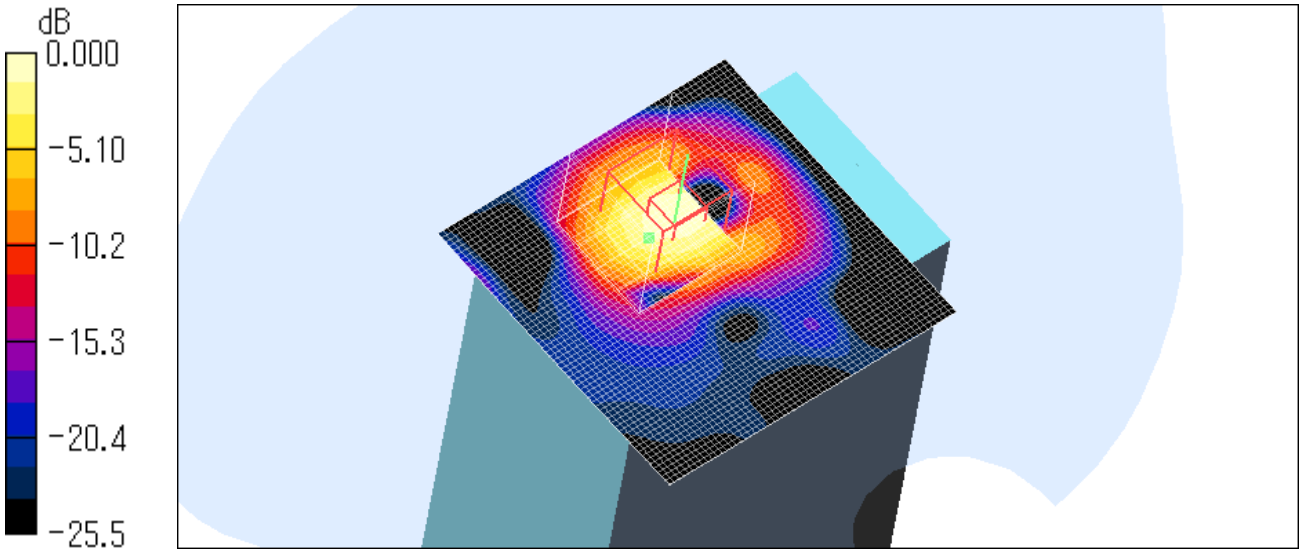
WM-G-MR-01 / Body / Top 10mm / 2437MHz /11b DBPSK (1Mbps)

Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)
DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.421 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.6 V/m; Power Drift = -0.102 dB
Peak SAR (extrapolated) = 0.911 W/kg
SAR(1 g) = 0.389 mW/g; SAR(10 g) = 0.172 mW/g

Maximum value of SAR (measured) = 0.426 mW/g
Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.



WM-G-MR-01 / Body / Top 2mm / 2437MHz /11b DBPSK (1Mbps)

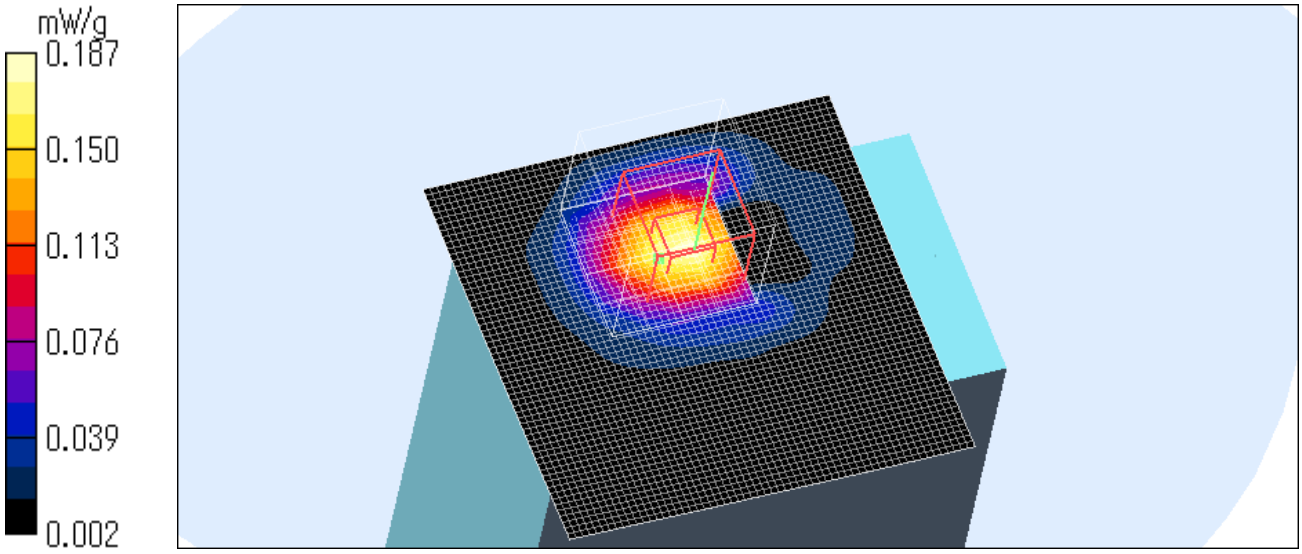
Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.225 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.755V/m ; Power Drift = -0.109 dB
Peak SAR (extrapolated) = 0.374 W/kg
SAR(1 g) = 0.175 mW/g; SAR(10 g) = 0.087 mW/g
Maximum value of SAR (measured) = 0.187 mW/g

Test Date = 05/30/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.



APPENDIX 4 : Additional test

1. Reference data of duty factor 100%

As a reference, the test was performed with the EUT controlled by PC (duty factor 100%).
This test was performed with antenn only was mounted on BHT.
The power supply of module was used in the 3.3V through the PCMCIA card slot.

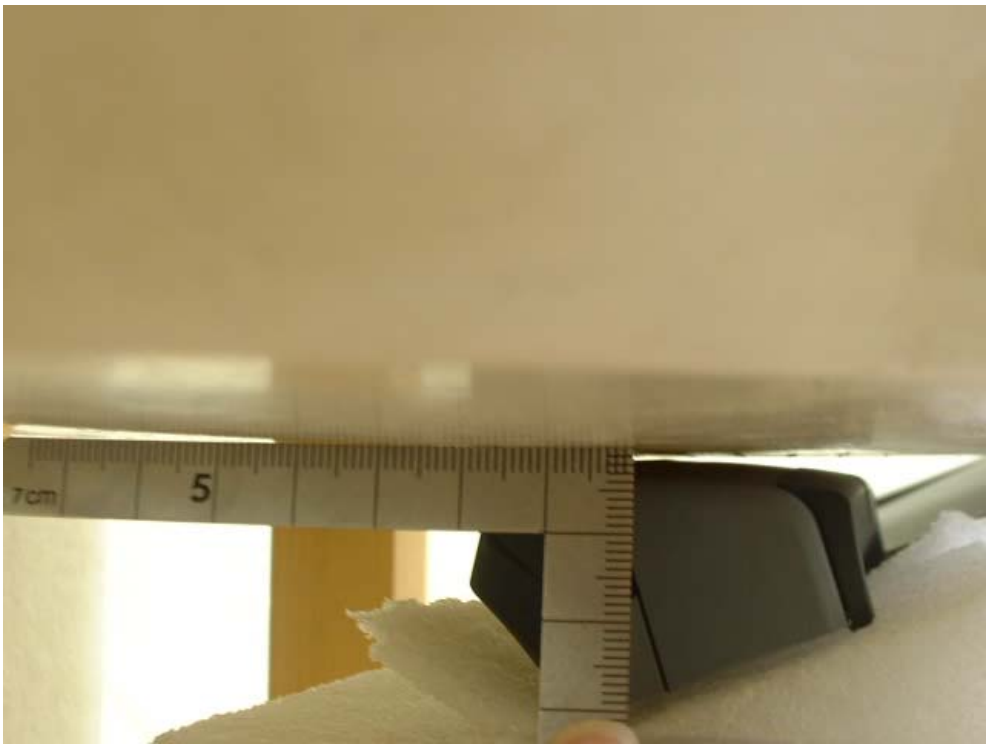
2. Reference data

Liquid Depth (cm)	:	**15.0**	Model	:	**WM-G-MR-01**
Parameters	:	ε_r =**50.1** σ =**2.04**	Serial No.	:	**63802482**
Ambient temperature (deg.c.)	:	**25.0**	Modulation	:	**DSSS**
Relative Humidity (%)	:	**50**	Crest factor	:	**1**
Date	:	**May 31, 2006**	Measured By	:	**Miyo Ikuta**

SAR MEASUREMENT RESULTS OFANTENNA

Frequency			Modulation (Data rate[bps])	EUT Set-up Conditions			Liquid Temp.[deg.c		SAR(1g) [W/kg]
Mode	ch	[MHz]		Antenna	Position	Separation [mm]	Before	After	Maximum value of
11b	**Step 1 Modulation search**								
	1	2437	DBPSK(1Mbps)	Fixed	Top	2	23.8	23.8	**1.43**
	6	2437	CCK(11Mbps)	Fixed	Top	2	23.8	23.8	**1.43**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population							**Body SAR : 1.6 W/kg (averaged over 1 gram)**		

Photograph of set up

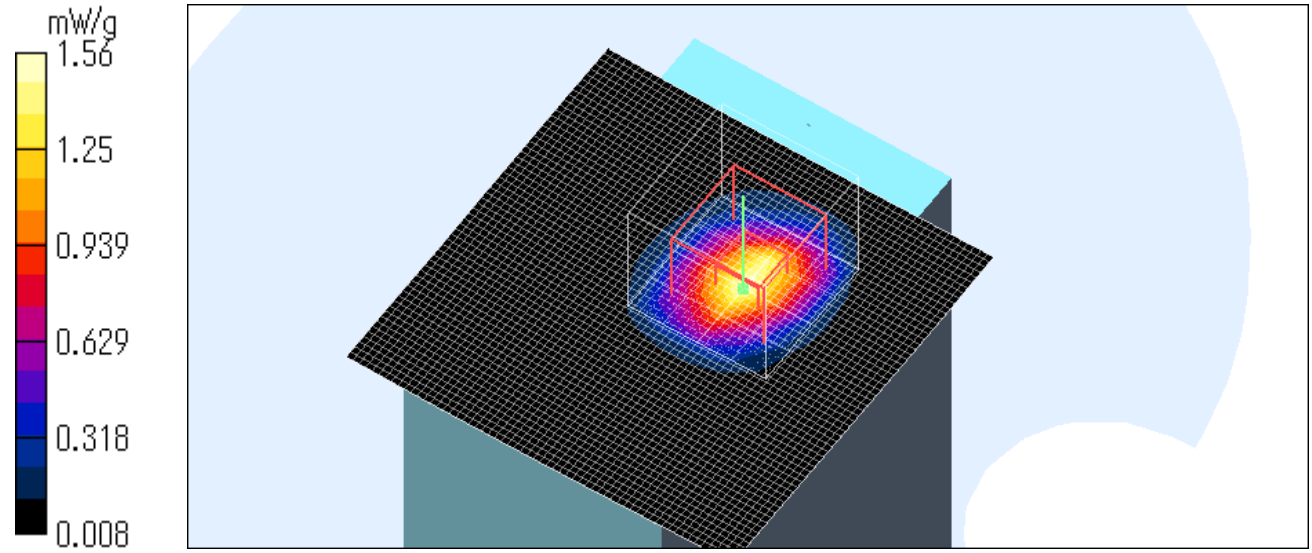


WM-G-MR-01 / Body / Top 2mm / 2412MHz /11b DBPSK (1Mbps)

Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.04 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)
DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.88 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.9 V/m; Power Drift = -0.228 dB
Peak SAR (extrapolated) = 3.53 W/kg
SAR(1 g) = 1.43 mW/g; SAR(10 g) = 0.614 mW/g
Maximum value of SAR (measured) = 1.56 mW/g
Test Date = 05/31/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.

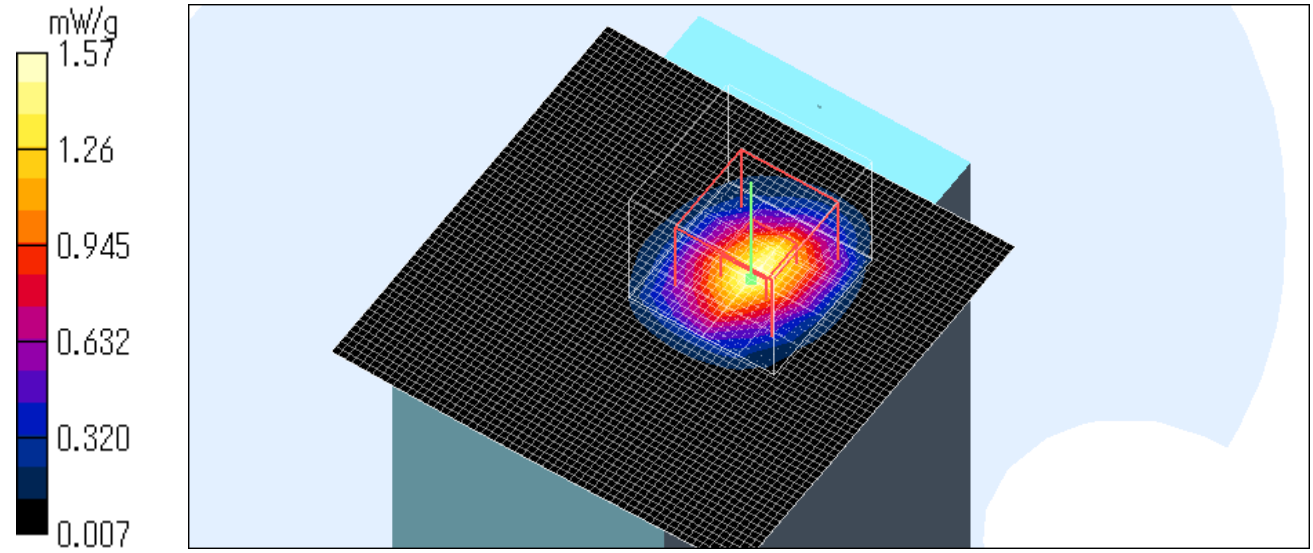


WM-G-MR-01 / Body / Top 2mm / 2437MHz /11b CCK (11Mbps)

Crest factor: 1
Medium parameters used: f = 2450 MHz; σ = 2.04 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)
DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.22, 4.22, 4.22); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.84 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.7 V/m; Power Drift = -0.104 dB
Peak SAR (extrapolated) = 3.54 W/kg
SAR(1 g) = 1.43 mW/g; SAR(10 g) = 0.610 mW/g
Maximum value of SAR (measured) = 1.57 mW/g
Test Date = 05/31/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.



3. Simulated tissue liquid parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.
The dielectric parameters measurement are reported in each correspondent section.

Head 2450 MHz

Type of liquid : **Head 2450 MHz**
Ambient temperature (deg.c.) : **25.0**
Relative Humidity (%) : **50**
Liquid depth (cm) : **15.0**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
		Before	After					
31-May	2450	23.2	23.2	Relative Permittivity εr	39.2	37.4	-4.6	+/-5
				Coductivity σ [mho/m]	1.80	1.86	3.3	+/-5

Muscle 2450 MHz

Type of liquid : **Head 2450 MHz**
Ambient temperature (deg.c.) : **25.0**
Relative Humidity (%) : **50**
Liquid depth (cm) : **15.0**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency	Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
		Before	After					
31-May	2450	24.2	24.2	Relative Permittivity εr	52.7	50.1	-4.9	+/-5
				Coductivity σ [mho/m]	1.95	2.04	4.6	+/-5

4. System validation data

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of +/-10%. The validation results are in the table below.
Please refer to "10. Validation measurement data".

System validation of 2450MHz

Type of liquid : **Head 2450 MHz**
Ambient temperature (deg.c.) : **25.0**
Relative Humidity (%) : **50**
Liquid depth (cm) : **15.0**
Dipole : **D2450V2 SN:713**
Power : **250mW**

SYSTEM PERFORMANCE CHECK										
Date	Liquid (HEAD 2450MHz)						System dipole validation target & measured			
	Liquid Temp [deg.c.]		Relative Permittivity εr		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
	Before	After	Target	Measured	Target	Measured	Target	Measured		
31-May	23.2	23.2	39.2	37.4	1.80	1.86	13.1	13.7	4.6	+/-10

Note: Please refer to Attachment for the result representation in plot format

System Validation / Dipole 2450 MHz / Forward Conducted Power : 250mW

Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:713
Communication System: CW; Frequency: 2450 MHz Crest factor:1
Medium parameters used: f = 2450 MHz; σ = 1.86 mho/m; ε_r = 37.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: ET3DV6 - SN1700; ConvF(4.6, 4.6, 4.6); Calibrated: 2006/04/28
Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE3 Sn518; Calibrated: 2005/08/31
Phantom: SAM 1196
Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 18.3 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 92.5 V/m; Power Drift = -0.013 dB
Peak SAR (extrapolated) = 30.6 W/kg
SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.25 mW/g
Maximum value of SAR (measured) = 15.1 mW/g

Test Date = 05/31/06
Ambient Temperature = 25.0degree C.
Liquid Temperature = Before 24.2 degree C. , After 24.2 degree C.