SAR EVALUATION REPORT

Manufacturer : OHSUNG ELECTRONICS CO., LTD.
#181 Gongdan-dong, Gumi-si, Gyeongbuk
Republic of Korea.
Attn : Mr. Kwang-Jae Ok / Team Leader of Q.C

Date of Issue : June 2, 2009
Order Number: GETEC-C1-09-119
Test Report S/N : GETEC-E3-09-073
Test Site : Gumi College EMC Center

FCC ID	**OZ5URCMX5000**
APPLICANT	**OHSUNG ELECTRONICS CO., LTD.**

Test method	**: IEEE Standard C95.1 / OET Bulletin 65 Supplement C**
EUT Type	**: RF Remote Controller** (Wi-Fi built in RF remote controller)
Model Name	**: MX-5000**
Trade Name	**: UNIVERSAL remote control**

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in IEEE Standard C95.1 / OET Bulletin 65 Supplement C

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the vest of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by,

Jae-Hoon Jeong, Senior Engineer
GUMI College EMC center

Reviewed by,

Tae-Sig Park, Technical Manger
GUMI College EMC center

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APPENDIX L – TEST SET UP PHOTOGRAPH

Scope: *Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and / or unintentional radiators for compliance with technical rules and regulations of the Federal Communications Commission.*

1. General Information

Applicant: OHSUNG ELECTRONICS CO., LTD.

Applicant Address: #181 Gongdan-dong, Gumi-si, Gyeongbuk, Republic of Korea.

Manufacturer: OHSUNG ELECTRONICS CO., LTD

Manufacturer Address: #181 Gongdan-dong, Gumi-si, Gyeongbuk, Republic of Korea.

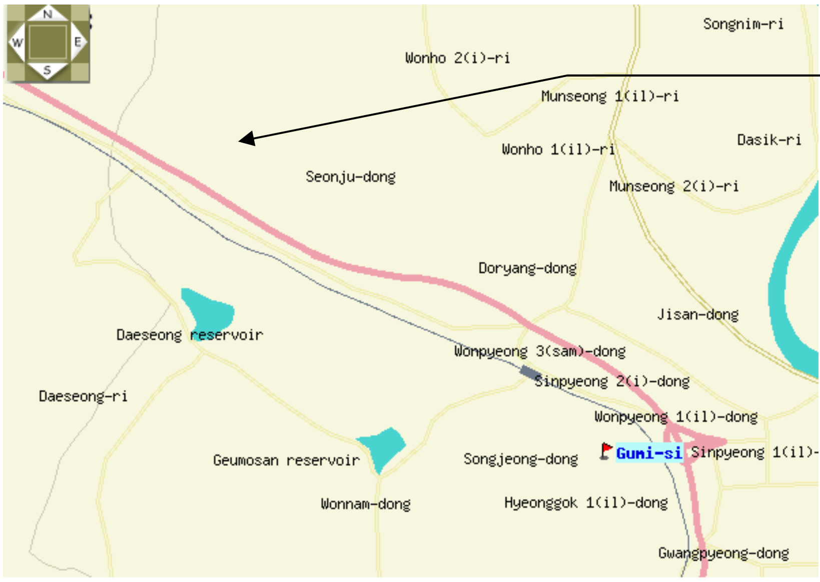
Contact Person: Mr. Kwang-Jae Ok / Team Leader Q.C
Tel Number: +82-54-468- 0831 Fax Number: +82-54- 461- 8368

- **FCC ID.** OZ5URCMX5000
- **Test method** IEEE Standard C95.1 / OET Bulletin 65 Supplement C
- **EUT Type** RF Remote Controller
  (WI-FI built in RF remote controller)
- **Power Source** AC 120 V/ 60 Hz,
  DC 3.7 V / 2400 mAh Rechargeable Lithium Polymer Battery
- **Model Name** MX-5000
- **Trade Name** UNIVERSAL remote control
- **Type of Authority** Certification
- **Dates of Test** May 27 ~ 28, 2009
- **Place of Test** **Gumi College EMC Center**
  407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.
- **Test Report Number** GETEC-E3-09-073
- **Dates of Issue** June 2, 2009

2. Introduction

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ASNI C63.4-2003) was used in determining radiated and conducted emissions emanating from **OHSUNG ELECTRONICS CO., LTD. RF Remote Controller (Model Name: MX-5000)**

These measurement tests were conducted at **Gumi College EMC Center**.
The site address is 407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.
This test site is one of the highest point of Gumi 1 college at about 200 kilometers away from Seoul city and 40 kilometers away from Daegu city. It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures. The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to ANSI C63.4 on October 19, 1992



GUMI COLLEGE EMC CENTER
407,Bugok-dong, Gumi-si,
Gyeongbuk 730-711, Korea.
Tel: +82-54-440-1195~8
Fax: +82-54-440-1199

Fig 1. The map above shows the Gumi College in vicinity area.

3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **OHSUNG ELECTRONICS CO., LTD. WI-FI built in RF Remote Controller (Model Name: MX-5000) FCC ID.: OZ5URCMX5000**

Used AC/DC Adapter : KSAD0600200W1US(UNIVERSAL remote control)
Input: AC (100-240) V, (50/60) Hz, 0.4 A
Output: DC 6 V, 2.0 A

Power output (Conducted power) 802.11b: 20.32 dBm
802.11g: 20.66 dBm

Modulation method DSSS (DQPSK / CCK)
OFDM (QPSK / 16QAM / 64 QAM)

Modulation DSSS for IEEE 802.11b, OFDM for IEEE 802.11g

Antenna type Internal

Dimensions (W) 223.51 mm × (D) 58.42 mm × (H) 22.86 mm

Weight Approx. 221.13 g

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2 400 ~ 2 483.5 MHz	1	2 412 MHz	7	2 442 MHz
	2	2 417 MHz	8	2 447 MHz
	3	2 422 MHz	9	2 452 MHz
	4	2 427 MHz	10	2 457 MHz
	5	2 432 MHz	11	2 462 MHz
	6	2 437 MHz		

3.2 Test Configuration

The data rates for SAR testing are 11 Mbps for 802.11b and 54 Mbps for 802.11 g. Engineering testing software installed on the EUT can provide continuous transmitting RF signal. This RF signal utilized in SAR measurement has almost 100 % duty cycle and its crest factor is 1. The measurements were performed on the lowest, middle, and hightest channel, i.e. channel 1, channel 6, and channel 11 for each testing position.

3.3 Position Information

-. Front Position: key-pad side facing phantom, EUT
-. Rear Position: Rear side facing phantom, EUT
-. Upper Edge Position: top / bottom upper side edge facing phantom, EUT
-. Side Edge Position: top / bottom side edge facing phantom, EUT

4. Description of tests

4.1 SAR Measurement Setup

Measurements are performed using DASY5 automated dosimetric assessment system. Which in made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), Robot controller, measurement server, DELL computer, nearfield probe, probe alignment sensor, and the SAM twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location(points) of maximum electromagnetic field (EMF) (Fig 2).

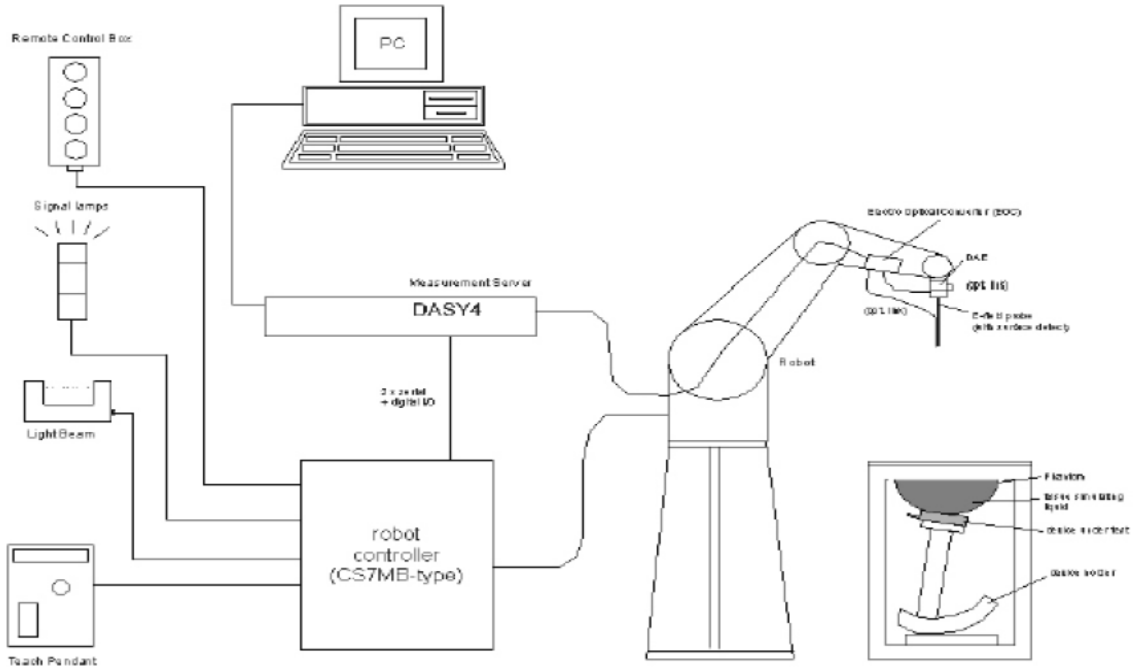


Fig 2. SAR Measurement System Setup

System Hardware

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and a remote control is used to drive the robot motors. The PC consists of the DELL computer with Window XP system and SAR measurement Software DASY5, LCD Monitor, mouse and keyboard. A Data Acquisition Electronic (DAE) circuit that performs the signal amplification, signal multiplexing, AD-conversion, offset measurements mechanical surface detection, collision detection, etc.

This is connected to the Electro-Optical coupler (EOC),. The EOC performs the conversion from optical into digital electric signal of DAE and transfers data to the measurement server.

System electronics

The DAE5 consists of a highly sensitive electrometer-grade preamplifier with autozeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and prove collision detection. The robot uses its own controller with a built in VME-bus computer.

4.2 E-field probe

The SAR measurement were conducted with the dosimetric probe ES3DV3, designed in the classical triangular configuration (see Fig. 4) and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip (see Fig.5). It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches a System maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY5 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting (see Fig.3). The approach is stopped at reaching the maximum.

Fig 3. DAE System

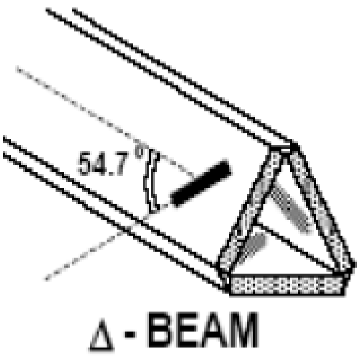


Fig 4. Triangular Probe Configuration

Fig 5. Probe Thick-Film Technique

4.3 E-field probe

The SAM Twin Phantom V4.0C is constructed of a fiberglass shell Integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. 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 the 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 in the robot. (See Fig. 6)

(Fig. 6 SAM Twin Phantom)

4.4 Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device (see Fig. 7) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening. 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 produce infinite number of configurations. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

(Fig. 7 Device Holder)

5. Measurement Procedure

EUT at the maximum power level is placed by a non metallic device holder in the above described positions at a shell phantom of a human being. The distribution of the electric field strength E is measured in the tissue simulating liquid within the shell phantom. For this miniaturized field probes with high sensitivity and low field disturbance are used. Afterwards the corresponding SAR values are calculated with the known electrical conductivity σ and the mass density *p* of the tissue in the SEMCAD software. The software is able to determine the averaged SAR values (averaging region 1 g or 10 g) for compliance testing.

The measurements are done by two scans: first a coarse scan determines the region of the maximum SAR, afterwards the averaged SAR is measured in a second scan within the sharp of a cube. The measurement times takes about 20 minutes.

The following steps are used for each test position:

STEP 1

Establish a call with the maximum output power with a base station simulator. The connection between the mobile phone and the base station simulator is established via air interface.

STEP2

Measurement of the local E-field value at a fixed location (P1)

This value serves as a reference value for calculating a possible power drift.

STEP 3

Measurement of the SAR distribution with a grid spacing of 15 mm × 15 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner surface of the phantom. Since the sensors can not directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With this values the area of the maximum SAR is calculated by a interpolation scheme (combination of a least-square fitted function and a weighted average method). Additional peaks within 3dB of the maximum SAR are searched.

STEP 4

Around this points, a cube of 30 mm * 30 mm * 30 mm is assessed by measuring 5 * 5 * 5 points. With these data, the peak spatial-average SAR value can be calculated with the SEMCAD software.

STEP 5

The used extrapolation and interpolation routines are all based on the modified Quadratic Shepard's method (DASY4)

STEP 6

Repetition of the E-Field measurement at the fixed location(P1) and repetition of the whole procedure if the two results differ by more than ± 0.023 dB.

5.1 Head / Muscle Simulating Mixture Characterization

The brain mixture consists of a viscous gel using hydroxethyl-cellullose (HEC) gelling agent and saline solution. Preservation with a bacteriacide is added and visual inspection is made to make sure air Bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 have been incorporated in the following table.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.15	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt(NaCI)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.50	56.70	41.50	55.20	41.50	55.00	40.00	53.30	39.2	52.5
Conductivity(S/m)	0.87	0.94	0.90	0.90	0.97	1.05	1.40	1.52	1.80	1.95

Typical Composition of Ingredients for Liquid Tissue Phantoms

5.2 Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table.

Test Frequency (MHz)	Head		Body	
	εr	σ (S/m)	εr	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(εr = relative permittivity, σ = conductivity and ρ = 1000 kg/m3)

5.3 FCC Limits for Specific Absorption Rate (SAR)

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

NOTE 1: See Section 1 for discussion of exposure categories.

NOTE 2: Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

NOTE 3: At frequencies above 6.0 GHz, SAR limits are not applicable and MPE limits for power density should be applied at 5 cm or more from the transmitting device.

Note 4: The time averaging criteria for field strength and power density do not apply to general population SAR limit of 47 CFR §2.1093.

6. Definition of Reference Points

6.1 EAR Reference Point

Fig. 8 shows the front, back and side views of SAM. The point “M” is the reference point for the center of mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERPs are 15 mm posterior to the entrance to ear canal (EEC) along the B-M line (Back-Mouth), as shown in Fig. 9

Fig. 8 Front, back and side view of SAM

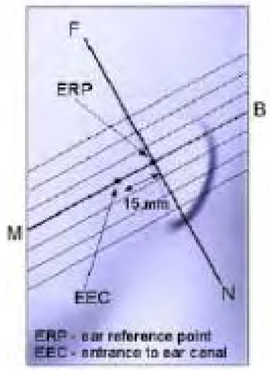


Fig. 9 Close up side view

The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front) perpendicular to the reference plane and passing through the RE(or LE) is called the Reference Pivoting Line (see Fig. 10).
Line B-M is perpendicular to the N-F line. Both N-F and B-M Lines should be marked on the external phantom shell to Facilitate handset positioning. Posterior to the N-F line, the thickness of the phantom shell with the shape of an ear is a flat surface 6 mm thick at the ERPs.

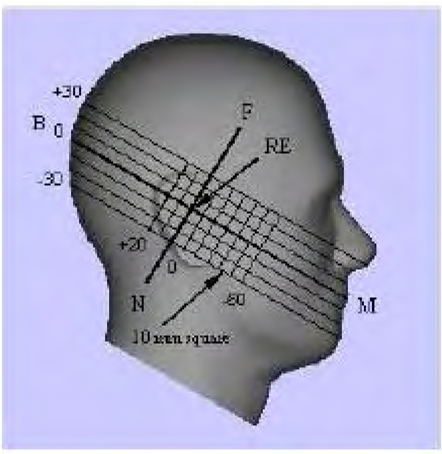


Fig. 10 Side view of the phantom showing relevant markings

6.2 Handset Reference Points

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the “test device reference point” located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (see Fig. 11).
The “test device reference point” was than located at the same level as the center of the eat reference point. The test device was positioned so that the “vertical centerline” was bisecting the front surface of the handset at it’s tip and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point.

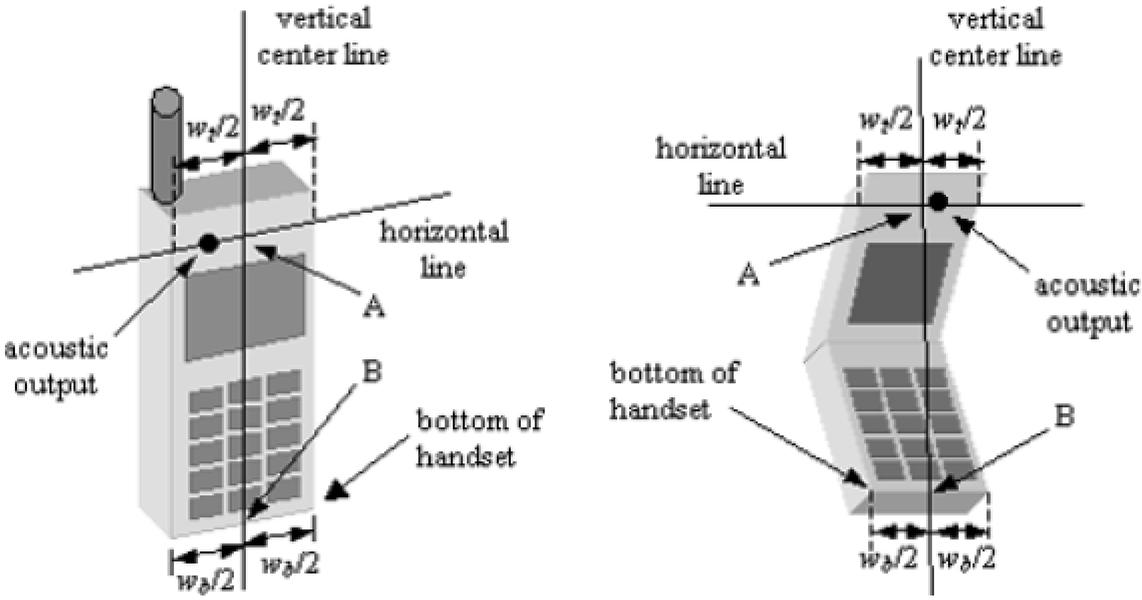


Fig. 11 Handset vertical and horizontal reference lines

7. Test Configuration Positions

7.1 Cheek/Touch Position

Step 1
The test device was positioned with the handset close to the surface of the phantom such that point. A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Fig. 12), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

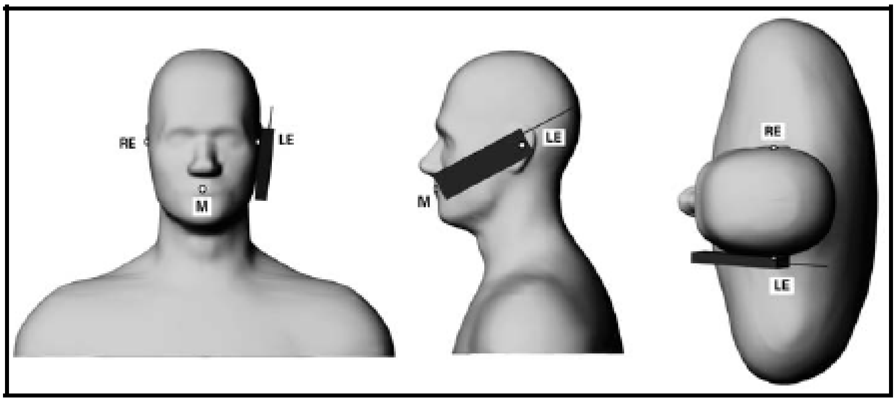


Fig. 12 Front, Side and Top View of Cheek/Touch Position

Step 2
The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the ear.

Step 3
While maintaining the handset in this plane, the handset was rotated around the LE-RE line Until the vertical centerline was in the plane normal to MB-NF including the line MB (reference plane).

Step 4
Rotate the handset around the vertical centerline until the phone (horizontal line) was symmetrical was respect to the line NF.

Step 5
While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, the handset was rotated about the line NF until any point on the handset made contact with a phantom point below the ear cheek.(See Fig. 9)

7.2 EAR/Tilt 15 ° Position

With the test device aligned in the “Cheek/Touch Position”:

Step 1
Repeat steps 1 to 5 of 6.2 to place the device in the “Cheek/Touch Position”

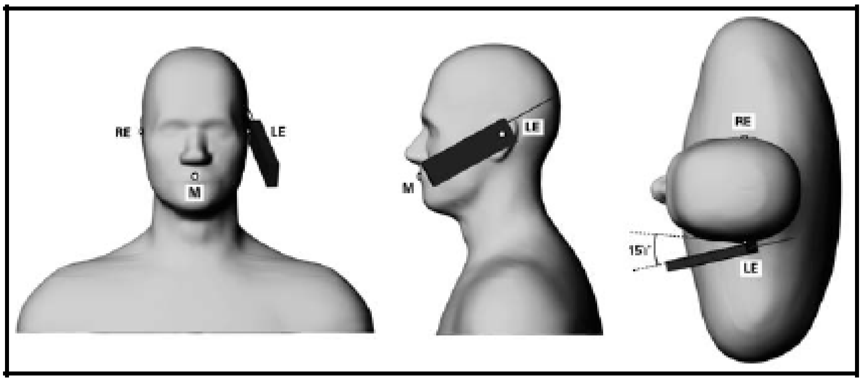


Fig. 13 Front, side and Top View of Ear/Tilt 15 ° Position

Step 2
While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degree.

Step 3
The phone was then rotated around the horizontal line by 15 degree.

Step 4
While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the phone touches the head.
(In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. The tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head. (See Fig. 13)

7.3 Body-worn and Other Configurations

7.3.1 Phantom Requirements

For body-worn and other configurations a flat phantom shall be used which is comprised of material with electrical properties similar to the corresponding tissues.

7.3.2 Test Position

The body-worn configurations shall be tested with the supplied accessories (belt-clips, holsters, etc.) attached to the device in normal use configuration. Devices with a headset output shall be tested with a connected headset. Since the Supplement C to OET Bulletin 65 was mainly issued for mobile phones it is only a guideline and therefore some requirements are not usable or practical for devices other than mobile phones.

7.3.3 Test to be Performed

For purpose of determining test requirements, accessories may be divided into two categories: those that do not contain metallic components and those that do. For multiple accessories that do not contain metallic components, the device may be tested only with that accessory which provides the closet spacing to the body. For multiple accessories that contain metallic components, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component, only the accessory that provides the closet spacing to the body must be tested.

If the manufacturer provides none body accessories, a separation distance of 1.5 cm between the back of the device and the flat phantom is recommended. Other separation distances may be used, but they shall not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

For devices with retractable antenna, the SAR test shall be performed with the antenna fully extended and fully retracted. Other factors that may affect the exposure shall also be tested. For example, optional antennas or optional battery packs which may significantly change the volume, lengths, flip open/closed, etc. of the device or any other accessories which might have the potential to considerably increase the peak spatial-average SAR value.

The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at the middle channel for each test configuration is at least 3.0dB lower than the SAR limit, testing at the high and low channel is optional.

8. Measurement Uncertainty

DAYS5 Uncertainty Budget According to IEEE 1528 [1]								
Error Description	Uncertainty value	Prob. Dist.	Div.	(Ci)lg	(Ci)lg	Std. Une. (lg)	Std. Une. (10g)	(vi) veff
Measurement system								
Probe Calibration	± 5.9 %	N	1	1	1	± 5.9 %	± 5.9 %	∞
Axial Isotropy	± 4.7 %	R	$\sqrt{3}$	0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical Isotropy	± 9.6 %	R	$\sqrt{3}$	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary Effects	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 1.6 %	∞
Linearity	± 4.7 %	R	$\sqrt{3}$	1	1	± 2.7 %	± 2.7 %	∞
System Detection Limits	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Readout Electronics	± 0.3 %	N	1	1	1	± 0.3 %	± 0.3 %	∞
Response Time	± 0.8 %	R	$\sqrt{3}$	1	1	± 0.5 %	± 0.5 %	∞
Integration Time	± 2.6 %	R	$\sqrt{3}$	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Conditions	± 3.0 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.4 %	R	$\sqrt{3}$	1	1	± 0.2 %	± 0.2 %	∞
Probe Positioning	± 2.9 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Max. SAR Eval.	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Test Sample Related								
Device Positioning	± 2.9 %	N	1	1	1	± 2.9 %	± 2.9 %	∞
Device Holder	± 3.6 %	N	1	1	1	± 3.6 %	± 3.6 %	∞
Power Drift	± 5.0 %	R	$\sqrt{3}$	1	1	± 2.9 %	± 2.9 %	∞
Phantom and Setup								
Phantom Uncertainty	± 4.0 %	R	$\sqrt{3}$	1	1	± 2.3 %	± 2.3 %	∞
Liquid Conductivity(target)	± 5.0 %	R	$\sqrt{3}$	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid Conductivity(meas.)	± 2.5 %	N	1	0.64	0.43	± 1.6 %	± 1.1 %	∞
Liquid Permittivity(target)	± 5.0 %	R	$\sqrt{3}$	0.6	0.49	± 1.7 %	± 1.4 %	∞
Liquid Permittivity (meas.)	± 2.5 %	N	1	0.6	0.49	± 1.5 %	± 1.2 %	∞
Combined Std. Uncertainty						± 10.8 %	± 10.6 %	330
Expanded STD Uncertainty						± 21.6 %	± 21.1 %	

DAYS5 Uncertainty Budget According to CENELEC EN 50361[2]								
Error Description	Uncertainty value	Prob. Dist.	Div.	(Ci)lg	(Ci)lg	Std. Une. (lg)	Std. Une. (10g)	(vi) veff
Measurement Equipment								
Probe Calibration	±5.9%	N	1	1	1	± 5.9 %	± 5.9 %	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	± 1.9 %	± 1.9 %	∞
Spherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	± 3.9 %	± 3.9 %	∞
Probe Linearity	±4.7%	R	$\sqrt{3}$	1	1	± 2.7 %	± 2.7 %	∞
Detection Limit	±1.0%	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Readout Electronics	±0.3%	N	1	1	1	± 0.3 %	± 0.3 %	∞
Response Time	±0.8%	N	1	1	1	± 0.8 %	± 0.8 %	∞
Noise	±0%	N	1	1	1	± 0 %	± 0 %	∞
Integration Time	±2.6%	N	1	1	1	± 2.6 %	± 2.6 %	∞
Mechanical Constraints								
Seanning System	±0.4%	R	$\sqrt{3}$	1	1	± 0.2 %	± 0.2 %	∞
Phantom Shell	±4.0%	R	$\sqrt{3}$	1	1	± 2.3 %	± 2.3 %	∞
Probe Positiooning	±2.9%	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Device Positioning	±2.9%	N	1	1	1	± 2.9 %	± 2.9 %	∞
Physical Parameters								
Liquid Conductivity (target)	±5.0%	R	$\sqrt{3}$	0.7	0.5	± 2.0 %	± 1.4 %	∞
Liquid Conductivity (meas.)	±4.3%	R	$\sqrt{3}$	0.7	0.5	± 1.7 %	± 1.2 %	∞
Liquid Permittivity (targer)	±5.0%	R	$\sqrt{3}$	0.6	0.5	± 1.7 %	± 1.4 %	∞
Liquid Permittivity (meas.)	±4.3%	R	$\sqrt{3}$	0.6	0.5	± 1.5 %	± 1.2 %	∞
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	± 2.9 %	± 2.9 %	∞
RF Ambient Conditions	±3.0%	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Post-Processing								
Extrap. And Integration	±1.0%	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Combined Std. Uncertainty						± 10.9 %	± 10.6 %	18125
Expanded STD Uncertainty						± 21.7 %	± 12.1 %	

9. System Verification

9.1 Tissue Verification

For the measurement of the following parameters the HP 85070E dielectric probe kit is used, representing the open-ended slim form probe measurement procedure. The measured values should be within ± 5 % of the recommended values given by the IEEE Standard C95.1 / OET Bulletin 65 Supplement C.

-. Test Date : May 27, 2009
-. Tissue : 2 450 MHz Muscle
-. Liquid Temperature : 22.0 °C

Table 9.1 Measured Tissue Parameters

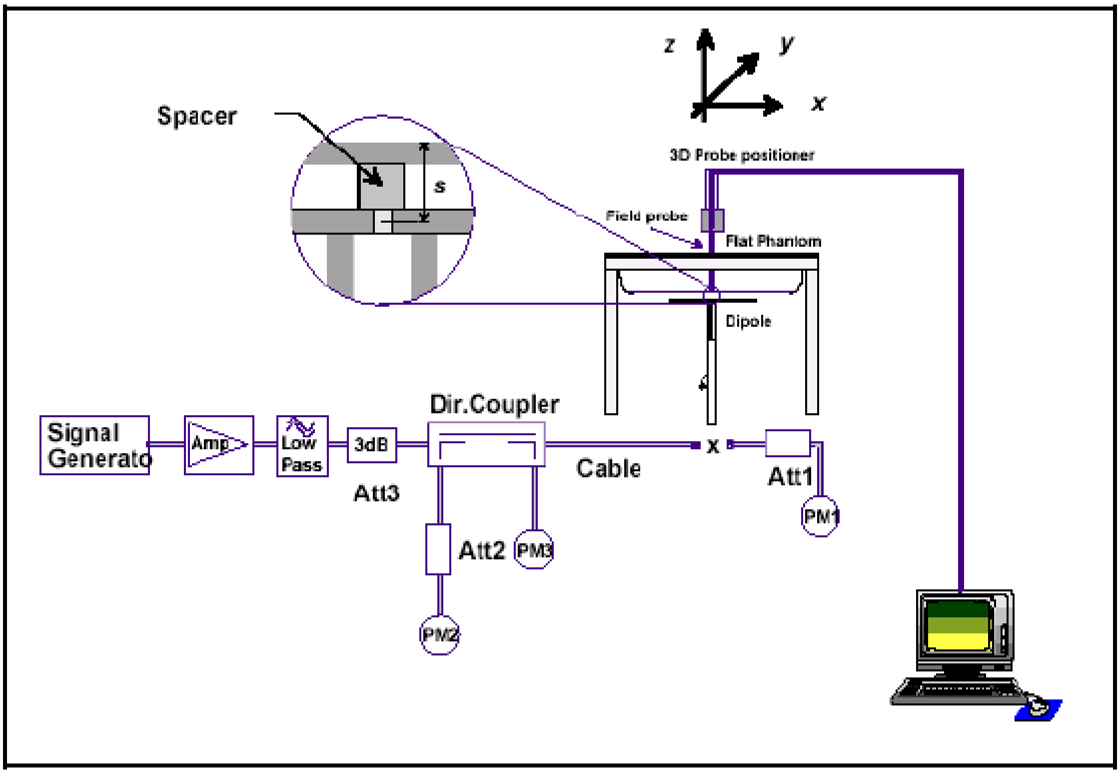
	Recommended Value	Measured Value
Dielectric Constant (ε)	52.7 ± 2.635	51.2
Conductivity (σ)	1.95 ± 0.0975	19.6

9.2 Test System Validation

The simplified performance check was realized using the dipole validation kits. The input power of the dipole antennas were 250 mW and they were placed under the flat Part of the SAM phantoms. The target and measured results are listed in the table 8.2

Table 9.2 System Validation Results

Tissue	Date		Targeted SAT (mW/g)	Measured SAR (mW/g)	Deviation (%)
2 450 MHz Muscle	2009.5.27	SAR (1g)	13.1	13.7	4.58



Dipole Validation Test Setup

9.3 Measurement Result of Test Data (2 450 MHz Validation)

Date/Time: 5/27/2009 9:32:05 AM

Test Laboratory: GUMI COLLEGE EMC CENTER

Validation(2450MHz)

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

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2 mho/m; ε_r = 54.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

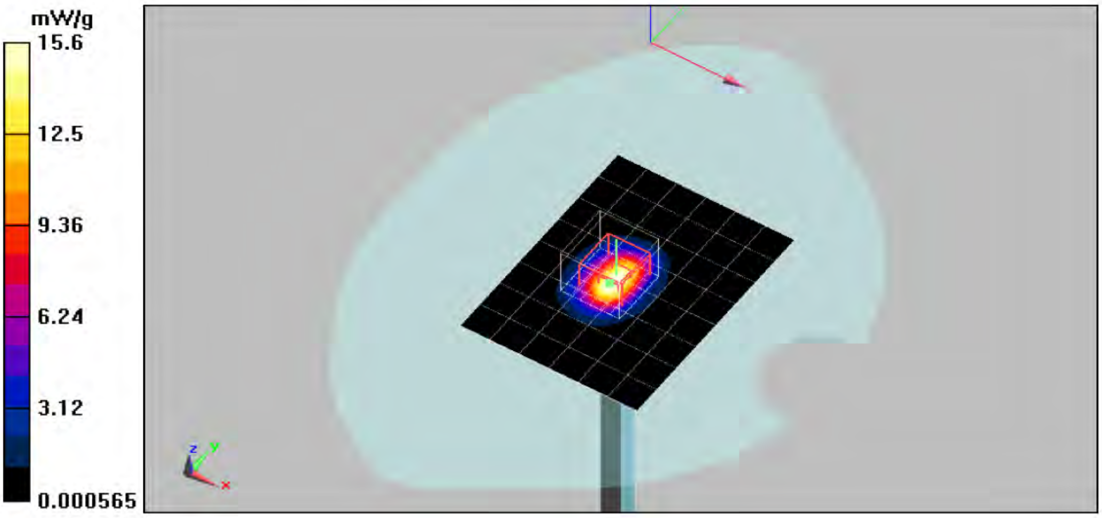
- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM; Serial: Not Specified
- Measurement SW: DASY5, V5.0 Build 119; SEMCAD X Version 13.2 Build 87

d=15mm, Pin=250mW/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 12.2 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.2 V/m; Power Drift = -0.073 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.3 mW/g

Maximum value of SAR (measured) = 15.6 mW/g



10. SAR Measurement Results

Procedures Used To Establish Test Signal

Engineering testing software installed on the EUT can provide continuous transmitting RF signal. This RF signal utilized in SAR measurement is Continuous wave.

 # Maximum SAR

Mode	CH	Frequency (MHz)	Position	SAR Limit (W/ kg)	Measured SAR (W/kg)	Result
802.11b	6	2 437	Left	1.6	0.587	Passed

10.1 SAR Data Summary

-. Test Date : May 27 ~ 28, 2009
-. Mixture Type : 2 450 MHz Muscle
-. Tissue Depth : 15.1 cm

Mode	Frequency		Power Drift(dB)	Antenna Position	SAR(W/kg)
	CH	(MHz)			
802.11b	1	2412	-0.010	Upper	0.222
	1	2412	0.095	Left	0.580
	6	**2437**	**0.049**	**Left**	**0.587**
	6	2437	-0.039	Front	0.237
	11	2462	0.281	Left	0.503
	11	2462	0.080	Rear	0.198
802.11g	1	2412	-0.059	Left	0.319
	1	2412	0.192	Front	0.138
	6	2437	0.163	Upper	0.125
	6	2437	-0.072	Left	0.335
	6	2437	0.127	Right	0.065
	6	2437	0.015	Rear	0.122
	6	2437	0.066	Front	0.128
	11	2462	-0.047	Upper	0.096
	11	2462	0.391	Left	0.253

Notes:
1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration.
2. All modes of operation were investigated, and worst-case results are reported.
3. SAR Measurement System ■ DASY5
4. Phantom Configuration □ Left Head ■ Flat Phantom □ Right Head
5. SAR Configuration □ Head ■ Body □ Hand
6. Test Signal Call Mode ■ Manu. Test Codes □ Base Station Simulator

Date/Time: 5/27/2009 2:27:15 PM

Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11g_CH6(Front, Test2)

DUT: MX-5000; Type: remote; Serial: Not Specified

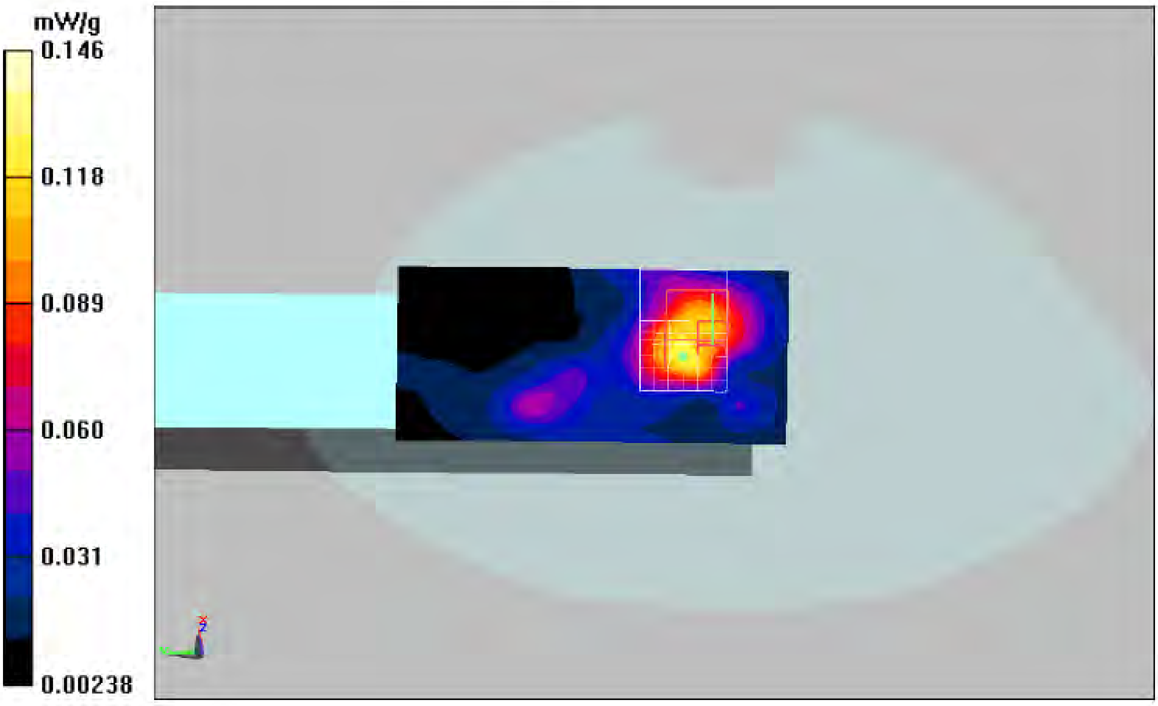
Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.94 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Front/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.33 V/m; Power Drift = 0.163 dB
Peak SAR (extrapolated) = 0.242 W/kg
SAR(1 g) = 0.125 mW/g; SAR(10 g) = 0.071 mW/g

Maximum value of SAR (measured) = 0.146 mW/g



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Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11g_CH6(Left, Test2)

DUT: MX-5000; Type: remote; Serial: Not Specified

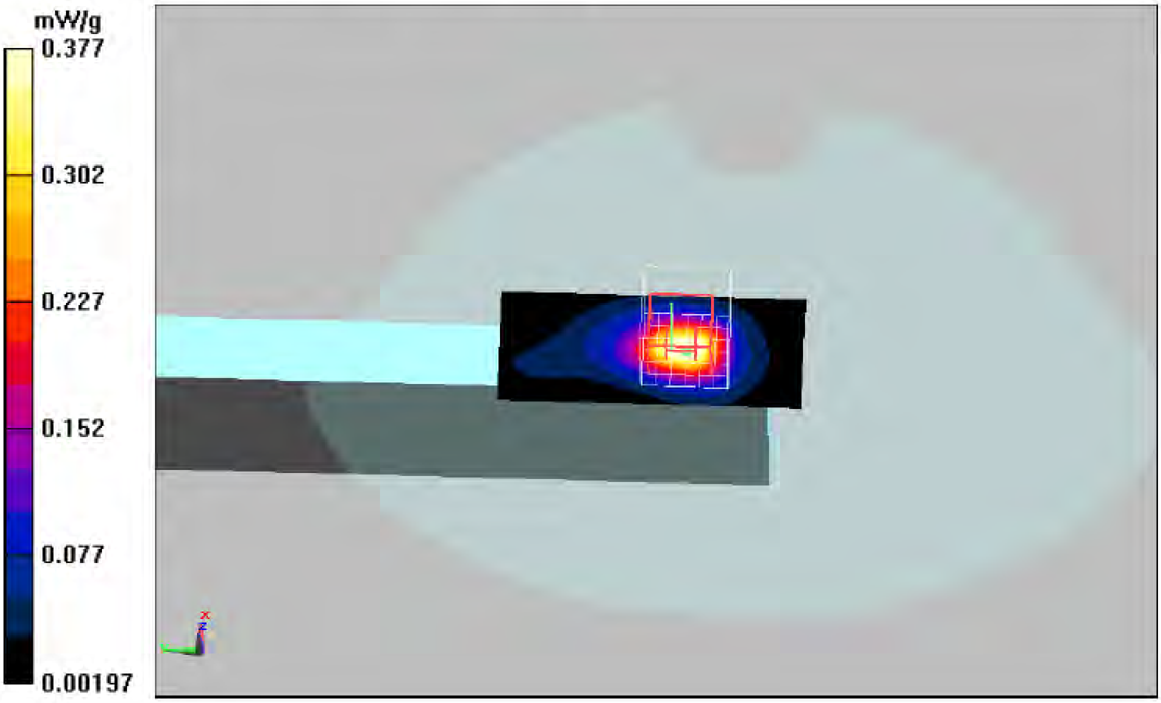
Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.94 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.08 V/m; Power Drift = -0.072 dB
Peak SAR (extrapolated) = 0.711 W/kg
SAR(1 g) = 0.335 mW/g; SAR(10 g) = 0.152 mW/g

Maximum value of SAR (measured) = 0.377 mW/g



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Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11g_CH6(Right, Test2)

DUT: MX-5000; Type: remote; Serial: Not Specified

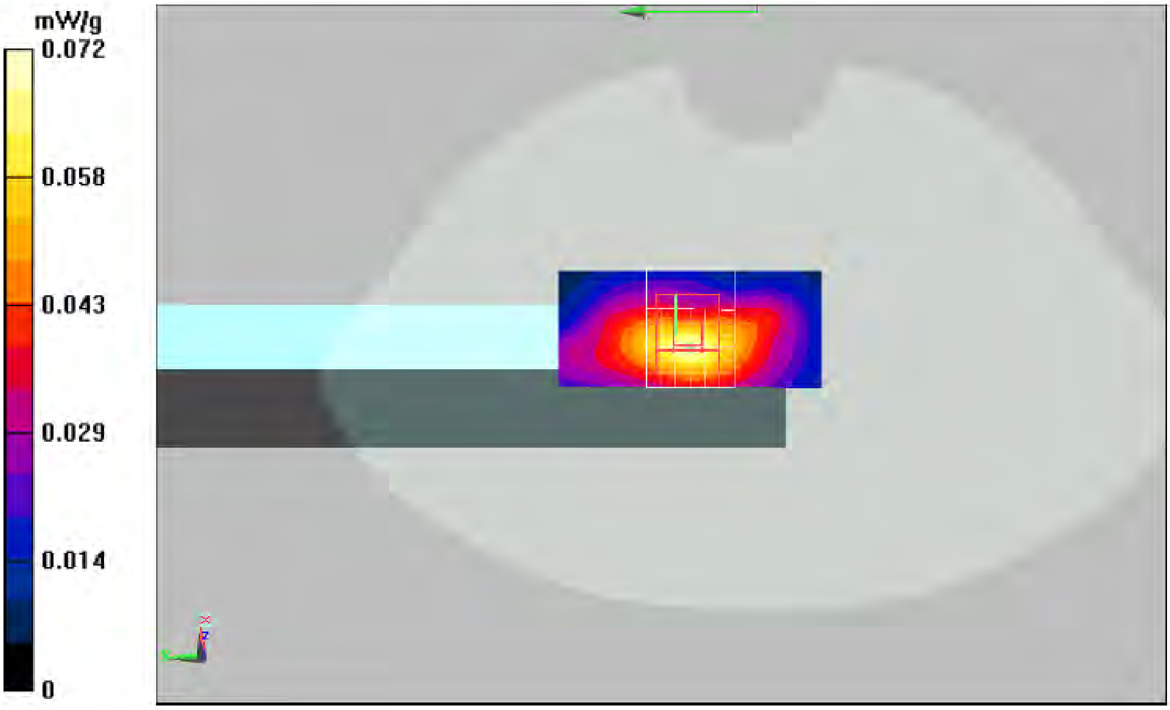
Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.94 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Right/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.42 V/m; Power Drift = 0.127 dB
Peak SAR (extrapolated) = 0.125 W/kg
SAR(1 g) = 0.065 mW/g; SAR(10 g) = 0.034 mW/g

Maximum value of SAR (measured) = 0.072 mW/g



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Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11g_CH6(Rear, Test1)

DUT: MX-5000; Type: remote; Serial: Not Specified

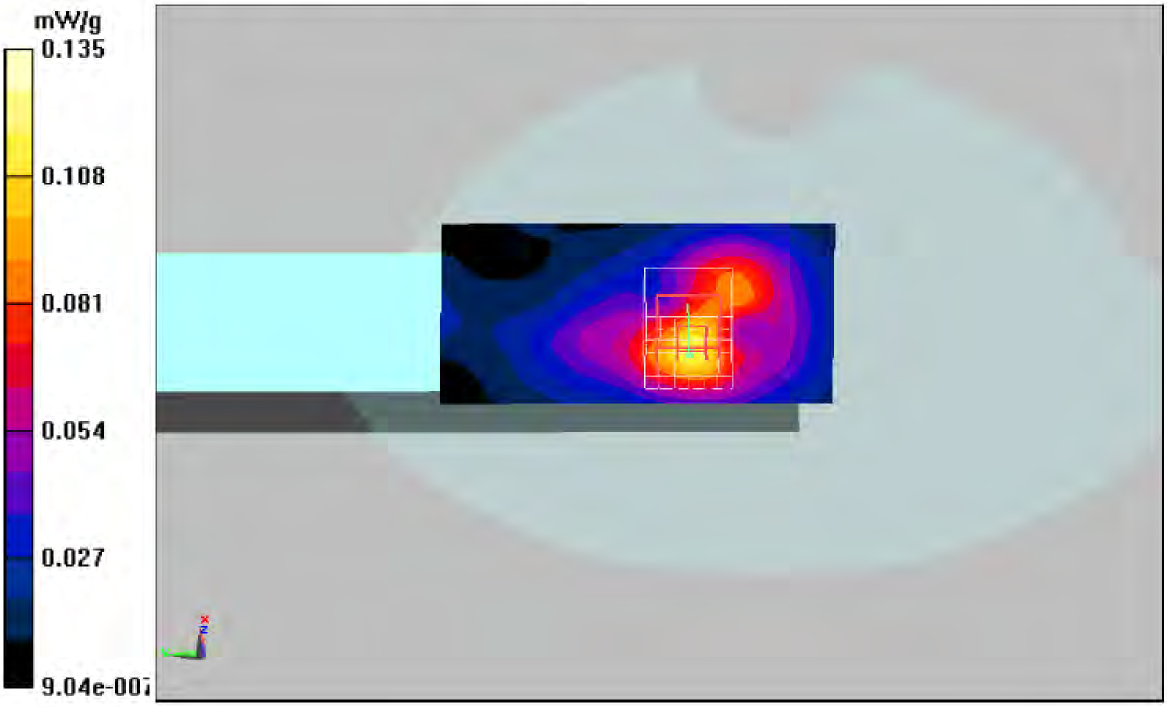
Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.94 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Rear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.92 V/m; Power Drift = 0.015 dB
Peak SAR (extrapolated) = 0.235 W/kg
SAR(1 g) = 0.122 mW/g; SAR(10 g) = 0.062 mW/g

Maximum value of SAR (measured) = 0.135 mW/g



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Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11g_CH6(Front, Test1)

DUT: MX-5000; Type: remote; Serial: Not Specified

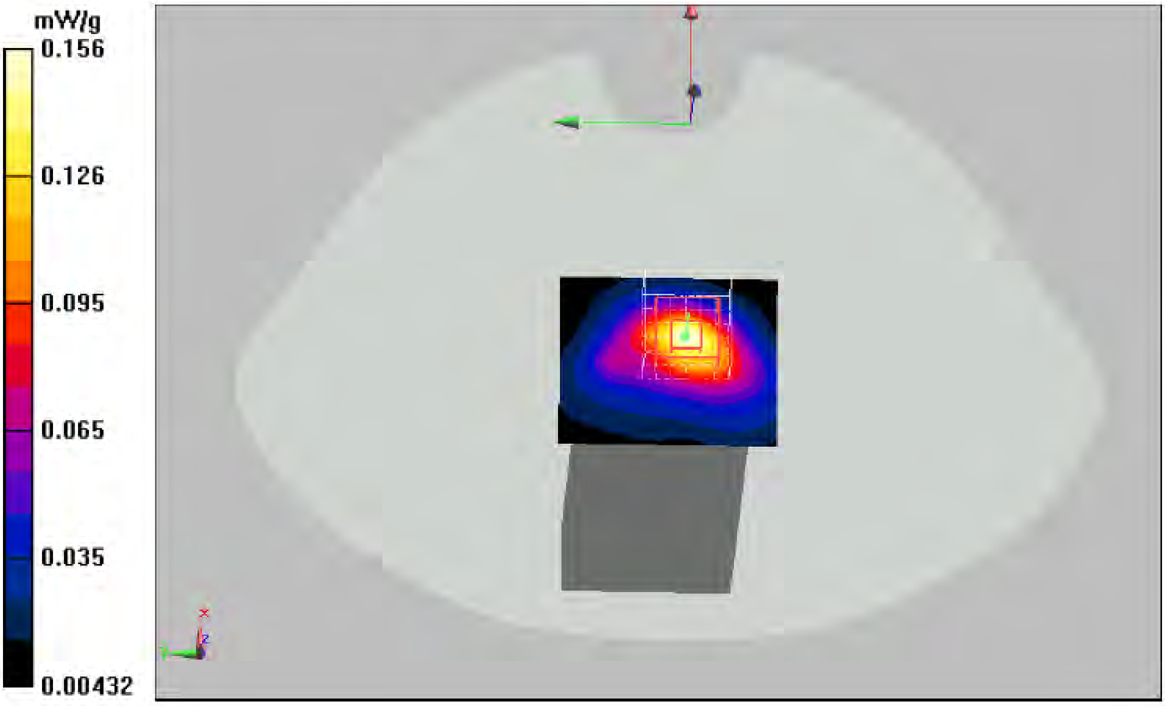
Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.94 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Front/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.99 V/m; Power Drift = 0.216 dB
Peak SAR (extrapolated) = 0.245 W/kg
SAR(1 g) = 0.128 mW/g; SAR(10 g) = 0.065 mW/g

Maximum value of SAR (measured) = 0.142 mW/g



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Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11g_CH1(Left,Test2)

DUT: MX-5000; Type: remote; Serial: Not Specified

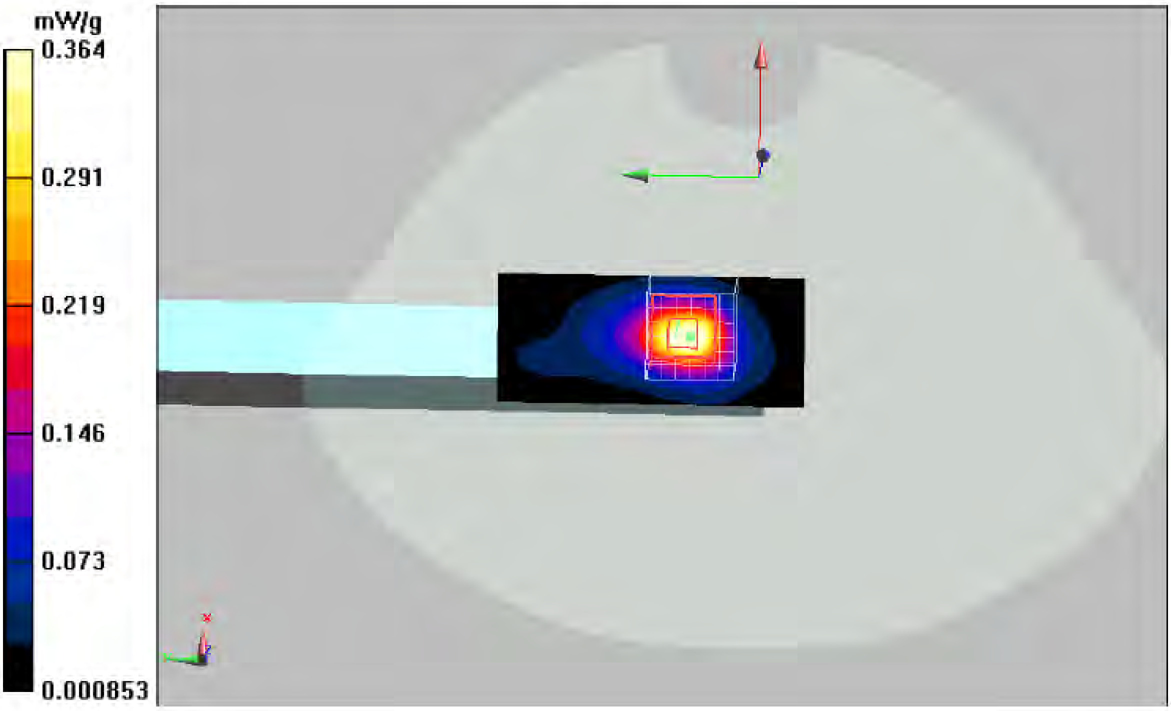
Communication System: WLAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.91 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.44 V/m; Power Drift = -0.059 dB
Peak SAR (extrapolated) = 0.677 W/kg
SAR(1 g) = 0.319 mW/g; SAR(10 g) = 0.145 mW/g

Maximum value of SAR (measured) = 0.364 mW/g



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Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11g_CH11(Left,Test2)

DUT: MX-5000; Type: remote; Serial: Not Specified

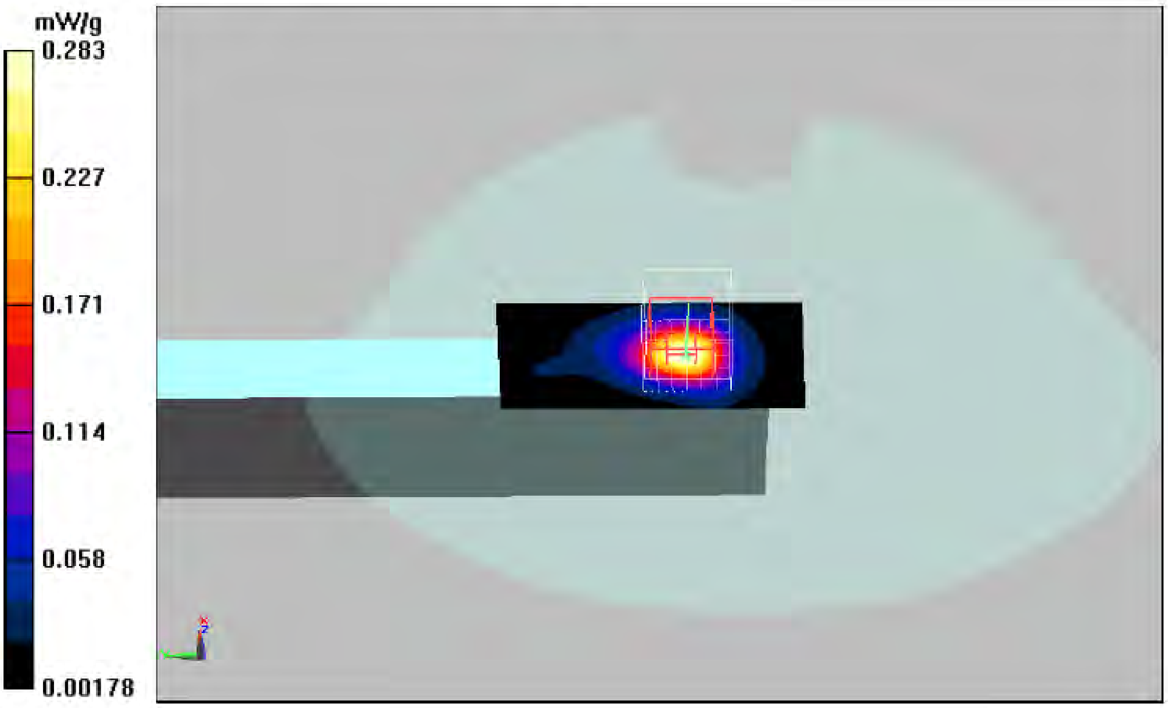
Communication System: WLAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.97 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.74 V/m; Power Drift = 0.391 dB
Peak SAR (extrapolated) = 0.544 W/kg
SAR(1 g) = 0.253 mW/g; SAR(10 g) = 0.114 mW/g

Maximum value of SAR (measured) = 0.283 mW/g



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Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11b_CH1(Left,Test1)

DUT: MX-5000; Type: remote; Serial: Not Specified

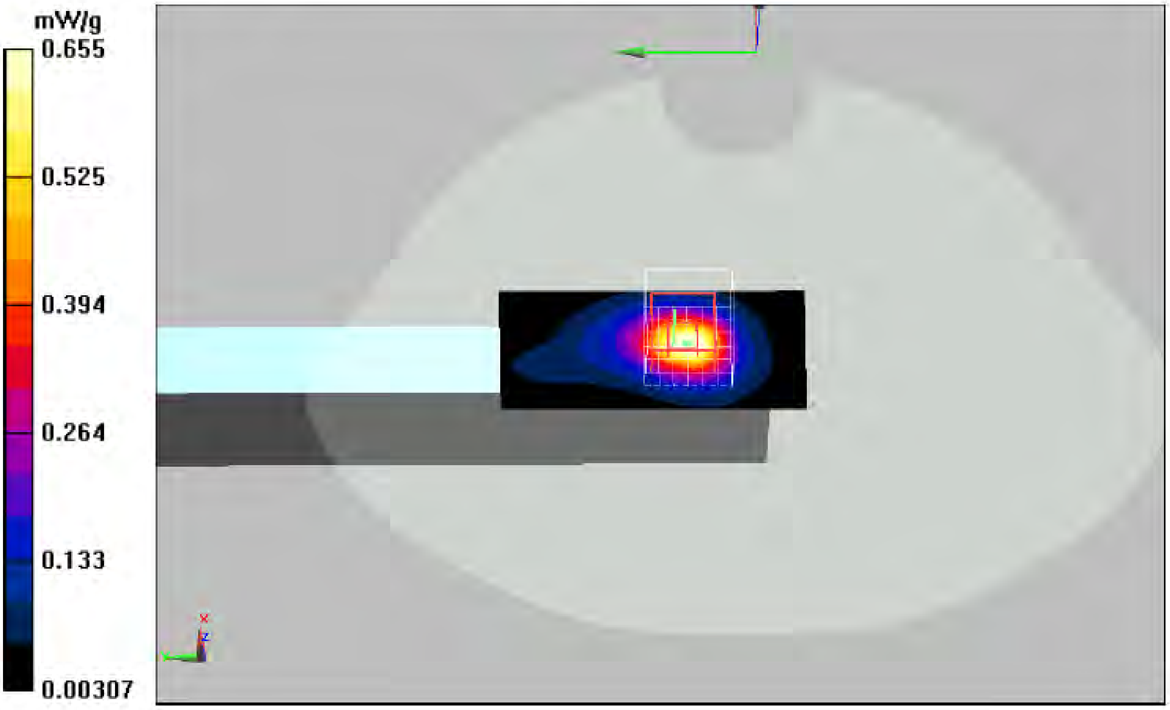
Communication System: WLAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.91 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.68 V/m; Power Drift = 0.095 dB
Peak SAR (extrapolated) = 1.22 W/kg
SAR(1 g) = 0.580 mW/g; SAR(10 g) = 0.264 mW/g

Maximum value of SAR (measured) = 0.655 mW/g



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Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11b_CH6(Left,Test1)

DUT: MX-5000; Type: remote; Serial: Not Specified

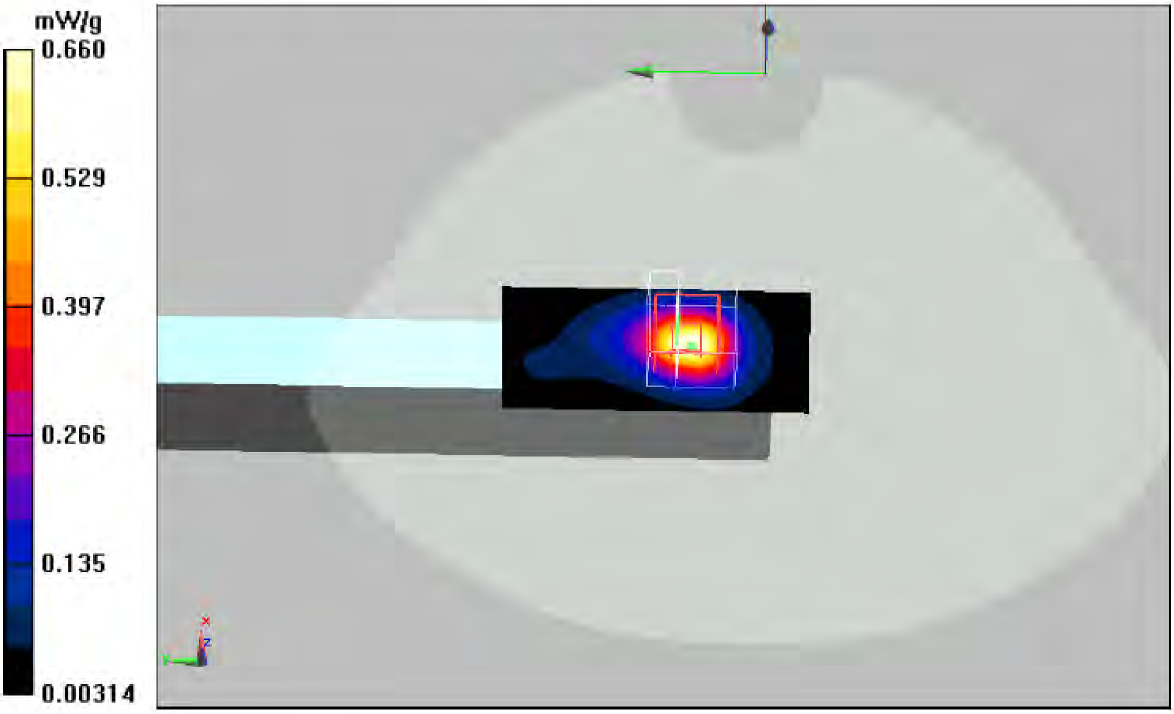
Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.94 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.31 V/m; Power Drift = 0.049 dB
Peak SAR (extrapolated) = 1.25 W/kg
SAR(1 g) = 0.587 mW/g; SAR(10 g) = 0.265 mW/g

Maximum value of SAR (measured) = 0.660 mW/g



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Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11b_CH11(Left,Test2)

DUT: MX-5000; Type: remote; Serial: Not Specified

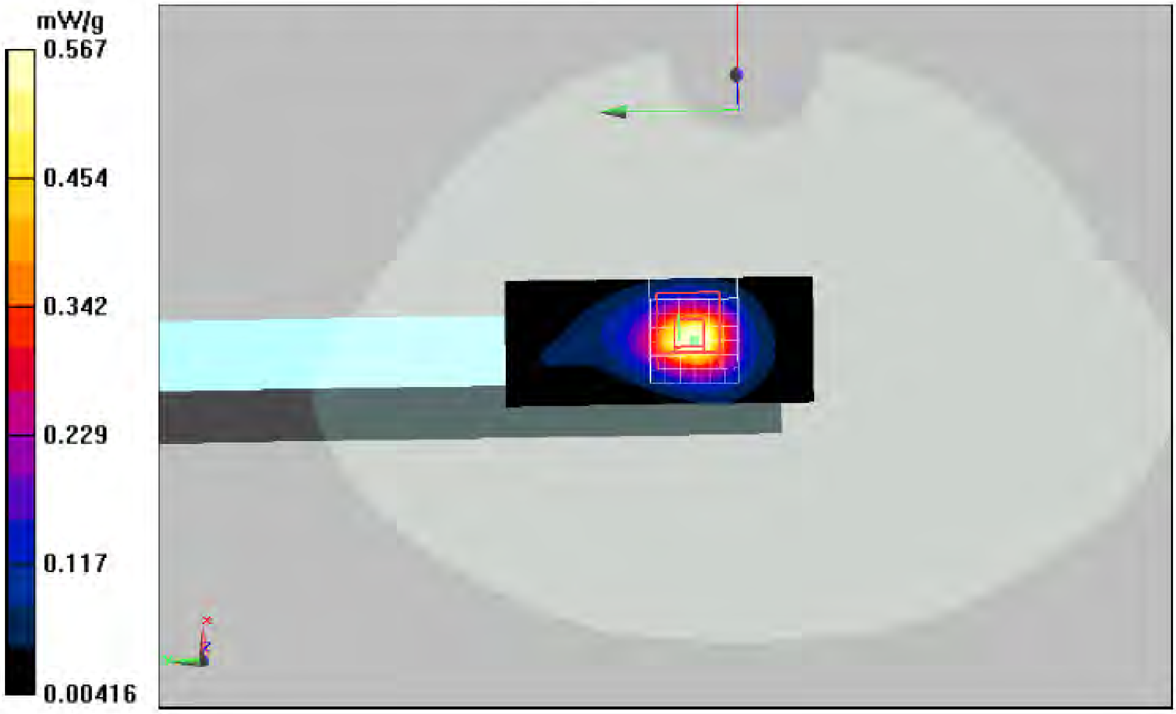
Communication System: WLAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.97 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Left/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.06 V/m; Power Drift = 0.281 dB
Peak SAR (extrapolated) = 1.07 W/kg
SAR(1 g) = 0.503 mW/g; SAR(10 g) = 0.227 mW/g

Maximum value of SAR (measured) = 0.567 mW/g



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Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11g_CH1(Front, Test1)

DUT: MX-5000; Type: remote; Serial: Not Specified

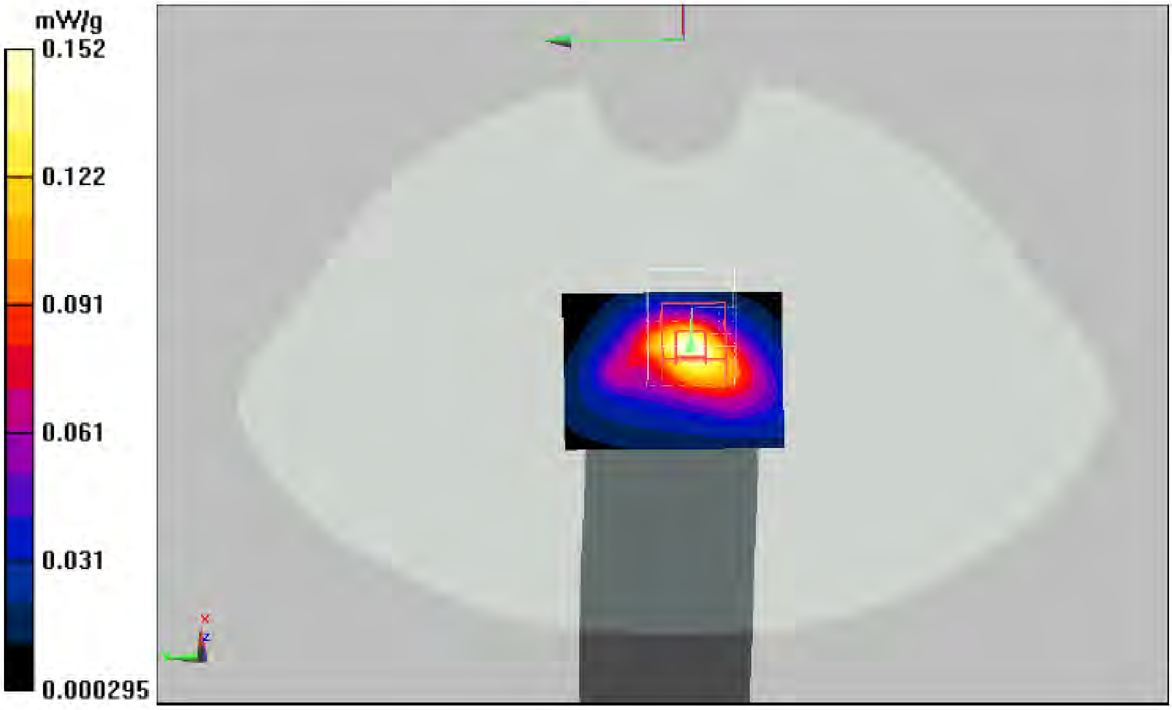
Communication System: WLAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.91 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Front/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.39 V/m; Power Drift = 0.192 dB
Peak SAR (extrapolated) = 0.258 W/kg
SAR(1 g) = 0.138 mW/g; SAR(10 g) = 0.071 mW/g

Maximum value of SAR (measured) = 0.152 mW/g



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Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11g_CH11(Front, Test1)

DUT: MX-5000; Type: remote; Serial: Not Specified

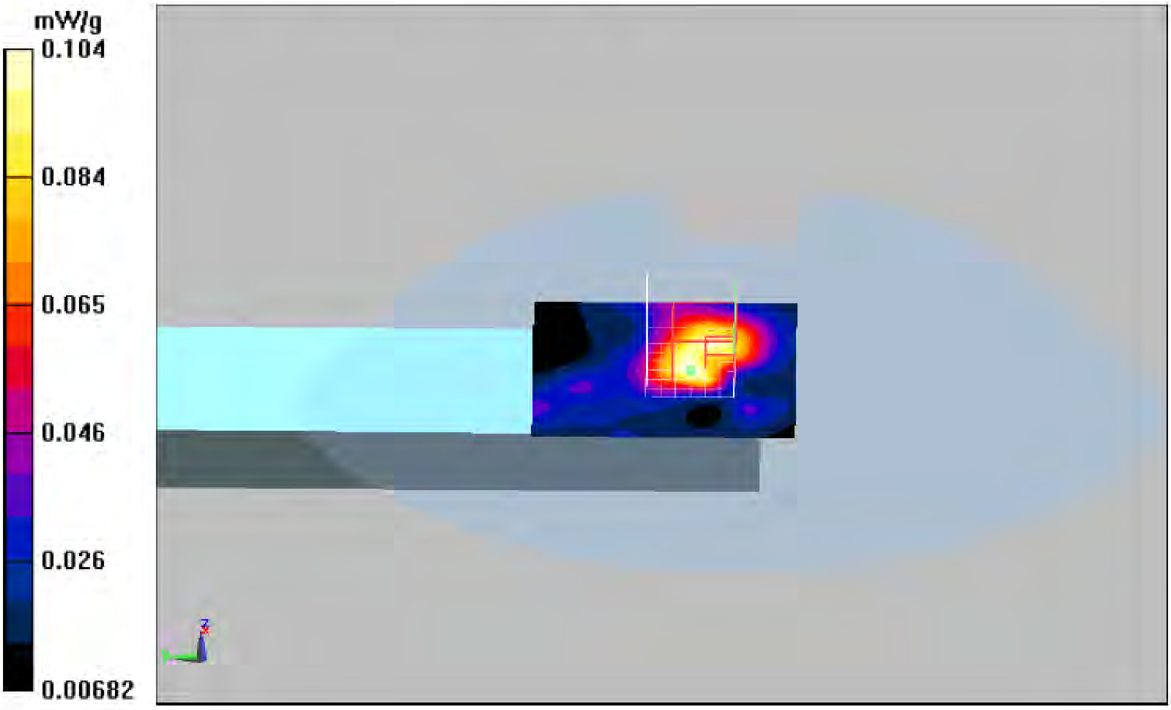
Communication System: WLAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.97 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Front/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.57 V/m; Power Drift = -0.047 dB
Peak SAR (extrapolated) = 0.192 W/kg
SAR(1 g) = 0.096 mW/g; SAR(10 g) = 0.054 mW/g

Maximum value of SAR (measured) = 0.112 mW/g



Date/Time: 5/28/2009 4:41:48 PM

Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11b_CH1(Front, Test2)

DUT: MX-5000; Type: remote; Serial: Not Specified

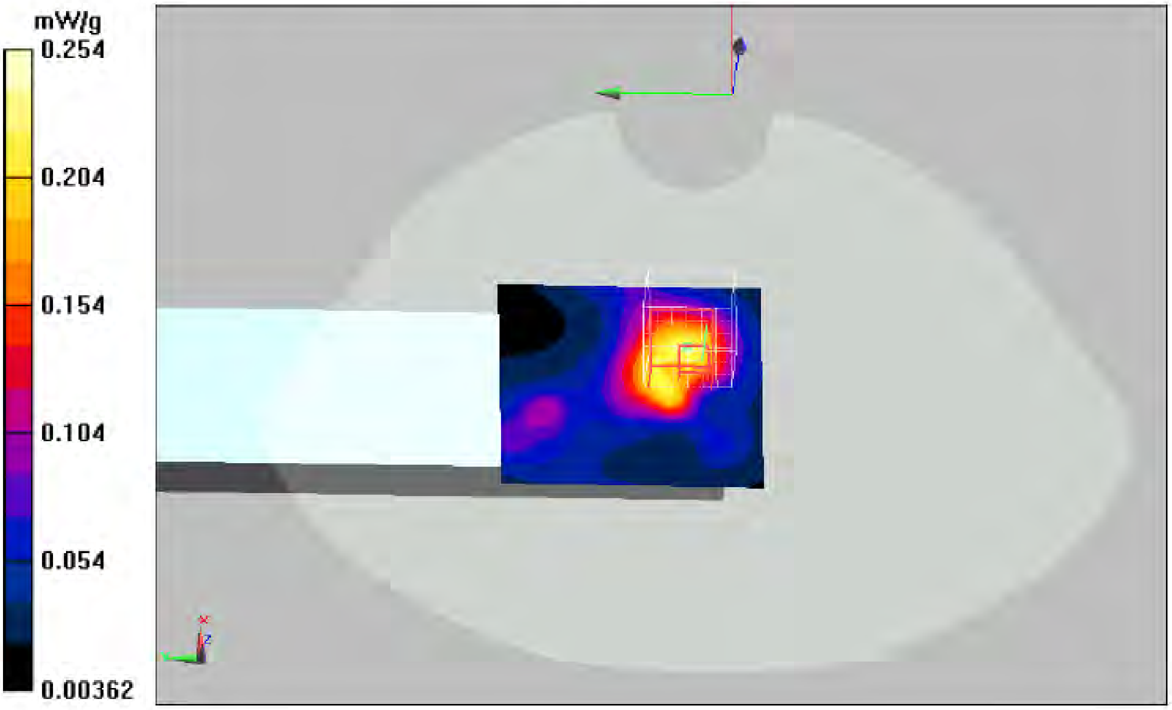
Communication System: WLAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.91 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Front/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.1 V/m; Power Drift = -0.010 dB
Peak SAR (extrapolated) = 0.431 W/kg
SAR(1 g) = 0.222 mW/g; SAR(10 g) = 0.123 mW/g

Maximum value of SAR (measured) = 0.254 mW/g



Date/Time: 5/28/2009 9:09:21 PM

Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11b_CH6(Front, Test2)

DUT: MX-5000; Type: remote; Serial: Not Specified

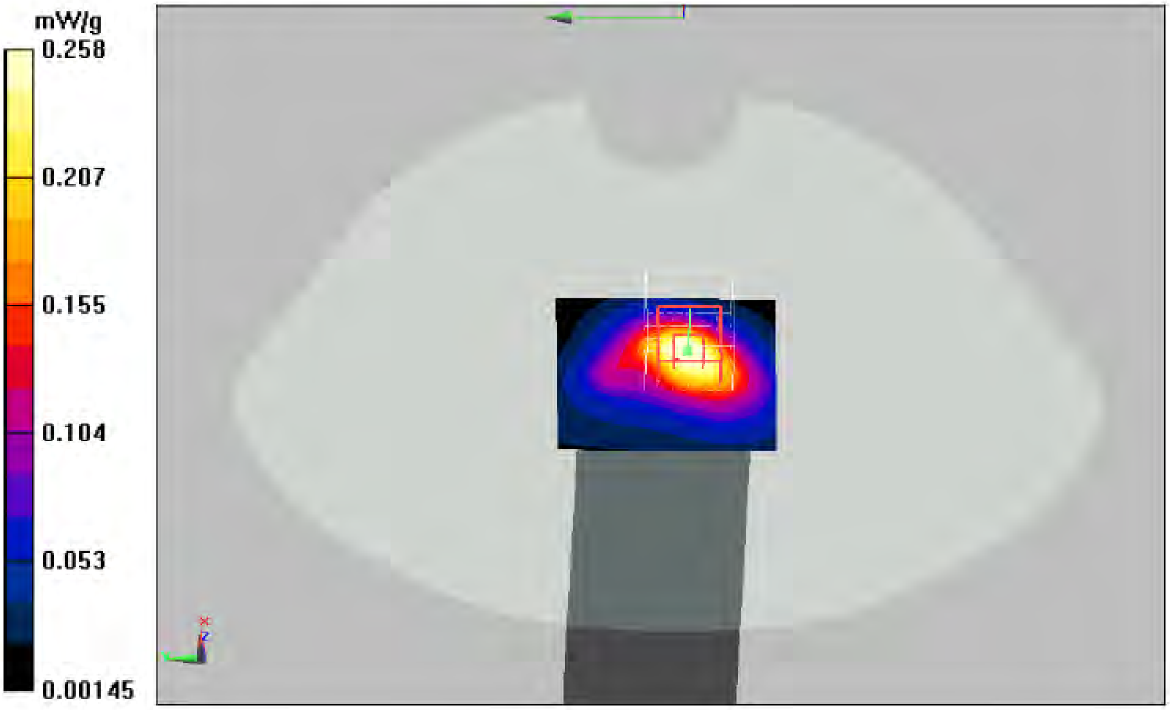
Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.94 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Front/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.9 V/m; Power Drift = -0.039 dB
Peak SAR (extrapolated) = 0.453 W/kg
SAR(1 g) = 0.237 mW/g; SAR(10 g) = 0.122 mW/g

Maximum value of SAR (measured) = 0.258 mW/g



Date/Time: 5/28/2009 6:01:00 PM

Test Laboratory: GUMI COLLEGE EMC CENTER

MX-5000_802.11b_CH11(Rear, Test1)

DUT: MX-5000; Type: remote; Serial: Not Specified

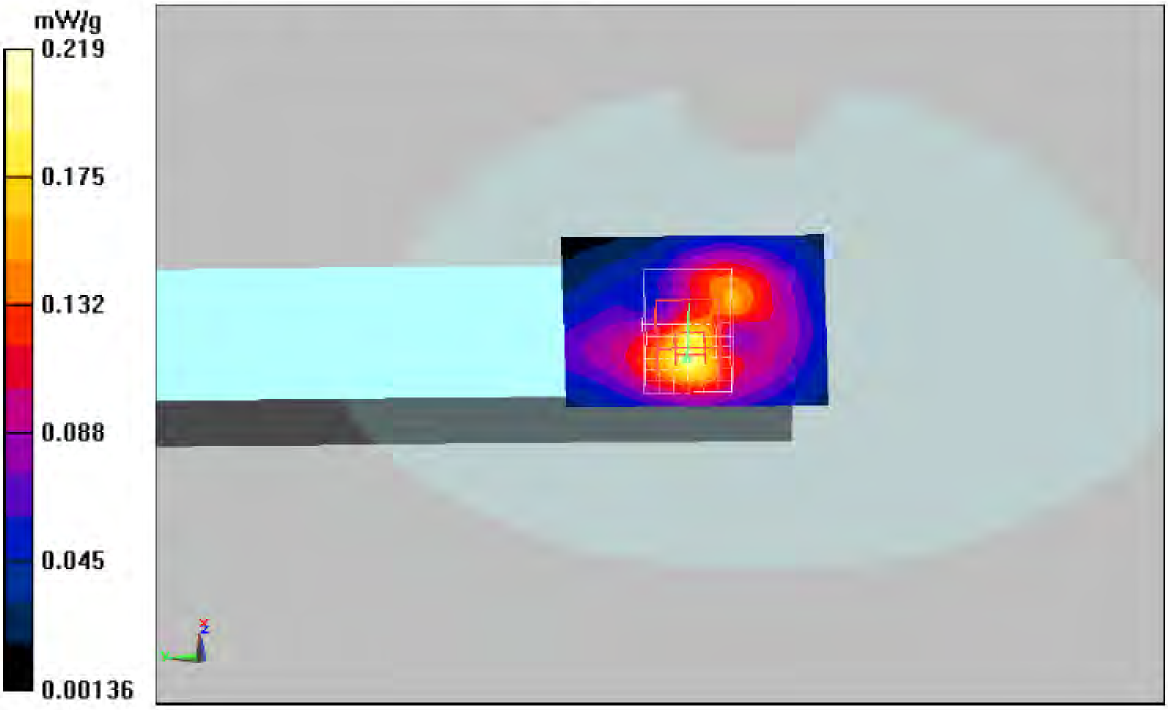
Communication System: WLAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.97 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: EX3DV4 - SN3625; ConvF(6.83, 6.83, 6.83); Calibrated: 11/6/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn782; Calibrated: 10/22/2008
- Phantom: SAM No1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

Rear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.47 V/m; Power Drift = 0.080 dB
Peak SAR (extrapolated) = 0.381 W/kg
SAR(1 g) = 0.198 mW/g; SAR(10 g) = 0.100 mW/g

Maximum value of SAR (measured) = 0.219 mW/g



11. SAR Test Equipment

11.1 Test equipment used

	Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ -	TX90XL	Speag	Robot Unit	F07/56X1A1/A/01	N/A
■	DAE4	Speag	Data Acquisition Electronics	782	10. 22. 2009
■	EX3DVx	Speag	E-Field Probes	3625	11. 06. 2009
■	EOC90	Speag	Electro-Optical Converter	1016	N/A
■	TP-1451	Speag	SAM Twin Phantom	SM 000 T01 DA	N/A
■	D835V2	Speag	Validation Dipole	4d055	11. 19. 2009
■	D900V2	Speag	Validation Dipole	1d048	11. 19. 2009
■	D1800V2	Speag	Validation Dipole	2d142	11. 05. 2009
■	D1900V2	Speag	Validation Dipole	5d085	11. 05. 2009
■	D2540V2	Speag	Validation Dipole	802	11. 05. 2009
■	85070E	Agilent	Dielectric Probe Kit	MY44300289	N/A
■	E5071C	Agilent	Network Analyzer	MY46102706	11. 12. 2009
■	BBS3Q7ECK	EM POWER	Power Amplifier	1053	10. 26. 2009
■	E4419B	Agilent	Power Meter	MY45102784	11. 09. 2009
■	E9300H	Agilent	Power Sensor	MY41495836	10. 03. 2009
■	E9300H	Agilent	Power Sensor	MY41495835	10. 03. 2009
■	E9300H	Agilent	Power Sensor	MY41495834	10. 03. 2009
■	N5181A	Agilent	Analog Signal Generator	MY47400099	11. 08. 2009

Note: The E-field probe was calibrated by SPEAG, by waveguide technique procedure. Dipole Validation measurement is performed by Nemkokorea Lab. before each test. The brain simulating material is calibrated by Nemkokorea using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the brain-equivalent material.

12. References

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

[2] EN 50361:2001, “Basic standard fields from mobile phones (200 MHz – 3 GHz)”, July 2001

[3] IEC 62209 - 1, “Specific Absorption Rate (SAR) in the frequency range of 300 MHz to 3 GHz

[4] IEC 62209 - 2, Draft Version 0.9, “Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body - Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation and Procedures Part 2: Procedure to determine the Specific Absorption Rate (SAR) for … including accessories and multiple transmitters”, December 2004

[5] OET Bulletin 65, Supplement C, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, Edition 01-01

[6] ANSI-PC63.19-2001, Draft 3.6, “American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids”, April 2005

13. Probe & dipole calibration

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

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Accreditation No.: SCS 108

Client **GDEP (Dymstec)**

Certificate No: EX3-3625_Nov08

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3625
Calibration procedure(s)	QA CAL-01.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	November 6, 2008
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	29-Mar-08 (METAS, No. 217-00670)	Mar-09
Power sensor E4412A	MY41495277	29-Mar-08 (METAS, No. 217-00670)	Mar-09
Power sensor E4412A	MY41498087	29-Mar-08 (METAS, No. 217-00670)	Mar-09
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-08 (METAS, No. 217-00719)	Aug-09
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-08 (METAS, No. 217-00671)	Mar-09
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-08 (METAS, No. 217-00720)	Aug-09
Reference Probe ES3DV2	SN: 3013	4-Jan-08 (SPEAG, No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 654	20-Apr-08 (SPEAG, No. DAE4-654_Apr08)	Apr-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Oct-08)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-08)	In house check: Oct-09

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

Issued: November 12, 2008

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

Certificate No: EX3-3625_Nov08 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) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not 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 EX3DV4

SN:3625

Manufactured: July 3, 2007
Calibrated: November 6, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

EX3DV4 SN:3625 November 6, 2008

DASY - Parameters of Probe: EX3DV4 SN:3625

Sensitivity in Free Space[A]

NormX	**0.380** ± 10.1%	$\mu V/(V/m)^2$
NormY	**0.440** ± 10.1%	$\mu V/(V/m)^2$
NormZ	**0.450** ± 10.1%	$\mu V/(V/m)^2$

Diode Compression[B]

DCP X	**82** mV
DCP Y	**86** mV
DCP Z	**90** 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		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	4.0	2.1
SAR_{be} [%]	With Correction Algorithm	0.3	0.2

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	6.3	3.7
SAR_{be} [%]	With Correction Algorithm	0.1	0.1

Sensor Offset

Probe Tip to Sensor Center **1.0** mm

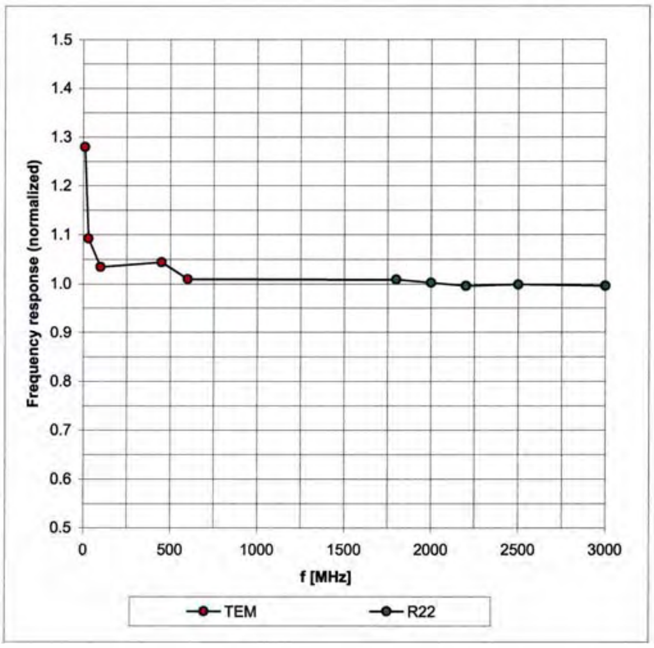
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[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.

EX3DV4 SN:3625 November 6, 2008

Frequency Response of E-Field

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

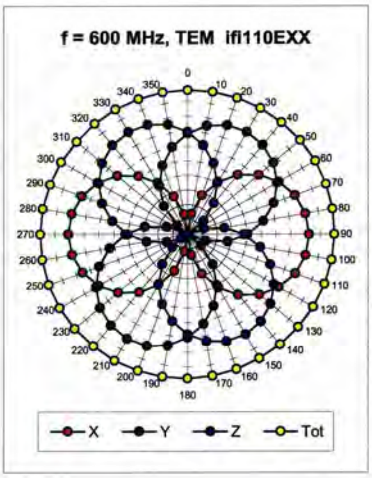


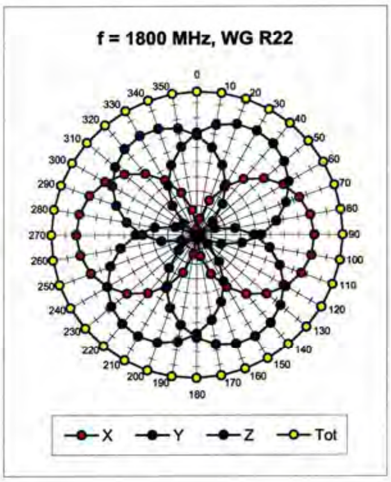
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

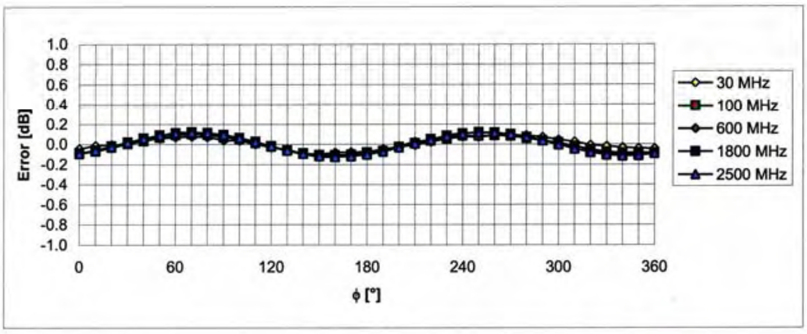
Certificate No: EX3-3625_Nov08 Page 5 of 9

EX3DV4 SN:3625 November 6, 2008

Receiving Pattern (φ), ϑ = 0°







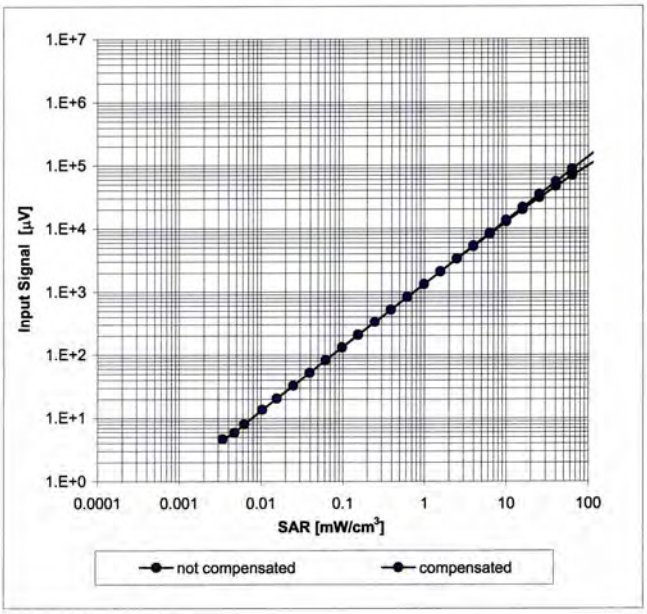
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

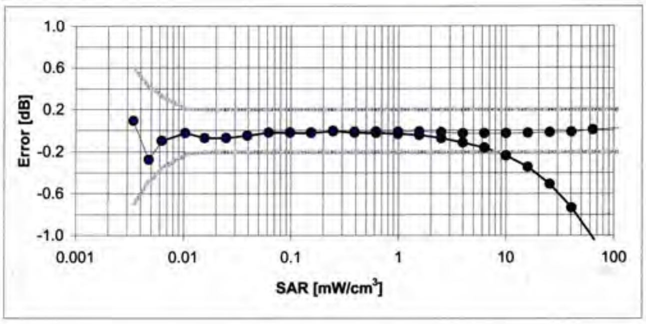
Certificate No: EX3-3625_Nov08 Page 6 of 9

EX3DV4 SN:3625 November 6, 2008

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)



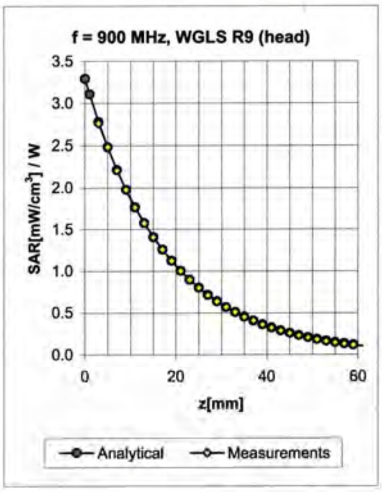


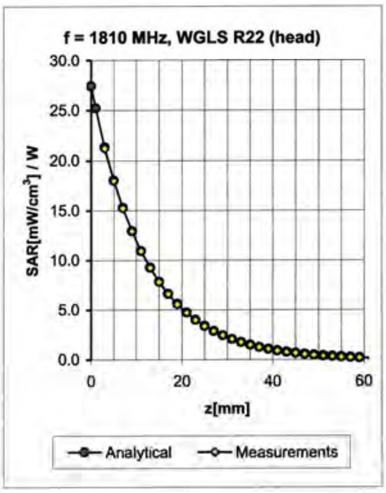
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Certificate No: EX3-3625_Nov08 Page 7 of 9

EX3DV4 SN:3625 November 6, 2008

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%	0.60	0.80	8.90	± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.17	1.19	7.50	± 11.0% (k=2)
2000	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.87	0.60	7.23	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.69	0.69	7.01	± 11.8% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.60	0.89	9.02	± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.30	0.90	7.54	± 11.0% (k=2)
2000	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.83	0.64	7.05	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.39	0.96	6.83	± 11.8% (k=2)

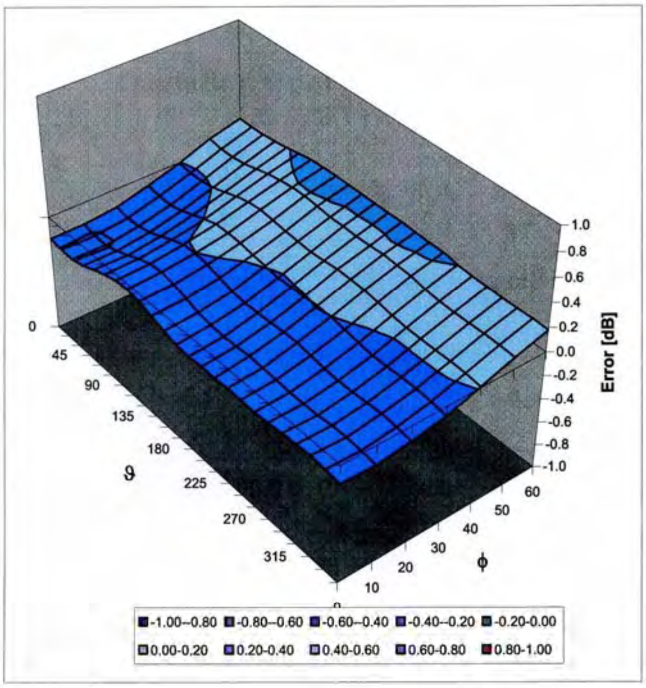
[c] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Certificate No: EX3-3625_Nov08 Page 8 of 9

EX3DV4 SN:3625 November 6, 2008

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Certificate No: EX3-3625_Nov08 Page 9 of 9

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Accreditation No.: SCS 108

Client GDEP (Dymstec)

Certificate No: D2450V2-802_Nov08

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 802
Calibration procedure(s)	QA CAL-05.v6 Calibration procedure for dipole validation kits
Calibration date:	November 06, 2008
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-442A	GB37480704	04-Oct-08 (METAS, No. 217-00736)	Oct-09
Power sensor HP 8481A	US37292783	04-Oct-08 (METAS, No. 217-00736)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-08 (METAS, No 217-00718)	Aug-09
Reference 10 dB Attenuator	SN: 5047.2 (10r)	07-Aug-08 (METAS, No 217-00718)	Aug-09
Reference Probe ES3DV2	SN: 3025	26-Oct-08 (SPEAG, No. ES3-3025_Oct08)	Oct-09
DAE4	SN: 601	30-Jan-08 (SPEAG, No. DAE4-601_Jan08)	Jan-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-08)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (SPEAG, in house check Oct-08)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: November 16, 2008

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Certificate No: D2450V2-802_Nov08 Page 1 of 6

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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) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4 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	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.4 ± 6 %	1.85 mho/m ± 6 %
Head TSL temperature during test	(21.5 ± 0.2) °C	-------	------

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	condition	
SAR measured	250 mW input power	13.7 mW / g
SAR normalized	normalized to 1W	54.8 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**53.6 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.31 mW / g
SAR normalized	normalized to 1W	25.2 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**25.0 mW / g ± 16.5 % (k=2)**

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

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.9 Ω + 0.4 jΩ
Return Loss	– 28.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.156 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	November 02, 2008

DASY4 Validation Report for Head TSL

Date/Time: 06.11.2008 16:24:25

Test Laboratory: SPEAG, Zurich, Switzerland

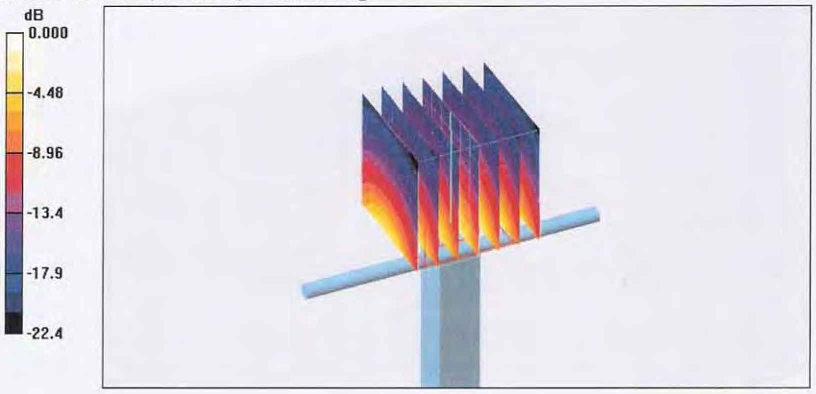
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN802

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U10 BB;
Medium parameters used: f = 2450 MHz; σ = 1.79 mho/m; ε_r = 38; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025 (HF); ConvF(4.41, 4.41, 4.41); Calibrated: 26.10.2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2008
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.0 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 29.7 W/kg
SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.31 mW/g
Maximum value of SAR (measured) = 15.0 mW/g



0 dB = 15.0mW/g

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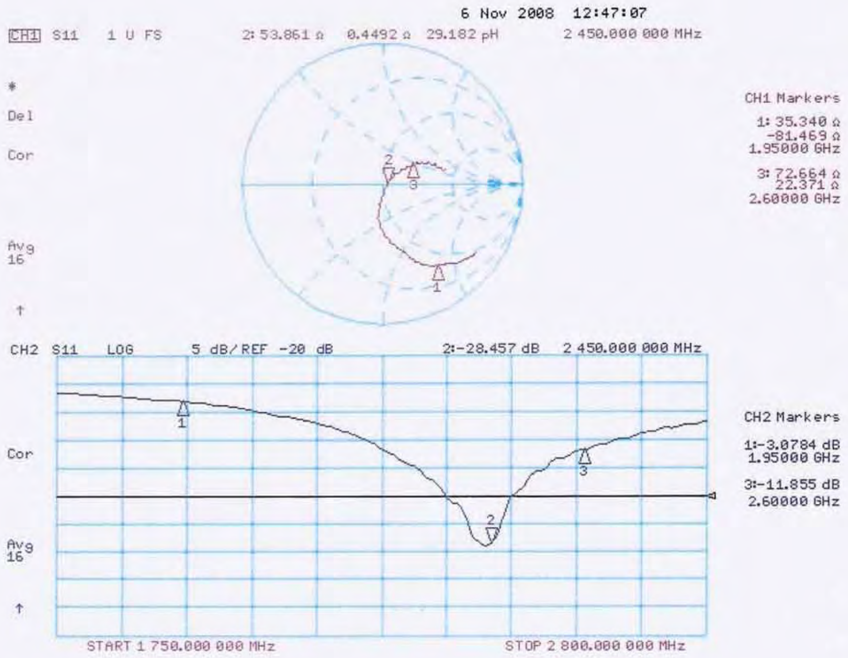
Impedance Measurement Plot for Head TSL



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