SAR Evaluation Report

FCC ID : RQKSMARTCOMPACT

Project Reference No. : NK2GR141

Product Type : Industrial PDA

Brand Name :

Model : SmartCompact

Tested According to : IEEE Standard C95.1 / OET Bulletin 65 Supplement C / EN50361

Tested Period : June. 30. 2006 to July. 04. 2006

Tested by	Seob Lee		date	: July. 05. 2006
Verified by	Seonteag.Jin	Seonteag Jin	date	: July. 05. 2006

This test results are only related to the item tested.
This test report is only limited to the client company and the product.
This report must not be used by the client to claim product endorsement by any agency of the U.S. Government.

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Nemko

Contents of This Report

1.General Information

1.1 Applicant

Company Name:	SAMMI information systems C.,Ltd
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Contact Name:	J.K. Kim

1.2 Manufacturer

Company Name:	SAMMI information systems C.,Ltd
Company Address:	496, Wonchun-dong, Yeongtong-ku,Suwon, Kyungki-do, Korea
Phone/Fax:	Phone: +82-31-217-8252 / +82-31-217-8254
Contact Name:	J.K. Kim

1.3 Description of Device

Category:	Industrial PDA
Model Name:	SmartCompact
Serial Number:	SM00250909
Frequency of Operation	2400MHz ~ 2483.5MHz
Power Output	802.11b : 15dBm / 802.11g : 13dBm Bluetooth : 1dBm
Modulation	DSSS / OFDM CCK, DQPSK, DBPSK, 16QAM, 64QAM
Channel	USA : 11ch / Europe : 13ch (Bluetooth 79ch)
Data Rate	802.11b : 1,2,5.5,11Mbps 802.11g : 6,9,12,18,24,36,48,54Mbps
Operating Condition	-20 to +60℃ 95%
Power Supply	+5V DC 3A
Antenna Gain	2dBi
Antenna Type	PIFA Antenna
Dimensions	77mm X 167mm X 42mm
Weight	Approx. 379g (with standard Battery)
Remarks:	-

2. General Test Condition

2.1 Location

Nemko Korea
300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Gyunggi-Do
Phone : 82-31-322-2333 , Fax : 82-31-322-2332

2.2 Operating Environment

Parameters	Recording during test	Accepted deviation
Ambient temperature	20 ± 2℃	15 ~ 30℃
Relative humidity	42 ± 15%	20 ~ 75%

2.3 Test Frequency

802.11b		802.11g	
Test Channel	Test Frequency (MHz)	Test Channel	Test Frequency (MHz)
1	2412	1	2412
6	2437	6	2437
11	2462	11	2462

2.4 Test Configuration

The data rates for SAR testing are 11Mbps for 802.11b and 54Mbps for 802.11g. 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.

2.5 Position Information

Top Position : key-pad side facing phantom, EUT

Bottom Position : Rear side facing phantom, EUT

Vertical Position : top / bottom side edge facing phantom, EUT

3. Description of Test Equipment

3.1 SAR Measurement Setup

Robotic System

Measurements are performed using the DASY4 automated dosimetric assessment system. Which is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Stäubli), robot controller, measurement server, H/P 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) (see Fig. 3.1).

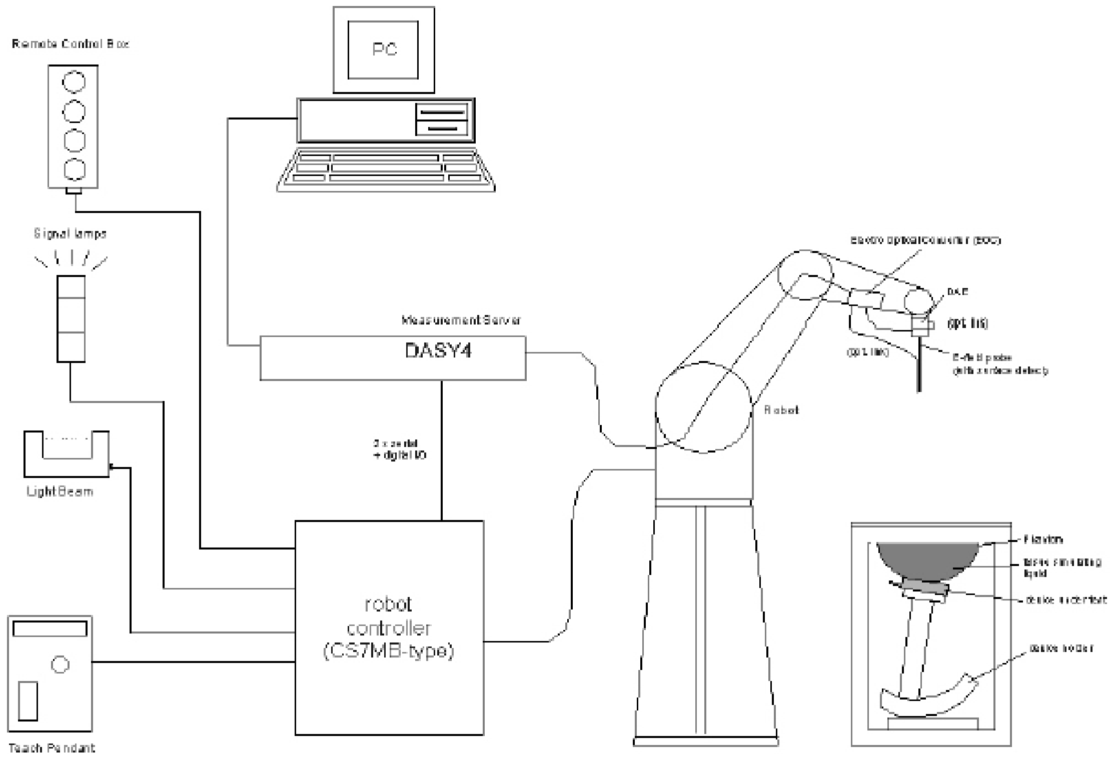

Figure 3.1 SAR Measurement System Setup

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 H/P computer with Windows XP system and SAR Measurement Software DASY4, LCD monitor, mouse and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot.
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 the optical into digital electric signal of the DAE and transfers data to the measurement server.

System Electronics

The DAE4 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 probe collision detection. The robot uses its own controller with a built in VME-bus computer.

3.2 E-field Probe

The SAR measurement were conducted with the dosimetric probe ES3DV3, designed in the classical triangular configuration (see Fig.3.3) 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.3.4). 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 DASY4 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting (see Fig.3.2).

The approach is stopped at reaching the maximum.

Figure3.2 DAE System

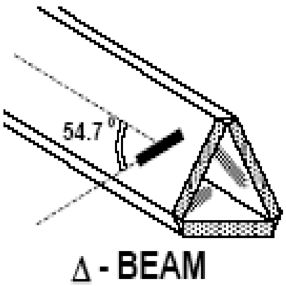

Figure 3.3 Triangular Probe Configuration

Figure 3.4 Probe Thick-Film Technique

Probe Specifications

Construction : Symmetrical design with triangular core
Interleaved sensors
Built-in shielding against static charges
PEEK enclosure material (resistant to organic DGBE)
Calibration : Basic Broad Band Calibration In air from 10 MHz to 3.0 GHz
In brain and muscle simulating tissue at Frequencies of HSL900, HSL1800 MHz, MSL2450 Calibration certificates please find attached.
Frequency : 10 MHz to > 6 GHz; Linearity: ±0.2 dB (30 MHz to 3 GHz)
Directivity ±0.2 dB in HSL (rotation around probe axis)
±0.3 dB in HSL (rotation normal to probe axis)
Dynamic Range 5μW/g to > 100mW/g; Linearity: ±0.2dB
Dimensions Overall length: 330mm (Tip : 20mm)
Tip diameter: 4.0mm (Body : 12mm)
Distance from probe tip to dipole centers: 2.0mm
Application General dosimetry up to 3 GHz
Compliance tests of mobile phones
Fast automatic scanning in arbitrary phantoms
Optical Surface Detection
± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces

3.3 SAM Phantom

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 Figure 3.5)

Figure 3.5 SAM Twin Phantom

Phantom Specification

Construction : The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 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 teaching three points with the robot.

Shell Thickness : 2 ± 0.2 mm
Filling Volume : Approx. 25 liters
Dimensions : Height; 830 mm; Length: 1000 mm; Width: 500 mm

3.4 Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device (see Fig. 3.6) 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.

Figure 3.6Device Holder

4. 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 1g or 10g) 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.

STEP 2
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 15mm × 15mm 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 30mm×30mm×30mm is assessed by measuring 5×5×7 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 ±0.22dB.

4.1 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 Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	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	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Typical Composition of Ingredients for Liquid Tissue Phantoms

4.2 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.

Target Frequency	Head		Body	
(MHz)	ε_r	σ (S/m)	ε_r	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

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

4.3 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.

5. Definition of Reference Points

5.1 EAR Reference Point

Figure 5.1 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 Figure 5.2.

Figure 5.1 Front, back and side view of SAM

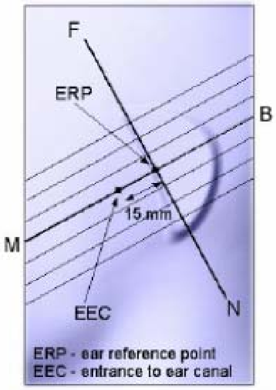

Figure 5.2 Close up side view

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 Figure 5.3).
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.

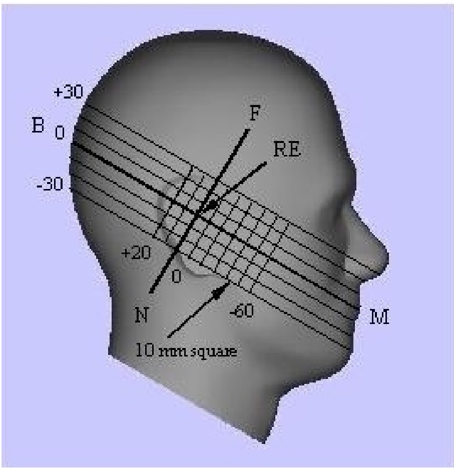

Figure 5.3 Side view of the phantom showing relevant markings

5.2 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. 5.4).
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.

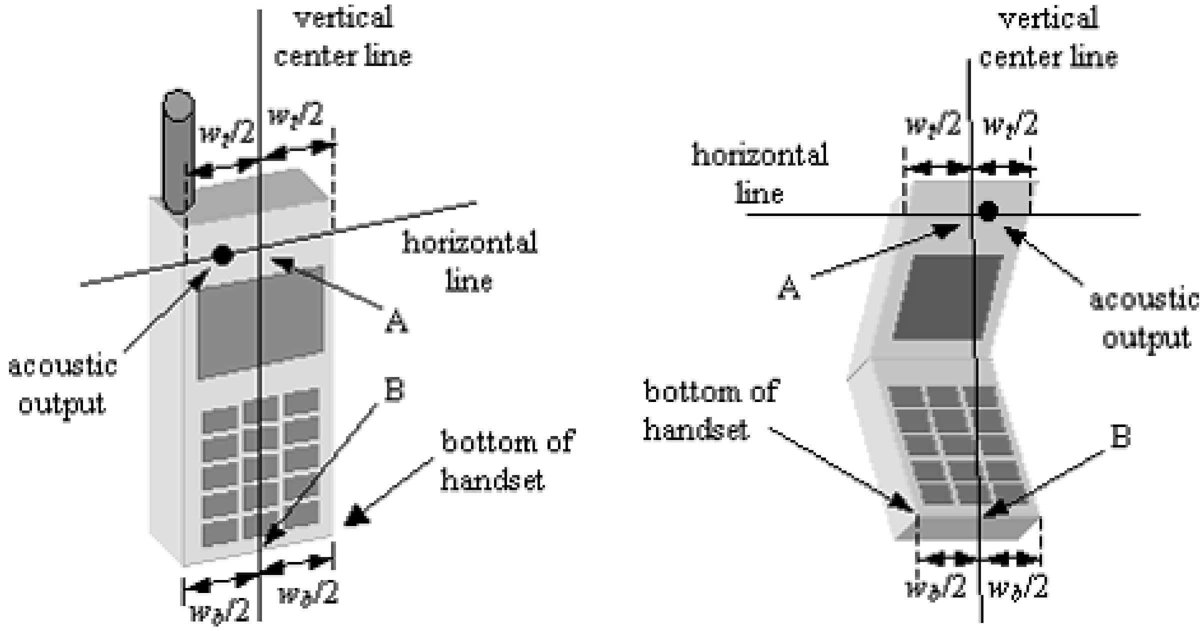

Figure 5.4 Handset vertical and horizontal reference lines

6. Test Configuration Positions

6.1 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 Figure 6.1), 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.

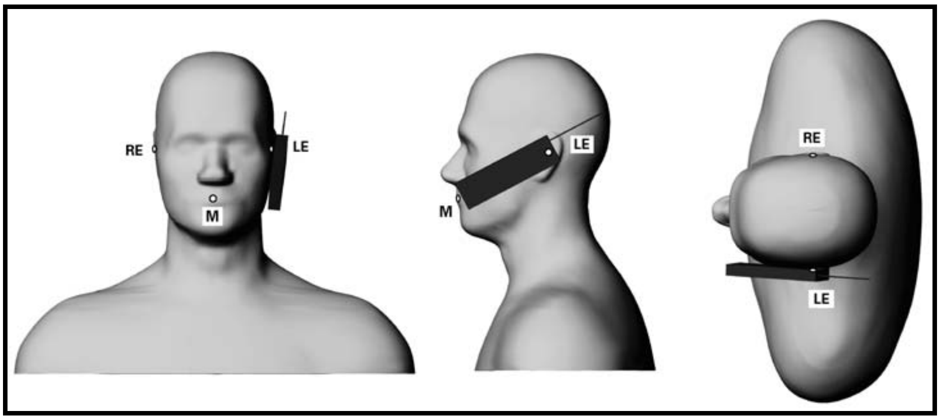

Figure 6.1 Front, Side and Top View of Cheek/Touch Position

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 Figure 5.2)

6.2 EAR/Tilt 15° Position

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

Step 1
Repeat steps 1 to 5 of 5.2 to place the device in the “Cheek/Touch Position”

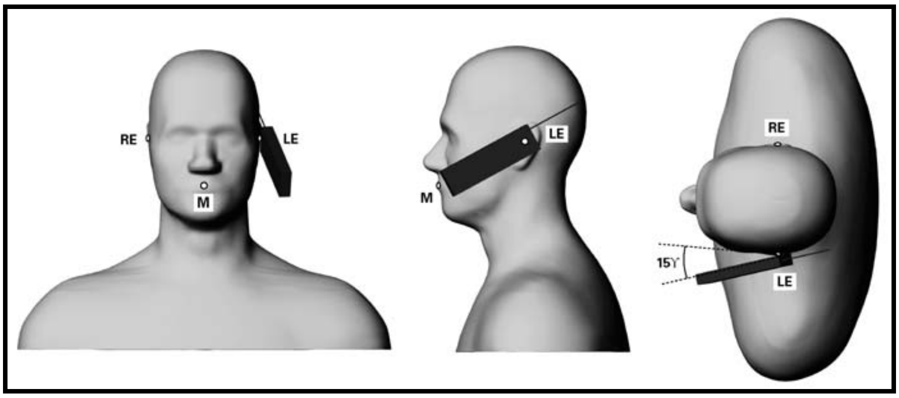

Figure 6.2 Front, side and Top View of Ear/Tilt 15° Position

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 Figure 6.2)

6.3 Body-worn and Other Configurations

6.3.1 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.

6.3.2 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.

6.3.3 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 2.5cm. 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.

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7. Measurement Uncertainty

DASY4 Uncertainty Budget
According to IEEE 1528 [1]

Error Description	Uncertainty value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
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 %	±0.6 %	∞
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 %	145
Device Holder	±3.6 %	N	1	1	1	±3.6 %	±3.6 %	5
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 %**	

DASY4 Uncertainty Budget
According to CENELEC EN 50361 [2]

Error Description	Uncertainty value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
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								
Scanning 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 Positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Device Positioning	±2.9%	N	1	1	1	±2.9,%	±2.9%	145
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 (target)	±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%	

8. System Verification

8.1 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.

Table 8.1 Measured Tissue Parameters

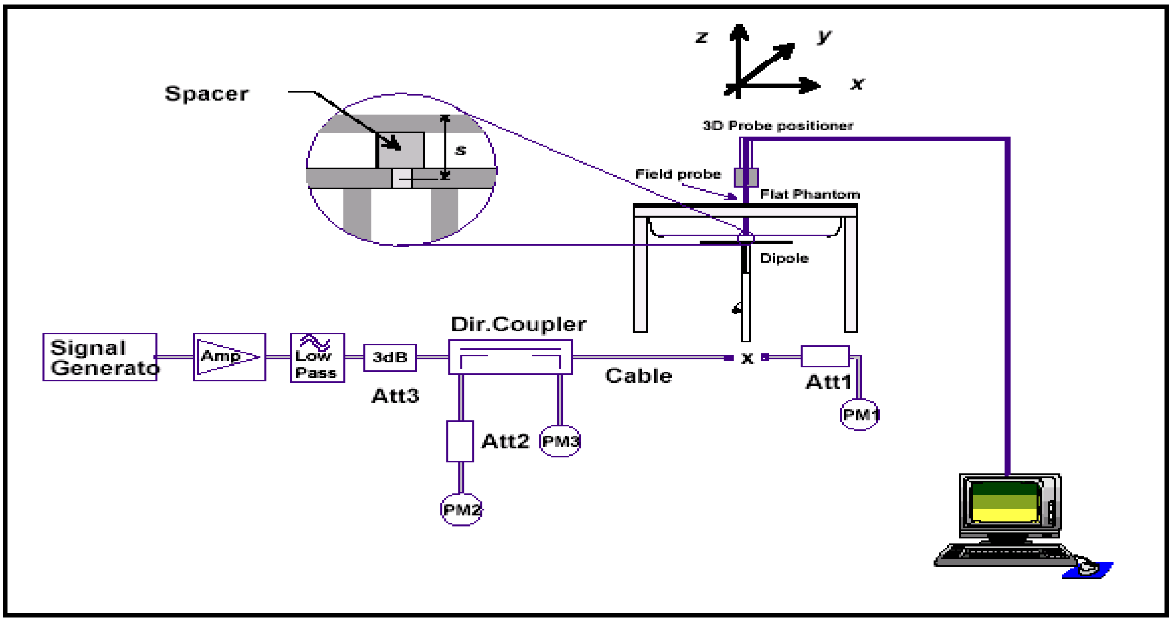
	2450MHz Muscle	
Date	July 02, 2006	
Liquid Temperature(°C)	21.2°C	
	Recommended Value	Measured Value
Dielectric Constant (ε)	52.7±2.635	**50.3**
Conductivity(σ)	1.95 ±0.0975	**1.97**

8.2 Test System Validation

The simplified performance check was realized using the dipole validation kits.
The input power of the dipole antennas were 250mW 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 8.2 System Validation Results

Tissue	Date		Targeted SAR (mW/g)	Measured SAR (mW/g)	Deviation (%)
2450MHz Muscle	July 03, 2006	SAR (1g)	13.1	**14.0**	**6.87**
		SAR (10g)	6.0	**6.53**	**8.83**



Dipole Validation Test Setup

8.3 Measurement Result of Test Data (2450MHz Validation)

Date/Time: 2006-07-03 1:52:58

Test Laboratory: Nemko Korea File Name: SmartCompact Validation.da4

DUT: Dipole 2450 MHz Type: D2450V2 Serial: D2450V2 - SN:774

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: CW Frequency: 2450 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 2450 MHz; σ = 1.97 mho/m; ε_r = 50.3; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

SmartCompact Validation/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 15.8 mW/g

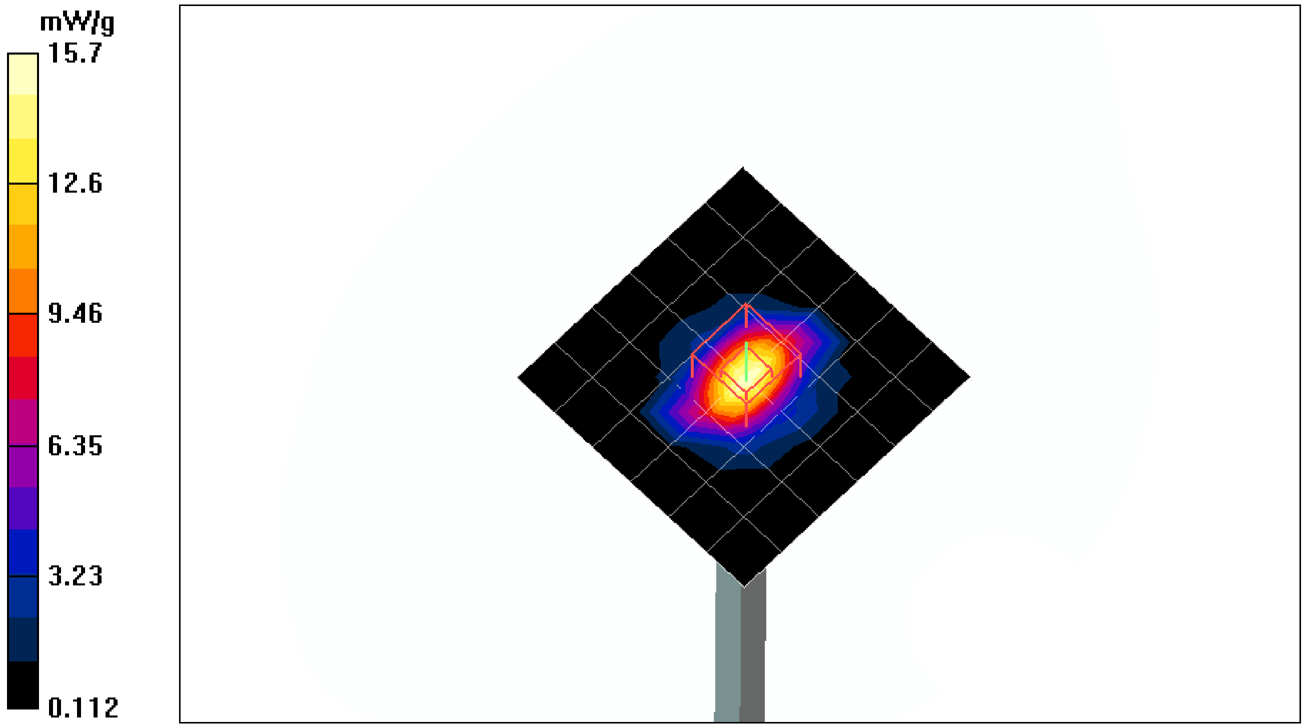
SmartCompact Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.0 V/m; Power Drift = 0.132 dB

Peak SAR (extrapolated) = 30.7 W/kg

SAR(1 g) = 14 mW/g; SAR(10 g) = 6.53 mW/g

Maximum value of SAR (measured) = 15.7 mW/g



9. 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
				1g	10g	1g	10g	
802.11b	6	2437	Top	1.6	2.0	0.434	0.183	Passed
802.11g	11	2462	Top (with bluetooth)	1.6	2.0	0.800	0.328	Passed

Conducted Measurement Output Power

Test Results

Mode	Channel	Frequency (MHz)	Output Power in (dBm)
802.11b	1	2412	13.3
	6	2437	13.8
	11	2462	14.6
802.11g	1	2412	11.5
	6	2437	11.9
	11	2462	12.7

Nemko

9.1 SAR Data Summary (802.11b)

Date of Test : July 04.2006
Mixture Type: 2450MHz Muscle
Tissue Depth: 15.2 Cm

Mode	Frequency		Power Drift (dB)	Antenna Position	SAR (W/kg)	
	CH	(MHz)			1g	10g
802.11b	6	2437	-0.005	TOP	0.434	0.183
	6	2437	-0.092	Bottom	0.025	0.013
	6	2437	0.011	Vertical	0.079	0.037
	1	2412	-0.210	Top	0.351	0.149
	11	2462	0.028	Top	0.402	0.167
	6	2437	-0.141	TOP with bluetooth	0.393	0.164

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 ■ DASY4
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: 2006-07-04 11:09:47

Test Laboratory: Nemko Korea File Name: b mode CH6(2437MHz)Top position.da4

DUT: SmartCompact Type: Industrial PDA Serial: SM00250909

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.95 mho/m; ε_r = 50.4; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

b mode CH6(2437MHz) Top Position/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.411 mW/g

b mode CH6(2437MHz) Top Position/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

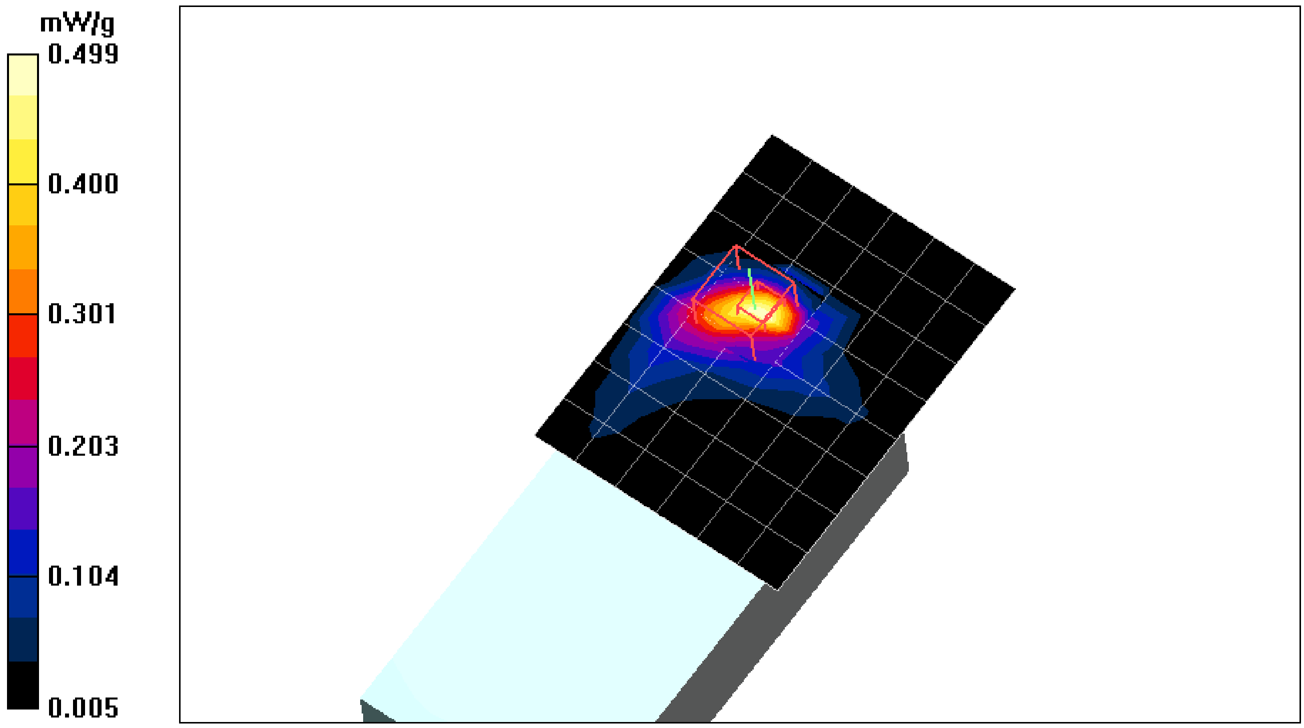
Reference Value = 9.17 V/m; Power Drift = -0.005 dB

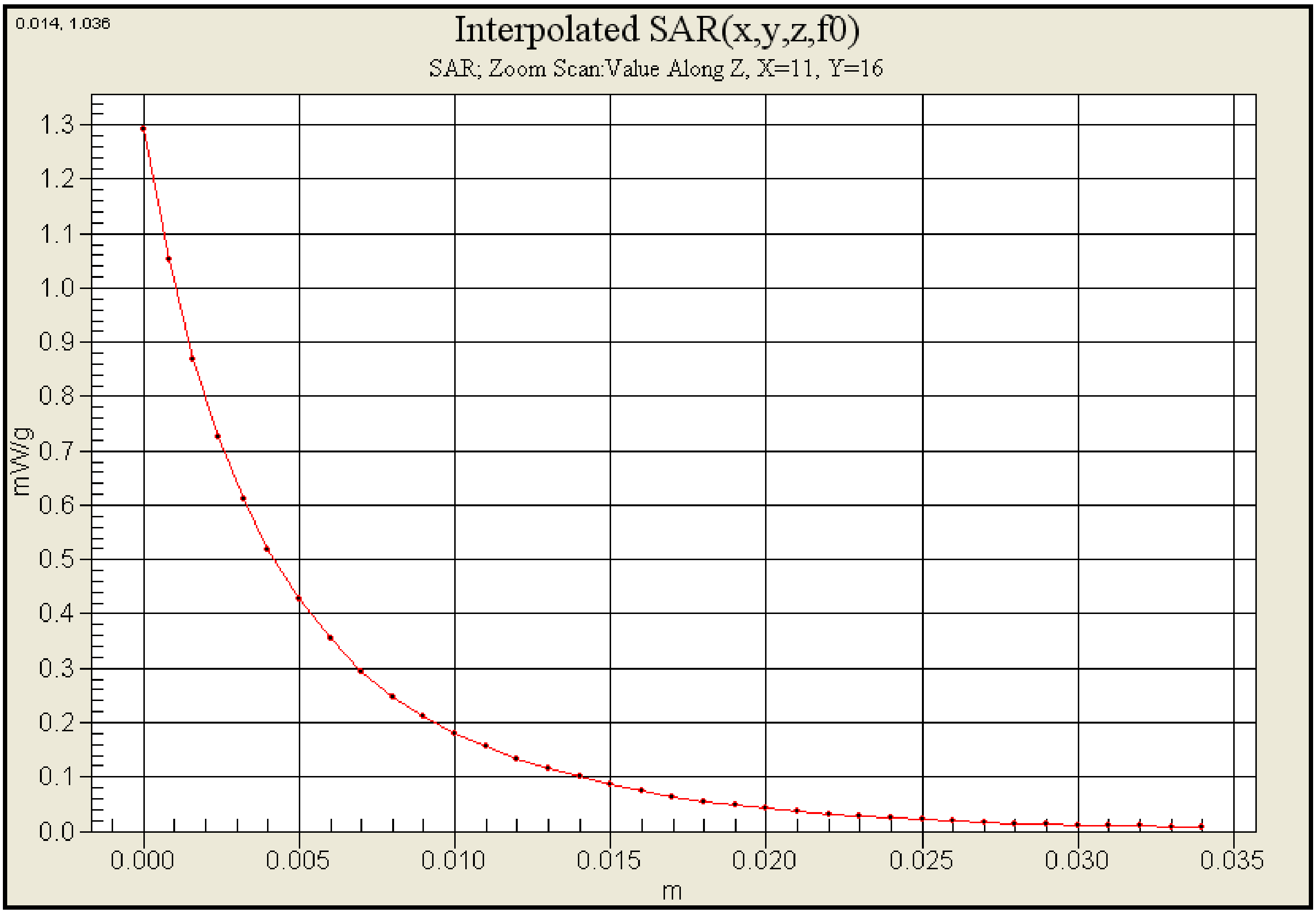
Peak SAR (extrapolated) = 1.29 W/kg

SAR(1 g) = 0.434 mW/g; SAR(10 g) = 0.183 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.499 mW/g




0.014, 1.036
Interpolated SAR(x,y,z,f0)
SAR; Zoom Scan:Value Along Z, X=11, Y=16
mW/g
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date/Time: 2006-07-04 11:31:55

Test Laboratory: Nemko Korea File Name: b mode CH6(2437MHz) Bottom position.da4

DUT: SmartCompact Type: Industrial PDA Serial: SM00250909

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.95 mho/m; ε_r = 50.4; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

b mode CH6(2437MHz) Bottom Position/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.025 mW/g

b mode CH6(2437MHz) Bottom Position/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

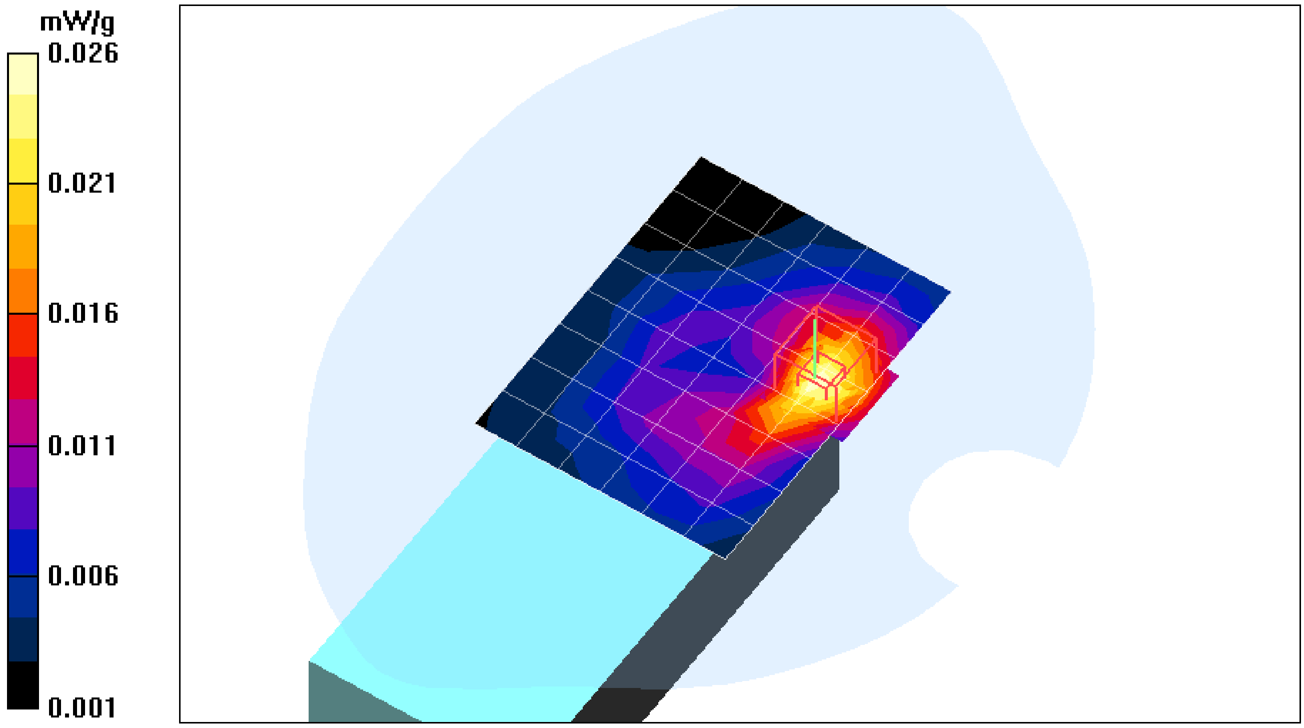
Reference Value = 1.89 V/m; Power Drift = -0.092 dB

Peak SAR (extrapolated) = 0.062 W/kg

SAR(1 g) = 0.025 mW/g; SAR(10 g) = 0.013 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.026 mW/g



Date/Time: 2006-07-04 1:30:33

Test Laboratory: Nemko Korea File Name: b mode CH6 (2437MHz) Vertical position.da4

DUT: SmartCompact Type: Industrial PDA Serial: SM00250909

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.95 mho/m; ε_r = 50.4; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

b mode CH6(2437MHz) Vertial Position/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.078 mW/g

b mode CH6(2437MHz) Vertial Position/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

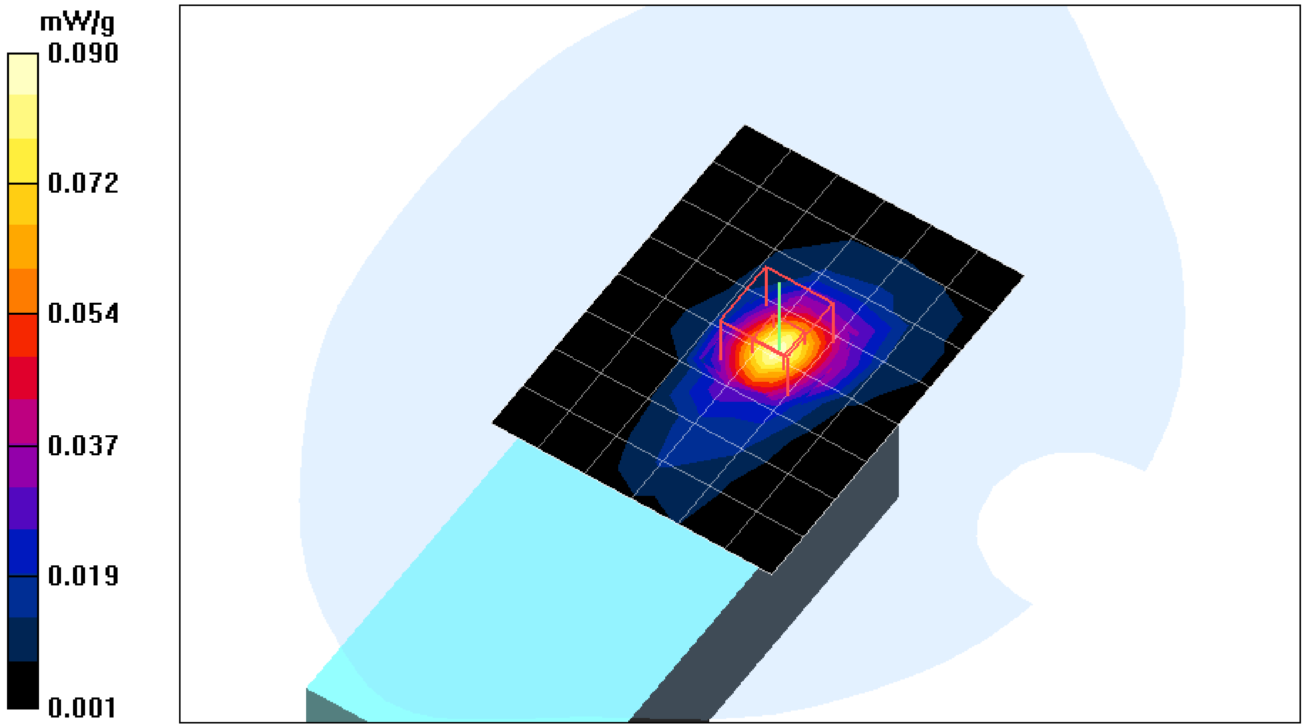
Reference Value = 6.59 V/m; Power Drift = 0.011 dB

Peak SAR (extrapolated) = 0.186 W/kg

SAR(1 g) = 0.079 mW/g; SAR(10 g) = 0.037 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.090 mW/g



Date/Time: 2006-07-04 1:58:38

Test Laboratory: Nemko Korea File Name: b mode CH1 (2412MHz) Top position.da4

DUT: SmartCompact Type: Industrial PDA Serial: SM00250909

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: Wireless LAN Frequency: 2412 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 2412 MHz; σ = 1.92 mho/m; ε_r = 50.6; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

b mode CH1(2412MHz) Top Position/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.298 mW/g

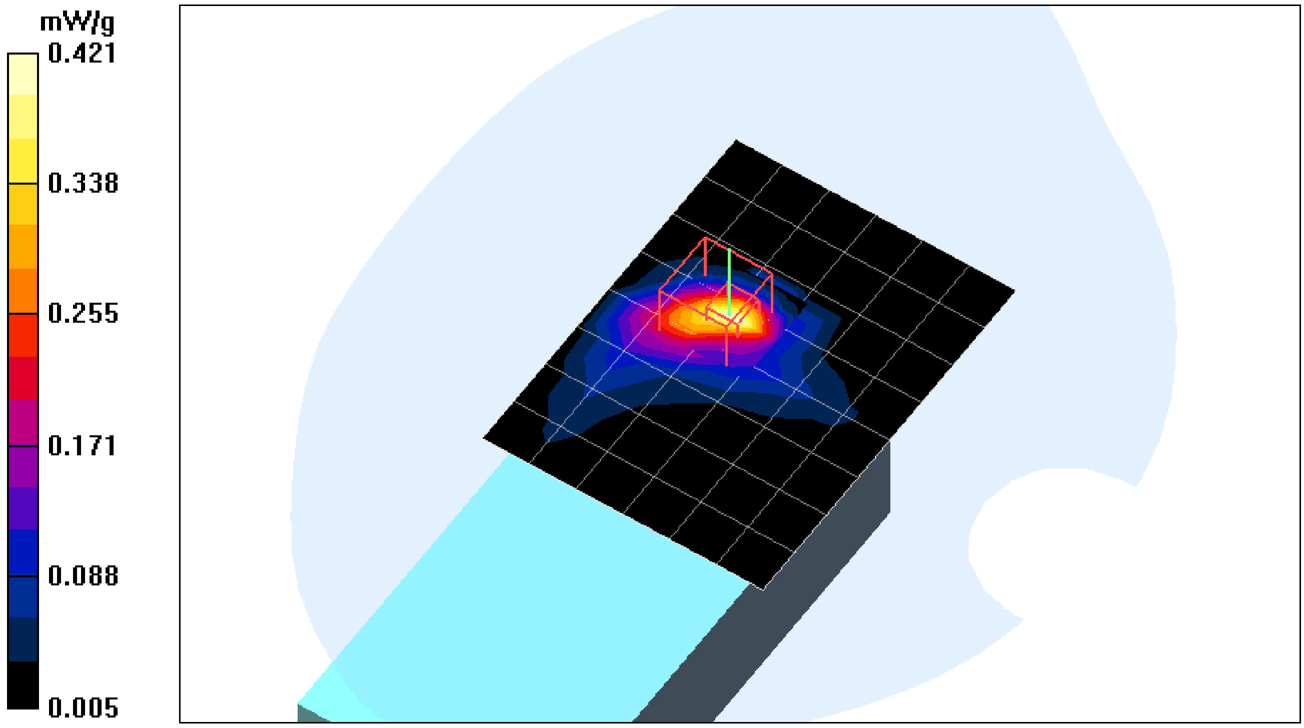
b mode CH1(2412MHz) Top Position/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.67 V/m; Power Drift = -0.210 dB

Peak SAR (extrapolated) = 1.02 W/kg

SAR(1 g) = 0.351 mW/g; SAR(10 g) = 0.149 mW/g

Maximum value of SAR (measured) = 0.421 mW/g



Date/Time: 2006-07-04 3:23:30

Test Laboratory: Nemko Korea File Name: b mode CH11 (2462MHz) Top position.da4

DUT: SmartCompact Type: Industrial PDA Serial: SM00250909

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: Wireless LAN Frequency: 2462 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 2462 MHz; σ = 1.99 mho/m; ε_r = 50.3; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

b mode CH11(2462MHz) Top Position/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.463 mW/g

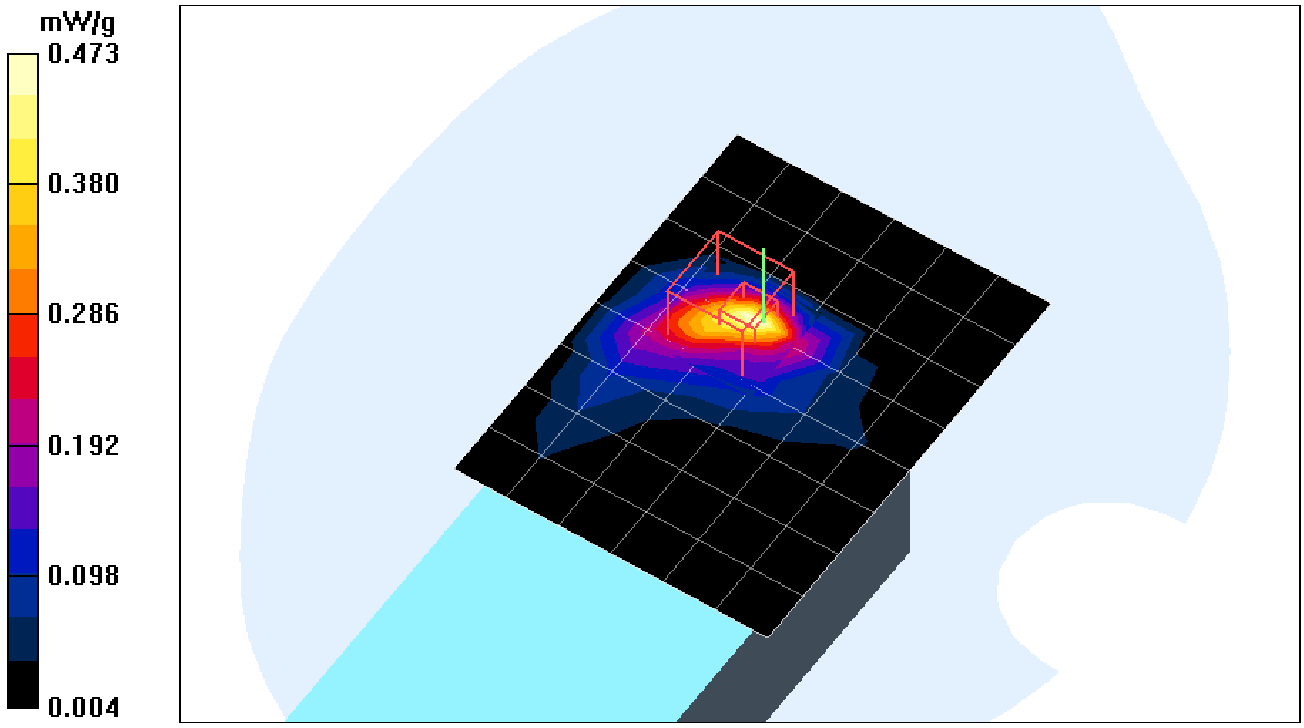
b mode CH11(2462MHz) Top Position/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.32 V/m; Power Drift = 0.028 dB

Peak SAR (extrapolated) = 1.22 W/kg

SAR(1 g) = 0.402 mW/g; SAR(10 g) = 0.167 mW/g

Maximum value of SAR (measured) = 0.473 mW/g



Date/Time: 2006-07-04 4:30:04

Test Laboratory: Nemko Korea File Name: b mode CH6 (2437MHz) Top position with bluetooth.da4

DUT: SmartCompact Type: Industrial PDA Serial: SM00250909

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.95 mho/m; ε_r = 50.4; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

b mode CH6(2437MHz) Top Position with bluetooth/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.315 mW/g

b mode CH6(2437MHz) Top Position with bluetooth/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

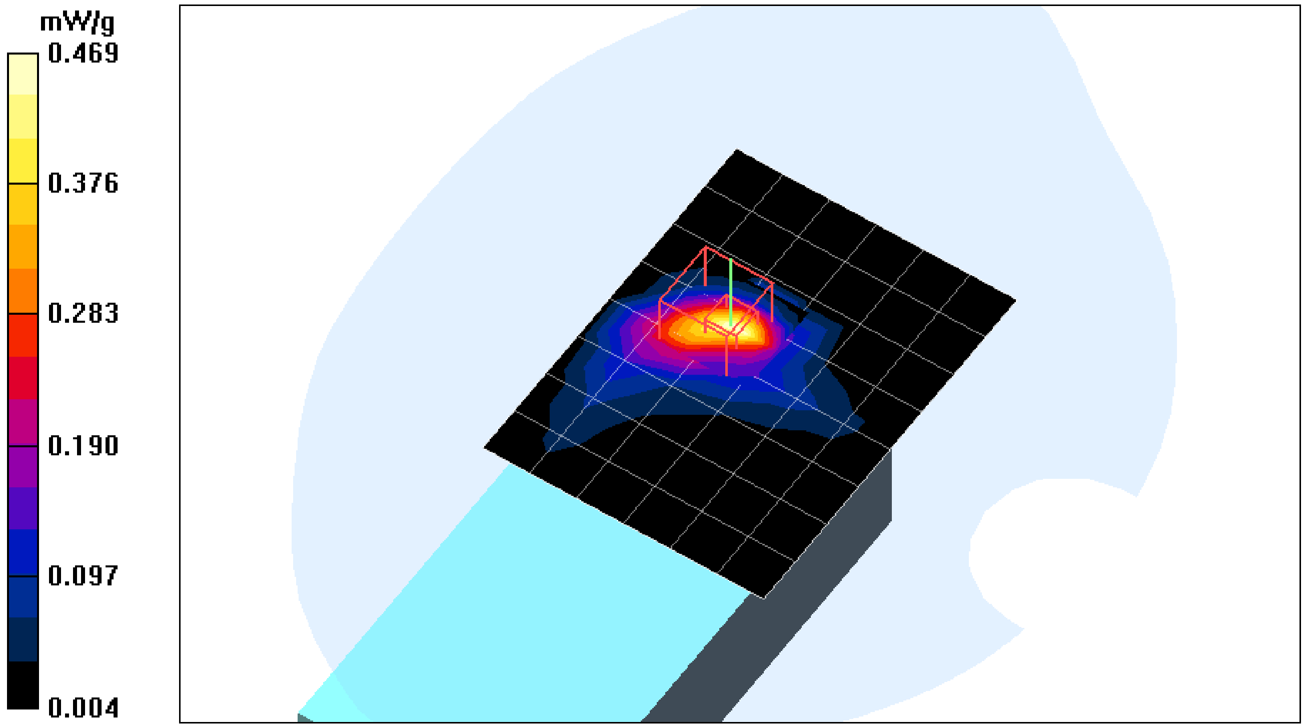
Reference Value = 9.16 V/m; Power Drift = -0.141 dB

Peak SAR (extrapolated) = 1.18 W/kg

SAR(1 g) = 0.393 mW/g; SAR(10 g) = 0.164 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.469 mW/g



9.2 SAR Data Summary (802.11g)

Date of Test : July 04.2006
Mixture Type: 2450MHz Muscle
Tissue Depth: 15.2 Cm

Mode	Frequency		Power Drift (dB)	Antenna Position	SAR (W/kg)	
	CH	(MHz)			1g	10g
802.11g	6	2437	0.182	TOP	0.672	0.278
	6	2437	-0.057	Bottom	0.033	0.018
	6	2437	0.077	Vertical	0.119	0.055
	1	2412	-0.060	Top	0.525	0.220
	11	2462	-0.081	Top	0.794	0.330
	6	2437	0.031	TOP with bluetooth	0.800	0.328

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 ■ DASY4
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: 2006-07-04 5:00:31

Test Laboratory: Nemko Korea File Name: g mode CH6 (2437MHz) Top position.da4

DUT: SmartCompact Type: Industrial PDA Serial: SM00250909

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.95 mho/m; ε_r = 50.4; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

g mode CH6(2437MHz) Top Position/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.796 mW/g

g mode CH6(2437MHz) Top Position/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

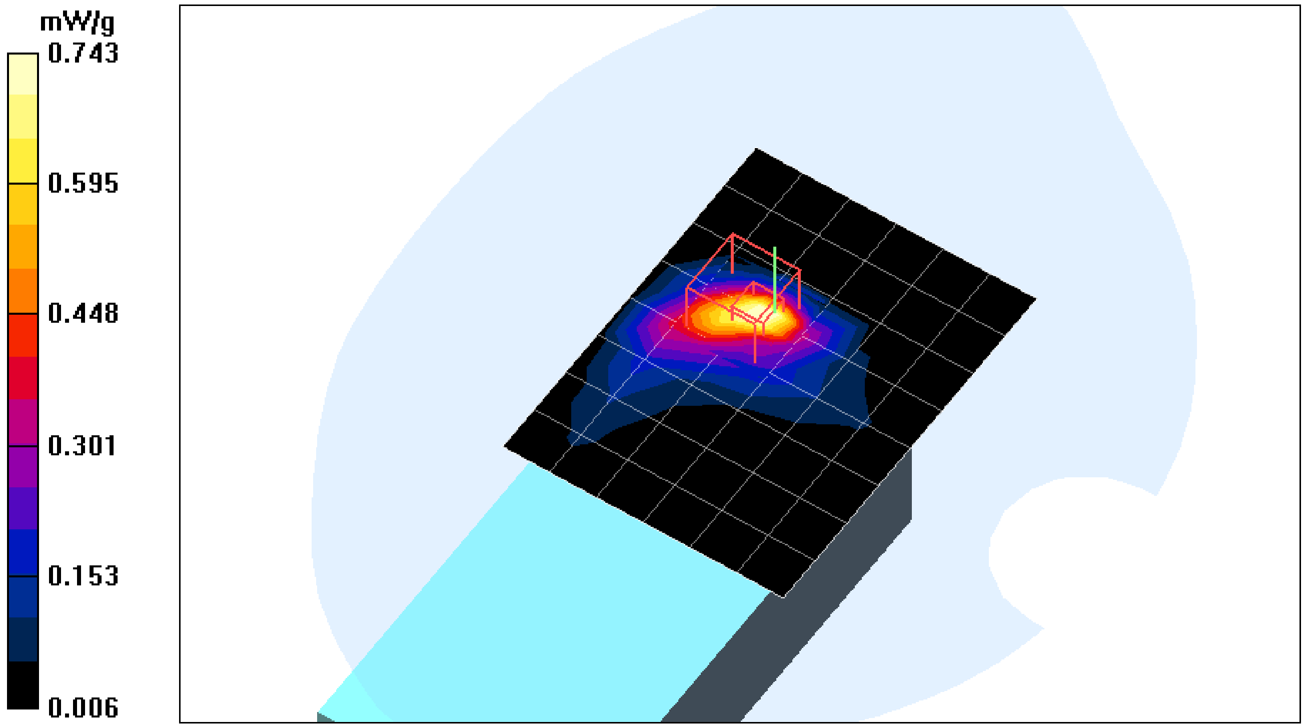
Reference Value = 11.0 V/m; Power Drift = 0.182 dB

Peak SAR (extrapolated) = 2.02 W/kg

SAR(1 g) = 0.672 mW/g; SAR(10 g) = 0.278 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.743 mW/g



Date/Time: 2006-07-04 5:32:06

Test Laboratory: Nemko Korea File Name: g mode CH6 (2437MHz) Bottom position.da4

DUT: SmartCompact Type: Industrial PDA Serial: SM00250909

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.95 mho/m; ε_r = 50.4; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

g mode CH6(2437MHz) Bottom Position/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.036 mW/g

g mode CH6(2437MHz) Bottom Position/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

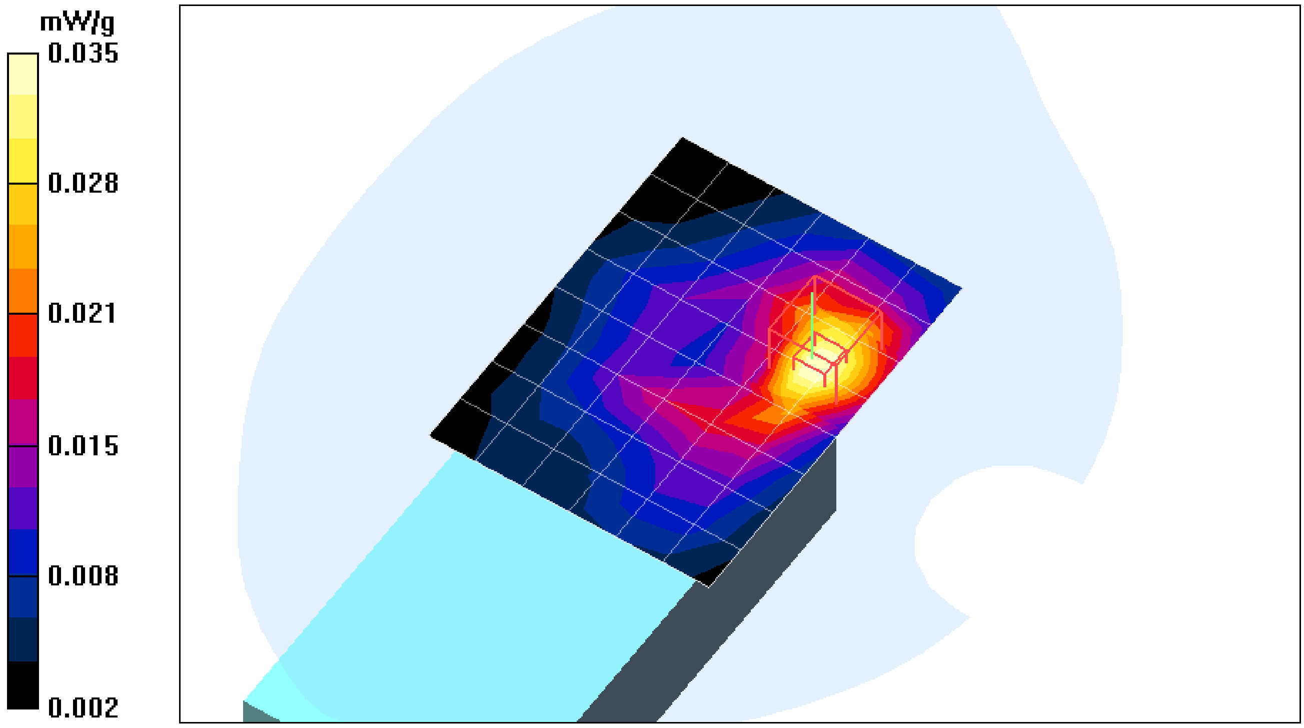
Reference Value = 2.38 V/m; Power Drift = -0.057 dB

Peak SAR (extrapolated) = 0.079 W/kg

SAR(1 g) = 0.033 mW/g; SAR(10 g) = 0.018 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.035 mW/g



Date/Time: 2006-07-04 5:56:07

Test Laboratory: Nemko Korea File Name: g mode CH6 (2437MHz) Vertical position.da4

DUT: SmartCompact Type: Industrial PDA Serial: SM00250909

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: Wireless LAN Frequency: 2437 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.95 mho/m; ε_r = 50.4; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

g mode CH6(2437MHz) Vertical Position/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.100 mW/g

g mode CH6(2437MHz) Vertical Position/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

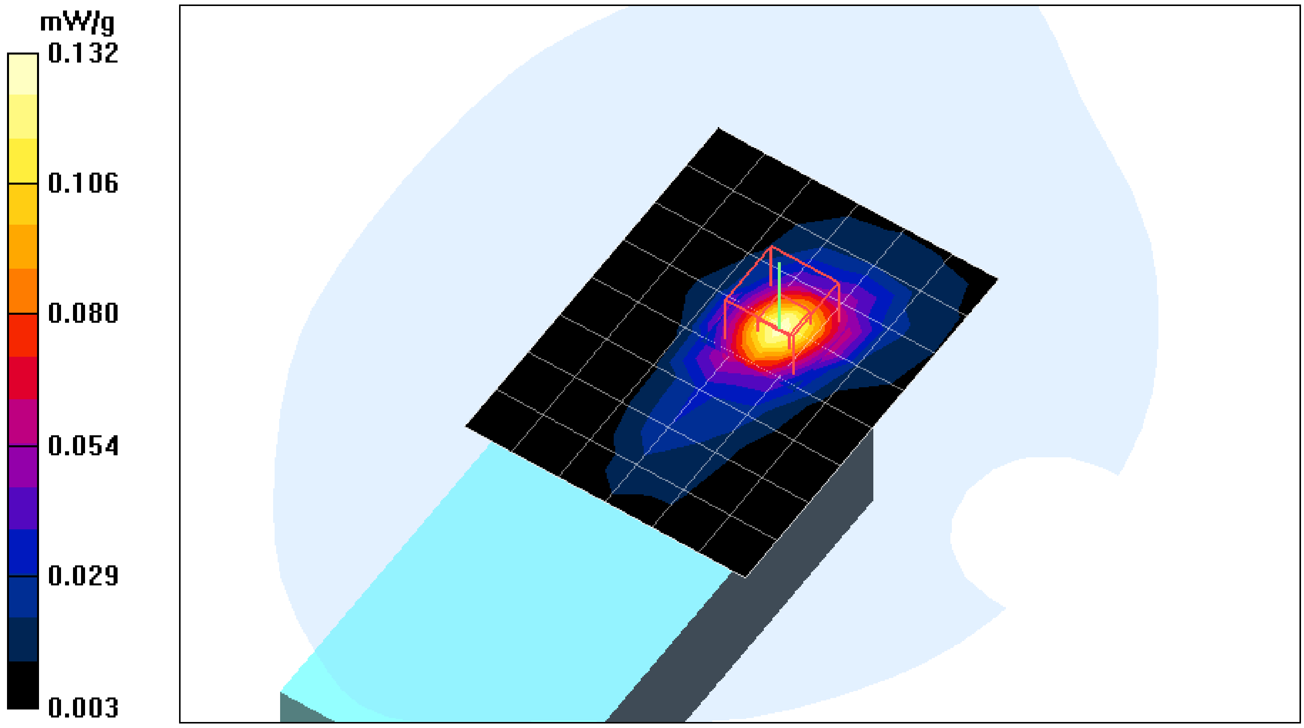
Reference Value = 5.84 V/m; Power Drift = 0.077 dB

Peak SAR (extrapolated) = 0.279 W/kg

SAR(1 g) = 0.119 mW/g; SAR(10 g) = 0.055 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.132 mW/g



Date/Time: 2006-07-04 6:25:25

Test Laboratory: Nemko Korea File Name: g mode CH1 (2412MHz) Top position.da4

DUT: SmartCompact Type: Industrial PDA Serial: SM00250909

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: Wireless LAN Frequency: 2412 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 2412 MHz; σ = 1.92 mho/m; ε_r = 50.6; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

g mode CH1(2412MHz) Topl Position/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.611 mW/g

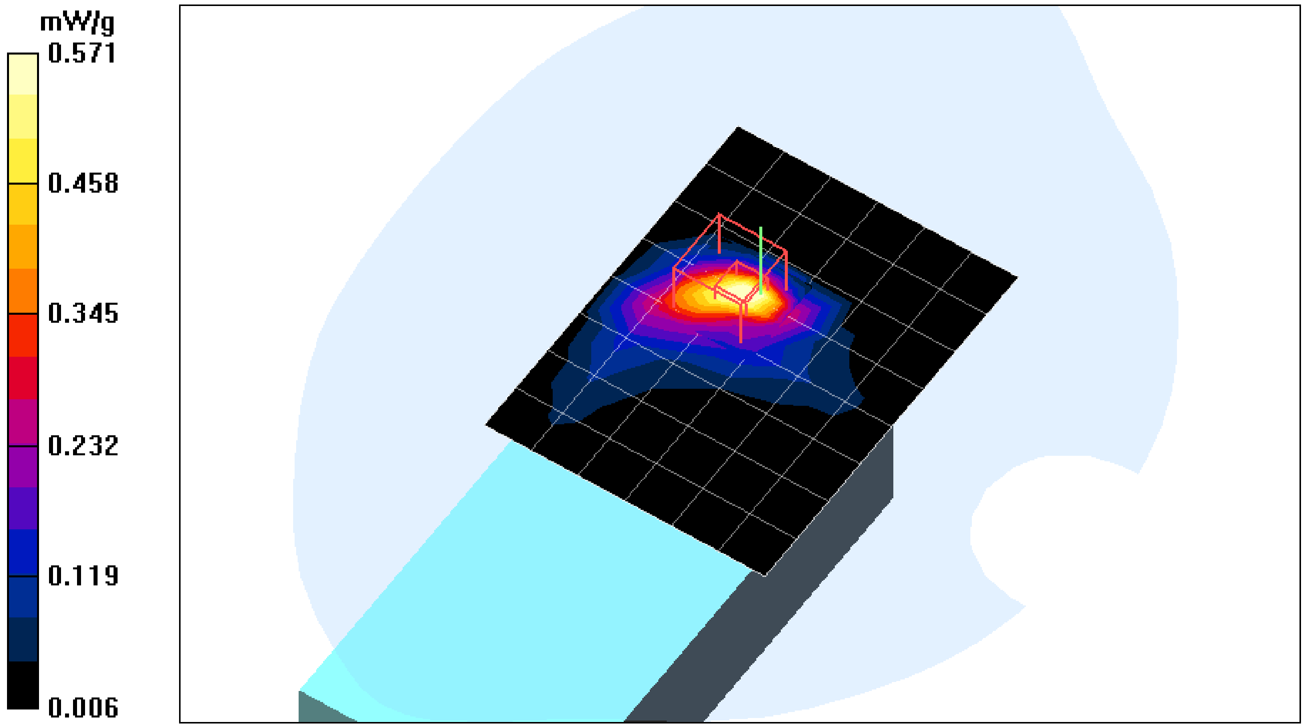
g mode CH1(2412MHz) Topl Position/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.1 V/m; Power Drift = -0.060 dB

Peak SAR (extrapolated) = 1.54 W/kg

SAR(1 g) = 0.525 mW/g; SAR(10 g) = 0.220 mW/g

Maximum value of SAR (measured) = 0.571 mW/g



Date/Time: 2006-07-04 6:48:56

Test Laboratory: Nemko Korea File Name: g mode CH11 (2462MHz) Top position.da4

DUT: SmartCompact Type: Industrial PDA Serial: SM00250909

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: Wireless LAN Frequency: 2462 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 2462 MHz; σ = 1.99 mho/m; ε_r = 50.3; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

g mode CH11(2462MHz) Topl Position/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.864 mW/g

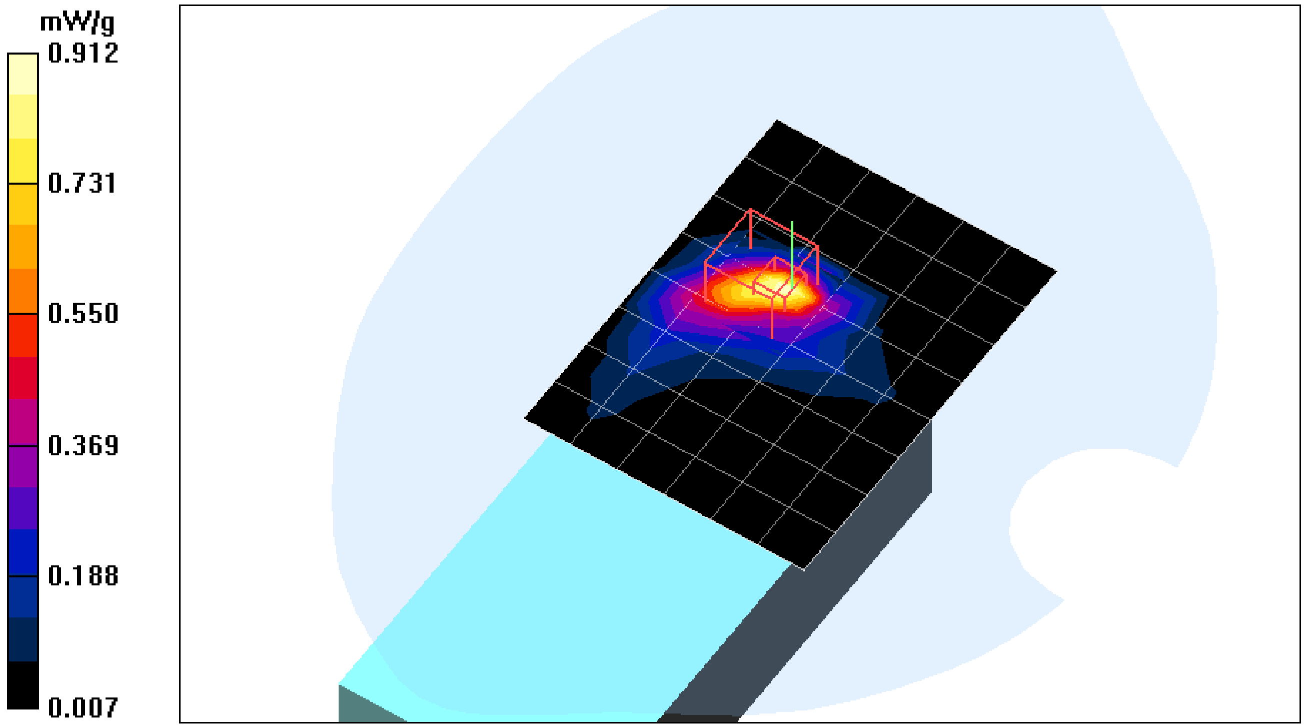
g mode CH11(2462MHz) Topl Position/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.9 V/m; Power Drift = -0.081 dB

Peak SAR (extrapolated) = 2.38 W/kg

SAR(1 g) = 0.794 mW/g; SAR(10 g) = 0.330 mW/g

Maximum value of SAR (measured) = 0.912 mW/g



Date/Time: 2006-07-04 8:18:51

Test Laboratory: Nemko Korea File Name: g mode CH11 (2462MHz) Top position with bluetooth.da4

DUT: SmartCompact Type: Industrial PDA Serial: SM00250909

Applicant Name: SAMMI information systems Co.,Ltd

Communication System: Wireless LAN Frequency: 2462 MHz

Duty Cycle: 1:1 Phantom section: Flat Section

Medium parameters used: f = 2462 MHz; σ = 1.99 mho/m; ε_r = 50.3; ρ = 1000 kg/m^3

DASY4 Configuration:

Probe: ET3DV6 - SN1591; ConvF(4.18, 4.18, 4.18); Calibrated: 2006-03-23

Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

Electronics: DAE4 Sn672; Calibrated: 2006-03-17

Phantom: SAM Phantom; Type: SAM; Serial: TP-1358

Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

g mode CH11(2462MHz) Topl Position with bluetooth/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.867 mW/g

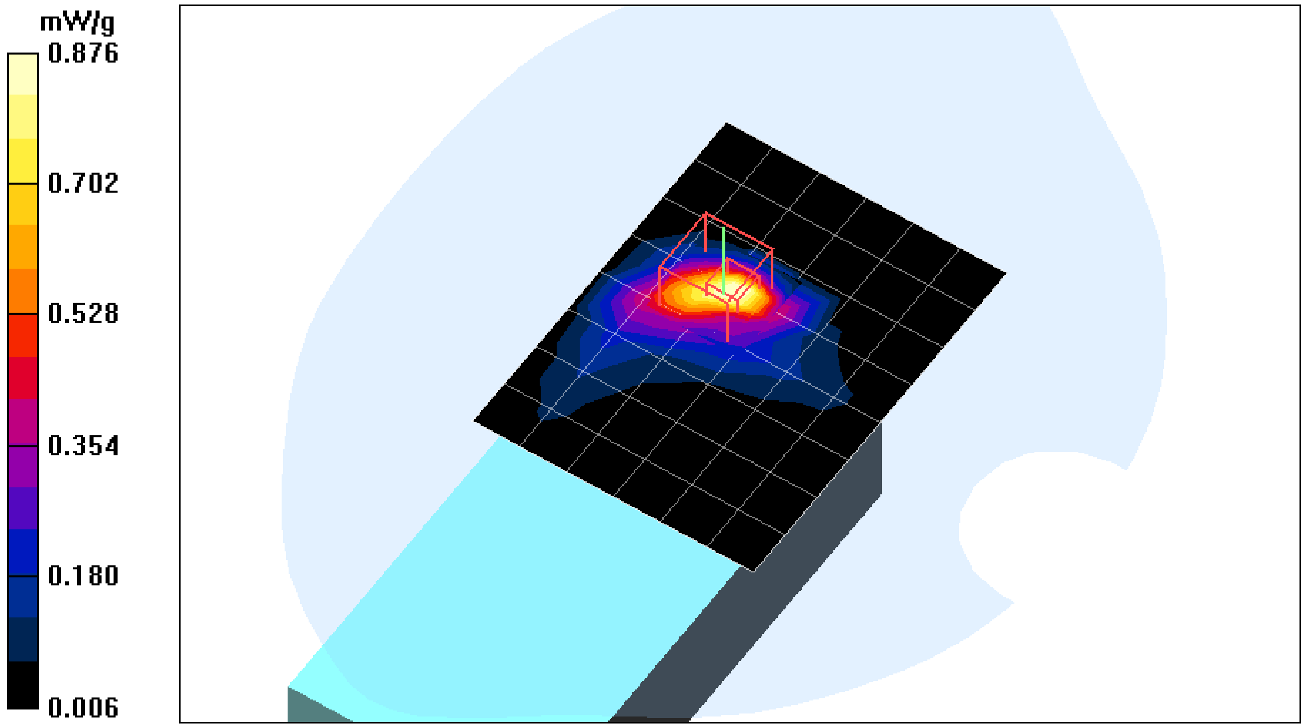
g mode CH11(2462MHz) Topl Position with bluetooth/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

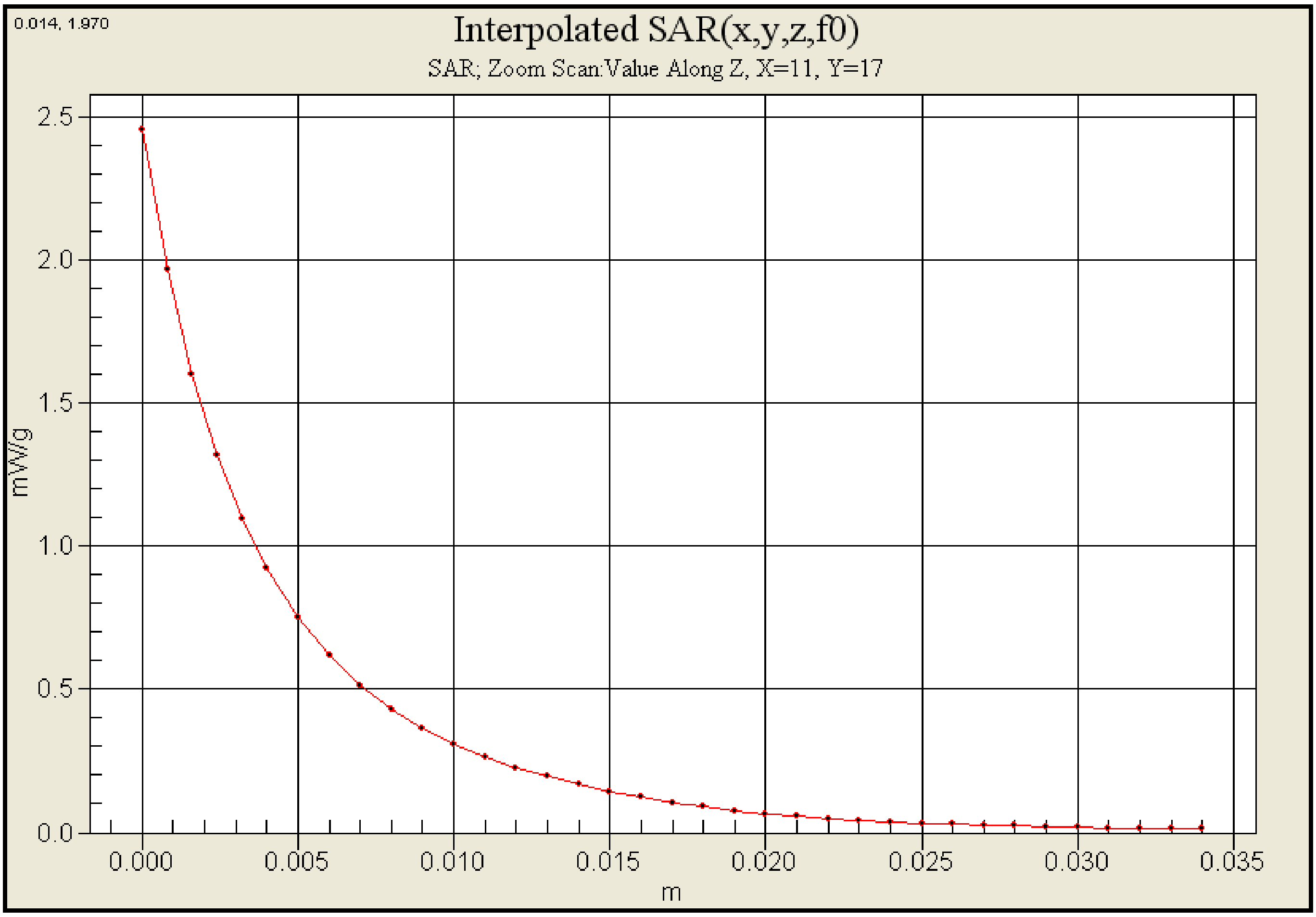
Reference Value = 11.7 V/m; Power Drift = 0.031 dB

Peak SAR (extrapolated) = 2.46 W/kg

SAR(1 g) = 0.800 mW/g; SAR(10 g) = 0.328 mW/g

Maximum value of SAR (measured) = 0.876 mW/g




0.014, 1.970
Interpolated SAR(x,y,z,f0)
SAR; Zoom Scan:Value Along Z, X=11, Y=17
mW/g
2.5
2.0
1.5
1.0
0.5
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

10. SAR Test Equipment

Table 10.1 Test Equipment Calibration

Description	Model	Serial No.	Due to Calibration
Staubli Robot Unit	RX60L	F05/51E1A1/A/01	N/A
Data Acquisition Electronics	DAE4	672	March.17. 2007
E-Field Probe	ET3DV6	1591	March.23. 2007
Electro-Optical Converter	EOC3	398	N/A
SAM Twin Phantom V4.0C	TP-1358	SM 00 T02 DA	N/A
Validation Dipole Antenna	D835V2	4d017	February.20. 2007
Validation Dipole Antenna	D900V2	1d016	April.05. 2007
Validation Dipole Antenna	D1800V2	2d111	February.17. 2007
Validation Dipole Antenna	D1900V2	5d059	April.11. 2007
PSA Series Spectrum Analyzer	E4440A	MY44022567	December.31.2006
Dielectric Probe Kit	85070E	MY44300121	N/A
Network Analyzer	8753ES	US39171172	Mar.10. 2007
Power Amplifier	NKRFSPA	NK00SP18	May.11. 2007
Power Meter	437B	2912U01687	December.06.2006
Power Sensor	8481A	3318A83210	August.17.2006
Power Meter	NRVS	835360/002	December.06.2006
Power Sensor	NRV-Z32	836019/028	December.06.2006
Series Signal Generator	E4436B	US39260598	December.06.2006

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.

11. 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 (200MHz – 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

APPENDIX A

SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy (*dU*) absorbed by (dissipated in) an incremental mass (*dm*) contained in a volume element (*dV*) of a given density (*p*). It is also defined as the rate of RF energy absorption pet unit mass at a point in an absorbing body (see Fig. A.1).

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{pdv}\right)$$

Figure A.1 SAR Mathematical Equation

SAR is expressed in units of Watts per Kilogram (W/kg).

$SAR = \sigma E^2 / p$

Where :

σ = conductivity of the tissue-simulant material (S/m)
p = mass density of the tissue-simulant material (kg/m3)
E = Total RMS electric field strength (V/m)

Note:
The primary factors that control rate or energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.

Nemko

APPENDIX B : Probe Calibration

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 **Dymstec**

Certificate No: **ET3-1591_Mar06**

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1591
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes
Calibration date:	March 23, 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	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41495277	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41498087	3-May-05 (METAS, No. 251-00466)	May-06
Reference 3 dB Attenuator	SN: S5054 (3c)	11-Aug-05 (METAS, No. 251-00499)	Aug-06
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
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: March 23, 2006

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

Certificate No: ET3-1591_Mar06 Page 1 of 9

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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**

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:1591

Manufactured:	May 18, 2001
Last calibrated:	July 22, 2004
Recalibrated:	March 23, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1591 March 23, 2006

DASY - Parameters of Probe: ET3DV6 SN:1591

Sensitivity in Free Space[A]

NormX	**1.88** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**95** mV
NormY	**1.84** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**95** mV
NormZ	**1.83** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**95** mV

Diode Compression[B]

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	7.6	4.2
SAR_{be} [%]	With Correction Algorithm	0.1	0.2

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	6.4	3.5
SAR_{be} [%]	With Correction Algorithm	0.2	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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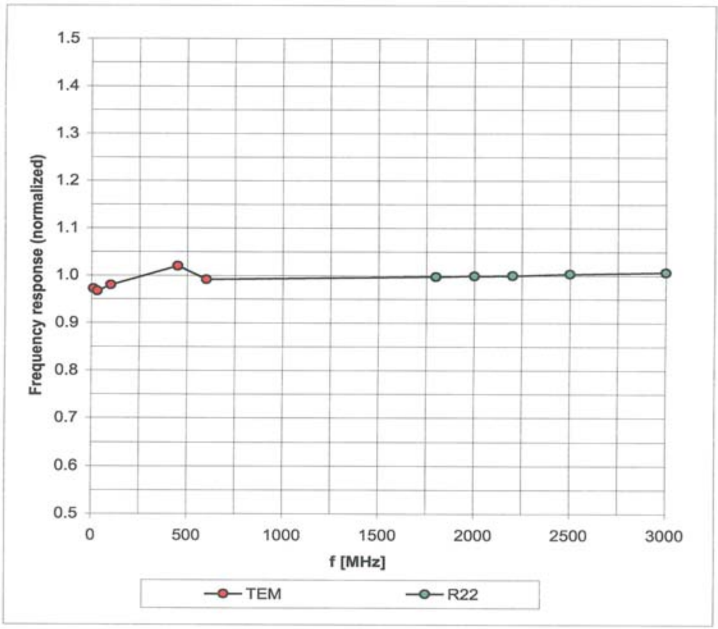
ET3DV6 SN:1591 March 23, 2006

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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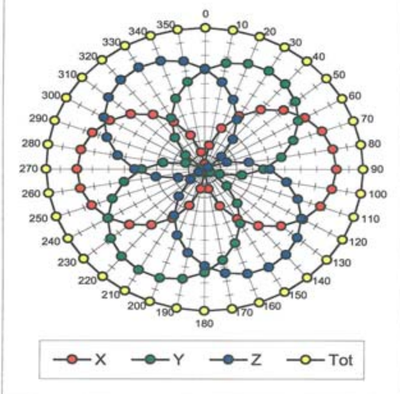
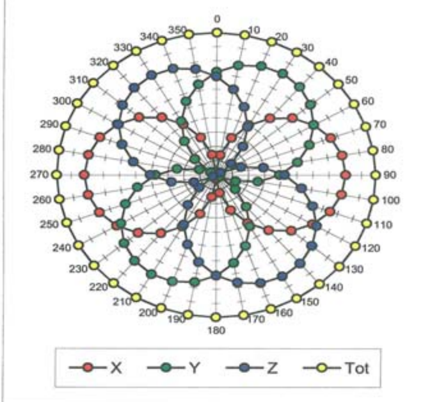
ET3DV6 SN:1591 March 23, 2006

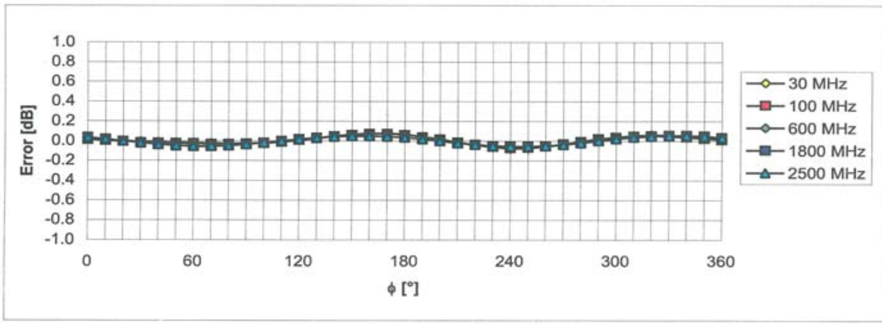
Receiving Pattern (ϕ), ϑ = 0°

f = 600 MHz, TEM ifi110EXX



f = 1800 MHz, WG R22





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

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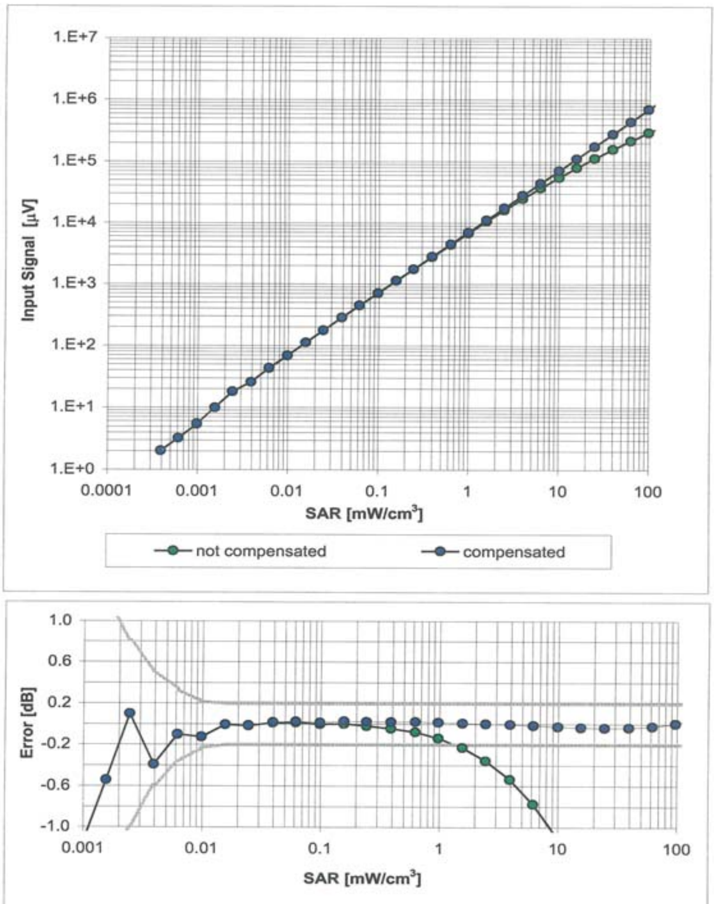
ET3DV6 SN:1591 March 23, 2006

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)



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

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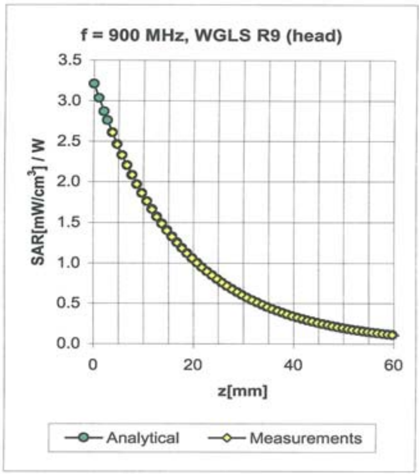
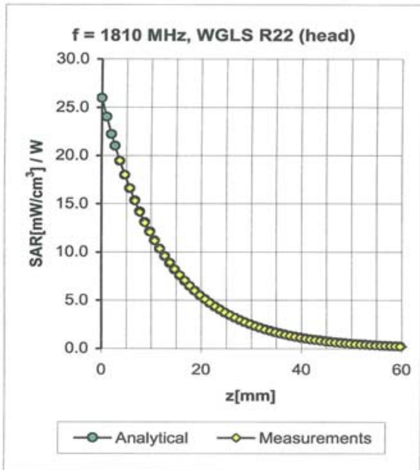
Conversion Factor Assessment





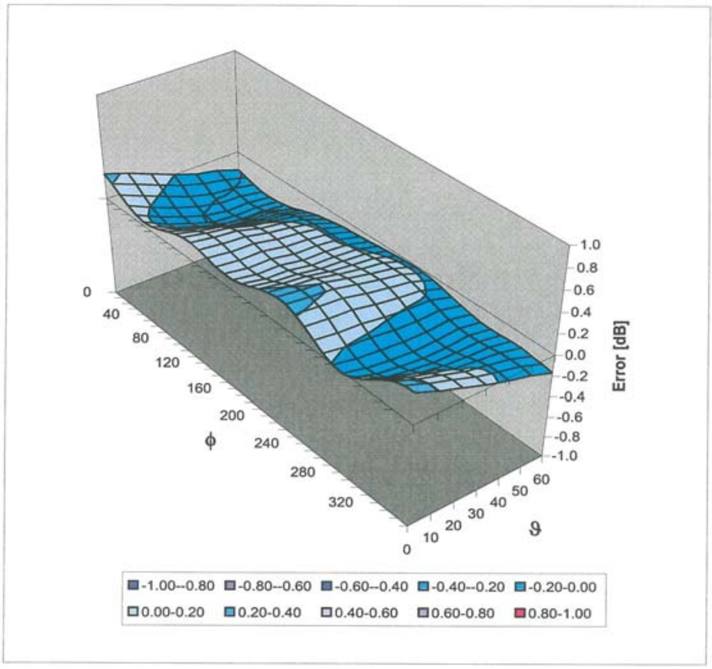
f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.49	1.91	6.87	± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.43	2.66	5.41	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.58	2.15	4.59	± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.40	2.24	6.35	± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.63	2.34	4.67	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.62	2.03	4.18	± 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.

ET3DV6 SN:1591 March 23, 2006

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Certificate No: ET3-1591_Mar06 Page 9 of 9

APPENDIX C : Photographs of EUT

Front View Of EUT

Rear View Of EUT

Top View Of EUT

Base View Of EUT

Side View Of EUT

Side View Of EUT

APPENDIX D : Test Position of EUT

Top Position

Bottom Position

Vertical Position