ENGINEERING TEST REPORT

UHF P25 TRUNKING HANDHELD TRANSCEIVER
Model No.: IC-F9021T

Tested For

ICOM Incorporated
1-1-32, Kamiminami, Hirano-ku
Osaka,
Japan, 547-0003

In Accordance With

SAR (Specific Absorption Rate) Requirements using guidelines established in IEEE C95.1-1992, FCC OET Bulletin 65 (Supplement C) and Industry Canada RSS-102(Issue 2)

UltraTech's File No.: ICOM-191-SAR

This Test report is Issued under the Authority of
Tri M. Luu, Professional Engineer,
Vice President of Engineering
UltraTech Group of Labs

Date: January 22, 2009

Report Prepared by: JaeWook Choi Issued Date: January 22, 2009	Tested by: Steven Lu Test Dates: December 22 & 23, 2008

The results in this Test Report apply only to the sample(s) tested, which has been randomly selected.

UltraTech

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	SAR (Specific Absorption Rate) Requirements IEEE C95.1-1992, FCC OET Bulletin 65 (Supplement C Edition 01-01) Industry Canada RSS-102 (Issue 2).
Title	Safety Levels with respect to human exposure to Radio Frequency Electromagnetic Fields Guideline for Evaluating the Environmental Effects of Radio Frequency Radiation
Purpose of Test:	To verify compliance with Federal regulated SAR requirements in Canada and the US.
Method of Measurements:	IEEE C95.1-1992, FCC OET Bulletin 65 (Supplement C Edition 01-01) and Industry Canada RSS-102 (Issue 2)
Device Category	Portable
Exposure Category	Occupational/Controlled

1.2. REFERENCES

The methods and procedures used for the measurements contained in this report are details in the following reference standards:

Publications	Year	Title
IEEE Std. 1528	2003	Draft Recommended practice for determining the Peak Spatial-Average Specific Absorption rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.
Industry Canada RSS102	2005	"Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields"
NCRP Report No.86	1986	"Biological Effects and Exposure Criteria for radio Frequency Electromagnetic Fields"
FCC OET Bulletin 65	2001	"Evaluating Compliance with FCC Guidelines for Human Exposure to radio Frequency Fields"
ANSI/IEEE C95.3	2002	"Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave"
ANSI/IEEE C95.1	2005	"Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300GHz"

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT AND MANUFACTURER INFORMATION

APPLICANT:	
Name:	ICOM Incorporated
Address:	1-1-32, Kamiminami, Hirano-ku, Osaka Japan, 547-0003
Contact Person:	Mr. Yoshiteru Yano Phone #: +81-66-793-5302 Fax #: +81-66-793-0013 Email Address: export@icom.co.jp

MANUFACTURER:	
Name:	ICOM Incorporated
Address:	1-1-32, Kamiminami, Hirano-ku, Osaka Japan, 547-0003
Contact Person:	Mr. Yoshiteru Yano Phone #: +81-66-793-5302 Fax #: +81-66-793-0013 Email Address: export@icom.co.jp

2.2. DEVICE UNDER TEST (D.U.T.) DESCRIPTION

The following is the information provided by the applicant.

Trade Name	ICOM Inc.
Type/Model Number	IC-F9021T
Type of Equipment	Licensed Non-Broadcast Transceiver Held to Face
Serial Number	1000002
Frequency of Operation	400~470 MHz
Rated RF Power	5 W conducted (High) 1 W conducted (Low) **Remark: Only low power mode is offered when used with BP-237 optional battery case.**
Modulation Employed	FM
Antenna	#1: ¼ Helical whip antenna (M/N: FA-S58U, 430-470 MHz, -3.0 dBi, red ring) #2: ¼ Helical whip antenna (M/N: FA-S30U, 380-430 Mhz, -2.6 dBi, green ring)
Power Supply	Rechargeable Li-Ion battery pack (M/N: BP-254, 7.4 V, 3040 mAh)
Primary User Functions of D.U.T.	UHF P25 Trunking Handheld Transceiver

2.3. LIST OF D.U.T.'S ACCESSORIES:

Belt-clip(M/N: MB-115), Speaker-microphone (M/N: HM-184)

2.4. SPECIAL CHANGES ON THE D.U.T.'S HARDWARE/SOFTWARE FOR TESTING PURPOSES

N/A

2.5. ANCILLARY EQUIPMENT

N/A

2.6. GENERAL TEST CONFIGURATIONS

2.6.1. Equipment Configuration

Power and signal distribution, grounding, interconnecting cabling and physical placement of equipment of a test system shall simulate the typical application and usage in so far as is practicable, and shall be in accordance with the relevant product specifications of the manufacturer.

The configuration that tends to maximize the D.U.T's emission or minimize its immunity is not usually intuitively obvious and in most instances selection will involve some trial and error testing. For example, interface cables may be moved or equipment re-orientated during initial stages of testing and the effects on the results observed.

Only configurations within the range of positions likely to occur in normal use need to be considered.

The configuration selected shall be fully detailed and documented in the test report, together with the justification for selecting that particular configuration.

2.6.2. Exercising Equipment

The exercising equipment and other auxiliary equipment shall be sufficiently decoupled from the D.U.T. so that the performance of such equipment does not significantly influence the test results.

2.7. SPECIFIC OPERATING CONDITIONS

N/A

2.8. BLOCK DIAGRAM OF TEST SETUP

The D.U.T. was configured as normal intended use. The following block diagram shows a representative equipment arrangement during tests:

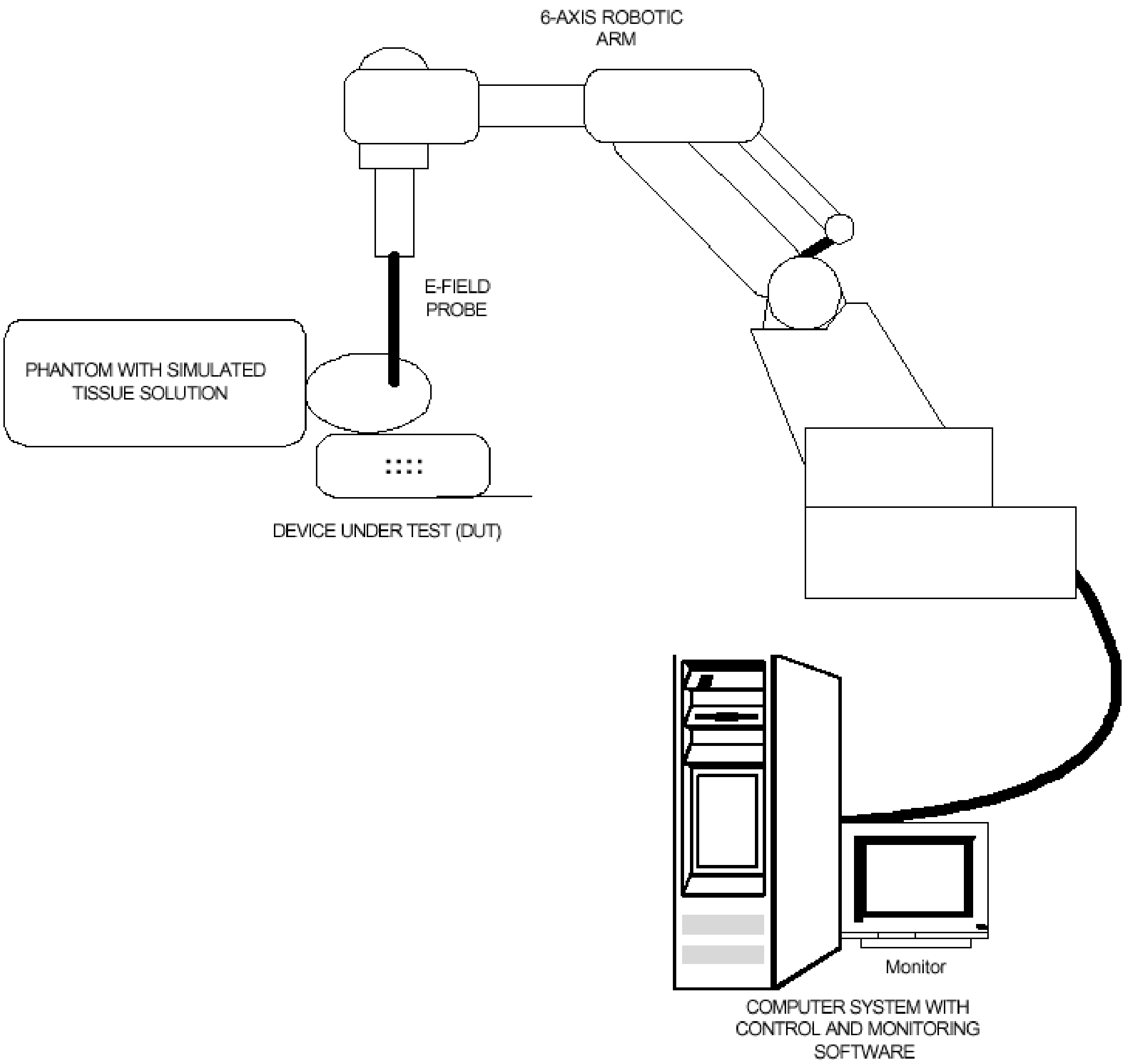

EXHIBIT 3. SUMMARY OF TEST RESULTS

3.1. LOCATION OF TESTS

All of the measurements described in this report were performed at UltraTech Group of Labs located at:

3000 Bristol Circle, in the city of Oakville, Province of Ontario, Canada.

All measurements were performed in UltraTech's shielded chamber, 24' x 16' x 8'.

3.2. APPLICABILITY & SUMMARY OF SAR RESULTS

The maximum peak spatial - average SAR measured was found to be 3.82 W/Kg.

EXHIBIT 4. MEASUREMENTS, EXAMINATIONS & TEST DATA

4.1. TEST SETUP

D.U.T. Information		Condition	
Product Name	UHF P25 TRUNKING HANDHELD TRANSCEIVER	**Robot Type**	6 Axis
Model Number	IC-F9021T	**Scan Type**	SAR – Area/Zoom/Att. Vs Depth
Serial Number	1000002	**Measured Field**	E
Frequency Band [MHz]	400-470	**Phantom Type**	2_{mm} base Flat Phantom
Frequency Tested [MHz]	406.2, 450.1	**Phantom Position**	Waist
Rated Conducted Power [W]	5 (High power mode)	**Room Temperature** [°C]	21.0 ± 1
Antenna Type	ICOM helical whip antenna M/Ns: #1FA-S58U and #2: FA-S30U	**Room Humidity** [%]	40 ± 10
Modulation	FM	**Tissue Temperature** [°C]	21.0 ± 1
Worst Case Duty Cycle	50 %		
Duty Cycle Tested	100 %		
Source(or Usage)-Based Time-Average Factor	0.5 (mechanical PTT button)		

Type of Tissue	Brain	Muscle
Test Frequency [MHz]	450	450
Target Conductivity [S/m]	0.87	0.94
Measured Conductivity [S/m]	0.84 (-3.4 %)	0.90 (-4.0 %)
Target Dielectric Constant	43.5	56.7
Measured Dielectric Constant	41.5 (-4.7 %)	56.1 (-1.1 %)
Penetration Depth (Plane Wave Excitation) [mm]	43.5	46.1
Probe Model Number	ET20	ET20
Probe Serial Number	03-MAR-0019	03-MAR-0019
Probe Orientation	Isotropic	Isotropic
Probe Offset [mm]	2.1	2.1
Probe Tip Diameter [mm]	4.0	4.0
Diode Compression (DCP_1, DCP_2, DCP)	92825, 96871, 86612	92825, 96871, 86612
Amplifier Setting (AS_1, AS_2, AS_3)	0.0075307056, 0.0080137981, 0.0081171369	0.0075307056, 0.0080137981, 0.0081171369
Sensor Factor (η_{pd}) [mV/(mW/cm^2)]	10.8	10.8
Conversion Factor (γ)	5.633	5.823
Sensitivity (ζ) [W/Kg/mV]	5.205E-02	5.395E-02

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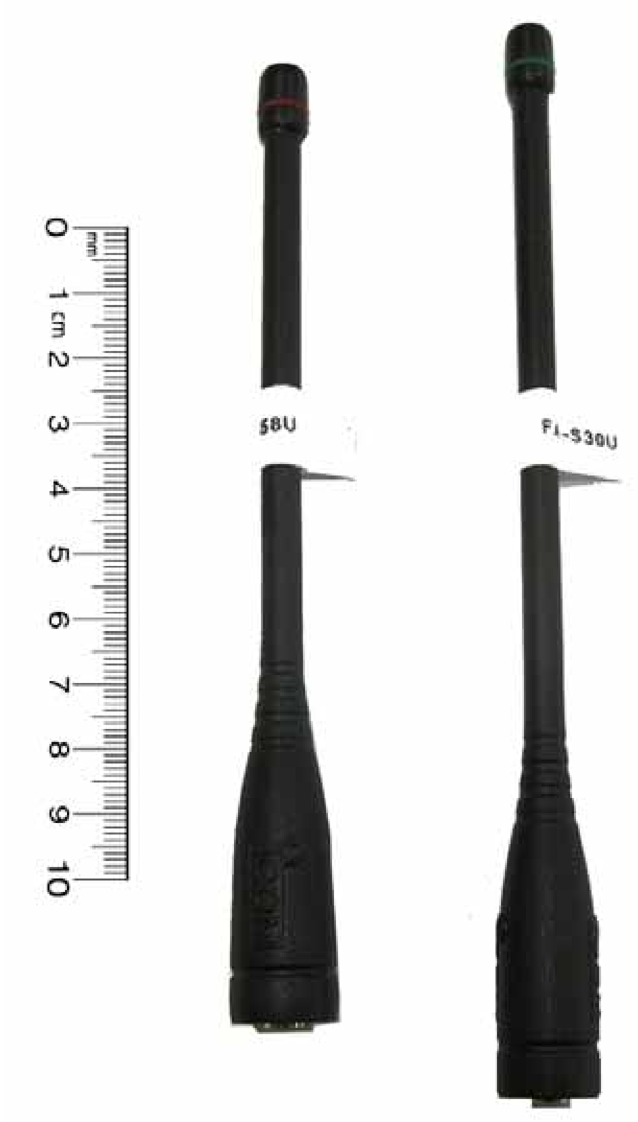
- Assessed by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia), VCCI (Japan)
- Accredited by Industry Canada (Canada) under ACC-LAB (Europe/Canada MRA and APEC/Canada MRA)
- Recognized/Listed by FCC (USA)
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

4.2. PHOTOGRAPH OF D.U.T

< D.U.T.'s front and rear view with FA-S58U antenna >

< D.U.T.'s front and rear view with FA-S30U antenna >

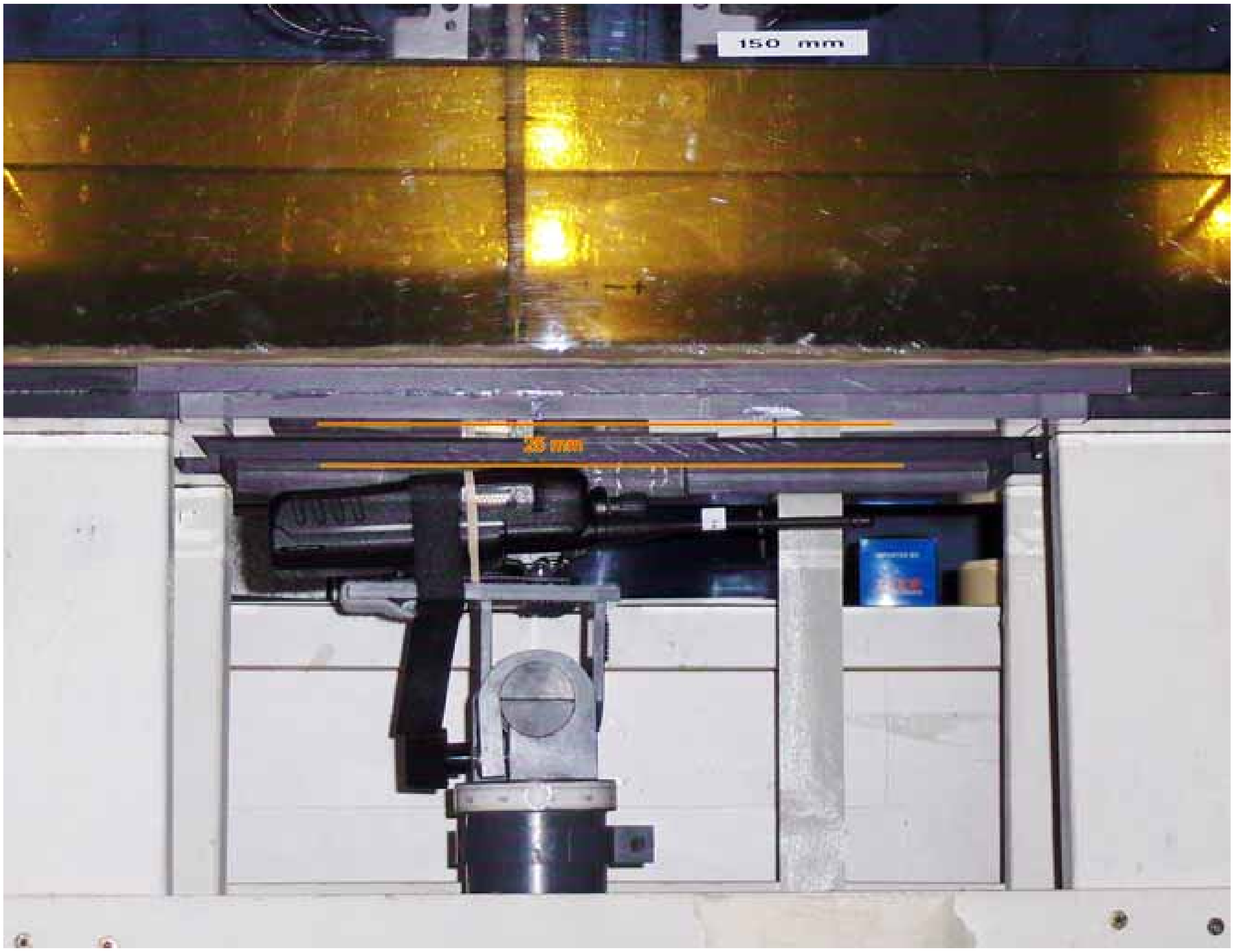


< FA-S58U antenna and FA-S30U antenna >

4.3. PHOTOGRAPHS OF D.U.T. POSITION

4.3.1. Head Configuration

4.3.1.1. Head-front PTT



< FA-S58U antenna >

Distance between EUT and phantom = 25 mm

< FA-S30U antenna >

Distance between EUT and phantom = 25 mm

4.3.2. Body Configuration

4.3.2.1. Body-worn; Back side of EUT in parallel to the phantom with the belt-clip in contact, Belt-clip (M/N: MB-115) and Speaker-microphone (M/N: HM-184)

< FA-S58U antenna >

Distance between back of EUT and phantom = 15 mm
Distance between antenna and phantom = 22 mm

< FA-S30U antenna >

Distance between back of EUT and phantom = 15 mm
Distance between antenna and phantom = 22 mm

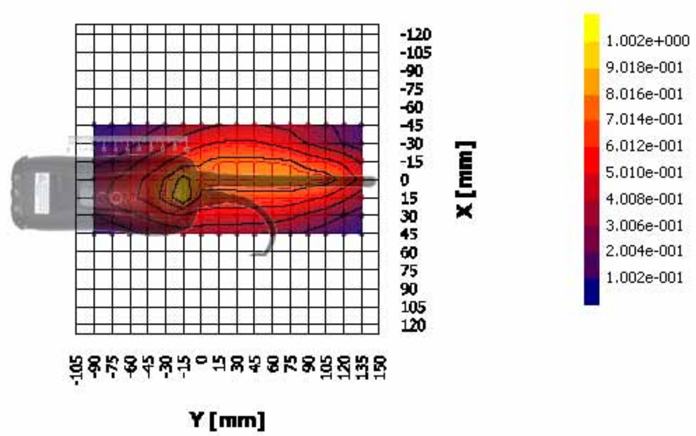
4.4. MAXIMUM PEAK SPATIAL-AVERAGE SAR

4.4.1. Maximum Peak Spatial-average SAR Data

#	Configuration	Device Test Positions	Antenna Position	Freq. [MHz]	Channel	MAX. SAR [W/Kg]
*	Occupational/Controlled Exposure Category Limit					8.0
08	¼ helical whip antenna (M/N: FA-S58U, 430~470 MHz, red ring) Belt clip (M/N: MB-115) Speaker-microphone (M/N: HM-184) 50% duty cycle for PTT	Body-worn	FIX	450.1	Middle	3.82

4.4.2. Maximum Peak Spatial-Average SAR Location

Complete area Prescans was conducted to determine the location of the highest SAR and the device was repositioned to allow the identified hot-spots to be orientated with as large an area around the hot-spots to come into contact with the phantom surface. This procedure ensured that the maximum SAR readings would be obtained from the hot-spot areas identified. Unless otherwise specified, the reference point (0, 0) in the plots was set to the point at the base of antenna in the projected image of D.U.T. to the phantom surface.



4.5. SAR MEASUREMENT DATA*

4.5.1. Head Configuration Result

4.5.1.1. Head-front; PTT

#	Configuration	Antenna Position	Frequency [MHz]	Channel	SAR_{local} Drift [%]	MAX SAR_{1g} [W/Kg]
*	Occupational/Controlled Exposure Category Limit					8.0
01	¼ helical whip antenna (M/N: FA-S58U, 430~470 MHz, red ring) 50% duty cycle for PTT	FIX	430	Low		-
02		FIX	450.1	Middle	-0.5	1.85
03		FIX	470	High		-
04	¼ helical whip antenna (M/N: FA-S30U, 380~430 MHz, green ring) 50% duty cycle for PTT	FIX	400	Low		
05		FIX	406.2	Low	-1.4	1.40
06		FIX	430	High		-

4.5.2. Body Configuration Result

4.5.2.1. Body-worn; Back-side in parallel to the phantom and the belt clip in contact

#	Configuration	Antenna Position	Frequency [MHz]	Channel	SAR_{local} Drift [%]	MAX SAR_{1g} [W/Kg]
*	Occupational/Controlled Exposure Category Limit					8.0
07	¼ helical whip antenna (M/N: FA-S58U, 430~470 MHz, red ring) Belt clip (M/N: MB-115) Speaker-microphone (M/N: HM-184) 50% duty cycle for PTT	FIX	430	Low		-
08		FIX	450.1	Middle	-2.3	3.82
09		FIX	470	High		-
10	¼ helical whip antenna (M/N: FA-S30U, 380~430 MHz, green ring) Belt clip (M/N: MB-115) Speaker-microphone (M/N: HM-184) 50% duty cycle for PTT	FIX	400	Low		-
11		FIX	406.2	Low	-2.8	3.15
12		FIX	430	High		-

* If the SAR measured at the highest output power channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the other channels are optional for such test configurations.

4.5.3. RF Power output Measurement

Fundamental Frequency (MHz)	Measured RF Output Power (W)
406.2	5.02
450.1	5.58
469.95	5.00

4.5.4. SAR Drift

The local SAR was measured at the arbitrary location in the vicinity of the antenna fed point in the simulated tissue at 450.1 MHz during the period of 30 minute for rechargeable Li-Ion battery pack (M/N: BP-254).

The power (SAR) drift after 30 minutes of the continuous transmission at the maximum power level was found to be less than ± 5 %.

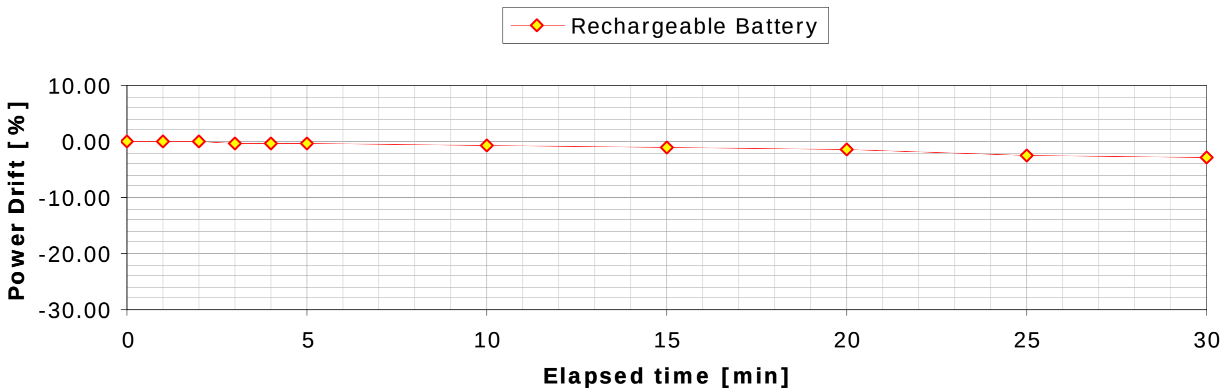


EXHIBIT 5. SAR SYSTEM CONFIGURATION & TEST METHODOLOGY

5.1. MEASUREMENT SYSTEM SPECIFICATIONS

Positioning Equipment	Probe
Type : 3D Near Field Scanner Location Repeatability : 0.1 [mm] Speed 180 [^{o}/sec] AC motors	Sensor : E-Field Spatial Resolution : 1 [mm^3] Isotropic Response : ±0.25 [dB] Dynamic Range : 0.01 to 100 [W/Kg]
Computer	**Phantom**
Type : Pentium III 500MHz Memory : 256 MB RAM Operating System : Windows 2000 Pro Monitor : 19" SVGA	Tissue : Simulated Tissue with electrical characteristics similar to those of the human at normal body temperature. Left/Right Head: IEEE P1528 Compliant SAM manufactured by Aprel Body/Frontal Head: IEEE Flat Phantom 2 $_{[mm]}$ Base

5.2. TEST PROCEDURES

In the SAR measurement, the positioning of the probes must be performed with sufficient accuracy to obtain repeatable measurements in the presence of rapid spatial attenuation phenomena. The accurate positioning of the E-field probe is accomplished by using a high precision robot. The robot can be taught to position the probe sensor following a specific pattern of points. In a first sweep, the sensor is positioned as close as possible to the interface, with the sensor enclosure touching the inside of the phantom shell. The SAR is measured on a grid of points, which covers the curved surface of the phantom in an area larger than the size of the D.U.T. After the initial scan, a high-resolution volume gird is used to locate the absolute maximum measured energy point and to calculate the peak spatial-average SAR. At this location, attenuation versus depth scan will be accomplished by the measurement system in order to verify the peak spatial-average SAR measured.

5.3. PHANTOM

For Head mounted devices placed next to the ear, the phantom used in the evaluation of the RF exposure of the user of the wireless device is a IEEE P1528 compliant SAM phantom, shaped like a human head and filled with a mixture simulating the dielectric characteristics of the brain. A left sided head and a right sided head are evaluated to determine the worst case orientation for SAR. For body mounted and frontal held push-to-talk devices, a flat phantom of dimensions 70x42x20cm with a base plate thickness of 2mm is used.

5.4. SIMULATED TISSUE

Simulated Tissue: Suggested in a paper by George Hartsgrove and colleagues in University of Ottawa Ref.: Bioelectromagnetics 8:29-36 (1987)

Ingredient	Quantity
Water	40.4 %
Sugar	56.0 %
Salt	2.5 %
HEC	1.0 %
Bactericide	0.1 %

Table 5.4. Example of composition of simulated tissue

This simulated tissue is mainly composed of water, sugar and salt. At higher frequencies, in order to achieve the proper conductivity, the solution does not contain salt. Also, at these frequencies, D.I. water and alcohol is preferred.

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}[*])

[*] The actual mass density of the equivalent tissue varies based on the composition of the tissue from 990 Kg/m^3 to 1,300 Kg/m^3.

5.4.1. Preparation

The weight requirements is determined and measured carefully for all the components. A clean container is used where the ingredients will be mixed. A stirring paddle mounted to a drill press is used to stir the mixture. First the heat is applied to the DI water to approximately 40^{o}C to help the ingredients dissolve well and then the salt and the bactericide are added. It is stirred until all the ingredients are completely dissolved. It is continuously stirred slowly while adding the sugar. Rotation of stirring paddle at a high RPM is avoided to prevent air bubbles in the mixture. Later on, the HEC is added to maintain the solution homogeneous. Mixing time is approximately 2 hours.

5.5. MEASUREMENT OF ELECTRICAL CHARACTERISTICS OF SIMULATED TISSUE

5.5.1. HP Dielectric Strength Probe System (open-ended coaxial transmission-line probe/sensor)

5.5.1.1. Equipment set-up

The equipment consists of a probe connected to one port of a vector network analyzer. The probe is an open-ended coaxial line, as shown in Figure B.2. Cylindrical coordinates (ρ, ϕ, z) are used where ρ is the radial distance from the axis, ϕ is the angular displacement around the axis, □ is the displacement along the axis, *a* is the inner conductor radius, and *b* is the outer conductor inner radius.

The sample holder is a non-metallic container that is large compared with the size of the probe immersed in it. A probe with an outer diameter *b* of 2 to 4 mm is suitable for the measurement of tissue-equivalent materials in the 300 MHz to 3 GHz frequency range. This probe size is commensurate with sample volumes of 50 cc or higher. Larger probes of up to 7 mm outer diameter *b* may be used with larger sample volumes. A flange is typically included to better represent the infinite ground-plane assumption used in admittance calculations.

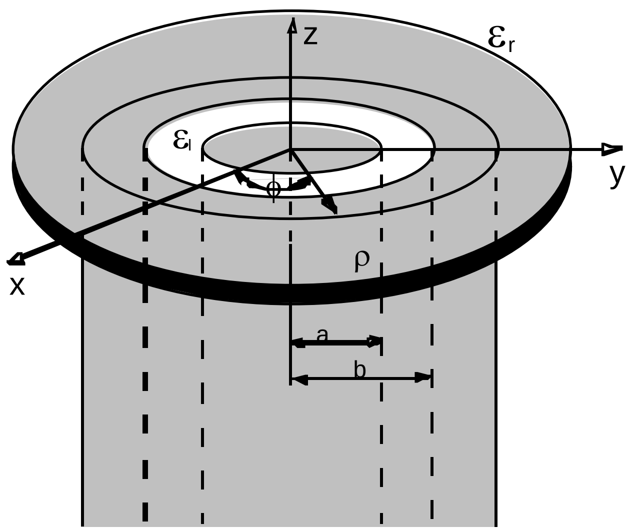


Figure 5.5.1.1. An open-ended coaxial probe with inner and outer radii *a* and *b*, respectively

The accuracy of the short-circuit measurement should be verified for each calibration at a number of frequencies. A short circuit can be achieved by gently pressing a piece of aluminum foil against the open end. For best electrical contact, the probe end should be flat and free of oxidation. Larger the sensors generally have better foil short-circuit repeatability. It is possible to obtain good contact with some commercial 4.6 mm probes using the metal-disk short-circuit supplied with the kit. For best repeatability, it may be necessary to press the disk by hand.

The network analyzer is configured to measure the magnitude and phase of the admittance. A one-port reflection calibration is performed at the plane of the probe by placing materials for which the reflection coefficient can be calculated in contact with the probe. Three standards are needed for the calibration, typically a short circuit, air, and de-ionized water at a well-defined temperature (other reference liquids such as methanol or ethanol may be used for calibration). The calibration is a key part of the measurement procedure, and it is therefore important to ensure that it has been performed correctly. It can be checked by re-measuring the short circuit to ensure that a reflection coefficient of Γ = -1.0 (linear units) is obtained consistently.

5.5.1.2. Measurement procedure

a) Configure and calibrate the network analyzer and probe system.

b) Place the sample in a non-metallic container and immerse the probe. A fixture or clamp is recommended to stabilize the probe, mounted such that the probe face is at an angle with respect to the liquid surface to minimize trapped air bubbles beneath the flange.

c) Measure the complex admittance with respect to the probe aperture.

d) Compute the complex relative permittivity $\varepsilon_r = \varepsilon_r' - j\,\sigma/\omega\varepsilon_0$.

5.5.2. Data Acquisition Methodology

5.5.2.1. E-Field Measurement

Probe output voltage can calculated as shown below. Be aware that probe output voltage is not scaled precisely to realistic voltage quantity but is scaled to historical number of 10.8 [mV], which typical prototype probe yielded even though it is noted using unit of [mV] hereafter. This is why the system can not be calibrated as individual components but only as one unit.

$$PO_1[mV] = U_{L,1} \times AS_1 \equiv |E_1|^2 \times \eta_{E2}$$
$$PO_2[mV] = U_{L,2} \times AS_2 \equiv |E_2|^2 \times \eta_{E2}$$
$$PO_3[mV] = U_{L,3} \times AS_3 \equiv |E_3|^2 \times \eta_{E2}$$
$$PO_{tot}[mV] \equiv |E|^2 \times \eta_{E2} = \left(|E_1|^2 + |E_2|^2 + |E_3|^2\right) \times \eta_{E2} = |E_1|^2 \times \eta_{E2} + |E_2|^2 \times \eta_{E2} + |E_3|^2 \times \eta_{E2} \equiv PO_1 + PO_2 + PO_3$$

$$|E|^2[(V/m)^2] \equiv \frac{PO_{tot}}{\eta_{E2}} = \frac{PO_1 + PO_2 + PO_3}{\eta_{E2}} = \frac{(U_{L,1} \times AS_1) + (U_{L,2} \times AS_2) + (U_{L,3} \times AS_3)}{\eta_{E2}}$$

AS_i	Amplifier setting for channel i
η_{Pd}	Sensor factor to the uniform power density, **an arbitrary value 10.8** [mV/(mW/cm^2)]
η_{E2}	Sensor Factor to the $\|E\|^2$, **an arbitrary value** 10.8/3,770 [mV/(V/m)^2]
φ	Smaller angle between the probe axis and the direction of the E-field (90° providing the probe axis is parallel to the plane of the septum inside TEM cell)
θ_i	Smaller angle between the probe axis and the dipole sensor axis of the channel i ($\theta_1 = \theta_2 = 45°$, $\theta_3 = 90°$ for I-beam probe, and $\theta_1 = \theta_2 = \theta_3 = 54.7°$ for triangular-beam probe)
P_d	Well-defined power density [mW/cm^2] at the calibration point in a test cell
$Norm_{i,peak}$	Normalization factor to peak at channel i

$$Norm_{i,peak} = \frac{\sum_{\delta=0}^{360} U_{L,i}(\delta)}{Num_{pk2pk} + Corr_i} = \frac{\sum_{\delta=0}^{360}\left(U_{O,i}(\delta) + \frac{(U_{O,i}(\delta))^2}{DCP_i}\right)}{Num_{pk2pk} + Corr_i}$$

- Assessed by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia), VCCI (Japan)
- Accredited by Industry Canada (Canada) under ACC-LAB (Europe/Canada MRA and APEC/Canada MRA)
- Recognized/Listed by FCC (USA)
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Where,

Num_{pk2pk}	Number of measurement points during one peak to peak. 12 when it is measured for every 15°.
$Corr_i$	Manually chosen correction factor to refine isotropic output
$U_{L,i}$	Linearized probe output voltage at channel i , **Unitless voltage quantity**
$U_{O,i}$	Raw probe output voltage at channel i, **Unitless voltage quantity**
DCP_i	Diode compensation potential at channel i

5.5.2.2. Sensitivity(ζ) of probe in the simulated tissue

The sensitivy(ζ) of the probe in the simulated tissue is rendered in terms of Sensor Enhancement Factor in the simulated tissue.

$$SAR_{tissue} = \frac{\sigma_{@meas} \times \left(\frac{PO_{tot\_tissue}}{\eta_{E2}} \times \frac{1}{\gamma} \right)}{\rho_{@meas}} = \frac{\sigma_{@meas} \times \left(\frac{1}{\eta_{E2}} \times \frac{1}{\gamma} \right)}{1000} \times PO_{tot\_tissue} = \left(\frac{\sigma_{@meas}}{1000 \times \eta_{E2} \times \gamma} \right) \times PO_{tot\_tissue}$$

$$\zeta[W/Kg/mV] = \frac{\sigma_{@meas}}{1{,}000[Kg/m^3] \times \eta_{E2} \times \gamma}$$

Where,

ζ	Sensitivity of the probe in the simulated tissue [W/Kg/mV]
γ	Conversion factor; ratio of sensor response in air to response in the dielectric media
$\sigma_{@meas}$	Conductivity of the simulated tissue during the measurement [S/m]
ρ	Mass density of the simulated tissue [Kg/m^3]; 1,000 [Kg/m3] is conventionally chosen.

Therefore, SAR can be yielded from

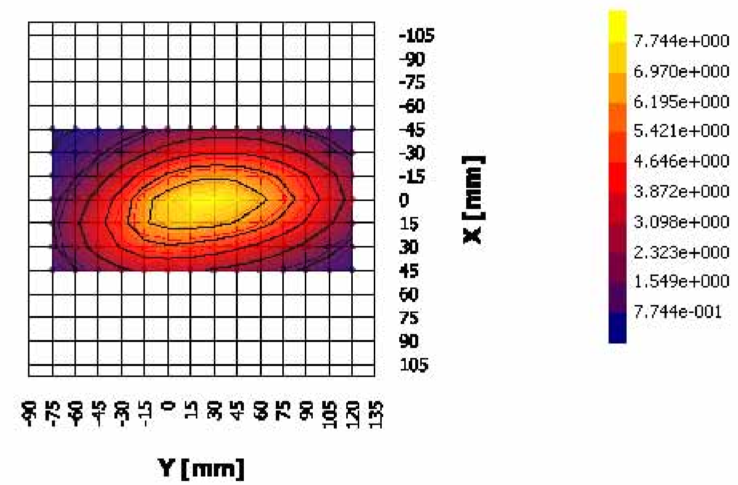
$$SAR[W/Kg] = \zeta[W/Kg/mV] \times PO_{tot\_tissue}[mV]$$

Where,

ζ	Sensitivity of the probe in the simulated tissue [W/Kg/mV]
PO_{tot_tissue}	Probe voltage output measured in the simulated tissue [mV]

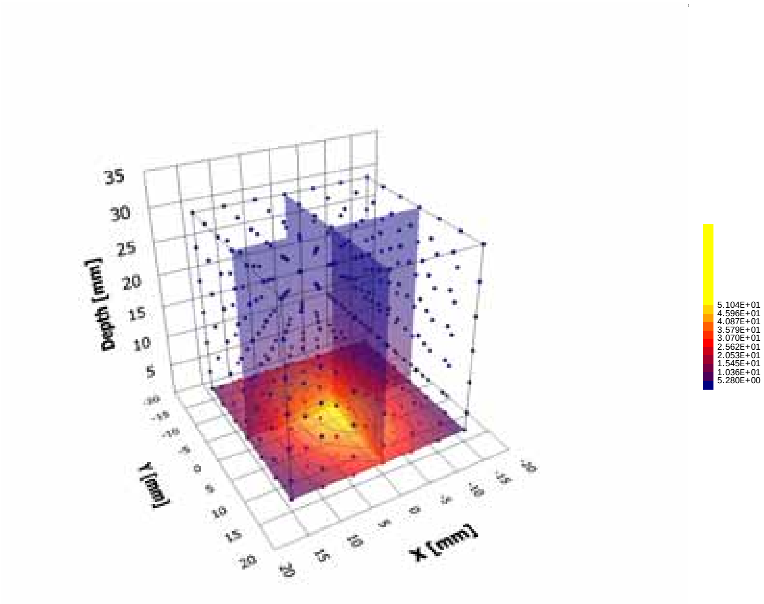
5.5.2.3. SAR Measurement

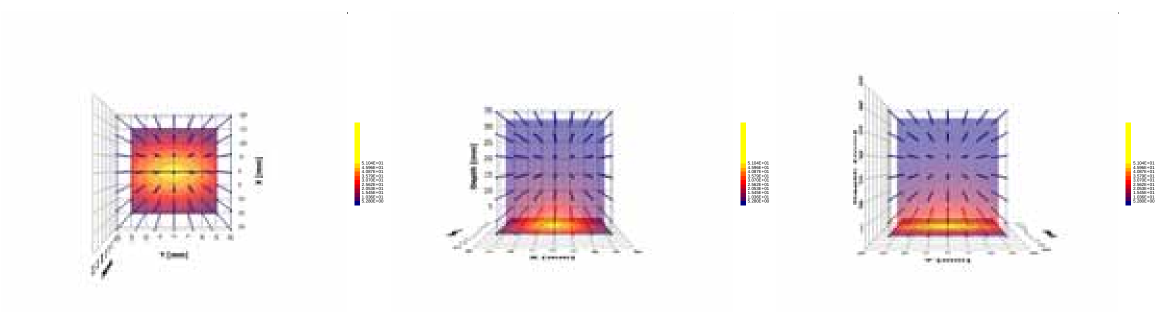
The goal of the measurement process is to scan the phantom over a selected area in order to find the region of highest levels of RF energy and then to obtain a single value for the peak spatial-average of SAR over a volume that would contain one gram (in the shape of a cube) of biological tissue. The test procedure, of course, measures SAR in the simulated tissue.



< Area scan >

The software request the user to move the probe to locations at two extreme corners of a rectangle that encloses the area to be scanned. An arbitrary origin and the spatial resolution for the scan are also specified. Under program control, the scan is performed automatically by the robot-guided probe.





< Zoom Scan >

The fine resolution volume scan region is centered at the peak SAR locations determined by the interpolated (cubic spline) data from the area scan measurements. The number of measurement point required in a zoom scan is defined to provide an accurate one-gram averaged SAR in terms of both the number of points ($PT_X \times PT_Y \times PT_Z$) and the size ($SZ_X$[mm] $\times$ SZ_Y[mm] $\times$ SZ_Z[mm]) of the cubic. For one-gram SAR, ($5 \times 5 \times 7$) and (28[mm] $\times$ 28[mm] $\times$ 30[mm]) is preferred to select below 1 GHz. The zoom scan region extends in each direction for at least 1.5 times the linear dimensions of 1- or 10-gram cube of tissue from each peak. The zoom scan spatial resolution is interpolated down to SAR values on a 1mm grid by using the tri-linear interpolation algorithm.

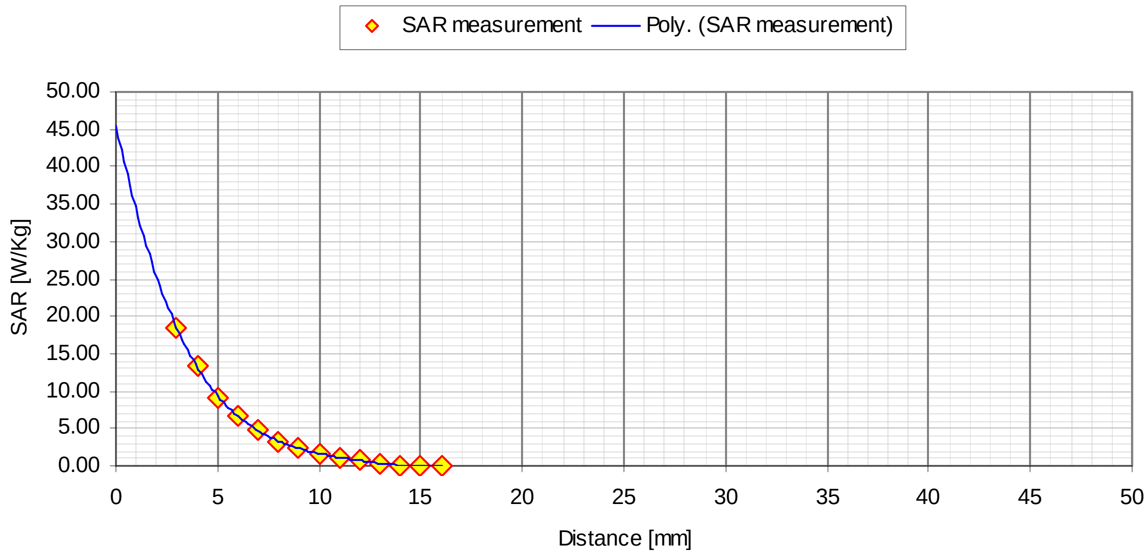
The peak field values near the surface of a homogeneous phantom are usually not measurable because the sensors in a field probe are located at 2-4 mm behind the tip of the probe and the measurement point is defined at the geometric center of the sensors where the calibration is defined. These SAR values are computed by extrapolating the closest measured points to the surface of the phantom to determine the highest one-gram averaged SAR The extrapolation coefficients are determined with a multi-order curve-fitting algorithm. Generally the 4-th order polynomial least-square fit is sufficient to extrapolate to the surface if the number of the valid measurements that are non-zero, along the probe axis is greater than 4.

The interpolated and extrapolated SAR values from the zoom scan measurements are integrated in the shape of 1- or 10-gram cube then traversed to determine the highest peak spatial-average SAR in the zoom scan region.

This peak spatial-averaged SAR is reported as SAR [W/kg] for compliance.

5.5.2.4. Data Extrapolation and boundary effect

The distance from the center of the sensor (diode) to the end of the protective tube is called the 'probe offset' or 'sensor offset'. To compensate we use a multi-order polynomial least-square curve fitting to obtain the peak surface value from the voltages measured at the distance from the inner surface of the phantom. The field is measured as close as possible to the phantom's surface and every pre-defined separation distance (1 [mm] to 5 [mm]) along the probe axis (z) for a distance of at least 50 mm until they are not measurable. The appropriate curve is obtained from all the points measured and used to define an exponential decay of the energy density versus depth.



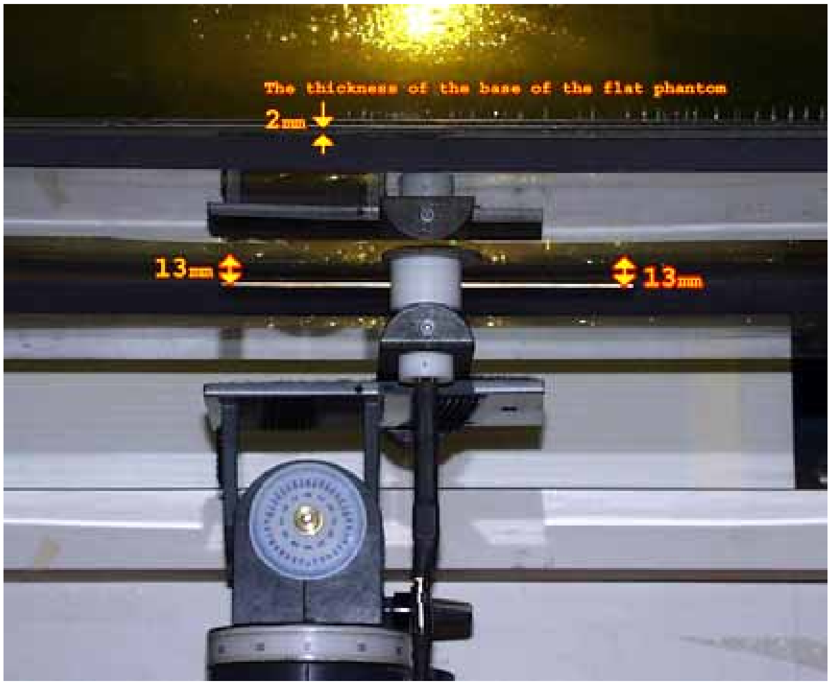
< Exponential decay of the energy density versus depth >

Boundary effects arise when the tip of an electric field probe approaches the interface between two dielectric media. Under these conditions, the external field is strongly perturbed by the superposition of a scattered field from the probe. The effect of the boundary on the peak spatial-average SAR values strongly depends on the probe dimensions, especially the diameter of the tip of the probe. It is known that the error due to boundary effects is very small if the distance between the probe tip and the surface is greater than half the probe diameter. Therefore the first one or two measurements at the vicinity to the phantom surface are excluded for evaluating the exponential decay curve in order to compensate for the boundary effect.

5.6. SAR MEASUREMENT SYSTEM VERIFICATION

5.6.1. Standard Source

A half-wave dipole is positioned below the bottom of the phantom and centered with its axis parallel to the longest side of the phantom. The distance between the liquid filled phantom bottom surface and the center of the dipole axis, *s*, is chosen as specified IEEE 1528 at the specific test frequency (i.e. 15 mm at 835 MHz). A low loss and low dielectric constant spacer is used to establish the correct distance between the top surface of the dipole and the bottom surface of the phantom.



5.6.2. Standard Source Input Power Measurement

The system validation is performed as shown below or in Figure 7.1 in IEEE 1528.

First the power meter PM1 (including attenuator Att1) is connected to the cable to measure the forward power at the location of the dipole connector (X). The signal generator is adjusted for the desired forward power at the dipole connector (taking into account the attenuation of Att1) as read by power meter PM2. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2. If the signal generator does not allow adjustment in 0.01dB steps, the remaining difference at PM2 must be taken into consideration. PM3 records the reflected power from the dipole to ensure that the value is not changed from the previous value. The reflected power was verified to be at least 20dB below the forward power.

5.6.3. System Validation Procedure

A complete 1g-averaged SAR measurement is performed. The measured 1g-averaged SAR value is normalized to a forward power of 1W to a half-wave dipole and compared with the reference SAR value for the reference dipole and flat phantom shown in columns 2 and 3 of Table 7.1 in IEEE 1528.

5.7. POWER MEASUREMENT

Whenever possible, a conducted power measurement is performed. To accomplish this, we utilize a fully charged battery, a calibrated power meter and a cable adapter provided by the manufacturer. The data of the cable and related circuit losses are also provided by the manufacturer. The power measurement is then performed across the operational band and the channel with the highest output power is recorded.

Power measurement is performed before and after the SAR to verify if the battery was delivering full power at the time of testing. A difference in output power would determine a need for battery replacement and to repeat the SAR test.

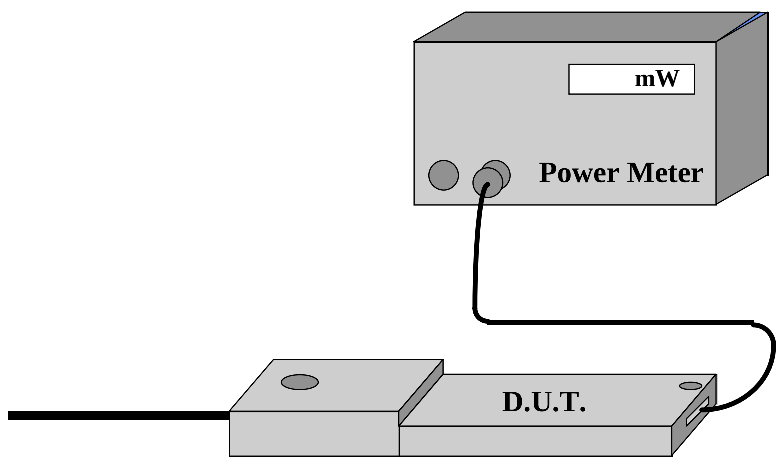


Figure 5.7. Measured Power + Cable and Switching Mechanism Loss

- Assessed by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia), VCCI (Japan)
- Accredited by Industry Canada (Canada) under ACC-LAB (Europe/Canada MRA and APEC/Canada MRA)
- Recognized/Listed by FCC (USA)
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

5.8. POSITIONING OF D.U.T.

The clear SAM phantom shell have been previously marked with a highly visible grid with a defined centre line, so it can easily be seen through the liquid simulated tissue. In the case of testing a cellular phone, this line is connecting the ear channel with the corner of the lips. The D.U.T. is then placed by centering the speaker with the ear channel and the center of the radio width with the corner of the mouth.

For HAND HELD devices (push-to-talk), or any other type of wireless transmitters positioned in front of the face, the D.U.T. will be positioned 2.5cm distance from a flat phantom to simulate the frontal facial position in use. All body-worn operating configurations are tested using a flat phantom. The length and width of the phantom is at least twice the corresponding dimensions of the test device, including its antenna.

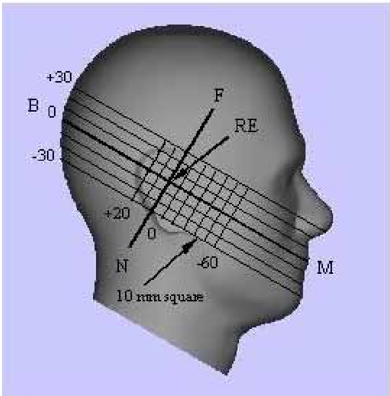


Figure 5.8.a. Side view of the phantom showing relevant marking

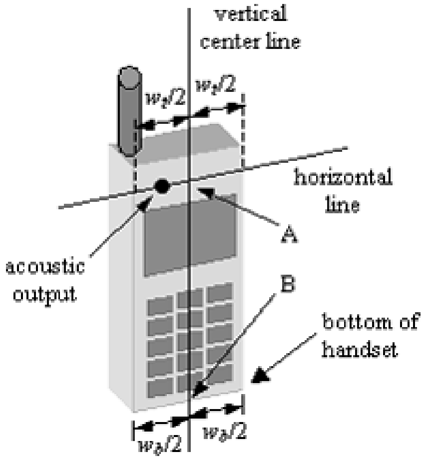


Figure 5.8.b. Handset vertical and horizontal reference lines – fixed case

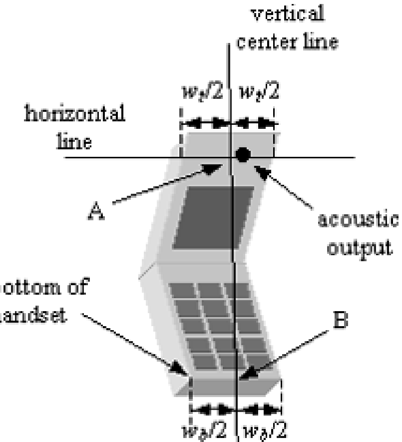


Figure 5.8.c. Handset vertical and horizontal reference lines – "clam-shell"

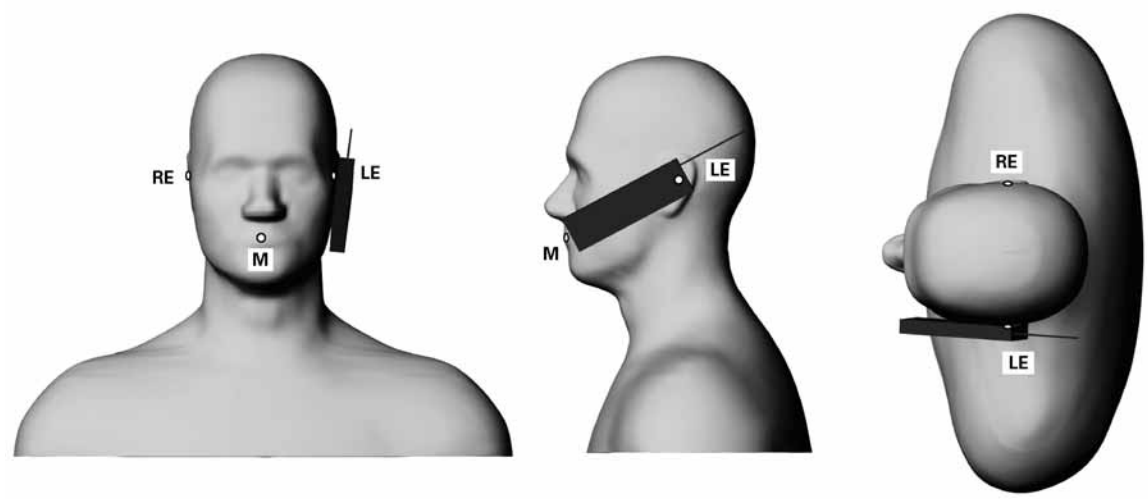


Figure 5.8.d. Phone position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

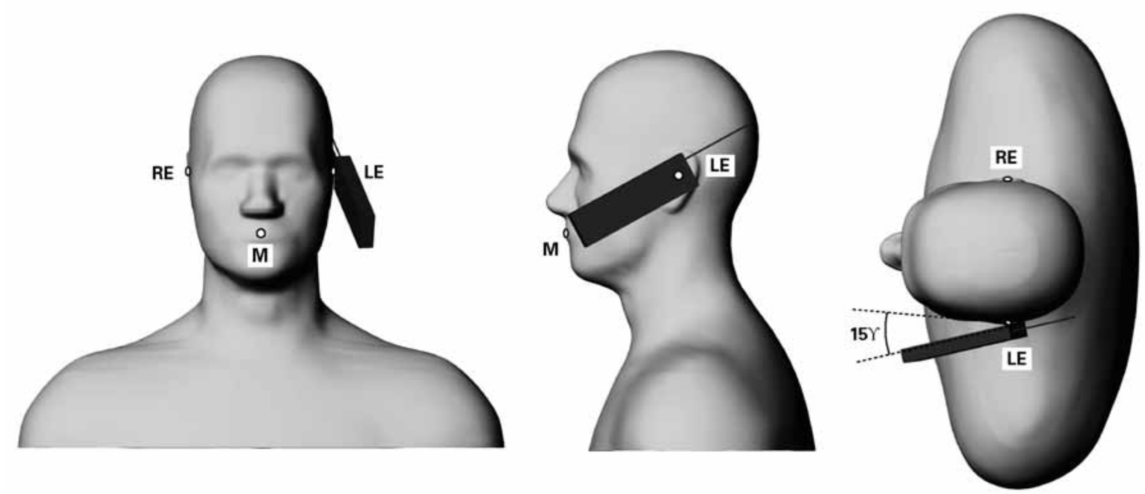


Figure 5.8.e. Phone position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

The handset holder is mainly made of PVC and contains no metallic component at all in order to minimize field
perturbation. Velcro and elastic band were used to attach the D.U.T. on the plate of handset holder.

5.9. SAR MEASUREMENT UNCERTAINTY

a	*c*	*d*	*e = f(d,k)*	*F*	*h = c x f / e*	*k*
Uncertainty Component	**Tol. (%)**	**Prob. Dist.**	**Div.**	**c_i (1-g)**	**1-g u_i (%)**	**v_i**
Measurement System						
Probe Calibration	3.0	N	1	1	3.0	
Axial Isotropy	5.0	R	3	0.7	2.0	
Hemispherical Isotropy	8.0	R	3	1	4.6	
Boundary Effect	10.0	R	3	1	5.8	
Linearity	4.2	R	3	1	2.4	
System Detection Limits	2.0	R	3	1	1.2	
Readout Electronics	1.0	N	1	1	1.0	
Response Time	1.5	R	3	1	0.9	
Integration Time	2.0	R	3	1	1.2	
RF Ambient Conditions	3.0	R	3	1	1.7	
Probe Positioner Mechanical Tolerance	1.0	R	3	1	0.6	
Probe Positioning with respect to Phantom Shell	3.0	R	3	1	1.7	
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	3.5	R	3	1	2.0	
Test sample Related						
Test Sample Positioning	7.5	N	1	1	7.5	*11*
Device Holder Uncertainty	6.5	N	1	1	6.5	*8*
Output Power Variation - SAR drift measurement	5.0	R	3	1	2.9	
Phantom and Tissue Parameters						
Phantom Uncertainty (shape and thickness tolerances)	4.0	R	3	1	2.3	
Liquid Conductivity Target - tolerance	5.0	R	3	0.7	2.0	
Liquid Conductivity - measurement uncertainty	4.0	R	3	0.7	1.6	
Liquid Permittivity Target tolerance	5.0	R	3	0.6	1.7	
Liquid Permittivity - measurement uncertainty	4.0	R	3	0.6	1.4	
Combined Standard Uncertainty		RSS			14.3	
Expanded Uncertainty (95% confidence interval)	(Coverage Factor of k = 2)				**±28.5 %**	

EXHIBIT 6. SAR MEASUREMENT*

6.1. HEAD CONFIGURATION

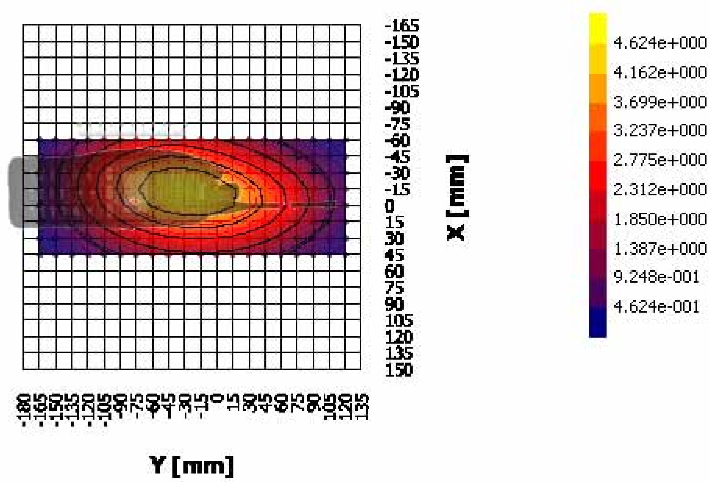
6.1.1. Head-front; PTT

#	Configuration	Antenna Position	Frequency [MHz]	Channel	SAR_{local} Drift [%]	MAX SAR_{1g} [W/Kg]
*	Occupational/Controlled Exposure Category Limit					8.0
01	¼ helical whip antenna (M/N: FA-S58U, 430~470 MHz, red ring) 50% duty cycle for PTT	FIX	430	Low		-
02		FIX	450.1	Middle	-0.5	1.85
03		FIX	470	High		-
04	¼ helical whip antenna (M/N: FA-S30U, 380~430 MHz, green ring) 50% duty cycle for PTT	FIX	400	Low		
05		FIX	406.2	Low	-1.4	1.40
06		FIX	430	High		-

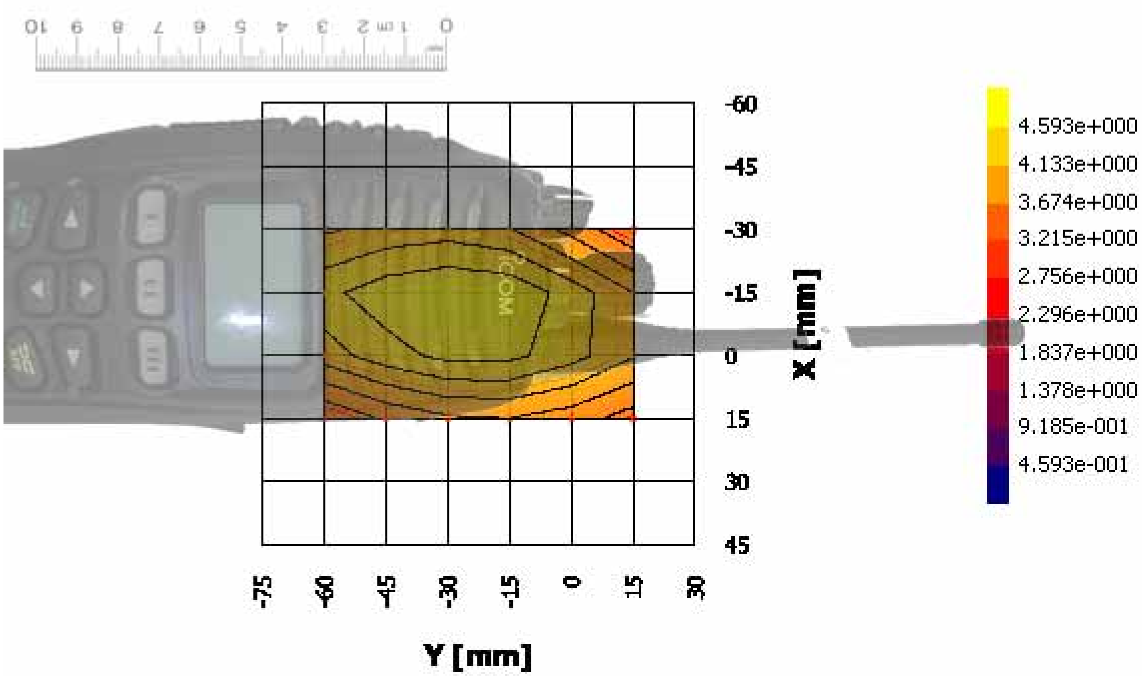
* If the SAR measured at the highest output power channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the other channels are optional for such test configurations.

6.1.1.1. ¼ helical whip antenna (M/N: FA-S58U); 450.1 MHz; #02

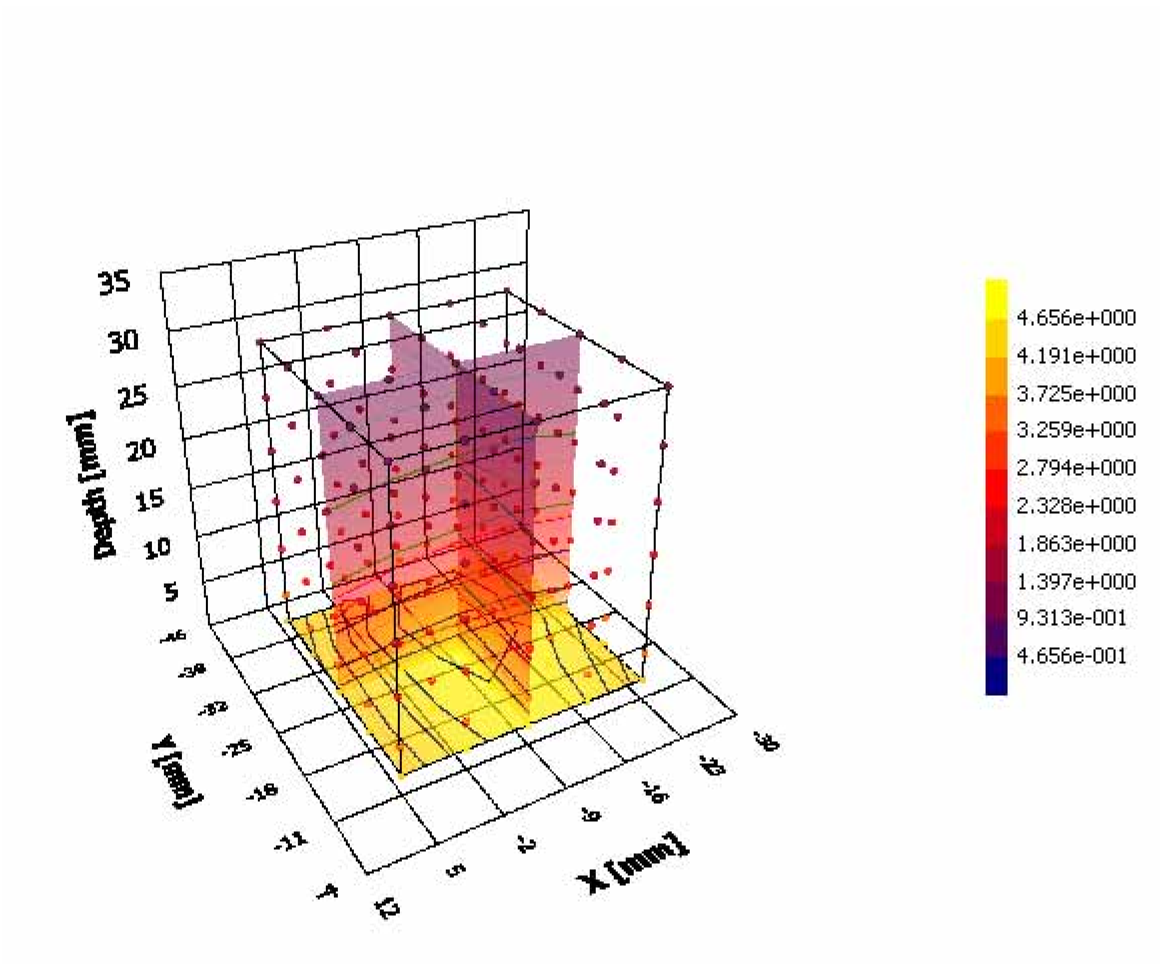
Test date [MM/DD/YYYY]	12/22/2008
Test by	Steven Lu
Room temperature [°C]	21
Room humidity [%]	40
Simulated tissue temperature [°C]	21
Separation distance, d [mm]	25
Test frequency [MHz]	450.1
E-field Probe	M/N: ET20, S/N: 03-MAR-0019, Sensor Offset: 2.1 mm
Sensor Factor (η_{Pd}) [mV/(mW/cm^2)]	10.8
Diode Compression (DCP_1, DCP_2, DCP_3)	92825, 96871, 86612
Amplifier Settings (AS_1, AS_2, AS_3)	0.0075307056, 0.0080137981, 0.0081171369
Tissue Type	Brain
Measured conductivity [S/m]	0.84 (-3.4 %)
Measured dielectric constant	41.5 (-4.7 %)
Conversion Factor ( )	5.633
Sensitivity ( ) [W/Kg/mV]	5.205E-02
Source-(or Usage-)Based Time-Average Factor	0.5
Measurement Area Specification (X × Y)	60 mm × 45 mm; Resolution: 15 mm × 15 mm
Measurement Volume Specification (X × Y × Z)	5 pts × 5 pts × 7 pts, 58 mm × 58 mm × 30 mm; Resolution: 7 mm × 7 mm × 5 mm
SAR_{Local} Drift [%]	-0.5
SAR_{1g} [W/Kg]	1.85



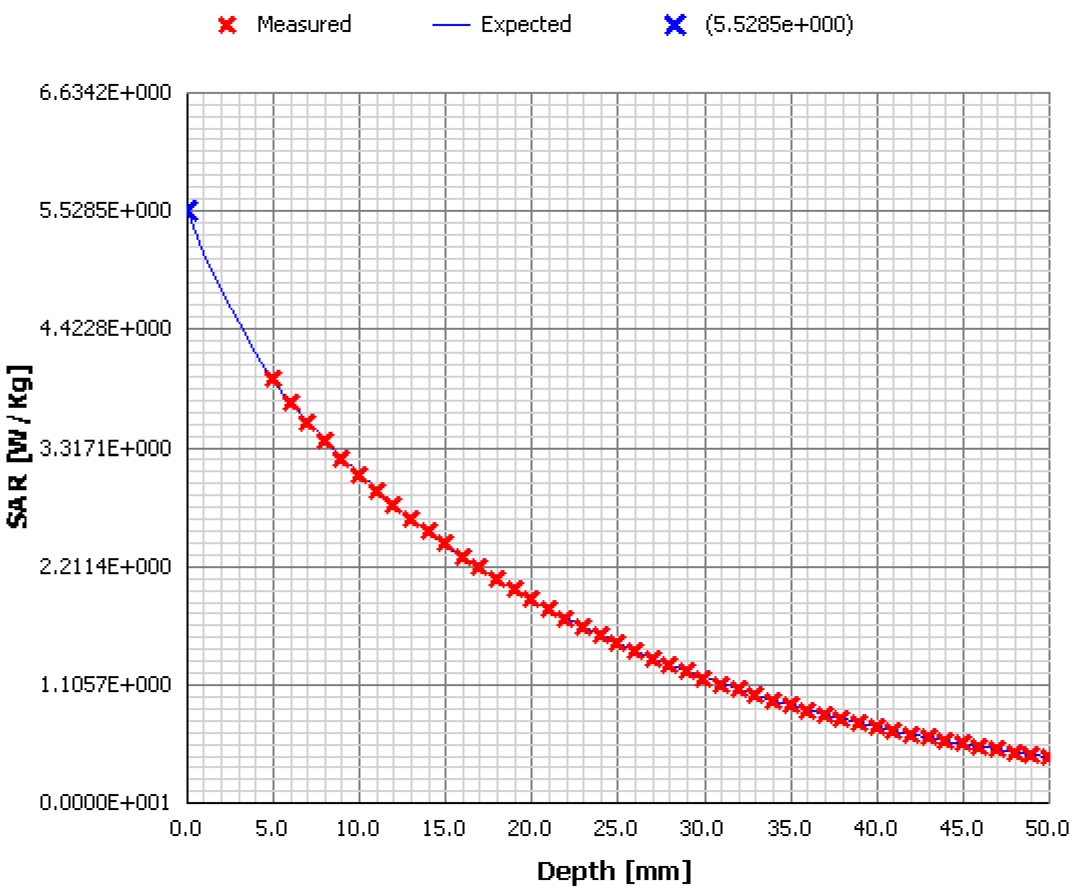
- Assessed by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia), VCCI (Japan)
- Accredited by Industry Canada (Canada) under ACC-LAB (Europe/Canada MRA and APEC/Canada MRA)
- Recognized/Listed by FCC (USA)
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*



Remark: Local SAR value in the above plot did not reflect 50% of user-based time-average correction for PTT.

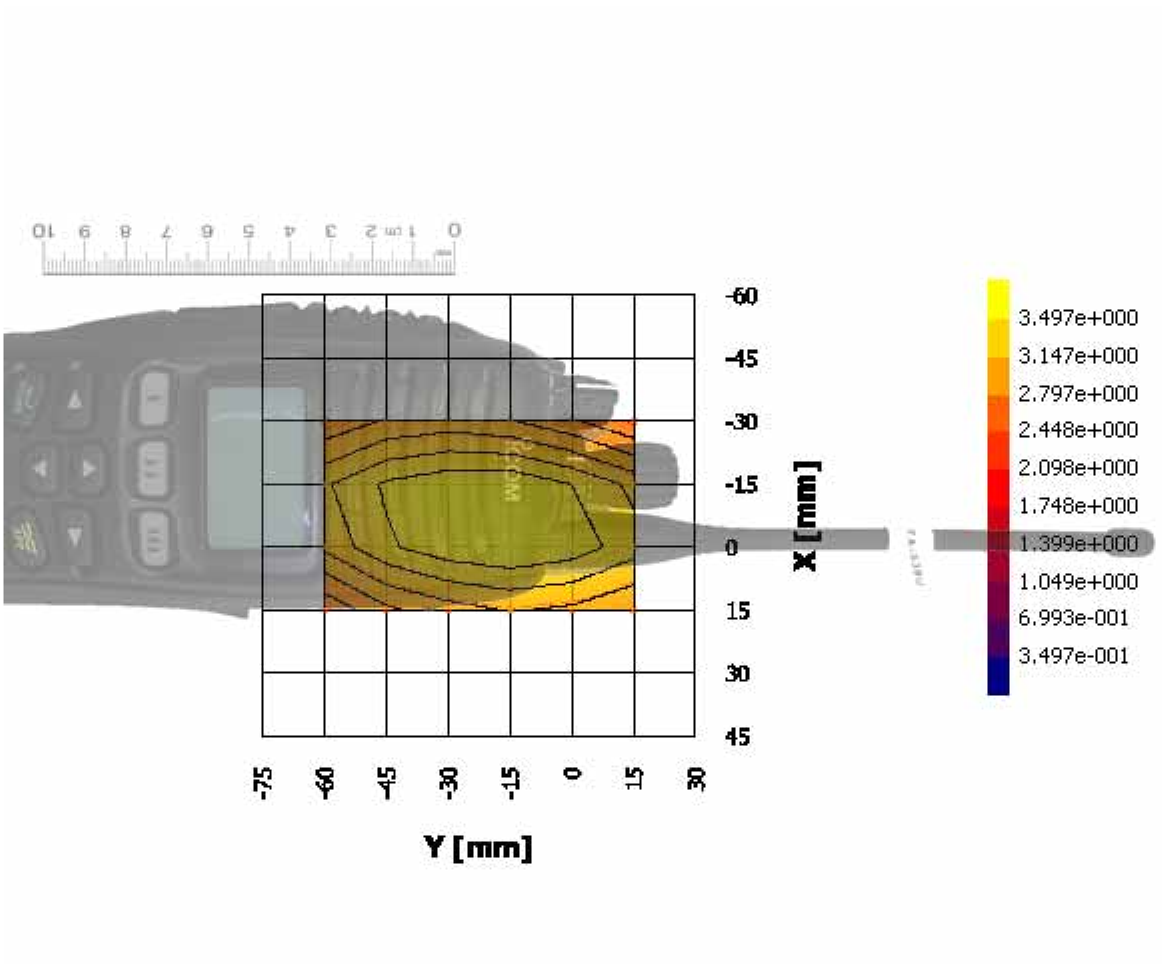


Remark: Local SAR value in the above plot did not reflect 50% of user-based time-average correction for PTT.

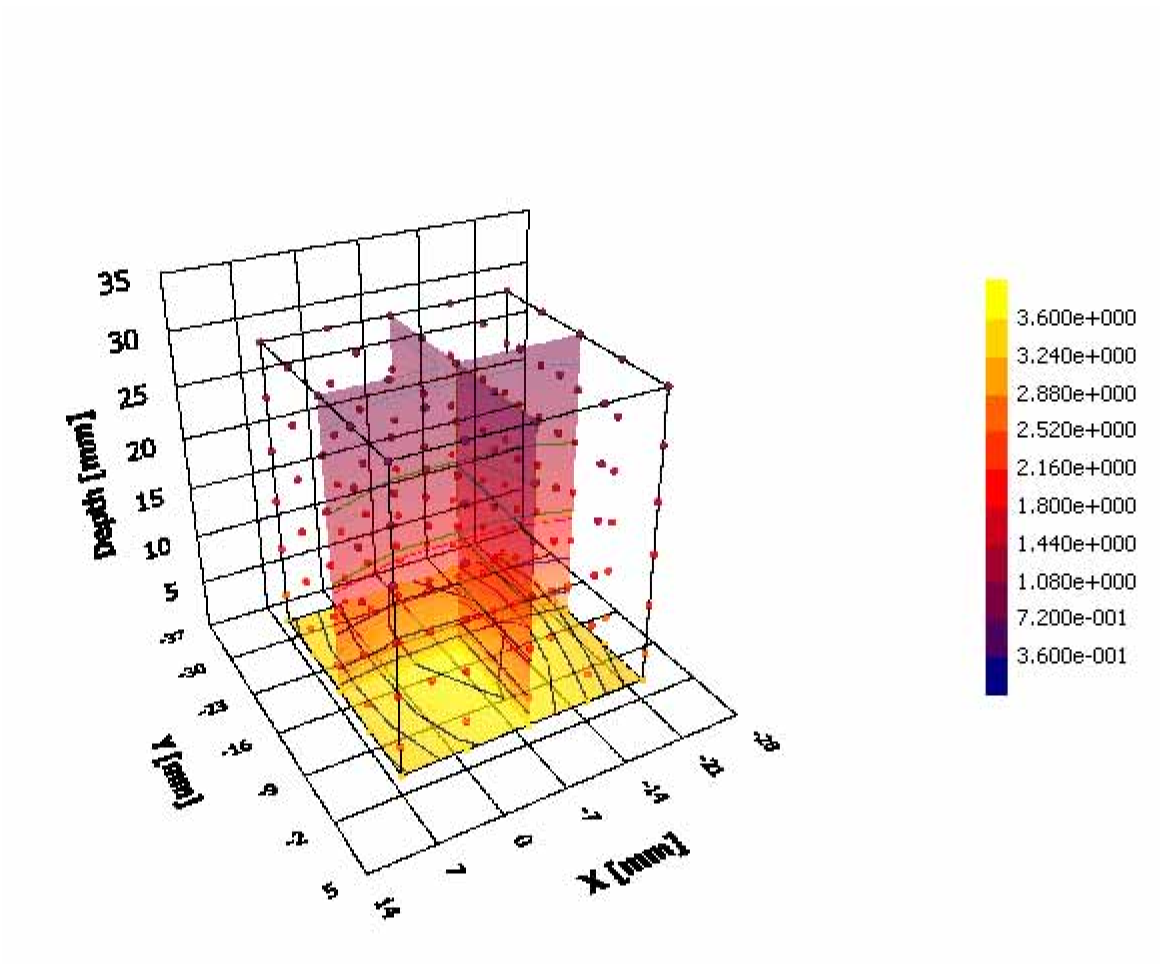

Measured
Expected
(5.5285e+000)
6.6342E+000
5.5285E+000
4.4228E+000
3.3171E+000
2.2114E+000
1.1057E+000
0.0000E+001
SA R [W / Kg]
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
Depth [mm]

6.1.1.2. ¼ helical whip antenna (M/N: FA-S30U); 406.2 MHz; #05

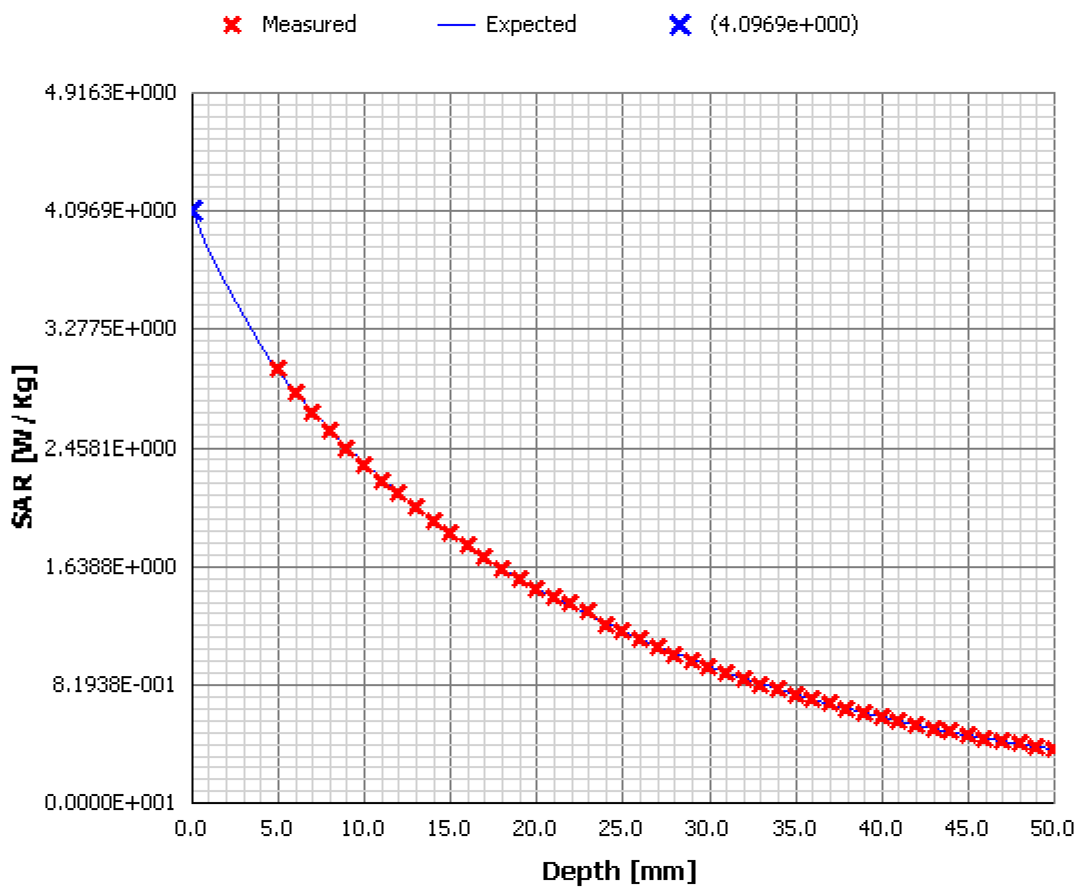
Test date [MM/DD/YYYY]	12/22/2008
Test by	Steven Lu
Room temperature [°C]	21
Room humidity [%]	40
Simulated tissue temperature [°C]	21
Separation distance, d [mm]	25
Test frequency [MHz]	450.1
E-field Probe	M/N: ET20, S/N: 03-MAR-0019, Sensor Offset: 2.1 mm
Sensor Factor (η_{Pd}) [mV/(mW/cm^2)]	10.8
Diode Compression (DCP_1, DCP_2, DCP_3)	92825, 96871, 86612
Amplifier Settings (AS_1, AS_2, AS_3)	0.0075307056, 0.0080137981, 0.0081171369
Tissue Type	Brain
Measured conductivity [S/m]	0.84 (-3.4 %)
Measured dielectric constant	41.5 (-4.7 %)
Conversion Factor ( )	5.633
Sensitivity ( ) [W/Kg/mV]	5.205E-02
Source-(or Usage-)Based Time-Average Factor	0.5
Measurement Area Specification (X × Y)	60 mm × 45 mm; Resolution: 15 mm × 15 mm
Measurement Volume Specification (X × Y × Z)	5 pts × 5 pts × 7 pts, 58 mm × 58 mm × 30 mm; Resolution: 7 mm × 7 mm × 5 mm
SAR_{Local} Drift [%]	-1.4
SAR_{1g} [W/Kg]	1.40



Remark: Local SAR value in the above plot did not reflect 50% of user-based time-average correction for PTT.



Remark: Local SAR value in the above plot did not reflect 50% of user-based time-average correction for PTT.


Measured
Expected
(4.0969e+000)
4.9163E+000
4.0969E+000
3.2775E+000
2.4581E+000
1.6388E+000
8.1938E-001
0.0000E+001
SAR [W / Kg]
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
Depth [mm]

6.2. BODY CONFIGURATION*

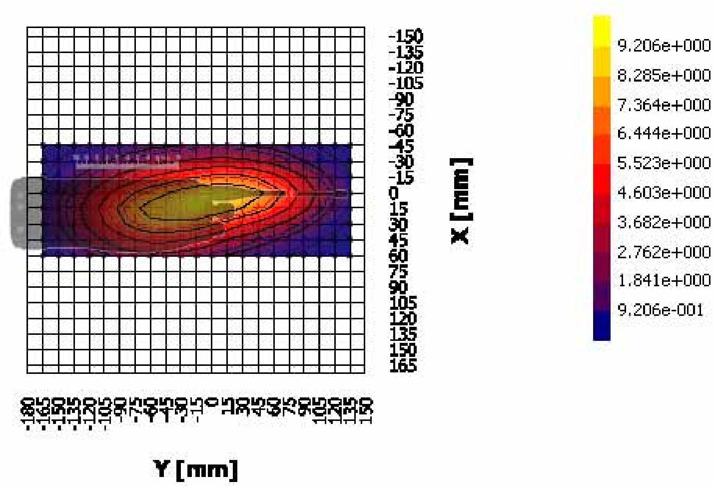
6.2.1. Body-worn; Back-side in parallel to the phantom and the belt clip in contact

#	Configuration	Antenna Position	Frequency [MHz]	Channel	SAR_{local} Drift [%]	MAX SAR_{1g} [W/Kg]
*	Occupational/Controlled Exposure Category Limit					8.0
07	¼ helical whip antenna (M/N: FA-S58U, 430~470 MHz, red ring)	FIX	430	Low		-
08	Belt clip (M/N: MB-115) Speaker-microphone (M/N: HM-184)	FIX	450.1	Middle	-2.3	3.82
09	50% duty cycle for PTT	FIX	470	High		-
10	¼ helical whip antenna (M/N: FA-S30U, 380~430 MHz, green ring)	FIX	400	Low		-
11	Belt clip (M/N: MB-115) Speaker-microphone (M/N: HM-184)	FIX	406.2	Low	-2.8	3.15
12	50% duty cycle for PTT	FIX	430	High		-

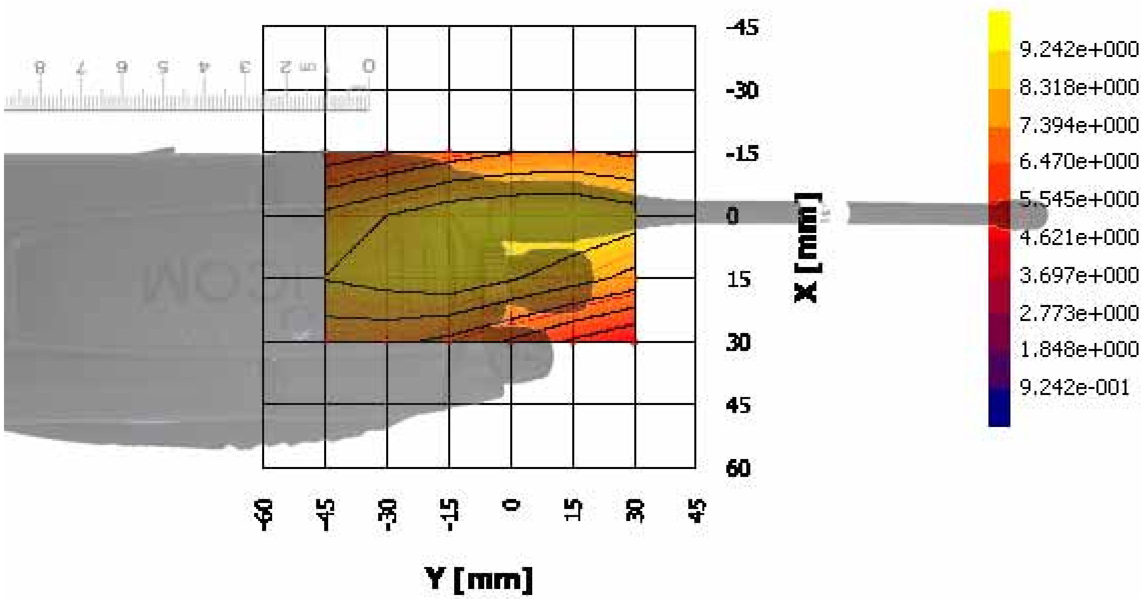
* If the SAR measured at the highest output power channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the other channels are optional for such test configurations.

6.2.1.1. ¼ helical whip antenna (M/N: FA-S58U), Belt Clip (M/N: MB-115), Speaker-microphone (M/N: HS-184); 450.1 MHz; #08

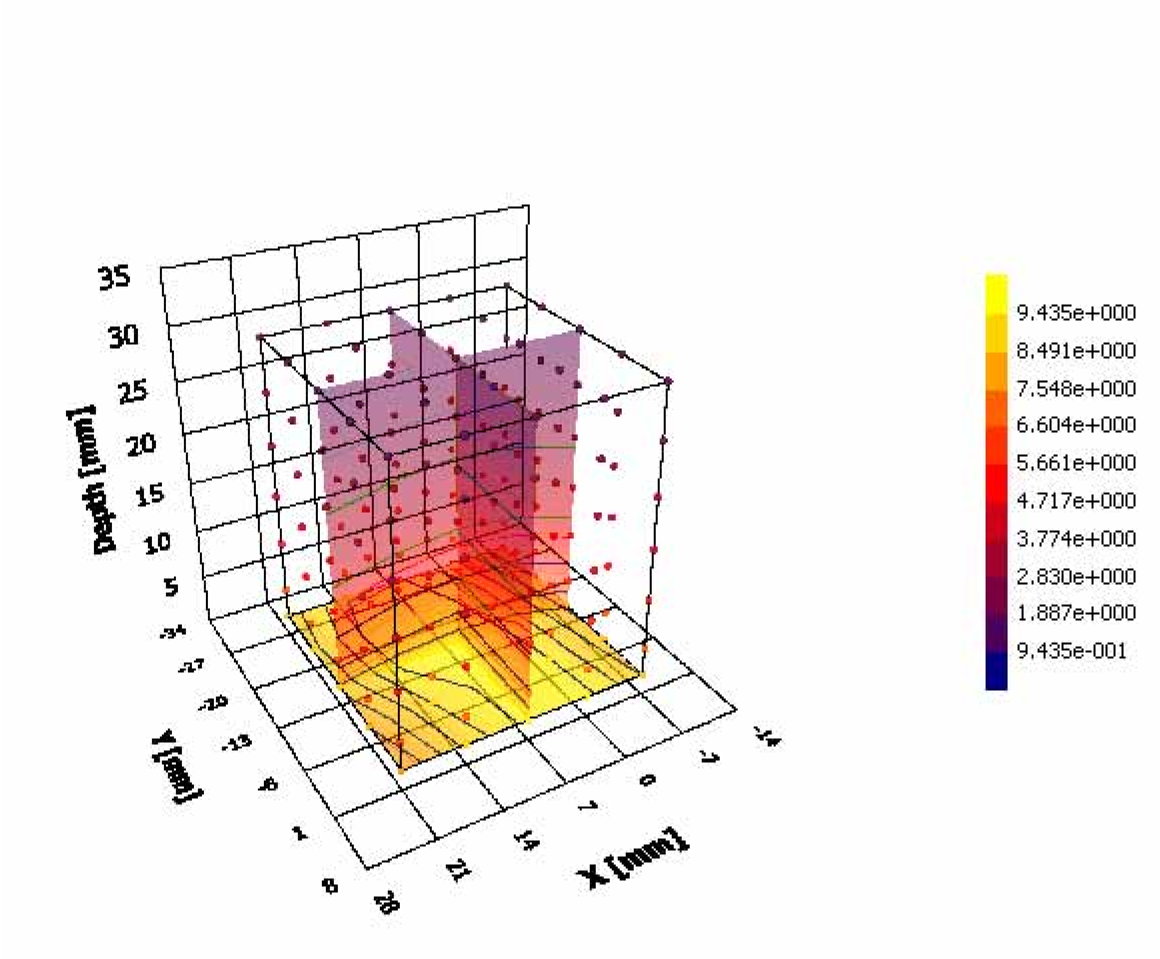
Test date [MM/DD/YYYY]	12/23/2008
Test by	Steven Lu
Room temperature [°C]	21
Room humidity [%]	40
Simulated tissue temperature [°C]	21
Separation distance, d [mm]	0
Test frequency [MHz]	450.1
E-field Probe	M/N: ET20, S/N: 03-MAR-0019, Sensor Offset: 2.1 mm
Sensor Factor (η_{Pd}) [mV/(mW/cm^2)]	10.8
Diode Compression (DCP_1, DCP_2, DCP_3)	92825, 96871, 86612
Amplifier Settings (AS_1, AS_2, AS_3)	0.0075307056, 0.0080137981, 0.0081171369
Tissue Type	Muscle
Measured conductivity [S/m]	0.90 (-4.0 %)
Measured dielectric constant	56.1 (-1.1 %)
Conversion Factor ( )	5.823
Sensitivity ( ) [W/Kg/mV]	5.395E-02
Source-(or Usage-)Based Time-Average Factor	0.5
Measurement Area Specification (X × Y)	60 mm × 45 mm; Resolution: 15 mm × 15 mm
Measurement Volume Specification (X × Y × Z)	5 pts × 5 pts × 7 pts, 58 mm × 58 mm × 30 mm; Resolution: 7 mm × 7 mm × 5 mm
SAR_{Local} Drift [%]	-2.3
SAR_{1g} [W/Kg]	3.82



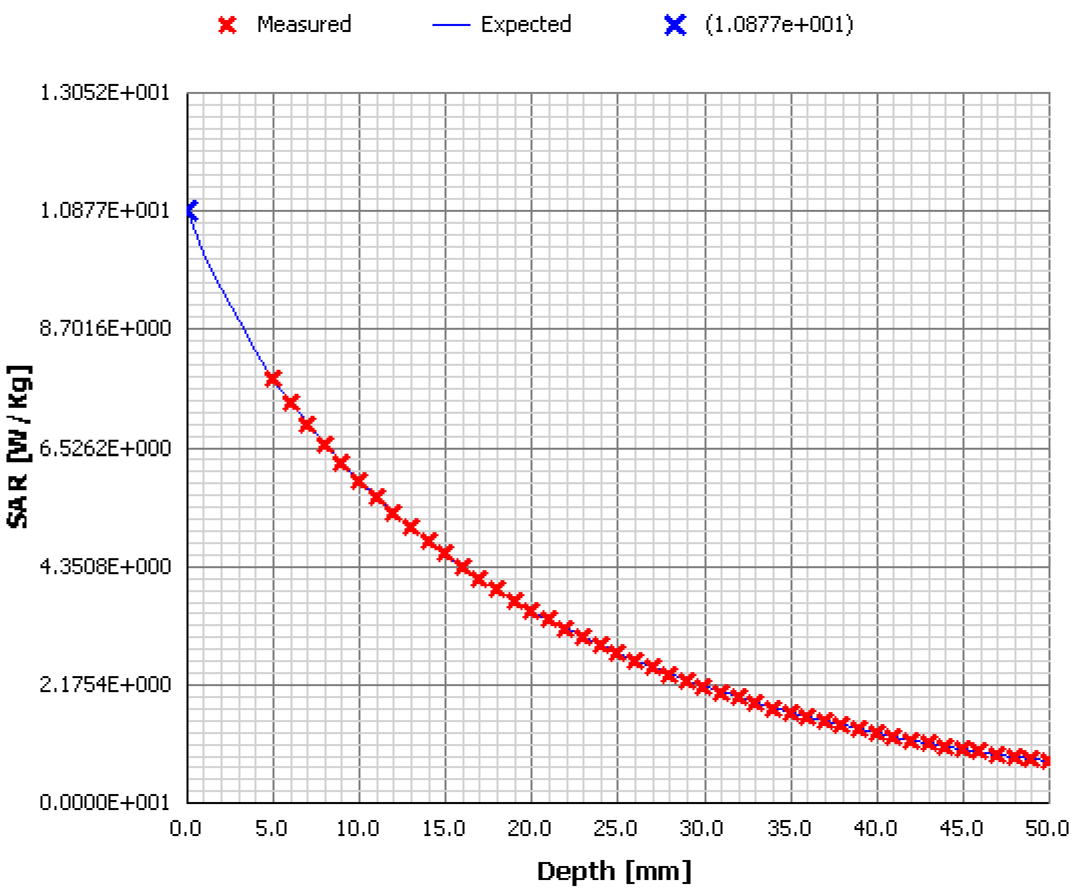
- Assessed by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia), VCCI (Japan)
- Accredited by Industry Canada (Canada) under ACC-LAB (Europe/Canada MRA and APEC/Canada MRA)
- Recognized/Listed by FCC (USA)
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*



Remark: Local SAR value in the above plot did not reflect 50% of user-based time-average correction for PTT.

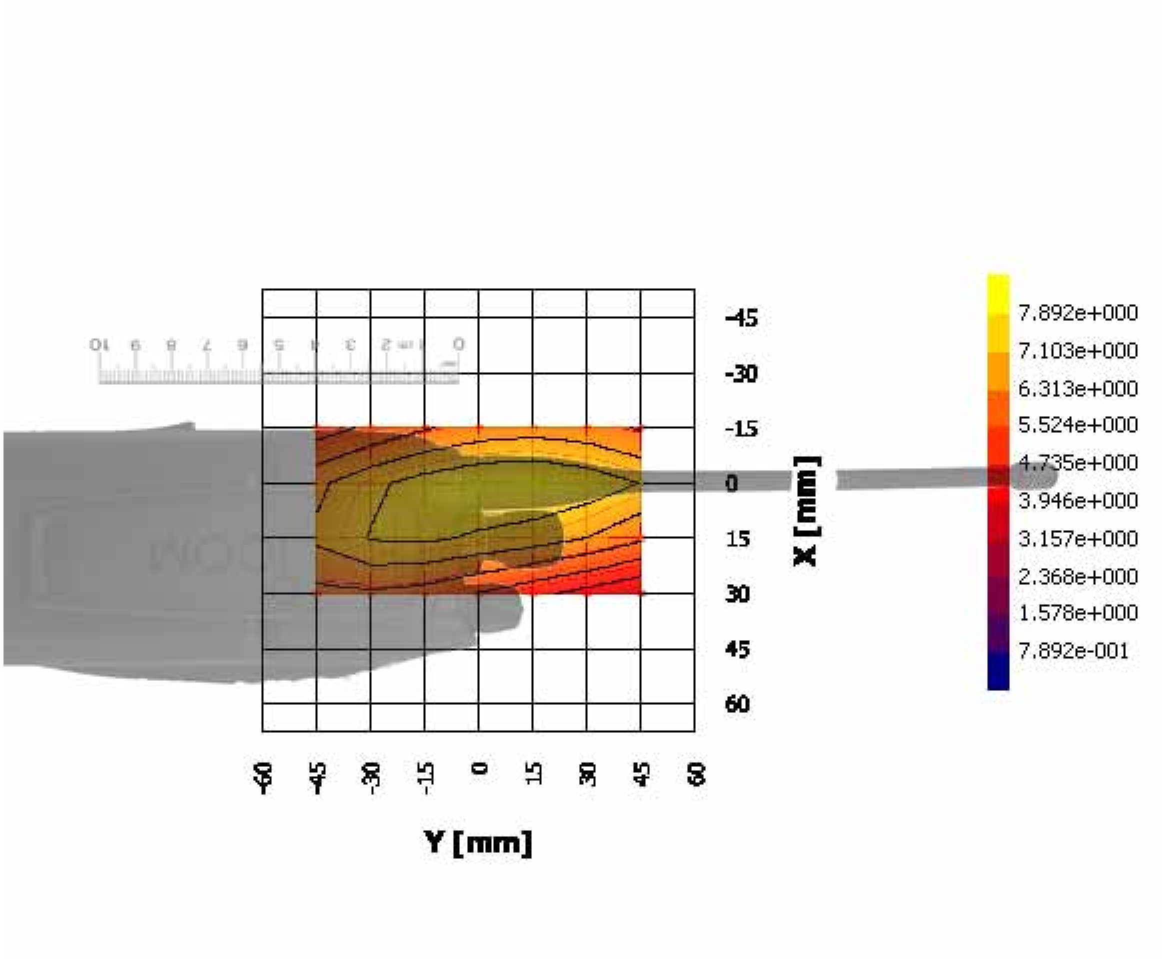


Remark: Local SAR value in the above plot did not reflect 50% of user-based time-average correction for PTT.

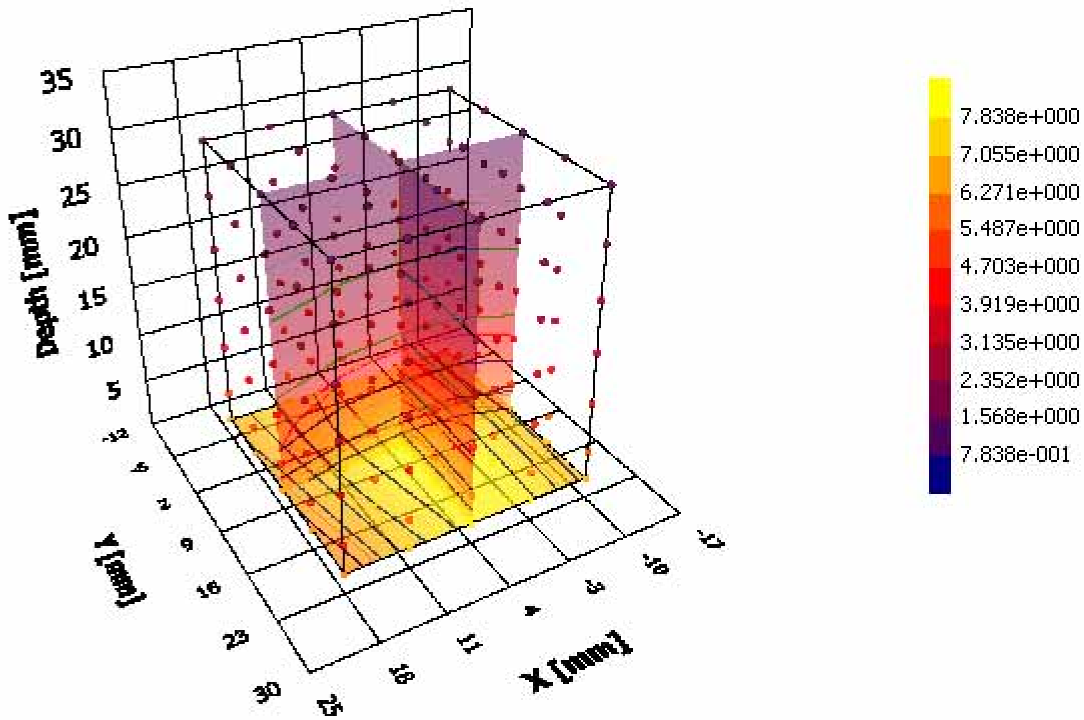

Measured
Expected
(1.0877e+001)
1.3052E+001
1.0877E+001
8.7016E+000
6.5262E+000
4.3508E+000
2.1754E+000
0.0000E+001
SAR [W / Kg]
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
Depth [mm]

6.2.1.2. ¼ helical whip antenna (M/N: FA-S30U), Belt Clip (M/N: MB-115), Speaker-microphone (M/N: HS-184); 406.2 MHz; #11

Test date [MM/DD/YYYY]	12/23/2008
Test by	Steven Lu
Room temperature [°C]	21
Room humidity [%]	40
Simulated tissue temperature [°C]	21
Separation distance, d [mm]	0
Test frequency [MHz]	406.2
E-field Probe	M/N: ET20, S/N: 03-MAR-0019, Sensor Offset: 2.1 mm
Sensor Factor (η_{Pd}) [mV/(mW/cm^2)]	10.8
Diode Compression (DCP_1, DCP_2, DCP_3)	92825, 96871, 86612
Amplifier Settings (AS_1, AS_2, AS_3)	0.0075307056, 0.0080137981, 0.0081171369
Tissue Type	Muscle
Measured conductivity [S/m]	0.90 (-4.0 %)
Measured dielectric constant	56.1 (-1.1 %)
Conversion Factor ( )	5.823
Sensitivity ( ) [W/Kg/mV]	5.395E-02
Source-(or Usage-)Based Time-Average Factor	0.5
Measurement Area Specification (X × Y)	60 mm × 45 mm; Resolution: 15 mm × 15 mm
Measurement Volume Specification (X × Y × Z)	5 pts × 5 pts × 7 pts, 58 mm × 58 mm × 30 mm; Resolution: 7 mm × 7 mm × 5 mm
SAR_{Local} Drift [%]	-2.8
SAR_{1g} [W/Kg]	3.15



Remark: Local SAR value in the above plot did not reflect 50% of user-based time-average correction for PTT.



Remark: Local SAR value in the above plot did not reflect 50% of user-based time-average correction for PTT.

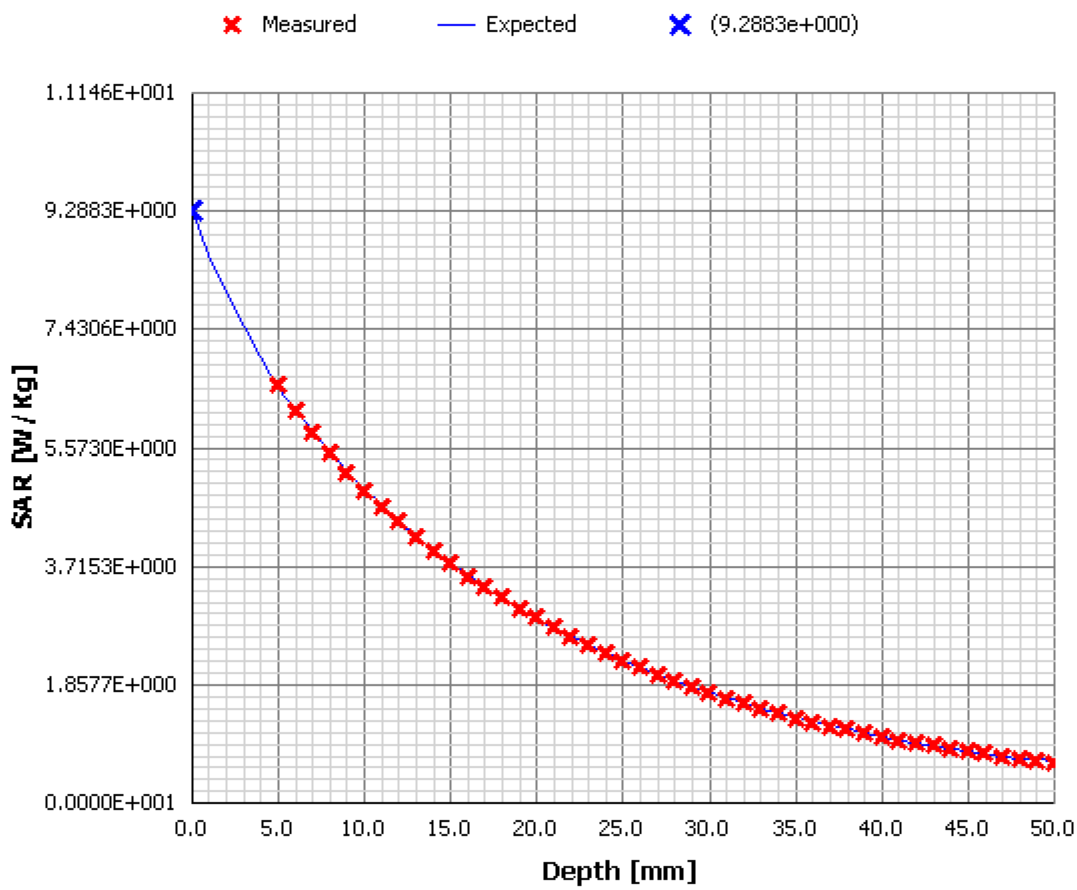

Measured
Expected
(9.2883e+000)
1.1146E+001
9.2883E+000
7.4306E+000
5.5730E+000
3.7153E+000
1.8577E+000
0.0000E+001
SAR [W/Kg]
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
Depth [mm]

EXHIBIT 7. TISSUE DIELECTRIC PARAMETER CALIBRATION

Tissue calibration type	HP Dielectric Strength Probe System (M/N: 85070C)	
Tissue calibration date [MM/DD/YYYY]	12/22/2008	12/22/2008
Tissue calibrated by	Steven Lu	Steven Lu
Room temperature [°C]	21	21
Room humidity [%]	40	40
Simulated tissue temperature [°C]	21	21
Tissue calibration frequency [MHz]	450	450
Tissue Type	Brain	Muscle
Target conductivity [S/m]	0.87	0.94
Target dielectric constant	43.5	56.7
Composition (by weight) [%]	DI Water (38.56 %) Sugar (56.32 %) Salt (3.95 %) HEC (0.25 %) Bactericide (0.92 %)	DI Water (51.16 %) Sugar (46.78 %) Salt (1.49 %) HEC (0.13 %) Bactericide (0.44 %)
Measured conductivity [S/m]	0.84 (-3.4 %)	0.90 (-4.0 %)
Measured dielectric constant	41.5 (-4.7 %)	56.1 (-1.1 %)
Penetration depth (plane wave excitation) [mm]	43.5	46.1

7.1. 450 MHZ BRAIN TISSUE

	Meas. after 5min			DI Water at 20°C			Init. Meas.		
Frequency [MHz]	**'**	**"**	**[S/m]**	**'**	**"**	**[S/m]**	**'**	**"**	**[S/m]**
425.000	41.9872	34.5652	0.82	79.7037	1.6267	0.04	42.0793	35.0740	0.83
450.000	41.4639	33.5618	0.84	79.7948	1.7229	0.04	41.6314	34.0600	0.85
475.000	40.8962	32.3982	0.86	79.8248	1.9758	0.05	40.9364	32.6583	0.86

7.2. 450 MHZ MUSCLE TISSUE

	Meas. after 5min			DI Water at 20°C			Init. Meas.		
Frequency [MHz]	**'**	**"**	**[S/m]**	**'**	**"**	**[S/m]**	**'**	**"**	**[S/m]**
425.000	56.4972	37.2780	0.88	79.7037	1.6267	0.04	56.5287	37.6537	0.89
450.000	56.0619	36.0524	0.90	79.7948	1.7229	0.04	56.1538	36.4156	0.91
475.000	55.6070	35.1062	0.93	79.8248	1.9758	0.05	55.5976	35.4082	0.94

EXHIBIT 8. SAR SYSTEM VERIFICATION USING DIPOLE REFERENCE

8.1.1. At 450 MHz

Flat phantom dimension (W × L × H) [mm]	420 × 700 × 200
Flat phantom shell thickness (d_3) [mm]	2.0
Flat phantom shell permittivity	2.98
Reference dipole dimension (L × h × d) [mm]	279 × 167 × 6.34
Dipole-to-Phantom (d_2) [mm]	13.0
Dipole-to-Liquid ($d_2 + d_3$) [mm]	15.0 (13.0 + 2.0)
Return Loss (at test frequency) [dB]	More than 20

8.2. SIMULATED TISSUE

8.2.1. Verification Result

8.2.1.1. Reference SAR values at 450 MHz[*]

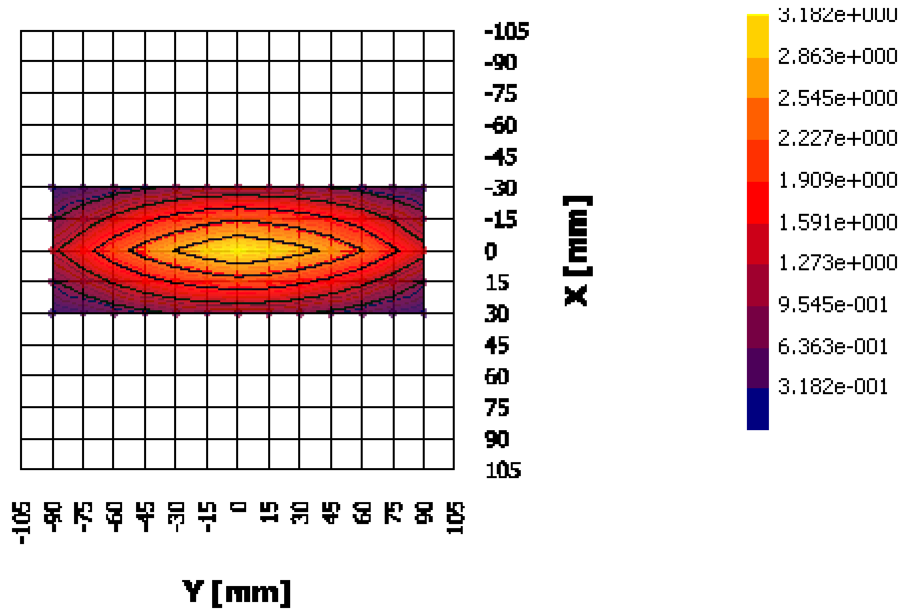
Reference SAR_{1g} [W/Kg]	4.9
Reference SAR_{s} [W/Kg]	7.2
Measured SAR_{1g} [W/Kg]	4.60
Measured SAR_{s} [W/Kg]	7.86

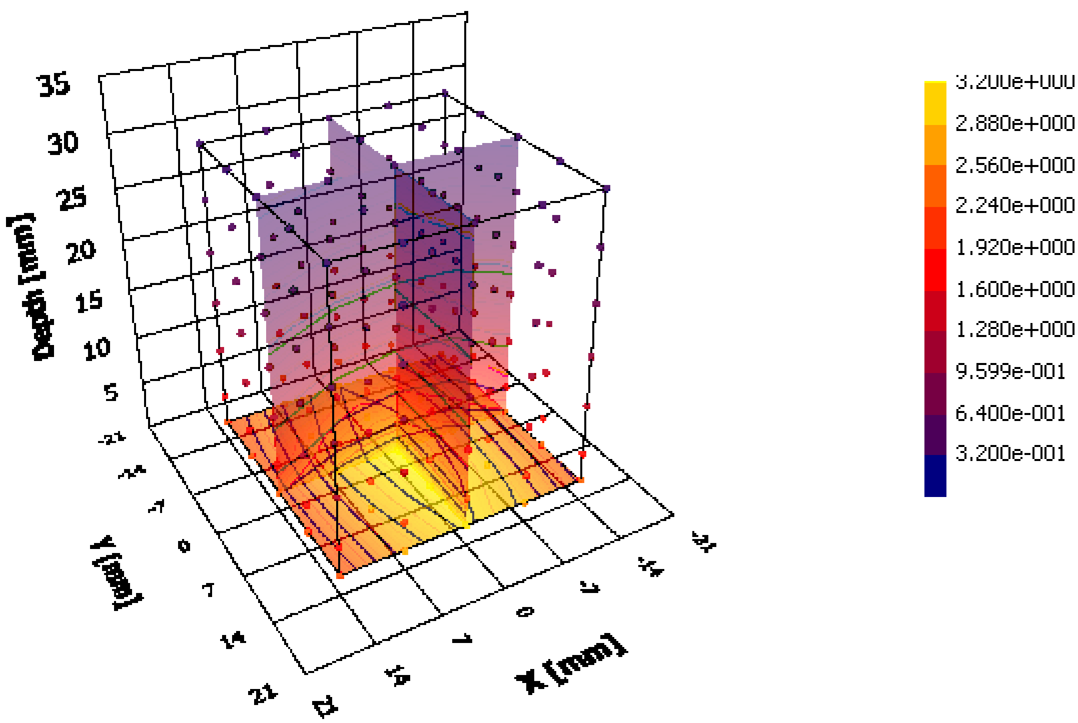
8.2.1.2. Verification at 450 MHz

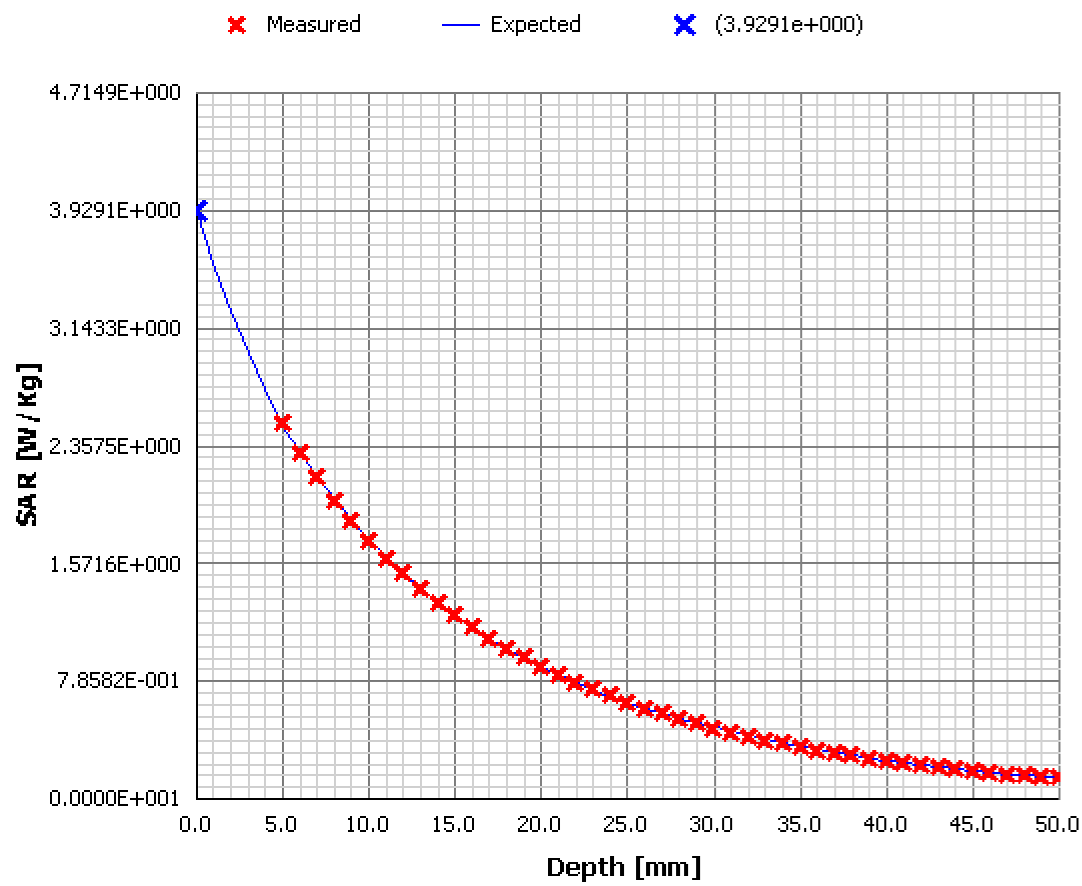
Test date [MM/DD/YYYY]	12/22/2008
Test by	Steven Lu
Room temperature [°C]	21
Room humidity [%]	40
Simulated tissue temperature [°C]	21
Test frequency [MHz]	450
E-field Probe	M/N: ET-20, S/N: 03-MAR-0019, Sensor Offset: 2.0 mm
Sensor Factor (η_{Pd}) [$mV/(mW/cm^2)$]	10.8
Diode Compensation (DCP_1, DCP_2, DCP_3)	92825, 96871, 86612
Amplifier Settings (AS_1, AS_2, AS_3)	0.0075307056, 0.0080137981, 0.0081171369
Tissue Type	Brain
Measured conductivity [S/m]	0.84 (-3.4 %)
Measured dielectric constant	41.5 (-4.7 %)
Conversion Factor (γ)	5.633
Sensitivity (ζ) [W/Kg/mV]	5.205E-02
Power [mW]	500 (forward power)
Measurement Volume Specification ($X \times Y \times Z$)	5 pts × 5 pts × 7 pts, 28 mm × 28 mm × 30 mm; Resolution: 7 mm × 7 mm × 5 mm
SAR_{1g} [W/Kg]	2.30
SAR_{s} [W/Kg]	3.93

[*] SAR values in 8.2.1.1 are normalized to a forward power of 1 W.

- Assessed by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia), VCCI (Japan)
- Accredited by Industry Canada (Canada) under ACC-LAB (Europe/Canada MRA and APEC/Canada MRA)
- Recognized/Listed by FCC (USA)
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*


-105
-90
-75
-60
-45
-30
-15
0
15
30
45
60
75
90
105
X [mm]
-105 -90 -75 -60 -45 -30 -15 0 15 30 45 60 75 90 105
Y [mm]
3.182e+000
2.863e+000
2.545e+000
2.227e+000
1.909e+000
1.591e+000
1.273e+000
9.545e-001
6.363e-001
3.182e-001


Depth [mm]
35
30
25
20
15
10
5
Y [mm]
-21
-14
-7
0
7
14
21
X [mm]
21
14
7
0
-7
-14
-21
3.200e+000
2.880e+000
2.560e+000
2.240e+000
1.920e+000
1.600e+000
1.280e+000
9.599e-001
6.400e-001
3.200e-001


Measured
Expected
(3.9291e+000)
4.7149E+000
3.9291E+000
3.1433E+000
2.3575E+000
1.5716E+000
7.8582E-001
0.0000E+001
SAR [W / Kg]
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
Depth [mm]