SAR TEST REPORT

Test item	:	PCS Licensed Transmitter
Model No.	:	N5 Premium
Order No.	:	1009-00908
Date of receipt	:	2010-09-14
Test duration	:	2010-09-18 ~ 2010-09-27
Date of issue	:	2010-10-04
Use of report	:	FCC Original Grant

Applicant : YUKYUNG TECHNOLOGIES INC.
200-11, Anyang-Dong, Manan-Ku, Anyang-Si, Kyunggi-Do, Korea

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Test specification	:	§2.1093, FCC/OET Bulletin 65 Supplement C[July 2001]
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DIGITAL EMC CO., LTD.

Tested by:	Witnessed by:	Reviewed by:
Engineer S.K.Ryu	N/A	Technical director Harvey Sung

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1. General Information

1.1 Equipment information

FCC Equipment Class	PCS Licensed Transmitter
Equipment type	MID(Mobile Internet Device)
Equipment model name	N5 Premium
Variant model name	N5 EX
Equipment add model name	N/A
Equipment serial no.	Identical prototype
TX Frequency Range	824.70 ~ 848.31 MHz(CDMA Cellular) / 1851.25 ~ 1908.75 MHz(PCS1900) 2412 ~ 2462 MHz (IEEE 802.11 b/g)
RX Frequency Range	869.70 ~ 893.31 MHz(CDMA Cellular) / 1931.25~ 1988.75MHz (PCS1900) 2412 ~ 2462 MHz (IEEE 802.11 b/g)
Max. SAR Measurement	**0.363** mW/g CDMA Cellular Body SAR **0.407** mW/g CDMA PCS Body SAR **0.00468** mW/g W-LAN Body SAR

2. INTROCUCTION/SAR DEFINITION

In 1974, the International Radiation Protection Association (IRPA) formed a working group on non-ionizing radiation (NIR), which examined the problems arising in the field of Protection against the various types of NIR. At the IRPA Congress in Paris in 1977, this working group because the International Non-Ionizing Radiation Committee (INIRC).

In cooperation with the Environmental Health Division of the World Health Organization (WHO), the IRPA/INIRC developed a number of health criteria documents on NIR as part of WHO'S Environmental Health Criteria Programme, sponsored by the United Nations Environment Programme (UNEP). Each document includes an overview of the physical characteristics, measurement and instrumentation, sources, and applications of NIR, a thorough review of the literature on biological effects, and an evaluation of the health risks of exposure to NIR. These health criteria have provided the scientific database for the subsequent development of exposure limits and codes of practice relating to NIR.

At the Eighth International Congress of the IRPA (Montreal, 18-22 May 1992), a new, independent scientific organization-the International Commission on Non-Ionizing Radiation Protection (ICNIRP)-was established as a successor to the IRPA/INIRC. The functions of the Commission are to investigate the hazards that may be association with the different forms of NIR, develop international guidelines on NIR exposure to static and extremely-low-frequency (ELF) electric and magnetic field have been reviewed by UNEP/WHO/IRPA (1984, 1987). Those publications and a number of others, including UNEP/WHO/IRPA (1993) and Allen et al. (1991), provided the scientific rationale for these guidelines.

A glossary of terms appears in the Appendix.

2.1 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 (ρ) It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Fig. 1.1)

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{\rho\, dv}\right)$$

Figure 1.1
SAR Mathematical Equation

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

SAR = E^2 / ρ

Where:

σ = conductivity of the tissue-simulant material (S/m)

ρ = mass density of the tissue-simulant material (kg/m3)

E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of theincident field in relations to the dimensions and geometry of the irradiated organism, the orientation of theorganism 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.[6]

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3. SAR MEASUREMENT SETUP

3.1Robotic System

Measurements are performed using the DASY4 automated dosimetric assessment system.The DASY4 is made by Schmid& Partner Engineering AG (SPEAG) in Zurich, Switzerlandand consists of high precision robotics system (Staubli), robot controller, Pentium III computer, near-field probe, probe alignment sensor, and the generic twin phantomcontaining the brain equivalent material. The robot is a six-axis industrial robotperforming precise movements to position the probe to the location (points) of maximumelectromagnetic field (EMF) (see Fig. 2.1).

3.2 System Hardware

A cell controller system contains the power supply, robot controller teachpendant(Joystick), and a remote control used to drive the robot motors. The PC consists of theMicron Pentium IV 500 MHz computer with Windows NT system and SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The StaubliRobotis connected to the cell controller to allow software manipulation of the robot. A dataacquisition electronic (DAE) circuit that performs the signal amplification, signalmultiplexing, AD-conversion, offset measurements, mechanical surface detection,collision detection, etc. 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 PC plug-in card.

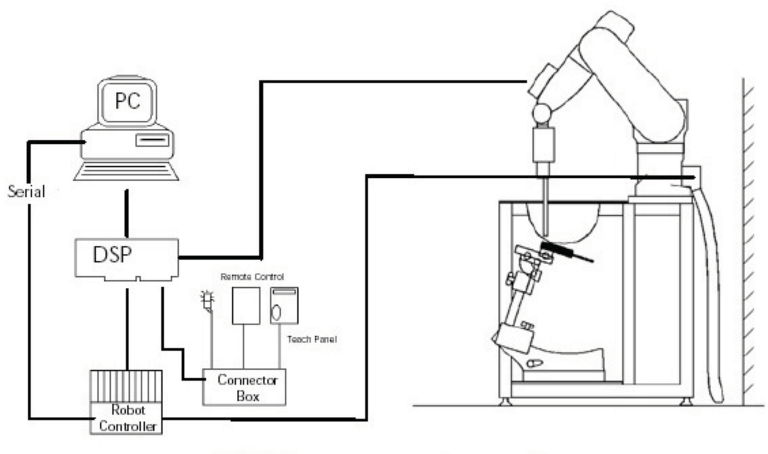

Figure 2.1 SAR Measurement System Setup

3.3 System Electronics

The DAE3 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and acommand decoder and control logic unit. Transmission to the PC-card is accomplishedthrough an opticaldownlink for data and statusinformation and an optical uplink forcommands and clock lines. The mechanicalprobe mounting device includestwodifferent sensor systems for frontal and sidewise probe contacts. They are also used formechanical surface detection and probe collision detection. The robotuses its owncontroller with a built in VME-bus computer. The system is described in detail in [7].

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3.4Probe Measurement System

Figure 3.1 DAE System

The SAR measurements were conducted with th edosimetric probe EX3DV4,designed in the classical triangular configuration [7](see Fig. 3.2) and optimizedor dosimetric evaluation. The probe is constructed using the thick film technique;with printed resistive lines onceramic substrates. The probe is equipped with an optical multifiber line ending at the front oftheprobe tip (see Fig. 3.3). It isconnected to the EOC box on the robot arm and provides anautomaticdetectionof the phantomsurface. Half of the fibers are connected to a pulsed infraredtransmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting tothe receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. Thedistance of the couplingmaximumto the surface isindependent of the surfacereflectivityandlargely independent of the surface toprobe angle. The DASY4 software reads the reflectionduring a software approachand looks for the maximum using a 2nd order fitting (see Fig.3.1). The approach isstopped at reaching the maximum.

3.5 Probe Specifications

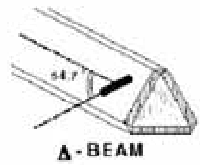

Figure 3.1 Triangular Probe Configuration

Calibration: In air from 10 MHz to 6.0 GHz
In brain and muscle simulating tissue atFrequencies of
835 MHz, 1750 MHz, 1900 MHz, 2450 MHz, 2600 MHz, 3500 MHz

Frequency: 10 MHz to 6 GHz

Linearity: ±0.2dB (30 MHz to 6 GHz)

Dynamic: 10 mW/kg to 100 W/kg

Range: Linearity: ±0.2dB

Dimensions: Overall length: 330 mm

Tip length: 20 mm

Body diameter: 12 mm

Tip diameter: 2.5 mm

Distance from probe tip to sensor center: 1 mm

Application: SAR Dosimetry Testing
Compliance tests of mobile phones

Figure 3.2 Probe Thick-Film Technique

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4. Probe Calibration Process

4.1Dosimetric Assessment Procedure

Each probe is calibrated according to a dosimetric assessment procedure described in [8] with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in[9] and found to be better than +/-0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.

4.2Free Space Assessment

The free space E-field fromamplified probe outputs is determined in a testchamber. This isperformed in a TEM cell for frequenciesbelow 1 GHz (see Fig. 4.1), and in a waveguide above 1GHz for free space. For the free space calibration, the probe is placed in the volumetric center ofthe cavity at the proper orientation with the field. The probe is then rotated 360 degrees.

4.3 Temperature Assessment *

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium; correlates to temperature risein a dielectric medium. For temperature correlation calibration a RF transparent the rmist or based temperature probe is used in conjunction with the E-field probe (see Fig. 4.2).

$$\mathrm{SAR} = C\frac{\Delta T}{\Delta t}$$

where:

Δt = exposure time (30 seconds),

C = heat capacity of tissue (brain or muscle),

ΔT = temperature increase due to RF exposure.

SAR is proportional to$\Delta T / \Delta t$, the initial rate of tissue heating, before thermal diffusion takes place. Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E- field;

$$\mathrm{SAR} = \frac{|E|^2 \cdot \sigma}{\rho}$$

where:

σ = simulated tissue conductivity,

ρ = Tissue density (1.25 g/cm^3 for brain tissue)

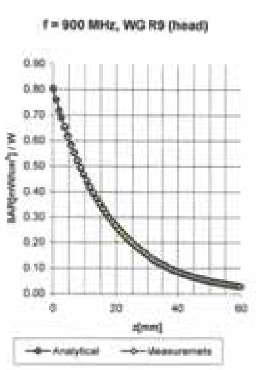

Figure 4.1 E-Field and Temperature Measurements at 900MHz[7]

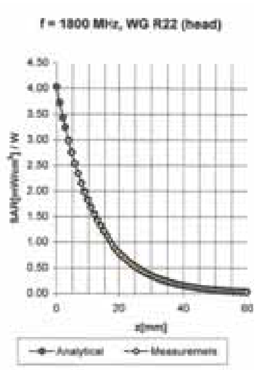

Figure 4.2 E-Field and Temperature Measurements at 1900MHz[7]

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5. PHANTOM & EQUIVALENT TISSUES

5.1SAM Phantom

Figure 5.1 SAM Twin Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a woodentable. 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 [11][12]. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usageat the flat phantom region. A cover prevent stheevaporation of the liquid.
Referencemarkings on thePhantom allow thecomplete setup of all predefined phantom positionsand measurement grids by manually teaching three points in the robot. (See Fig. 5.1)

5.2 Brain & Muscle Simulating Mixture Characterization

Figure 5.2 Simulated Tissue

The brain and muscle mixtures consist of a viscous gel using hydroxethylcellullose (HEC) gelling agent and saline solution (see Table 6.1). 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. Other head and body tissue parameters that have not be specified in P1528 are derived from the issue dielectric parameters computed from he 4-Cole-Cole equations The mixture characterizations used for the brain and muscle tissue simulating liquids are according to the data by C. Gabriel and G. Harts grove [13].(see Fig. 5.2)

Table 5.1 Composition of the Muscle Tissue Equivalent Matter

INGREDIENTS		SIMULATING TISSUE					
		835 MHz Brain	835 MHz Muscle	1900 MHz Brain	1900 MHz Muscle	2450MHz Brain	2450MHz Muscle
Mixture Percentage							
WATER		41.45	52.50	54.90	40.40	62.70	73.20
DGBE		0.000	0.000	44.92	58.00	0.000	26.70
SUGAR		56.00	45.00	0.000	0.000	0.000	0.000
SALT		1.450	1.400	0.180	0.500	0.500	0.040
BACTERICIDE		0.100	0.100	0.000	0.100	36.80	0.000
HEC		1.000	1.000	0.000	1.000	0.000	0.000
Dielectric Constant	Target	**41.50**	**55.20**	**40.00**	**53.30**	**39.2**	**52.7**
Conductivity (S/m)	Target	**0.900**	**0.970**	**1.400**	**1.520**	**1.80**	**1.95**

5.3Device Holder for Transmitters

Figure 5.2 Mounting Device

In combination with the SAM Twin Phantom V4.0 the Mounting Device(see Fig. 5.2),enables the rotation of the mounted transmitter in spherical coordinates whereby therotation point is the ear opening. The devices can be easily, accurately, and repeat ably be positioned according to the FCC specifications. The device holder can be locked atdifferent 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 [12]. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during thetests.

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6. TEST SYSTEM SPECIFICATIONS

6.1Automated Test System Specifications

Positioner

Robot: StäubliUnimation Corp. Robot Model: RX60L
Repeatability:0.02 mm
No. of axis:6

Data Acquisition Electronic (DAE) System
Cell Controller

Processor: Pentium 4 CPU
Clock Speed:3 GHz
Operating System: Window 2000
Data Card:DASY4 PC-Board

Figure 6.1 DASY4 Test System

Data Converter

Features: Signal,multiplexer,A/D converter. & control logic
Software:DASY4
Connecting Lines: Optical downlink for data and status info
Optical uplink for commands and clock

PC Interface Card

Function:24 bit (64 MHz) DSP for real time processing
Link to DAE 3
16 bit A/D converter for surface detection system
serial link to robot
direct emergency stop output for robot

E-Field Probes

Model:EX3DV4 S/N: 3643
Construction: Triangular core fiber optic detection system
Frequency:10 MHz to 6 GHz
Linearity:±0.2dB (30MHz to 6GHz)

Phantom

Phantom:SAM Twin Phantom (V4.0)
Shell Material: Vivac Composite
Thickness:2.0 ± 0.2 mm

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7. DOSIMETRIC ASSESSMENT & PHANTOM SPECS

7.1 Measurement Procedure

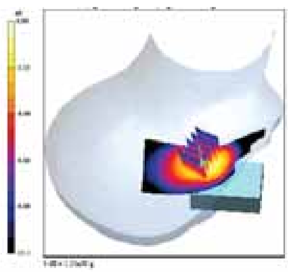
Figure 7.1 Sample Sar Area Scan

The evaluation was performed using the following procedure:

1. The SAR measurement was taken at a selected spatial reference point to monitor power variations during testing. This fixed location point was measured and used as a reference value.
2. The SAR distribution at the exposed side of the head was measured at a distance of 3.9mm from the Inner surface of the shell.The areacovered thentiredimension of the head and the horizontal grid spacing was 15 mm x 15 mm.
3. Based on theareascandata,the area of the maximum absorption was determined by spline interpolation. Around this point, avolume of 32mm x32mm x 30 mm(fine resolution volume scan, zoom scan)was assessedbymeasuring5 x 5 x 7 points. On this basis of this data set, the spatial peak SARvalue was evaluated with the following procedure (see Fig. 7.1):

a. The data at the surface was extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surfaceand the lowest measuring point is 1.2mm. The extrapolation was based on a least square algorithm [15]. A polynomial of the fourth order was calculatedthrough the points in z-axes. This polynomial was then used to evaluate thepoints between the surface and the probe tip.

b. The maximum interpolated value was searched with a straight–forward algorithm. Around this maximum the SAR values averaged over the spatialvolumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines withthe "Not a knot" condition (in x, y, and z directions) [15][16]. The volumewas integrated with the trapezoidal algorithm. One thousand points (10 x 10x 10) were interpolated to calculate the average.

c. All neighboring volumes were evaluated until no neighboring volume with ahigher average value was found.

4.TheSARreferencevalue,at the same location as procedure #1,was re-measured. If the value changed by more than 5%, the evaluation is repeated.

7.2 Specific Anthropomorphic Mannequin (SAM) Specifications

The phantom for handset SAR assessment testing is a low-loss dielectric shell, with shapeand dimensions derived from the anthropometric data of the 90th percentile adult malehead dimensions as tabulated by the US Army. The SAM Twin Phantom shell is bisected along the mid-sagittal plane into right and left halves (see Fig. 7.2). The perimeter side walls of each phantom halves are extended to allow filling withliquid to a depth that is sufficient to minimized reflections from the upper surface. The liquid depth is maintained at a minimum depth of 15cm to minimize reflections from the upper surface.


Figure 7.2 SAM Twin Phantom shell

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8. DEFINITION OF REFERENCE POINTS

8.1 EAR Reference Point

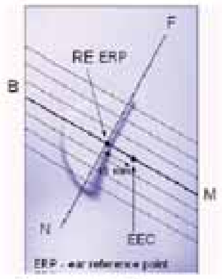

Figure 8.2 Close-up side view of ERPs

Figure 8.1 shows the front,back and side views of the SAM Twin Phantom. The point“M” is the reference point for the center of the mouth, “LE” is the left ear reference point(ERP), and “RE” is the right ERP. The ERPs are 15mm posterior to the entrance to the Earcanal (EEC) along the B-M line (Back-Mouth), as shown in Figure 9.2. The plane Passing, through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck- Front) is perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 8.2). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5]

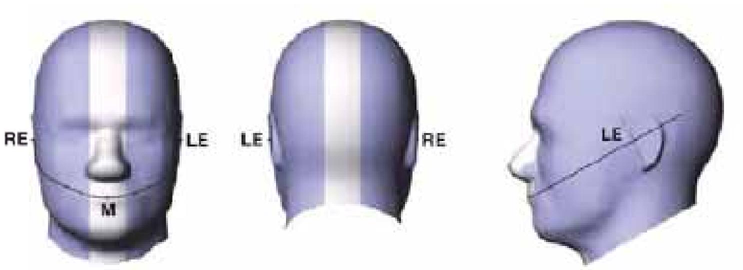

Figure 8.1 Front, back and side view of SAM Twin Phantom

8.2 Handset Reference Points

Two imaginary lines on the handset were established: the vertical centerline and thehorizontal line. The test device was placed in a normal operating position with the “testdevice reference point” located along the “vertical centerline” on the front of the devicealigned to the “ear reference point” (See Fig. 8.3). The “test device reference point” wasthan located at the same level as the center of the ear reference point. The test devicewas positioned so that the “vertical centerline” was bisecting the front surface of the handset at it’s top and bottom edges, positioning the “ear reference point” on the outersurface of the both the left and right head phantoms on the ear reference point.

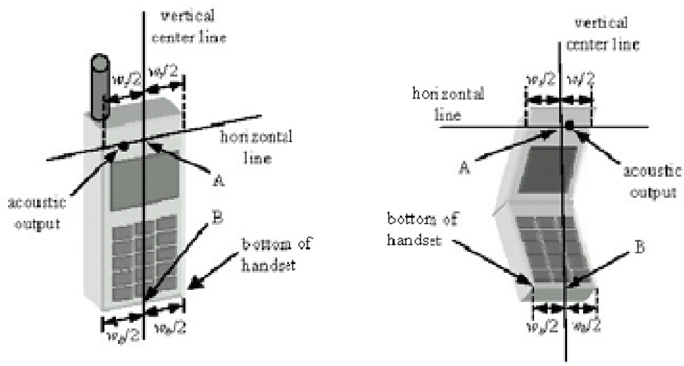

Figure 8.3 Handset Vertical Center & Horizontal Line Reference Points

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9. TEST CONFIGURATION POSITIONS

9.1 Positioning for Cheek/Touch

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 9.1), 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 9.1 Front, Side and Top View of Cheek/Touch Position

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

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).

4. The phone was hen rotated around the vertical centerline until the phone (horizontal line) was symmetrical was respect to the line NF.

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 9.2)

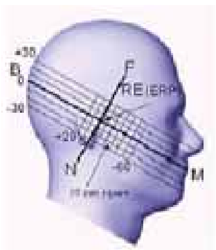

Figure 9.2 Side view w/ relevant markings

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9. TEST CONFIGURATION POSITIONS (Continued)

9.2 Positioning for Ear / 15 ° Tilt

With the test device aligned in the “Cheek/Touch Position”:
1. 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 15degree.
2. The phone was then rotated around the horizontal line by 15 degree.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference planeuntil 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 9.3).

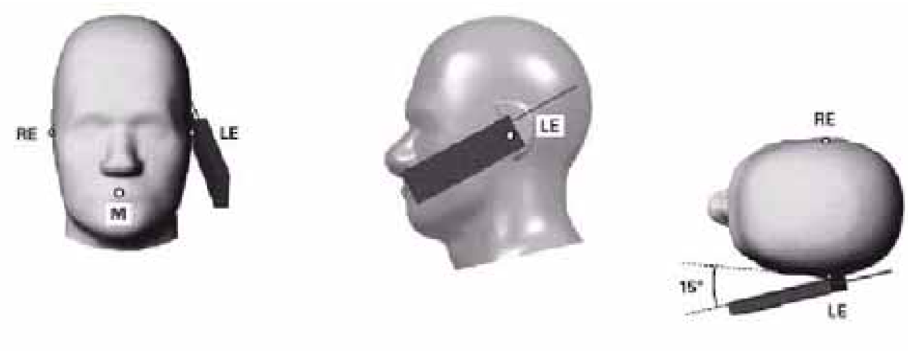

Figure 9.3 Front, Side and Top View of Ear/15° Tilt Position

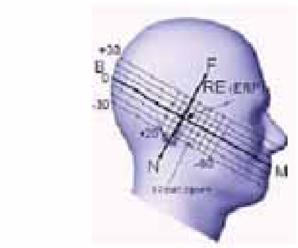

Figure 9.4 Side view w/ relevant markings

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9. TEST CONFIGURATION POSITIONS (Continued)

9.3 Body Holster /Belt Clip Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in anormal use configuration (see Figure 9.5). A devicewith a headset output is tested with a headset connected to the device. Body dielectric parameters are used.

Figure 9.5 Body Belt Clip & Holster Configurations

Accessories for Body-worn operation configurationsare divided into two categories: those that do notcontain metallic components and those that docontain metallic components. When multipleaccessories that do not contain metallic componentsare supplied with the device, the device is testedwith only the accessory that dictates the closestspacing to the body. Then multiple accessories thatcontain metallic components are supplied with thedevice, the device is tested with each accessory thatcontains a unique metallic component. If multipleaccessories share an identical metallic component(i.e. the same metallic belt-clip used with differentholsters with no other metallic components) only theaccessory that dictates the closest spacing to thebody is tested.

Body-worn accessories may not always be supplied or available as options for some Devices intended to be authorized for body-worn use. In this case, a test configuration where a separation distance between the back of the device and the flat phantom is used. All test position spacings are documented.

Transmitters that are designed to operate in front of a person’s face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters,SAR complianceis tested with the accessory(ies),including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

In all cases SAR measurements are performed to investigate the worst-case positioning. Worst-case positioning is then documented and used to perform Body SAR testing. In order for users to be aware of the body-worn operating requirements for meeting RFexposure compliance, operating instructions and cautions statements are included in theuser’s manual.

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10. ANSI / IEEE C95.1-1992 RF EXPOSURE LIMITS

10.1 Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individualswhohavenoknowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential forexposure or cannot exercise control over their exposure. Members of the general public would come under thiscategory when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

10.2 Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 10.1.SAR Human Exposure Specified in ANSI/IEEE C95.1-1992

	HUMAN EXPOSURE LIMITS	
	General Public Exposure (W/kg) or (mW/g)	Occupational Exposure (W/kg) or (mW/g)
Whole-Body average SAR (W/kg)	0.08	0.40
Localized SAR (head and trunk) (W/kg)	1.60	8.00
Localized SAR (limbs) (W/kg)	4.00	20.0

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11. IEEE P1528 –MEASUREMENT UNCERTAINTIES

Error Description	Uncertaint value ±%	Probability Distribution	Divisor	(Ci) 1g	Standard (1g)	vi 2 or Veff
Measurement System						
Probe calibration	± 4.8	Normal	1	1	± 4.8 %	∞
Axial isotropy	± 4.7	Rectangular	√3	0.7	± 1.9 %	∞
Hemispherical isotropy	± 9.6	Rectangular	√3	0.7	± 3.9 %	∞
Boundary Effects	± 1.0	Rectangular	√3	1	± 0.6 %	∞
Probe Linearity	± 4.7	Rectangular	√3	1	± 2.7 %	∞
Detection limits	± 1.0	Rectangular	√3	1	± 0.6 %	∞
Readout Electronics	± 1.0	Normal	1	1	± 1.0 %	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5 %	∞
Integration time	± 2.6	Rectangular	√3	1	± 1.5 %	∞
RF Ambient Conditions	± 3.0	Rectangular	√3	1	± 1.7 %	∞
Probe Positioner	± 0.4	Rectangular	√3	1	± 0.2 %	∞
Probe Positioning	± 2.9	Rectangular	√3	1	± 1.7 %	∞
Algorithms for Max. SAR Eval.	± 1.0	Rectangular	√3	1	± 0.6 %	∞
Test Sample Related						
Device Positioning	± 2.9	Normal	1	1	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	± 2.9 %	∞
Physical Parameters						
Phantom Shell	± 4.0	Rectangular	√3	1	± 2.3 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	± 1.8 %	∞
Liquid conductivity (Meas.)	± 2.5	Normal	1	0.64	± 1.6 %	∞
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.6	± 1.7 %	∞
Liquid permittivity (Meas.)	± 2.5	Normal	1	0.6	± 1.5 %	∞
CombinedStandard Uncertainty					**± 10.3 %**	330
Expanded Uncertainty (k=2)					**± 20.6 %**	

The above measurement uncertainties are according to IEEE P1528 (2003)

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12. SYSTEM VERIFICATION

12.1 Tissue Verification

Table 12.1 Simulated Tissue Verification

MEASURED TISSUE PARAMETERS					
Date(s)	Target Frequency	Dielectric constant: ε		Conductivity: σ	
		Target	Measured	Target	Measured
September.27,2010	835 MHz Muscle	55.2	55.9	0.97	0.966
September.18,2010	1900 MHz Muscle	53.3	54.3	1.52	1.510
September.20,2010	2450 MHz Muscle	52.7	53.6	1.95	1.980

12.2 Test System Validation

Prior to assessment, the system is verified to the ±10% of the specifications at 835 MHz, 1900 MHz and 2450 MHz by using the system validation kit(s). (Graphic Plots Attached)

Table 12.2 System Validation

SYSTEM DIPOLE VALIDATION TARGET & MEASURED (835 MHz / 1900 MHz / 2450 MHz values are normalized to a forward power of 1/4 W)					
Date(s)	System Validation Kit:	Target Frequency	Targeted SAR_{1g} (mW/g)	Measured SAR_{1g} (mW/g)	Deviation (%)
September.27,2010	D-835V2, S/N: 464	835 MHz Muscle	2.375	2.50	5.26
September.18,2010	D-1900V2, S/N: 5d029	1900 MHz Muscle	9.925	10.8	8.82
September.20,2010	D-2450V2, S/N: 726	2450 MHz Muscle	13.1	12.8	-2.29

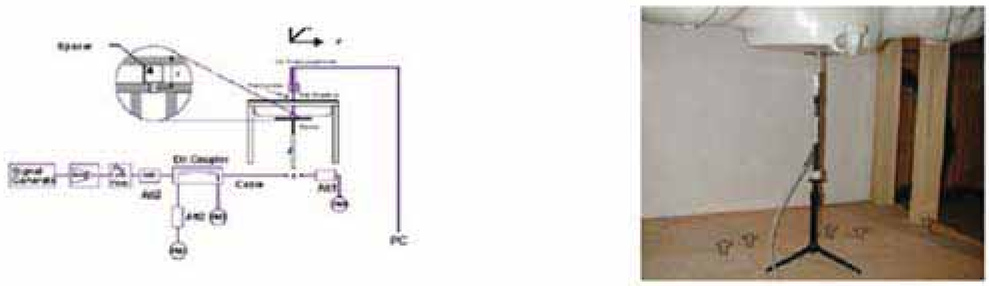

Figure 12.1 Dipole Validation Test Setup

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13.MultipleTRANSMITTERS SAR CONSIDERATIONS

13.1 KDB447498 & KDB616217 RF Exposure

13.1.1 SAR is not required for the following simultaneous transmission conditions

1) When specific requirements for simultaneous transmission SAR evaluation have not been established for the host platform or device configuration:

(1) for the antennas that are located < 5 cm from persons, where

(a) The closest antenna separation distance is ≥ 5 cm for all simultaneous transmitting antennas within the host or device; and

(b) The sum of the 1-g SAR is < 1.6 W/kg for all simultaneous transmitting antennas that require stand-alone SAR evaluation or the SAR to peak location separation ratios are < 0.3 for all simultaneous transmitting antenna pairs;18 and

(c) The output power is ≤ 60/f(GHz) mW for any simultaneous transmitting antenna(s) for which stand-alone SAR evaluation is not required.

13.3 Multiple Antenna Transmission Information for N5 Premium

13.3.1 The closest separation distance between antenna and antenna

Antenna Location

W-LAN - Bluetooth: 9.3 cm

CDMA - Bluetooth : 9 cm

CDMA – W-LAN : 14.5 cm

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13.3.2 W-LAN(802.11b)out power

Frequency		Power(dBm)	Power(W)
W-LAN	2412 MHz	14.85	0.031
	2437 MHz	14.20	0.026
	2462 MHz	**15.81**	**0.038**

13.3.2 Bluetooth out power

Frequency (MHz)	Channel No.	Measured power (dBm)	Power(W)
2402	**1**	**-5.05**	**0.000313**
2441	**40**	**-5.34**	**0.000292**
2480	**79**	**-5.66**	**0.000313**

Note 1 : SAR For individual evaluation

- W-LAN SAR test is required because output power is ≥ 60/f(GHz) mW.
- BT SAR test is not required because output power is ≤ 60/f(GHz) mW.

Note 2 : SAR For Simultaneous transmission evaluation

-Because (CDMA_Cellular$_{sar}$ + W-LAN$_{sar}$) > 1.6 W/kg, so simultaneous transmission is not performed.
-Beacuse (CDMA_PCS$_{sar}$ + W-LAN$_{sar}$) > 1.6 W/kg, so simultaneous transmission is not performed.

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14. FCC 3G SAR MEASUREMENT PROCEDURES – OCT. 2007

FCC 3G MEASUREMENT PROCEDURES

Power measurements were performed using a base station simulator under average power.

14.1 SAR MEASURMENT CONDITIONS FOR CDMA2000

The following procedures were followed according to FCC"SAR Measurements Procedures for 3G Devices" v02, October 2007.

Output Power Verification

See 3GPP2 C.S0011/TIA-98-E as recommended by "SAR Measurement Procedures for 3G Devices", June 2006. Maximum output power is verified on the High, Middle and Low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SO55 tests were measured with power control bits in "All Up" condition. .

1. If the mobile station (MS) supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1, Table 13-1 parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH0 and demodulation of RC 3,4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9600 bps Fundamental Channel and 9600 bps SCH0 data rate.
4. Under RC3, C.S0011 Table 4.4.5.2-2, Table 13-2 was applied.
5. FCHs were configured at full rate for maximum SAR with "All Up" power control bits.

Table 13-1
Parameters for Max. Power for RC1

Parameter	Units	Value
$\hat{I}_{or}$	dBm/1.23 MHz	-104
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

Table 13-2
Parameters for Max. Power for RC3

Parameter	Units	Value
$\hat{I}_{or}$	dBm/1.23 MHz	-86
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

14.2 Body SAR Measurements

SAR is measured using FTAP/RTAP and FETAP/RETAP respectively for Rev. 0 and Rev. A devices. The AT is tested with a Reverse Data Channel rate of 153.6 kbps in Subtype 0/1 Physical Layer
Configurations; and a Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots in Subtype 2 Physical Layer Configurations. Both FTAP and FETAP are configured with a Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots. AT power control should be in All Bits Up conditions for TAP/ETAP.

Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0. SAR for Subtype 2 Physical Layer configurations is not required for Rev. A when the maximum average output of each RF channels is less than that measured in Subtype 0/1 Physical layer configurations. Otherwise, SAR is measured on the maximum output channel for Rev. A using the exposure configuration that results in the highest SAR for that RF channels in Rev 0. Head SAR is required for EV-DO devices that support operations next to the ear; for example, with VOIP, using Subtype 2 Physical Layer configurations according to the required handset test configurations.

14.3 1x RTT Support

For EV-DO devices that also support 1xRTT voice and/or data operations, SAR is not required for 1xRTT when the maximum average output of each channel is less than 1/4 dB higher than that measured in Subtype 0/1 Physical Layer configurations for Rev. 0. Otherwise, the 'Body SAR Measurements' procedures in the 'CDMA-2000 1x Handsets' section should be applied

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15. Configuring 802.11 a/b/g Transmitters for SAR Measurement

15.1 SAR Testing with IEEE 802.11 a/b/g Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g transmitters. Unpredictable in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable.

15.2 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be sued for all measurements.

15.3 Frequency Channel Configurations

802.11 a/b/g and 4.9 GHz operation modes are tested independently according to the service requirements in each frequency band. 802.11 b/g modes are tested on channels 1, 6 and11. 802.11a is tested for UNII operations on channels 36 and 48 in the 5.15-5.25 GHz Band; channels 52 and 64 in the 5.25-5.35 GHz band; channels 104, 116, 124 and 136 in the 5.470-5.725 GHz BAND; and channel 149 and 161 in the 5.8 GHz band. When 5.8 GHz § 15.247 is also available, channels 149, 157 and 165 should be tested of the UNII channels. 4.9 GHz is tested on channels 1., 10 and 5 or 6, whichever has the higher output power, for 5MHz channels; channels 11, 15 and 19 for 10MHz channels; and channels 21 and 25 for 20MHz channels. These are referred to as the “default test channels”. 802.11g mode was evaluated only if the output power was 0.25 dB higher than the 802.11b mode.

Table 15.1802.11 Test channels per FCC Requirements

Mode		GHz	Channel	Turbo Channel	"Default Test Channels"			
					§15.247		UNII	
					802.11b	802.11g		
802.11 b/g		2.412	1*		√	∇		
		2.437	6	6	√	∇		
		2.462	11*		√	∇		
802.11a	UNII	5.18	36				√	
		5.20	40	42 (5.21 GHz)				*
		5.22	44					*
		5.24	48	50 (5.25 GHz)			√	
		5.26	52				√	
		5.28	56	58 (5.29 GHz)				*
		5.30	60					*
		5.32	64				√	
		5.500	100	Unknown				*
		5.520	104				√	
		5.540	108					*
		5.560	112					*
		5.580	116				√	
		5.600	120					*
		5.620	124				√	
		5.640	128					*
		5.660	132					*
		5.680	136				√	
		5.700	140					*
	UNII or §15.247	5.745	149		√		√	
		5.765	153	152 (5.76 GHz)		*		*
		5.785	157		√			*
		5.805	161	160 (5.80 GHz)		*	√	
	§15.247	5.825	165		√			

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16. SAR TEST DATA SUMMARY AND POWER TABLE

See Measurement Result Data Pages

Procedures Used To Establish Test Signal

The EUT was placed into simulated call mode (CDMACellular,PCS,W-LAN (802.11b)) using manufacturers test codes. Such test signals offer a consistent means for testing SAR and are recommended for evaluating SAR [4]. When test modes are not available or inappropriate for testing a EUT, the actual transmission is activated through a base station simulator or similar equipment. See data pages for actual procedure used in measurement.

Device Test Conditions

The EUT is battery operated. Each SAR measurement was taken with a fully charged battery.
In order to verify that the device was tested at full power, conducted output power measurements were performed before and after each SAR measurement to confirm the output power. If a conducted power deviation of more than 5% occurred, the test was repeated.

16.1 Max. Power Output Table for N5 Premium (Cellular, PCS)

Band	Channel	1X RRT					EvDo (Rev.0)		EvDo (Rev.A)	
		RC1	RC1	RC3	RC3	RC3				
		SO2	SO55	SO2	SO55	SO32 (TDSO)	FTAP	RTAP	FETAP	RETAP
Cellular	1013	24.3	24.3	24.3	24.3	24.3	24.2	24.2	24.2	24.1
	0384	24.6	24.5	24.5	24.5	24.5	24.5	24.4	24.4	24.3
	0777	24.4	24.3	24.4	24.4	24.3	24.3	24.2	24.3	24.2
PCS	0025	23.9	23.8	23.9	23.8	23.8	23.8	23.7	23.7	23.6
	0600	23.7	23.6	23.6	23.7	23.7	23.6	23.5	23.6	23.5
	1175	22.6	22.6	22.6	22.6	22.6	22.6	22.5	22.5	22.4

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16.2 Max. Power Output Table for N5 Premium (W-LAN)

Mode	Frequency (MHz)	Channel No.	Measured Data (dBm)
802.11b	2412	1	14.85
	2437	6	14.20
	2462	11	**15.81**
802.11g	2412	1	11.75
	2437	6	12.63
	2462	11	14.10

※ **SAR is not required for 802.11g channels when the maximum average output power is less than $^{1}/_{4}$ dB higher than that measured on the corresponding 802.11b channels.**

16.2 Max. Power Output Table for N5 Premium (Bluetooth)

Frequency (MHz)	Channel No.	Measured power (dBm)
2402	1	-5.05
2441	40	-5.34
2480	79	-5.66

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17. SAR TEST DATA SUMMARY

Mixture Type: 835 MHz Body**(EV-DO Rev. O)**

17.1 MEASUREMENT RESULTS (CDMA Cellular Body SAR)							
FREQUENCY		**Begin Power (dBm)**	**Drift Power (dB)**	**Mode**	**Device Test Position**	**Antenna Position**	**SAR (W/kg)**
MHz	**Ch**						
824.70	1013	24.2	0.309	Cellular	0 mm[Normal]	Internal	0.313
836.52	**384**	**24.5**	**-0.234**	**Cellular**	0 mm[Normal]	**Internal**	**0.363**
848.31	777	24.3	0.395	Cellular	0 mm[Normal]	Internal	0.292
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/ Occupational Exposure							**Body 1.6 W/kg (mW/g)** averaged over 1 gram

NOTE:

1. The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Prior to testing the conducted output power was measured.
4. The EUT is tested 2nd hot-spot peak, if it is less than 2dB below the highest peak.
5. Test Signal Call Mode □ Continuous Tx On □ManuTest Codes ▣BaseStation Simulator
6. Tissue parameters and temperatures are listed on the SAR plots.
7. Liquid tissue depth is 15.0cm.±0.1
8. CDMA and WLAN Simultaneous SAR is not required, Because the sum of the 1g SAR is <1.6 W/kg.

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17. SAR TEST DATA SUMMARY (Continued)

Mixture Type: 1900 MHz Body(EV-DO Rev. O)

17.2 MEASUREMENT RESULTS (CDMA PCS Body SAR)							
FREQUENCY		Begin Power (dBm)	Drift Power (dB)	Mode	Device Test Position	Antenna Position	SAR (W/kg)
MHz	Ch						
1851.25	**25**	**23.8**	**0.315**	**PCS**	0 mm[Normal]	**Internal**	**0.407**
1880.00	600	23.6	-0.137	PCS	0 mm[Normal]	Internal	0.378
1908.75	1175	22.6	0.130	PCS	0 mm[Normal]	Internal	0.167
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/ Occupational Exposure							**Body 1.6 W/kg (mW/g)** averaged over 1 gram

NOTE:

1. The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Prior to testing the conducted output power was measured.
4. The EUT is tested 2nd hot-spot peak, if it is less than 2dB below the highest peak.
5. Test Signal Call Mode □ Continuous Tx On □Manu.Test Codes ▣BaseStation Simulator
6. Tissue parameters and temperatures are listed on the SAR plots.
7. Liquid tissue depth is 15.0cm.±0.1
8. CDMA and WLAN Simultaneous SAR is not required, Because the sum of the 1g SAR is <1.6 W/kg.

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17. SAR TEST DATA SUMMARY (Continued)

Mixture Type: 2450 MHz Body

17.3 MEASUREMENT RESULTS (W-LAN(802.11b) Body SAR)							
FREQUENCY		Begin Power (dBm)	Drift Power (dB)	Mode	Device Test Position	Antenna Position	SAR (W/kg)
MHz	Ch						
2412	**1**	**14.85**	**-0.311**	**W-LAN**	0 mm[Normal]	**Internal**	**0.00468**
2437	6	14.20	-0.227	W-LAN	0 mm[Normal]	Internal	0.00323
2462	11	15.81	0.210	W-LAN	0 mm[Normal]	Internal	0.00348
ANSI / IEEE C95.1 1992 – SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/ Occupational Exposure**							**Body** **1.6 W/kg** **(mW/g)** averaged over 1 gram

NOTE:

1. The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Prior to testing the conducted output power was measured.
4. The EUT is tested 2nd hot-spot peak, if it is less than 2dB below the highest peak.
5. Battery is fully charged for all readings.
6. Test Signal Call Mode ▣Continuous Tx On □ Manu.Test Codes □ BaseStation Simulator
7. Tissue parameters and temperatures are listed on the SAR plots.
8. Liquid tissue depth is 15.0cm.±0.1
9. The 802.11b modes of this DUT were programmed to be in continuously transmitting mode.

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18. SAR TEST EQUOPMENT

Table 18.1 Test Equipment Calibration

EQUIPMENT SPECIFICATIONS			
Type	**Calibration Date**	**Next Calibration Date**	**Serial Number**
Robot	N/A	N/A	F02/5Q85A1/A/01
Robot Controller	N/A	N/A	F02/5Q85A1/C/01
Joystick	N/A	N/A	D221340031
Hicron Computer 1.1GHz Pentium Celeron ,Window 2000	N/A	N/A	N/A
Data Acquisition Electronics	November 19, 2009	November 19, 2010	520
Dosimetric E-Field Probe	January 26, 2010	January 26, 2011	3643
Dummy Probe	N/A	N/A	N/A
Sam Phantom	N/A	N/A	N/A
Probe Alignment Unit LB	N/A	N/A	321
SPEAG Validation Dipole D835 MHz	March 22, 2010	March 22, 2012	464
SPEAG Validation Dipole D1900 MHz	March 23, 2010	March 23, 2012	5d029
SPEAG Validation Dipole D2450 MHz	March 18, 2010	March 18, 2012	726
Head/Body Equivalent Matter(835MHz)	January 2010	January 2011	N/A
Head/Body Equivalent Matter(1900MHz)	January 2010	January 2011	N/A
Head/Body Equivalent Matter(2450MHz)	January 2010	January 2011	N/A
HP EPM-442A Power Meter	March 12, 2010	March 12, 2011	GB37170267
HP ESG-3000A Signal Generator	July 01, 2010	July 01, 2011	US37230529
Attenuator (10dB)	January 11, 2010	January 11, 2011	BP4387
Attenuator (3dB)	July 01, 2010	July 01,2011	MY39260700
Low pass filter (1.5GHz)	January 11, 2010	January 11, 2011	N/A
Low pass filter (3.0GHz)	October 13, 2009	October 13, 2010	N/A
Dual Directional Coupler	January 11, 2010	January 11, 2011	50228
Amplifier	November 02, 2009	November 02, 2010	1020 D/C 0221
Network Analyzer	March 12, 2010	March 12, 2011	3410J01204
HP85070D Dielectric Probe Kit	N/A	N/A	LISO1440118
SEMITEC Engineering	N/A	N/A	Shield Room
8960Series 10 Wireless CommsTest Set	July 02, 2010	July 02, 2011	GB43461134

NOTE:

The E-field probe was calibrated by SPEAG, by temperature measurement procedure. Dipole Validation Measurementisperformed by Digital EMC. Before each test, the brain simulating material is calibratedby Digital EMC using the dielectric probe system and network analyzer to determine the conductivity andpermittivity (dielectric constant) of the brain-equivalent material.

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19.CONCLUSION

Measurement Conclusion

The SAR measurement indicates that the EUT complies with the RF radiation exposurelimits of the FCC. These measurements are taken to simulate the RF effects exposureunder the worst-case conditions. Precise laboratory measures were taken to assurerepeatability of the tests. The tested device complies with the requirements in respect toall parameters subject to the test. The test results and statements relate only to the item(s)tested.

Please note that the absorption and distribution of electromagnetic energy in the body arevery complex phenomena that depend on the mass, shape, and size of the body, theorientation of the body with respect to the field vectors, and the electrical properties ofboth the body and the environment. Other variables that may play asubstantial roleimpossiblebiological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those thatcharacterize the individual (e.g. age, gender, activity level, debilitation, or disease).

Because innumerable factors may interact to determine the specific biological outcome ofan exposure to electromagnetic fields, any protection guide shall consider maximalamplification of biological effects as a result of field-body interactions environmental conditions, and physiological variables.

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DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:464

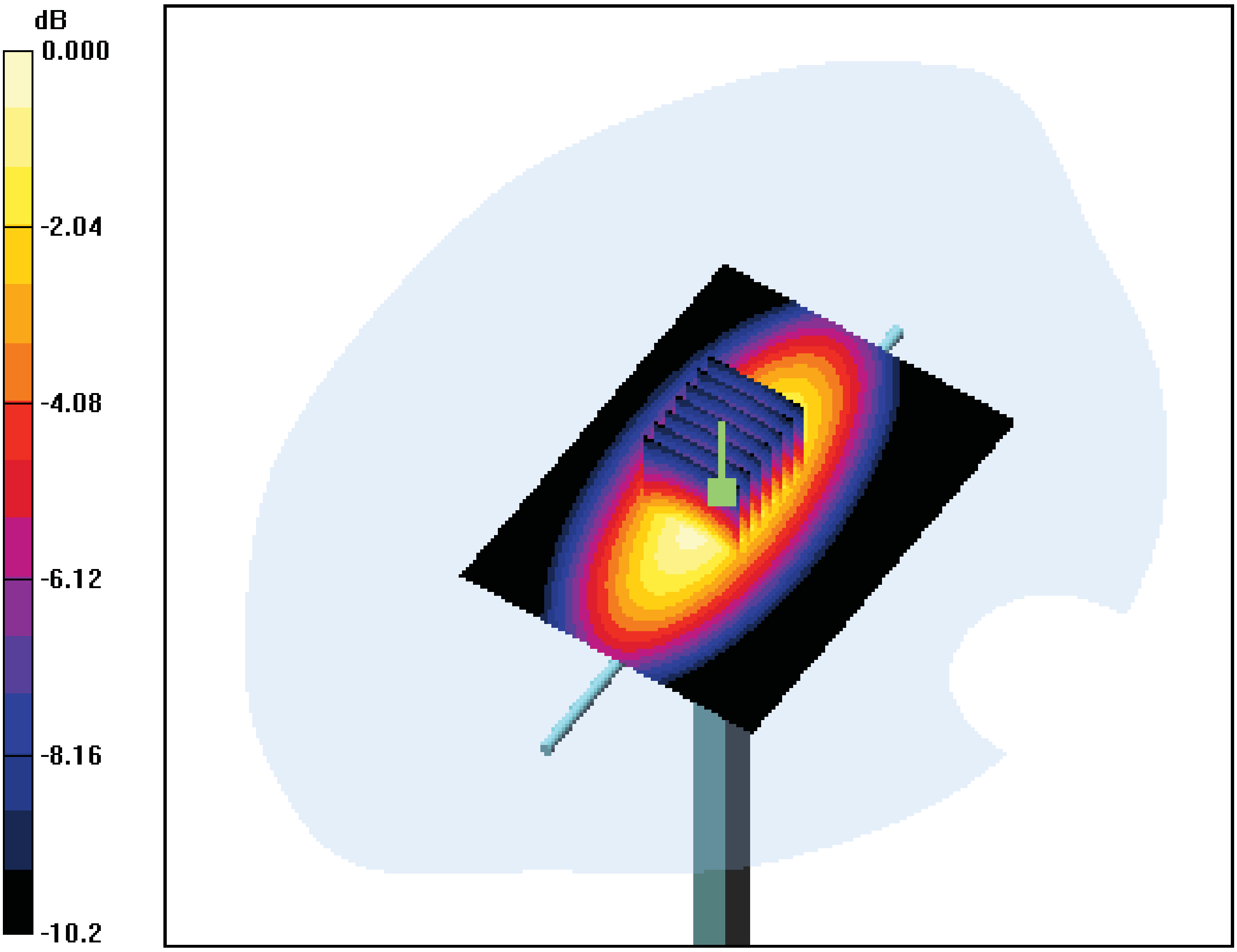
Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.966 mho/m; ε_r = 55.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(9.31, 9.31, 9.31); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM with 835MHz; Type: SAM; Serial: TP-1223
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-27; Ambient Temp: 22.0; Tissue Temp: 22.5

Dipole Validation

Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.064 dB
Peak SAR (extrapolated) = 3.77 W/kg
SAR(1 g) = 2.5 mW/g; SAR(10 g) = 1.65 mW/g



0 dB = 3.07mW/g

DIGITAL EMC CO., LTD

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d029

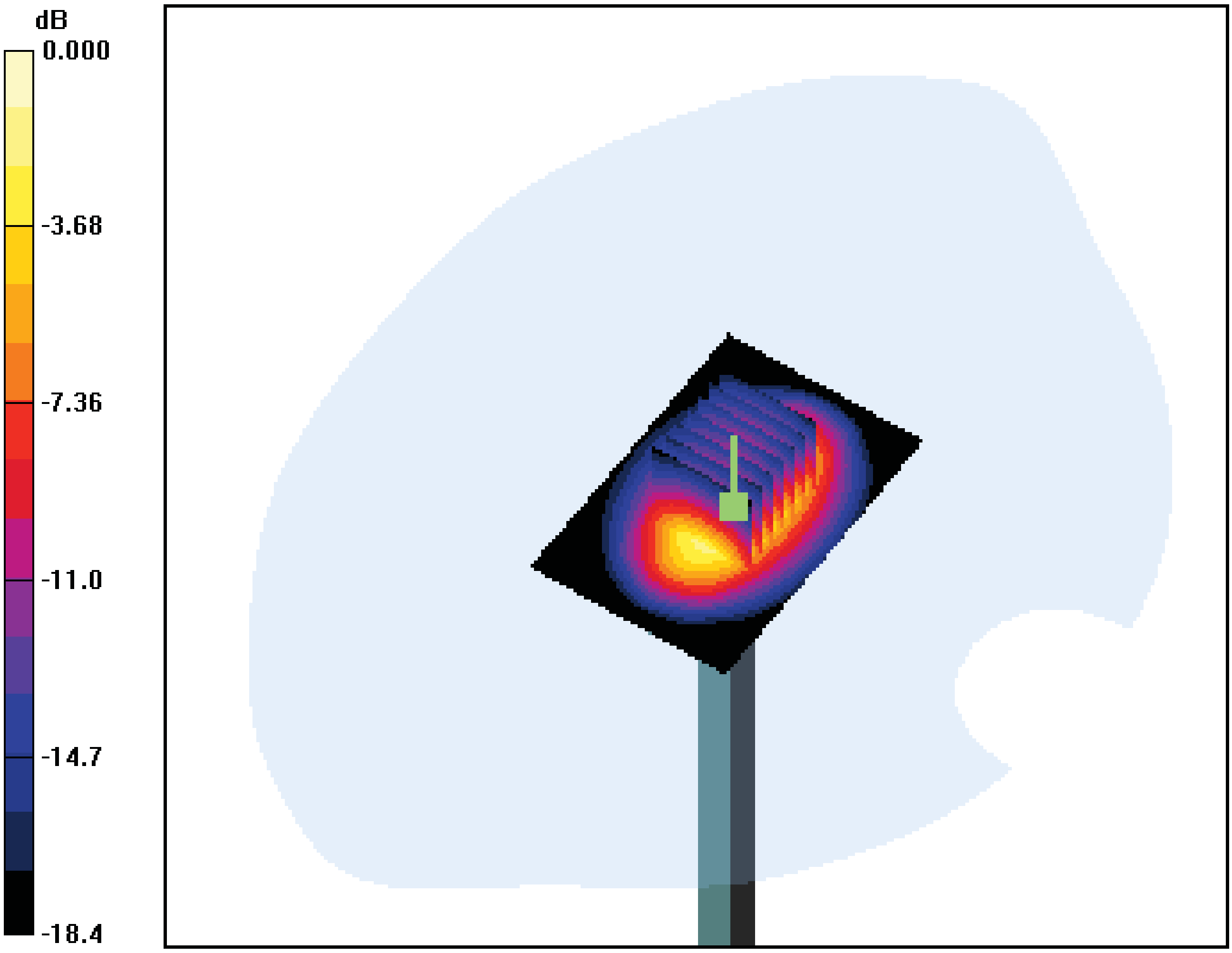
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.51 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.59, 7.59, 7.59); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-18; Ambient Temp: 22.0; Tissue Temp: 23.0

Dipole Validation

Area Scan (61x91x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.044 dB
Peak SAR (extrapolated) = 21.1 W/kg
SAR(1 g) = 10.8 mW/g; SAR(10 g) = 5.47 mW/g



0 dB = 15.0mW/g

DIGITAL EMC CO., LTD

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:726

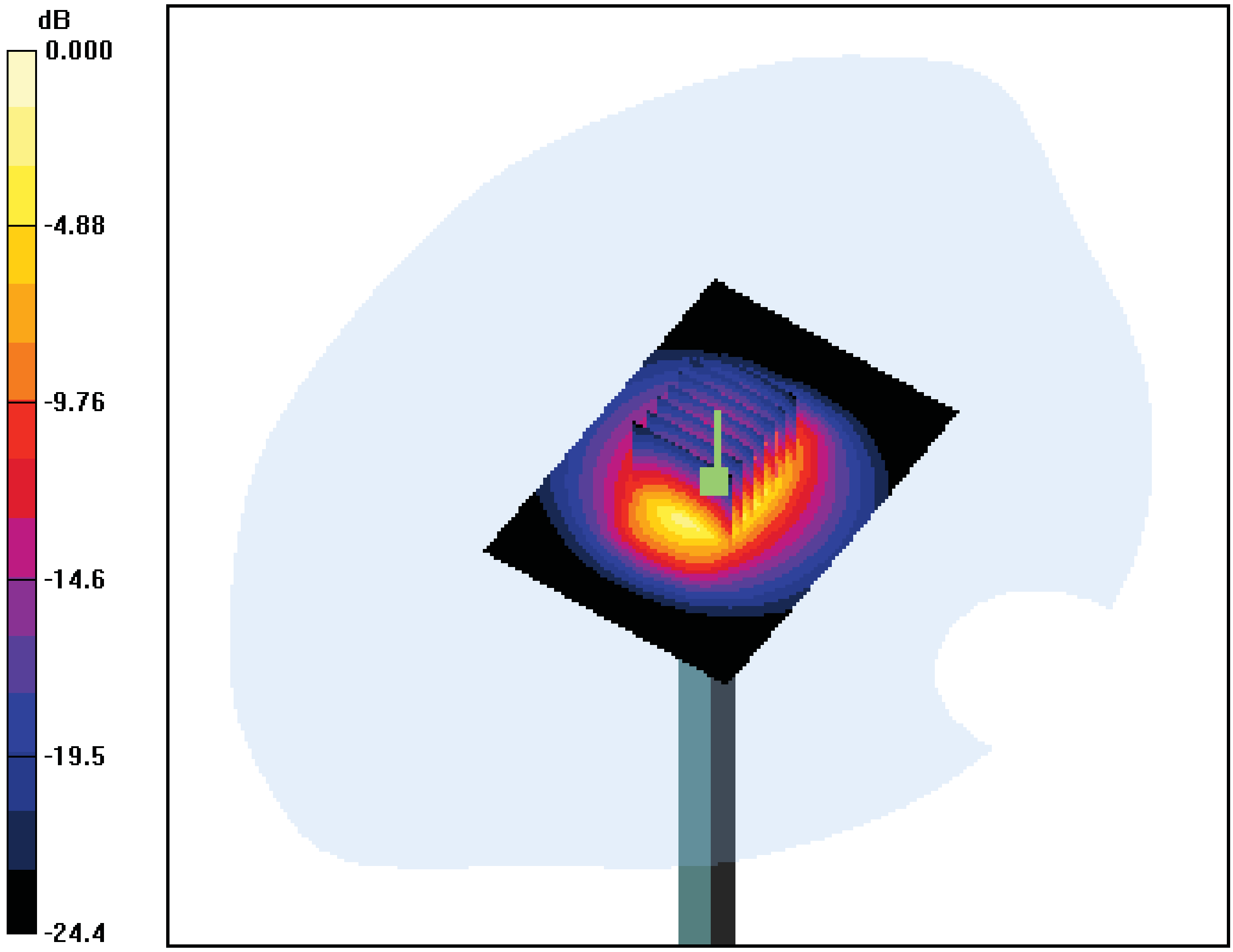
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.41, 7.41, 7.41); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-20; Ambient Temp: 22.5; Tissue Temp: 23.0

Dipole Validation

Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.064 dB
Peak SAR (extrapolated) = 28.4 W/kg
SAR(1 g) = 12.8 mW/g; SAR(10 g) = 5.7 mW/g



0 dB = 18.5mW/g

DIGITAL EMC CO., LTD

DUT: N5 Premium; Type: MID

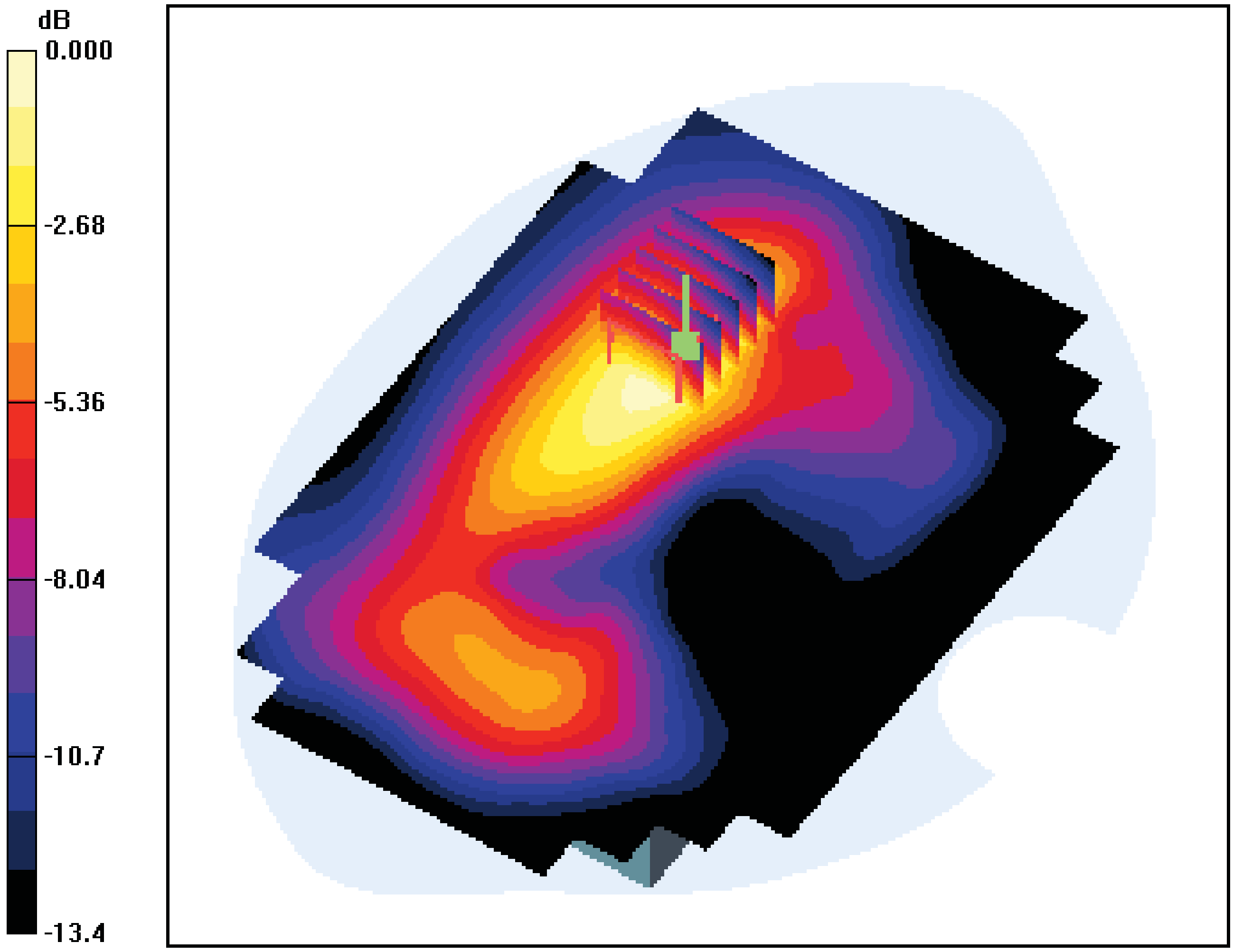
Communication System: FCC CDMA; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 824.7 MHz; σ = 0.956 mho/m; ε_r = 56; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(9.31, 9.31, 9.31); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM with 835MHz; Type: SAM; Serial: TP-1223
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-27; Ambient Temp: 22.0; Tissue Temp: 22.5

Touch from Body, Normal, CDMA Cellular Ch. 1013, Ant Internal

Area Scan (111x151x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Power Drift = 0.309 dB
Peak SAR (extrapolated) = 0.454 W/kg
SAR(1 g) = 0.313 mW/g; SAR(10 g) = 0.209 mW/g



0 dB = 0.372mW/g

DIGITAL EMC CO., LTD

DUT: N5 Premium; Type: MID

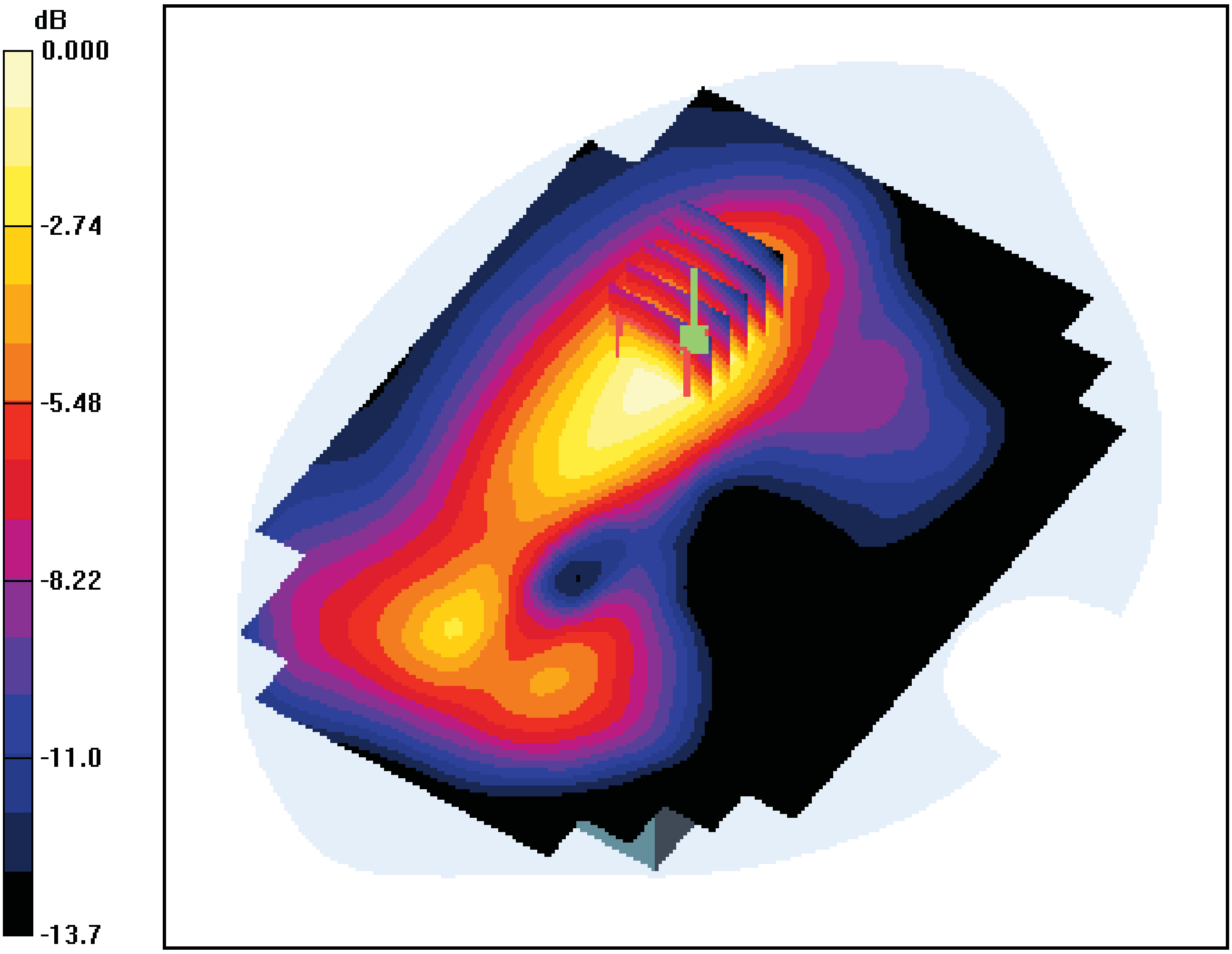
Communication System: FCC CDMA; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used: f = 836.667 MHz; σ = 0.967 mho/m; ε_r = 55.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(9.31, 9.31, 9.31); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM with 835MHz; Type: SAM; Serial: TP-1223
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-27; Ambient Temp: 22.0; Tissue Temp: 22.5

Touch from Body, Normal, CDMA Cellular Ch. 384, Ant Internal

Area Scan (111x151x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Power Drift = -0.234 dB
Peak SAR (extrapolated) = 0.524 W/kg
SAR(1 g) = 0.363 mW/g; SAR(10 g) = 0.242 mW/g



0 dB = 0.425mW/g

DUT: N5 Premium; Type: MID

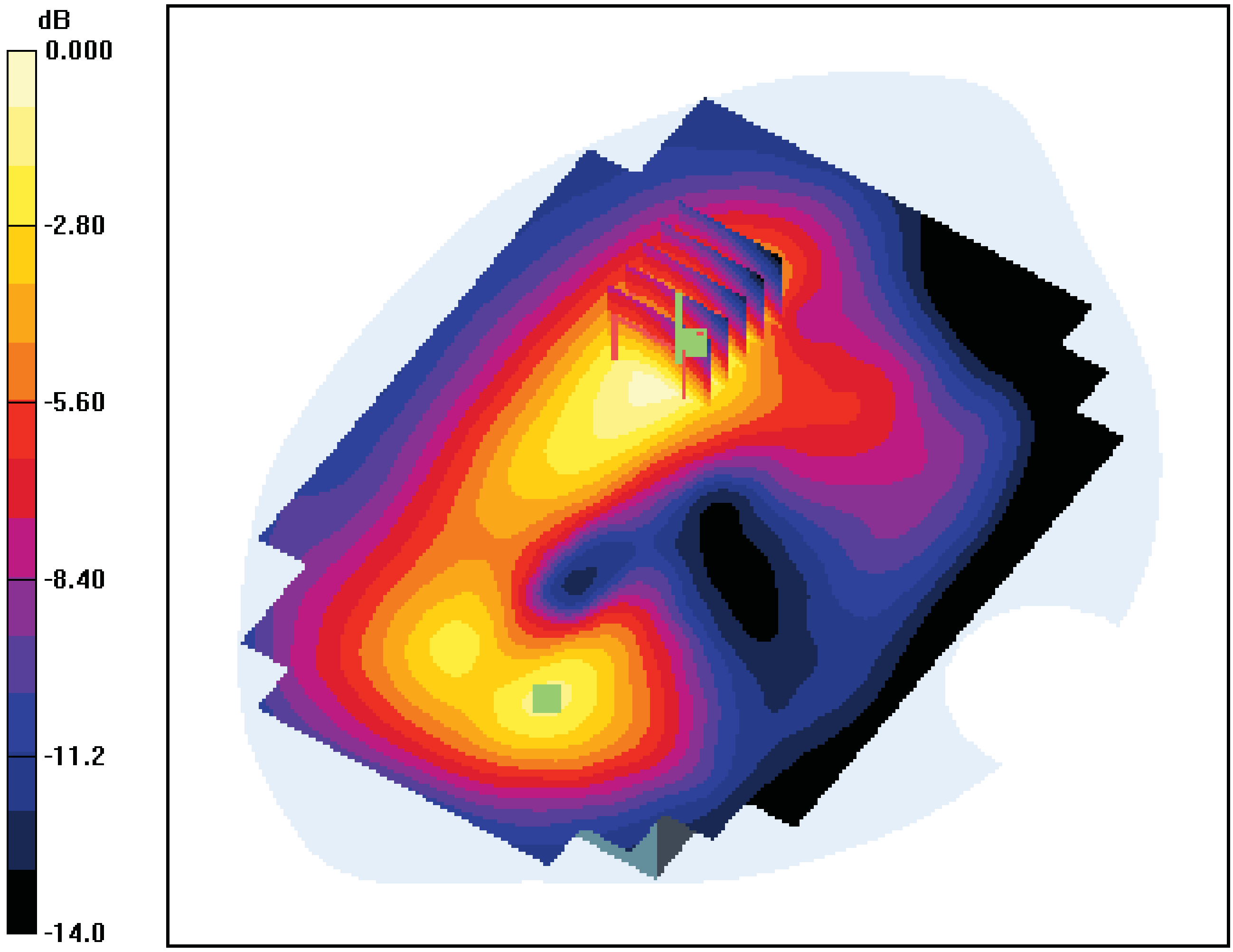
Communication System: FCC CDMA; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium parameters used: f = 848.333 MHz; $\sigma = 0.978$ mho/m; $\varepsilon_r = 55.8$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(9.31, 9.31, 9.31); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM with 835MHz; Type: SAM; Serial: TP-1223
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-27; Ambient Temp: 22.0; Tissue Temp: 22.5

Touch from Body, Normal, CDMA Cellular Ch. 777, Ant Internal

Area Scan (111x151x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Power Drift = 0.395 dB
Peak SAR (extrapolated) = 0.422 W/kg
SAR(1 g) = 0.292 mW/g; SAR(10 g) = 0.195 mW/g



0 dB = 0.345mW/g

DUT: N5 Premium; Type: MID

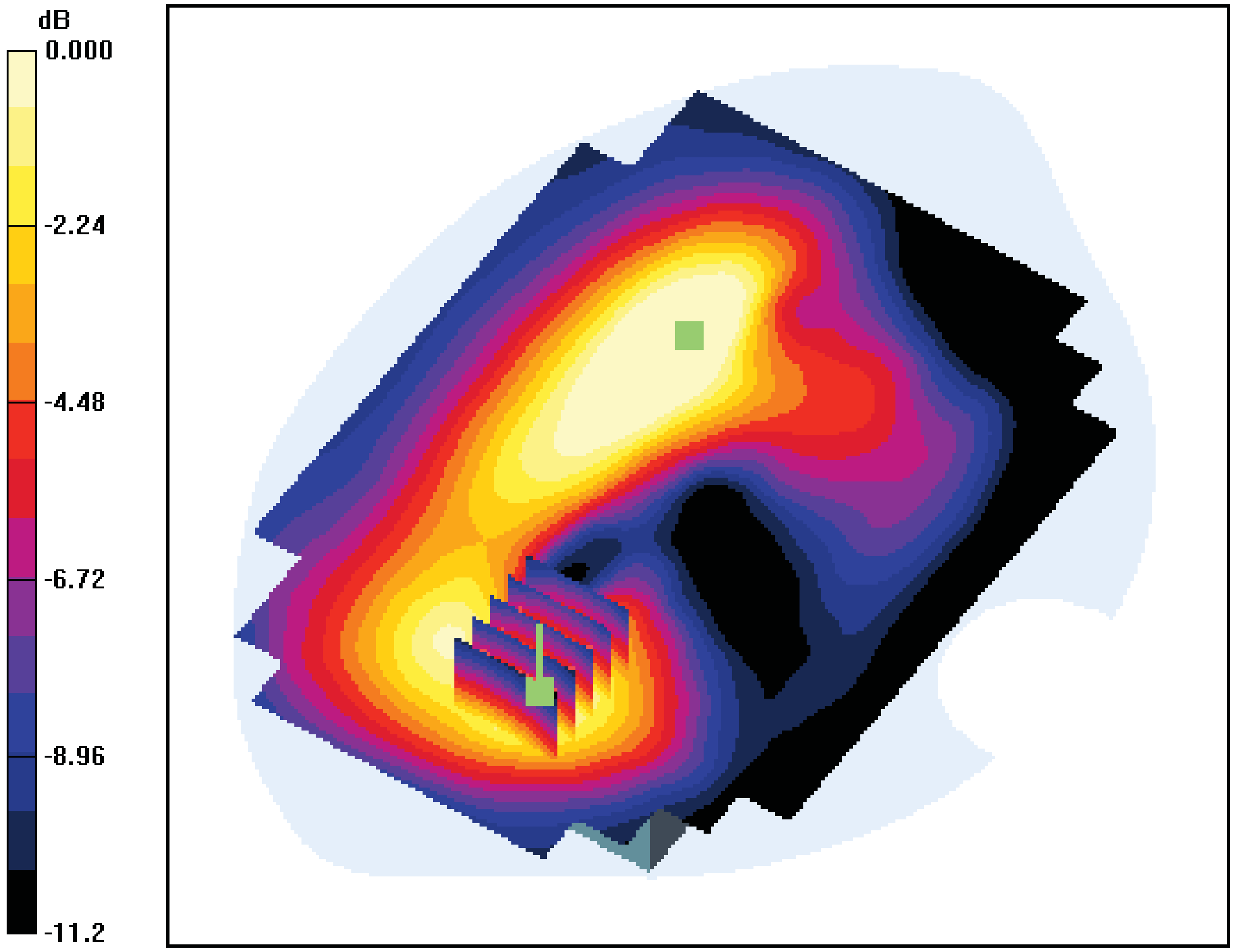
Communication System: FCC CDMA; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium parameters used: f = 848.333 MHz; $\sigma = 0.978$ mho/m; $\varepsilon_r = 55.8$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(9.31, 9.31, 9.31); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM with 835MHz; Type: SAM; Serial: TP-1223
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-27; Ambient Temp: 22.0; Tissue Temp: 22.5

Touch from Body, Normal, CDMA Cellular Ch. 777, Ant Internal

Area Scan (111x151x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Power Drift = 0.395 dB
Peak SAR (extrapolated) = 0.282 W/kg
SAR(1 g) = 0.192 mW/g; SAR(10 g) = 0.129 mW/g



0 dB = 0.230mW/g

DIGITAL EMC CO., LTD

DUT: N5 Premium; Type: MID

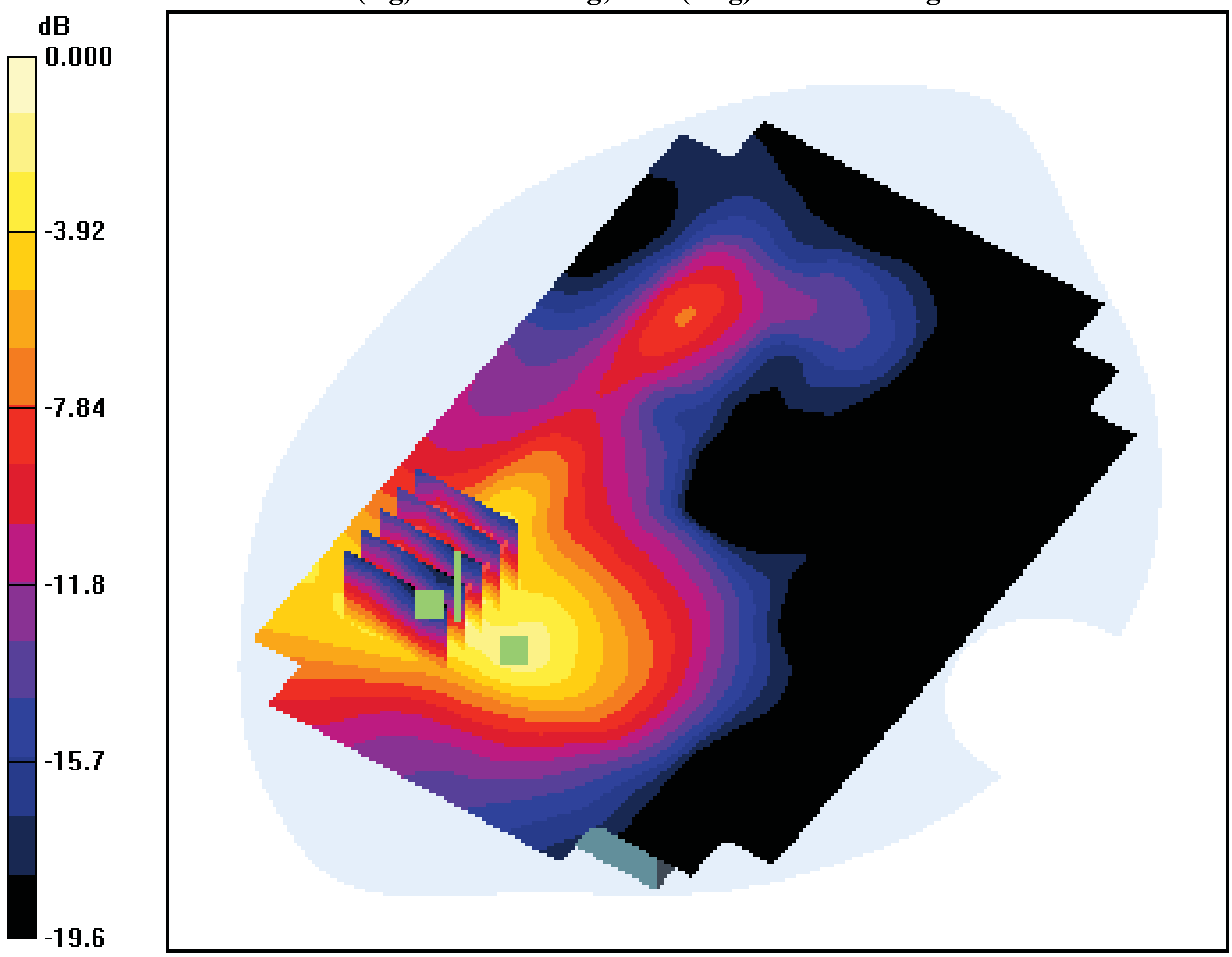
Communication System: FCC_PCS; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1851.33 MHz; σ = 1.56 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.59, 7.59, 7.59); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-18; Ambient Temp: 22.0; Tissue Temp: 23.0

Touch from Body, Normal, CDMA PCS Ch. 25, Ant Internal

Area Scan (101x151x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Power Drift = 0.315 dB
Peak SAR (extrapolated) = 0.893 W/kg
SAR(1 g) = 0.407 mW/g; SAR(10 g) = 0.212 mW/g



0 dB = 0.562mW/g

DUT: N5 Premium; Type: MID

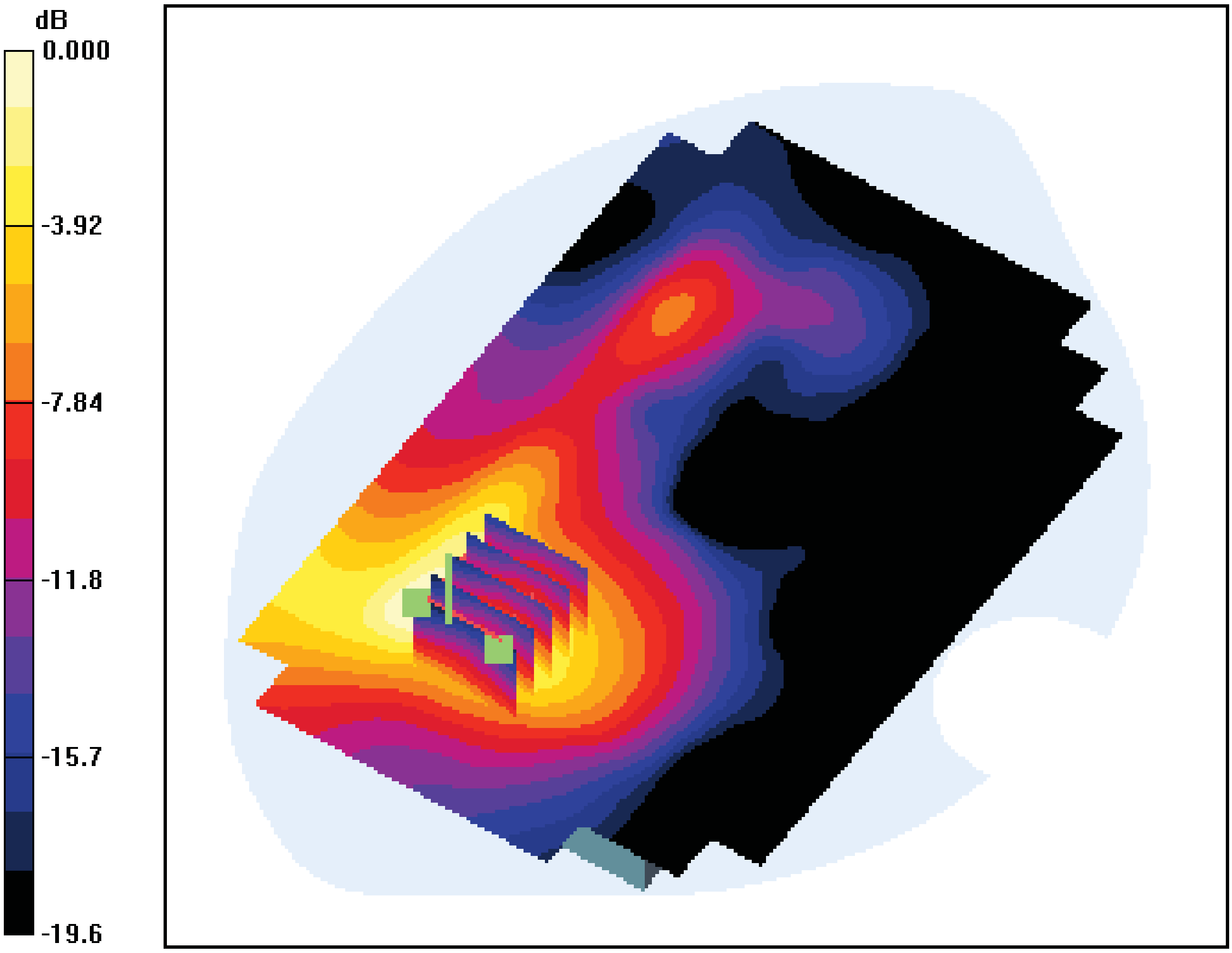
Communication System: FCC_PCS; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1851.33 MHz; σ = 1.56 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.59, 7.59, 7.59); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-18; Ambient Temp: 22.0; Tissue Temp: 23.0

Touch from Body, Normal, CDMA PCS Ch. 25, Ant Internal

Area Scan (101x151x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Power Drift = 0.315 dB
Peak SAR (extrapolated) = 0.841 W/kg
SAR(1 g) = 0.297 mW/g; SAR(10 g) = 0.172 mW/g



0 dB = 0.510mW/g

DIGITAL EMC CO., LTD

DUT: N5 Premium; Type: MID

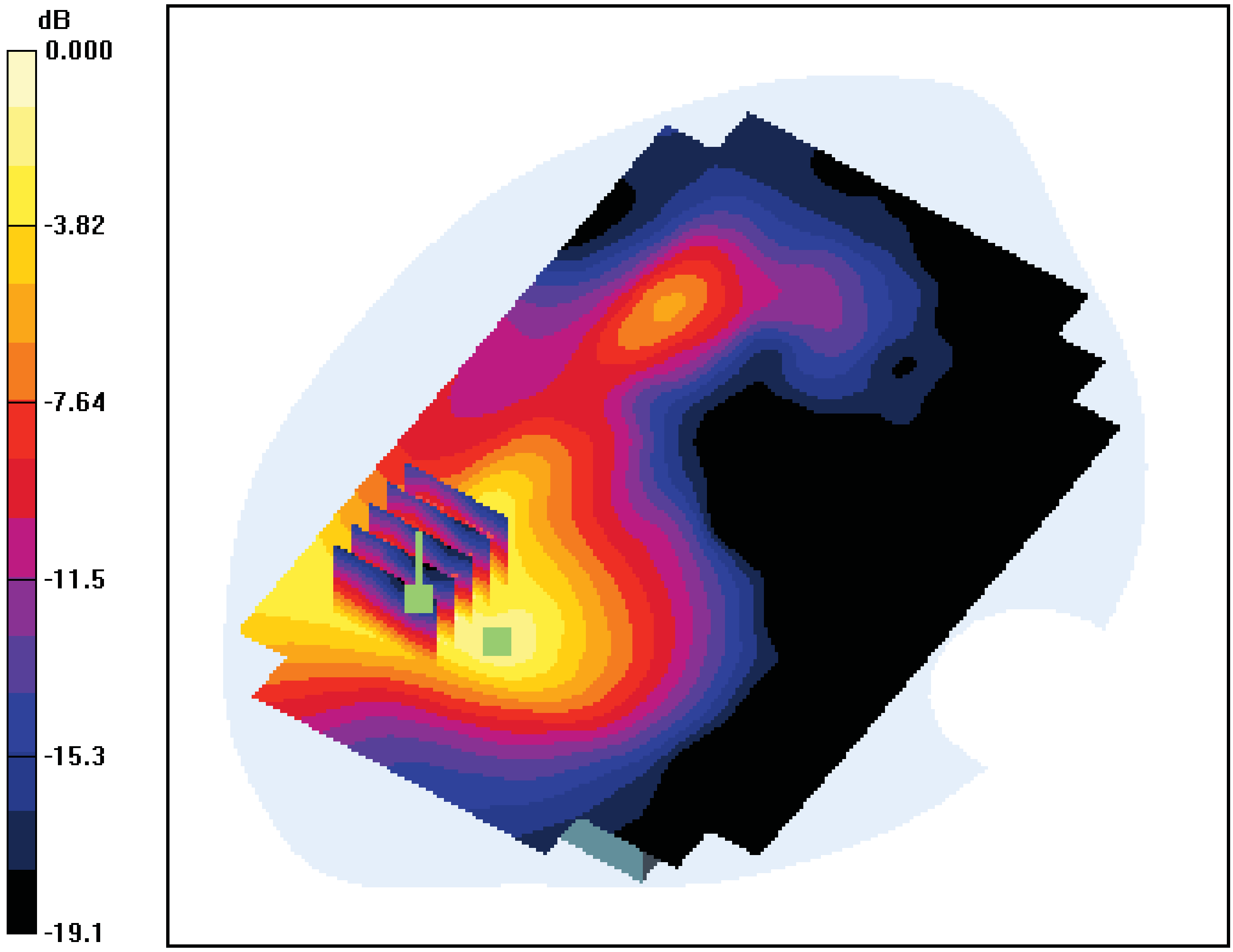
Communication System: FCC_PCS; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.55 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.59, 7.59, 7.59); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-18; Ambient Temp: 22.0; Tissue Temp: 23.0

Touch from Body, Normal, CDMA PCS Ch. 600, Ant Internal

Area Scan (101x151x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Power Drift = -0.137 dB
Peak SAR (extrapolated) = 0.815 W/kg
SAR(1 g) = 0.378 mW/g; SAR(10 g) = 0.200 mW/g



0 dB = 0.497mW/g

DUT: N5 Premium; Type: MID

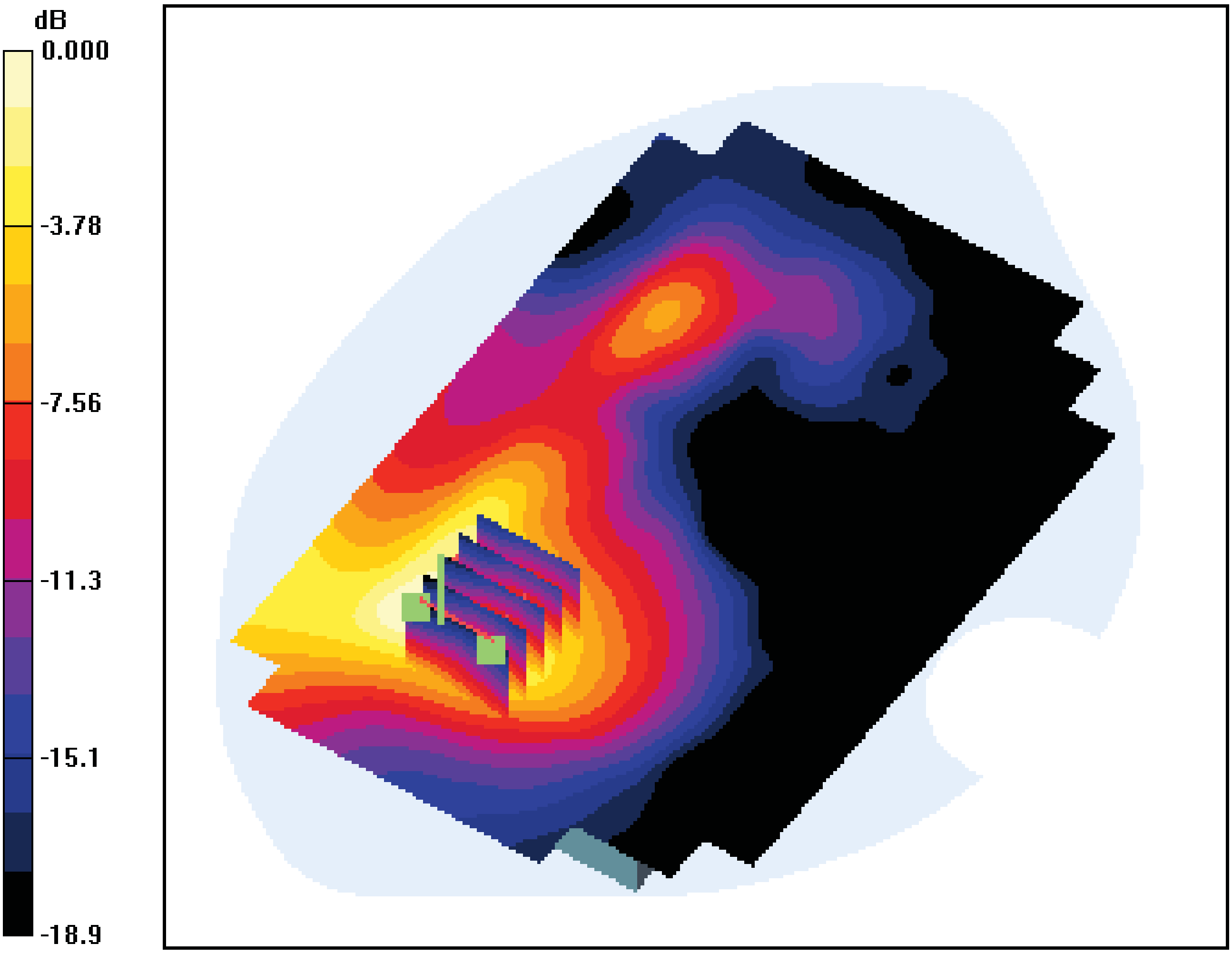
Communication System: FCC_PCS; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; $\sigma = 1.55$ mho/m; $\varepsilon_r = 54.3$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.59, 7.59, 7.59); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-18; Ambient Temp: 22.0; Tissue Temp: 23.0

Touch from Body, Normal, CDMA PCS Ch. 600, Ant Internal

Area Scan (101x151x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Power Drift = -0.137 dB
Peak SAR (extrapolated) = 0.811 W/kg
SAR(1 g) = 0.277 mW/g; SAR(10 g) = 0.158 mW/g



0 dB = 0.483mW/g

DIGITAL EMC CO., LTD

DUT: N5 Premium; Type: MID

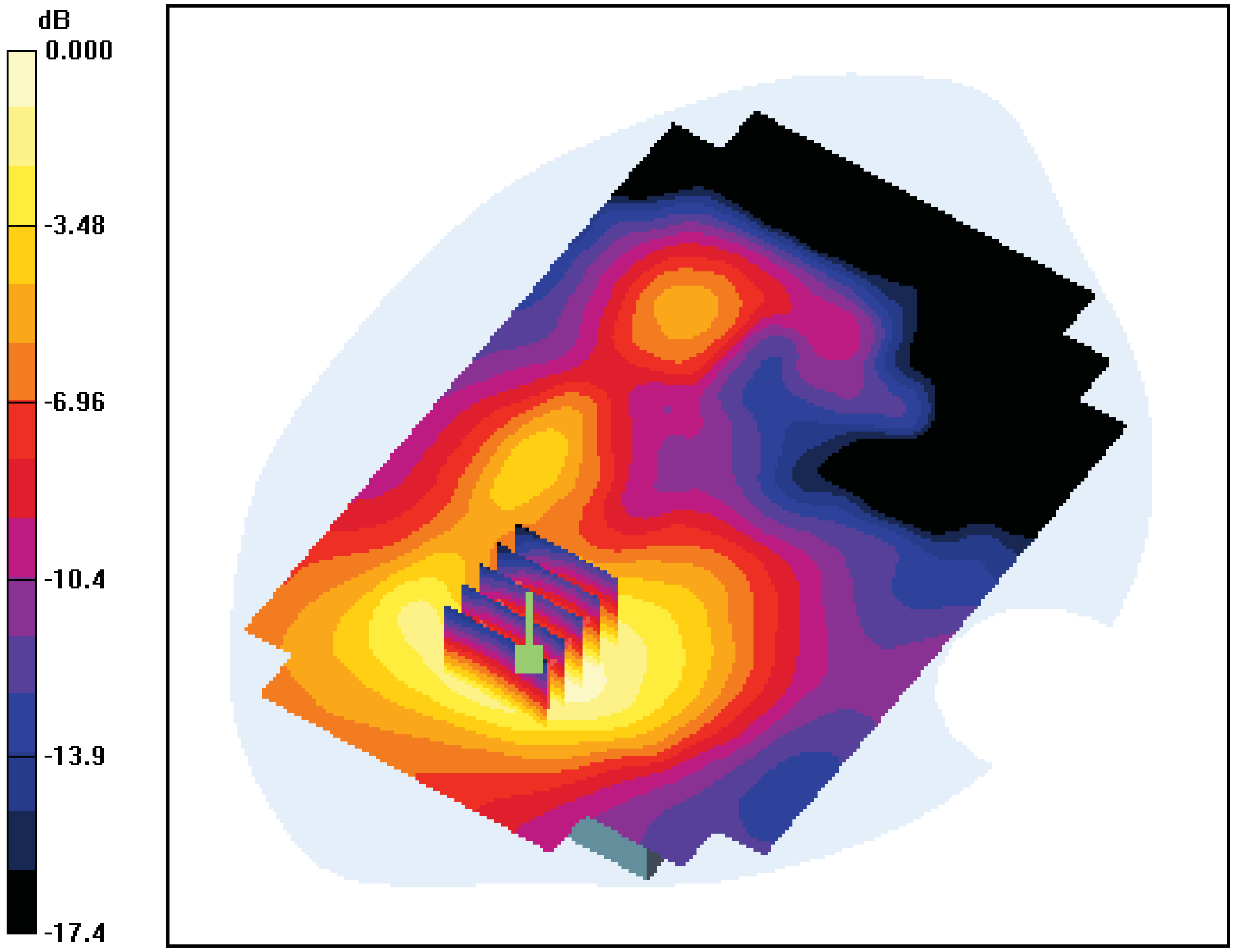
Communication System: FCC_PCS; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1908.75 MHz; σ = 1.5 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.59, 7.59, 7.59); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-18; Ambient Temp: 22.0; Tissue Temp: 23.0

Touch from Body, Normal, CDMA PCS Ch. 1175, Ant Internal

Area Scan (101x151x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Power Drift = 0.130 dB
Peak SAR (extrapolated) = 0.274 W/kg
SAR(1 g) = 0.167 mW/g; SAR(10 g) = 0.101 mW/g



0 dB = 0.209mW/g

DIGITAL EMC CO., LTD

DUT: N5 Premium; Type: MID

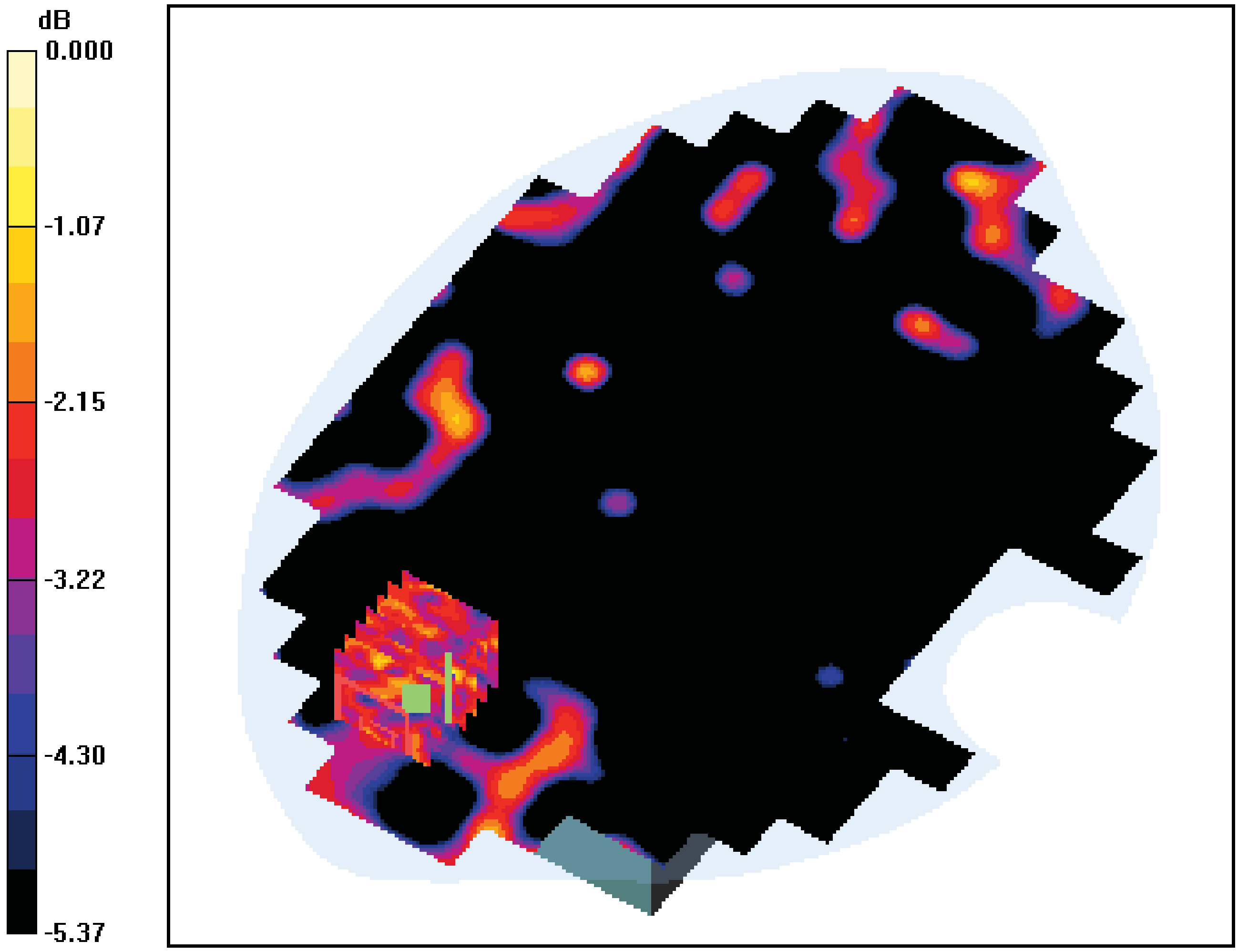
Communication System: W-LAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.93 mho/m; ε_r = 53.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.41, 7.41, 7.41); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-20; Ambient Temp: 22.5; Tissue Temp: 23.0

Body, Normal, W-LAN(802.11b) Ch. Low(2412 MHz), Ant Internal

Area Scan (141x201x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.311 dB
Peak SAR (extrapolated) = 0.020 W/kg
SAR(1 g) = 0.00468 mW/g; SAR(10 g) = 0.00303 mW/g



0 dB = 0.008mW/g

DIGITAL EMC CO., LTD

DUT: N5 Premium; Type: MID

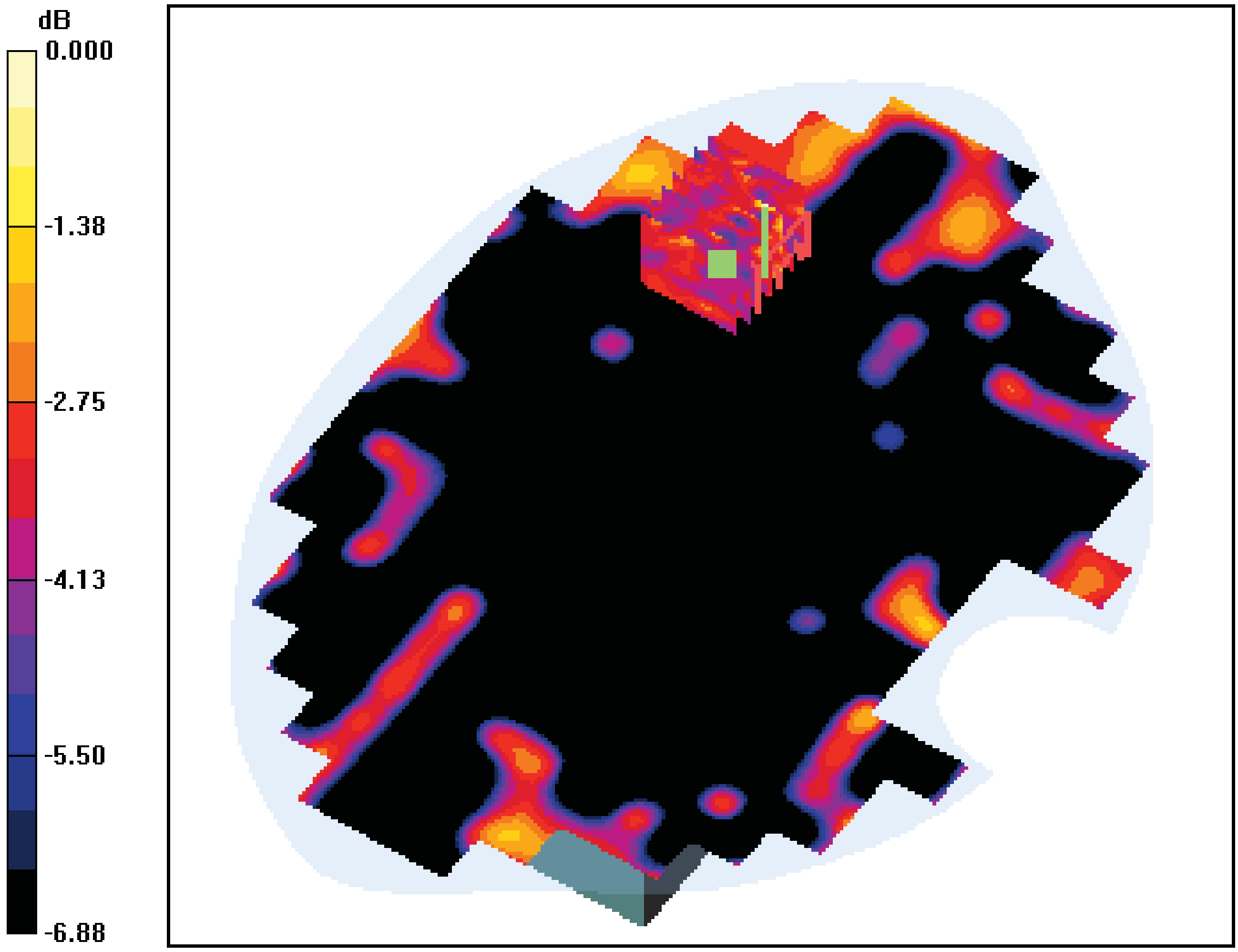
Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.95 mho/m; ε_r = 53.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.41, 7.41, 7.41); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-20; Ambient Temp: 22.5; Tissue Temp: 23.0

Body, Normal, W-LAN(802.11b) Ch. Mid(2437 MHz), Ant Internal

Area Scan (141x201x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.227 dB
Peak SAR (extrapolated) = 0.015 W/kg
SAR(1 g) = 0.00323 mW/g; SAR(10 g) = 0.00179 mW/g



0 dB = 0.010mW/g

DIGITAL EMC CO., LTD

DUT: N5 Premium; Type: MID

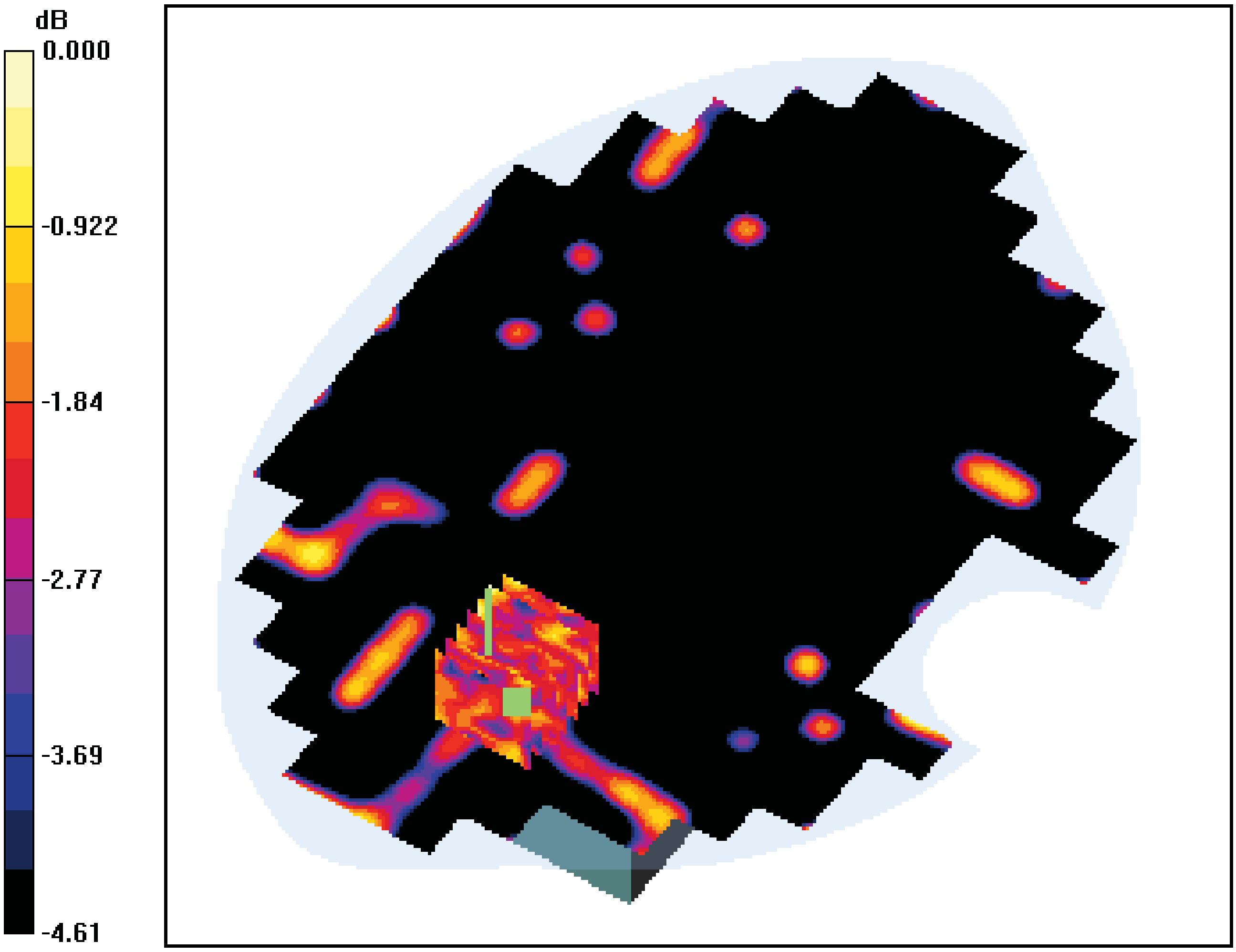
Communication System: W-LAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.99 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.41, 7.41, 7.41); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-20; Ambient Temp: 22.5; Tissue Temp: 23.0

Body, Normal, W-LAN(802.11b) Ch. High(2462 MHz), Ant Internal

Area Scan (141x201x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = 0.210 dB
Peak SAR (extrapolated) = 0.014 W/kg
SAR(1 g) = 0.00348 mW/g; SAR(10 g) = 0.00144 mW/g



0 dB = 0.007mW/g

DIGITAL EMC CO., LTD

DUT: N5 Premium; Type: MID

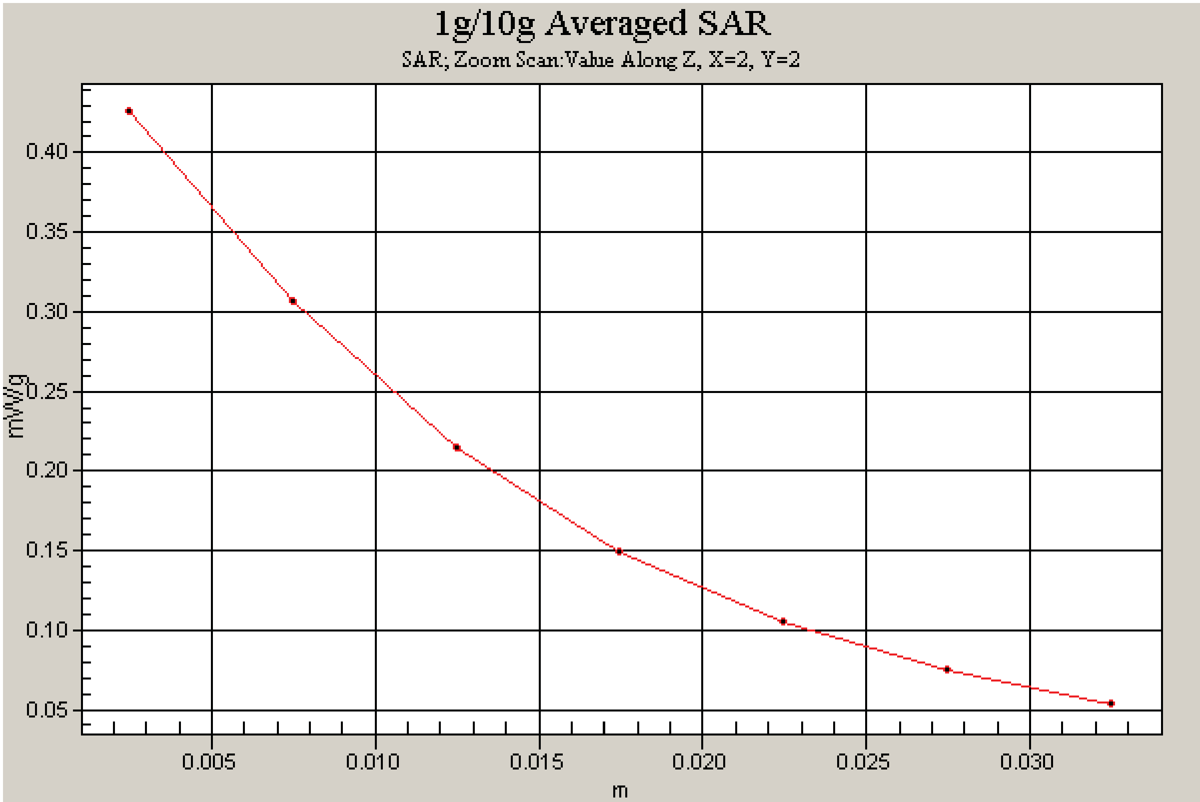
Communication System: FCC CDMA; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used: f = 836.667 MHz; $\sigma = 0.967$ mho/m; $\varepsilon_r = 55.9$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(9.31, 9.31, 9.31); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM with 835MHz; Type: SAM; Serial: TP-1223
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-27; Ambient Temp: 22.0; Tissue Temp: 22.5

Touch form Body, Normal, CDMA Cellular Ch. 384, Ant Internal

Area Scan (111x151x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Power Drift = -0.234 dB
Peak SAR (extrapolated) = 0.524 W/kg
SAR(1 g) = 0.363 mW/g; SAR(10 g) = 0.242 mW/g



DIGITAL EMC CO., LTD

DUT: N5 Premium; Type: MID

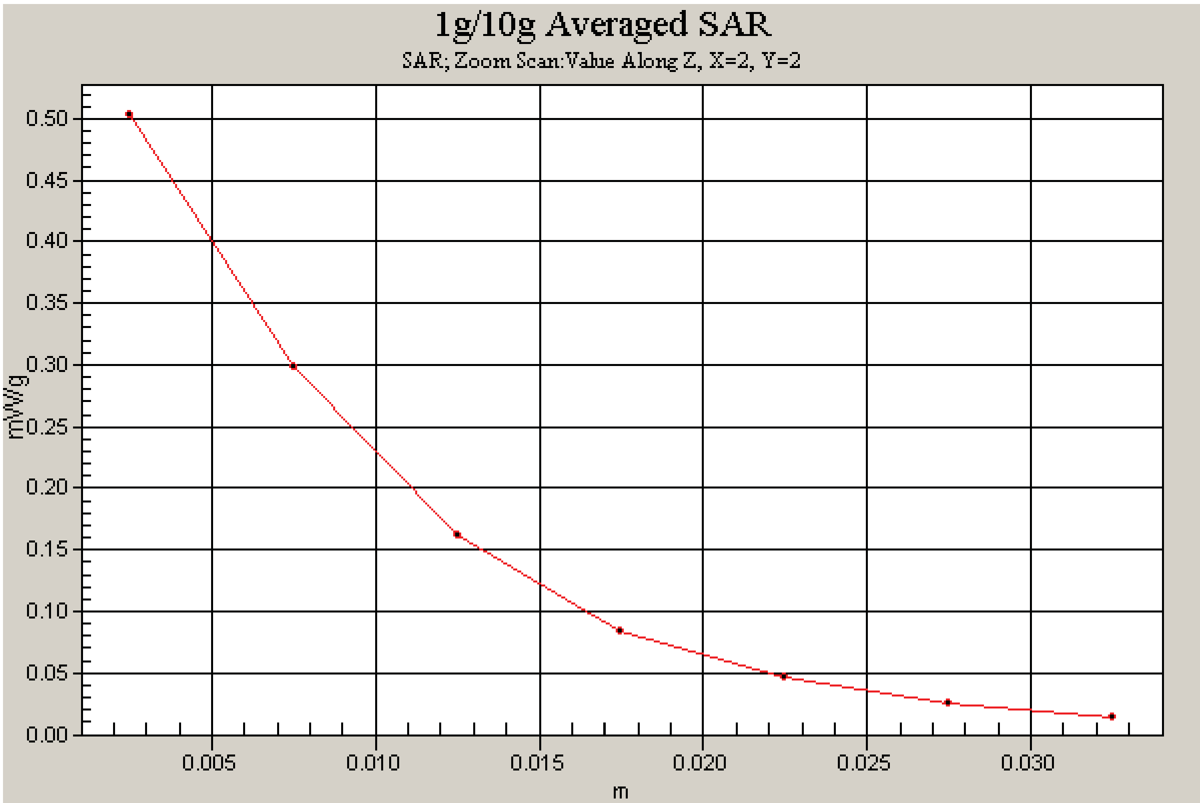
Communication System: FCC_PCS; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1851.33 MHz; σ = 1.56 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.59, 7.59, 7.59); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-18; Ambient Temp: 22.0; Tissue Temp: 23.0

Touch form Body, Normal, CDMA PCS Ch. 25, Ant Internal

Area Scan (101x151x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Power Drift = 0.315 dB
Peak SAR (extrapolated) = 0.893 W/kg
SAR(1 g) = 0.407 mW/g; SAR(10 g) = 0.212 mW/g



DIGITAL EMC CO., LTD

DUT: N5 Premium; Type: MID

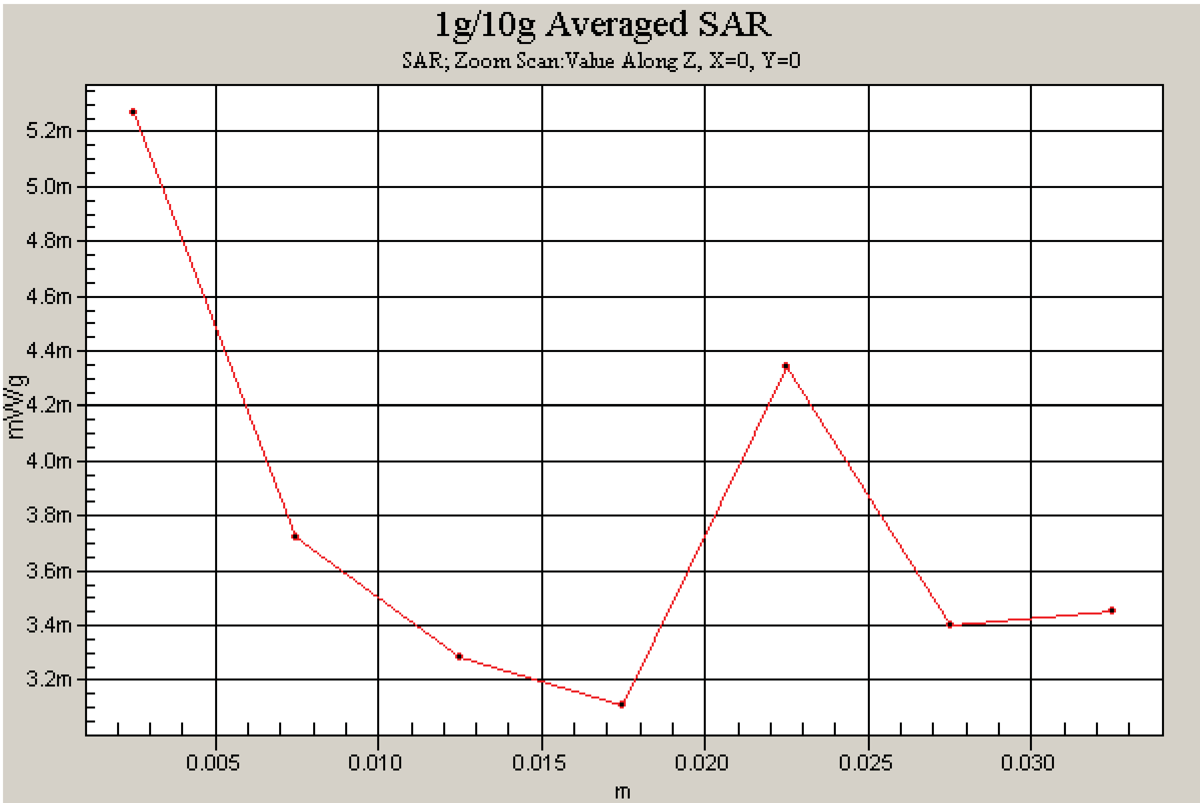
Communication System: W-LAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.93 mho/m; ε_r = 53.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.41, 7.41, 7.41); Calibrated: 2010-01-26; Electronics: DAE3 Sn520
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2010-09-20; Ambient Temp: 22.5; Tissue Temp: 23.0

Body, Normal, W-LAN(802.11b) Ch. Low(2412 MHz), Ant Internal

Area Scan (141x201x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.311 dB
Peak SAR (extrapolated) = 0.020 W/kg
SAR(1 g) = 0.00468 mW/g; SAR(10 g) = 0.00303 mW/g



SAR TEST SET UP PHOTO

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View 1

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View 2 (Normal)

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Accreditation No.: **SCS 108**

Client **Digital EMC (Dymstec)**

Certificate No: **EX3-3643_Jan10**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3643
Calibration procedure(s)	QA CAL-01.v6, QA CAL-14.v3, QA CAL-23.v3 and QA CAL-25.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	January 26, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	29-Sep-09 (No. DAE4-660_Sep09)	Sep-10
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Fin Bomholt	R&D Director	F. Bomholt

Issued: January 26, 2010

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3643

Manufactured:	January 8, 2008
Last calibrated:	January 14, 2009
Recalibrated:	January 26, 2010

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: EX3DV4 SN:3643

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.38	0.43	0.46	± 10.1%
DCP (mV)[B]	90.8	84.9	87.5	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300	± 1.5%
			Y	0.00	0.00	1.00	300	
			Z	0.00	0.00	1.00	300	

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 Pages 5 and 6).

[B] Numerical linearization parameter: uncertainty not required.

[E] Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

DASY - Parameters of Probe: EX3DV4 SN:3643

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	9.41	9.41	9.41	0.82	0.59 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	8.09	8.09	8.09	0.58	0.68 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	7.86	7.86	7.86	0.62	0.65 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	7.19	7.19	7.19	0.32	0.90 ± 11.0%
2600	± 50 / ± 100	39.0 ± 5%	1.96 ± 5%	7.20	7.20	7.20	0.37	0.87 ± 11.0%
3500	± 50 / ± 100	37.9 ± 5%	2.91 ± 5%	6.63	6.63	6.63	0.38	0.99 ± 13.1%

[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.

DASY - Parameters of Probe: EX3DV4 SN:3643

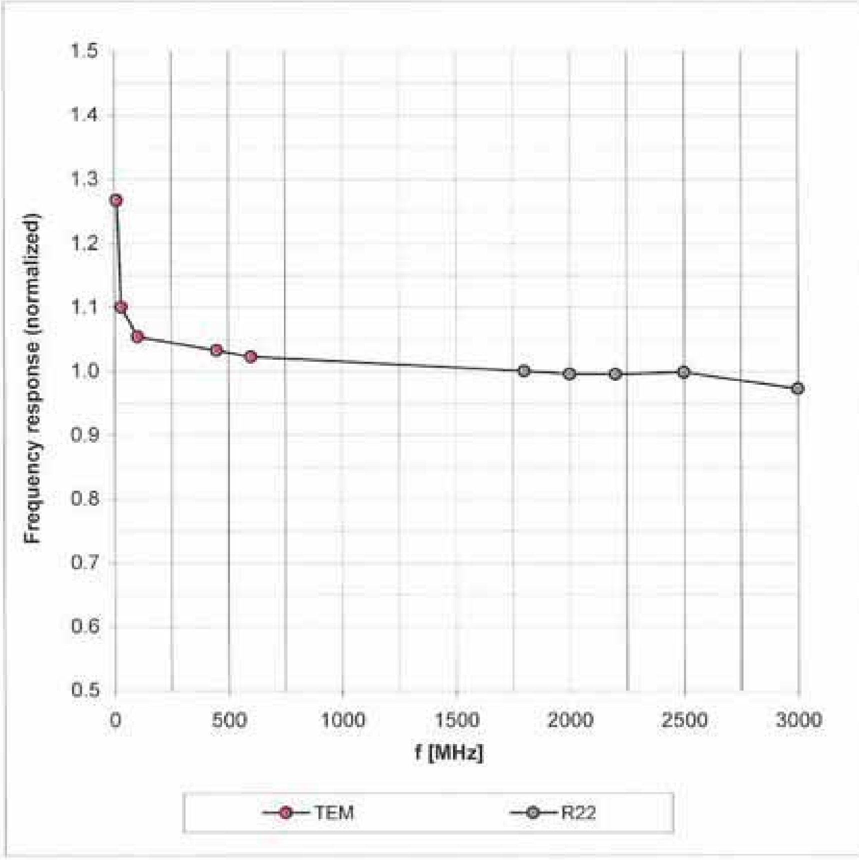
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	9.31	9.31	9.31	0.61	0.72 ± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	7.92	7.92	7.92	0.65	0.66 ± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	7.59	7.59	7.59	0.86	0.58 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	7.41	7.41	7.41	0.37	0.87 ± 11.0%
2600	± 50 / ± 100	52.5 ± 5%	2.16 ± 5%	7.25	7.25	7.25	0.36	0.98 ± 11.0%
3500	± 50 / ± 100	51.3 ± 5%	3.31 ± 5%	6.19	6.19	6.19	0.45	0.97 ± 13.1%

[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.

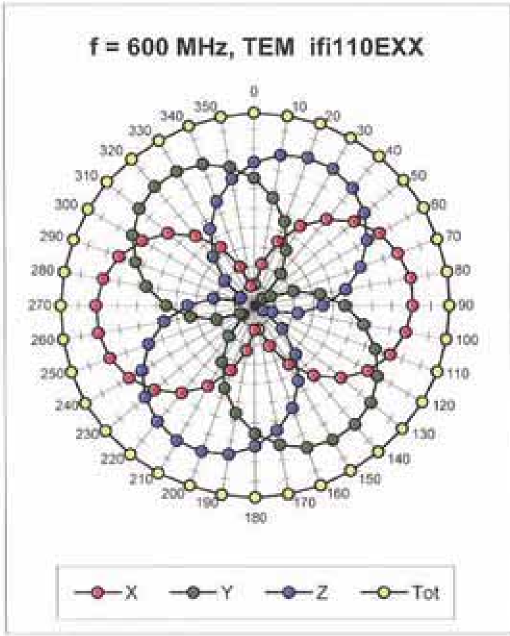
Frequency Response of E-Field

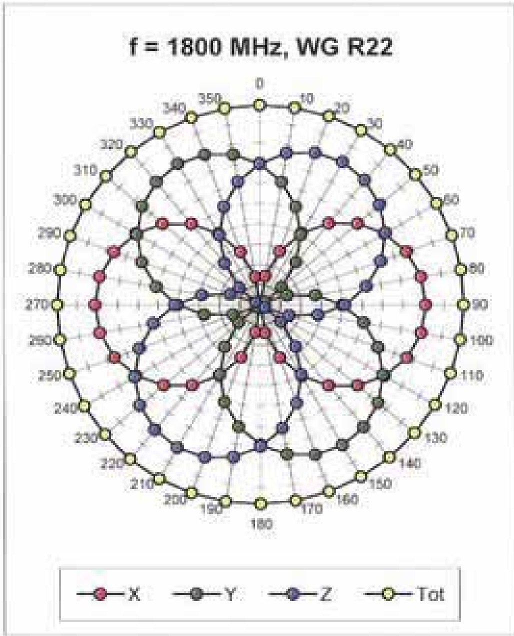
(TEM-Cell:ifi110 EXX, Waveguide: R22)

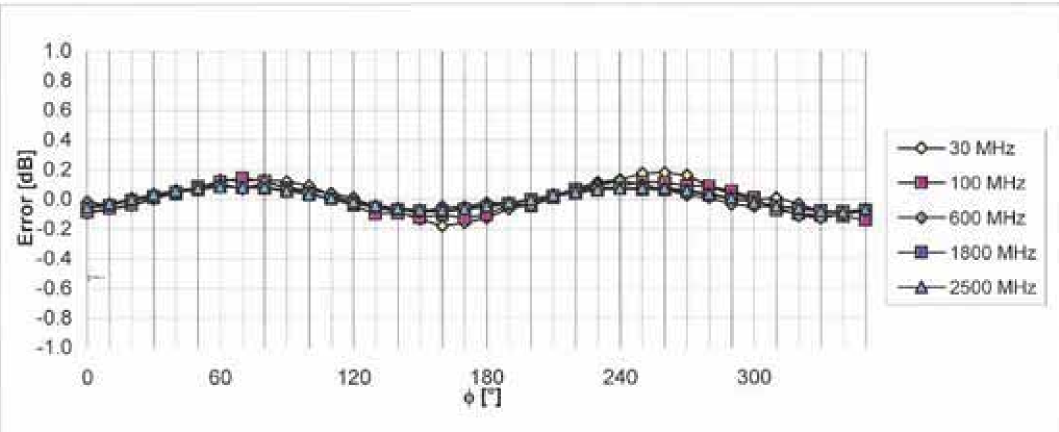


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), $\vartheta = 0°$



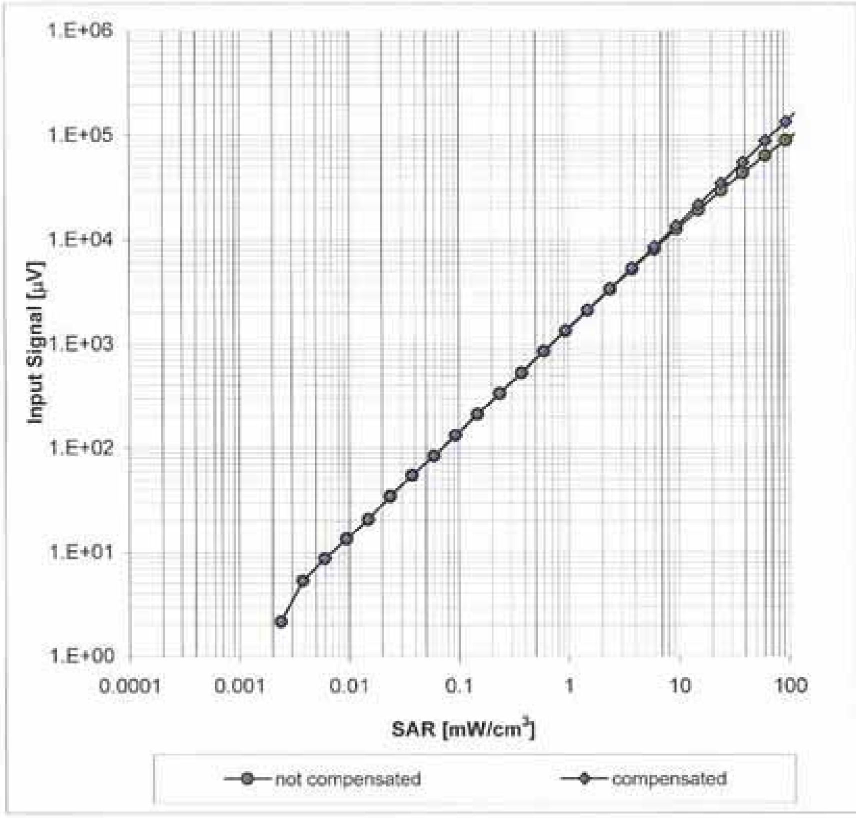


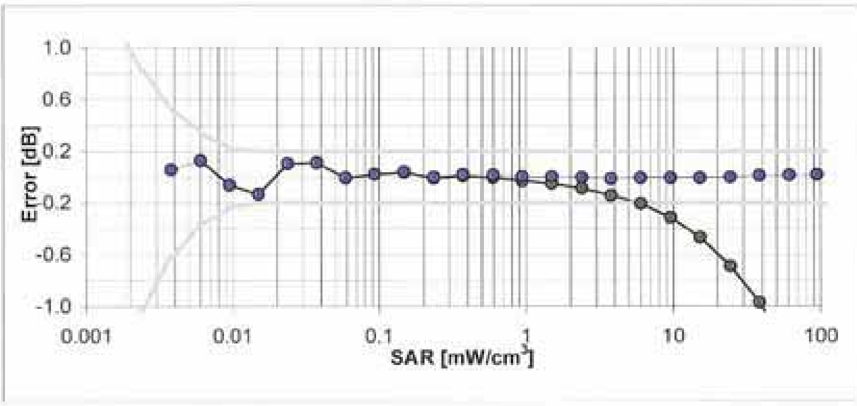


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

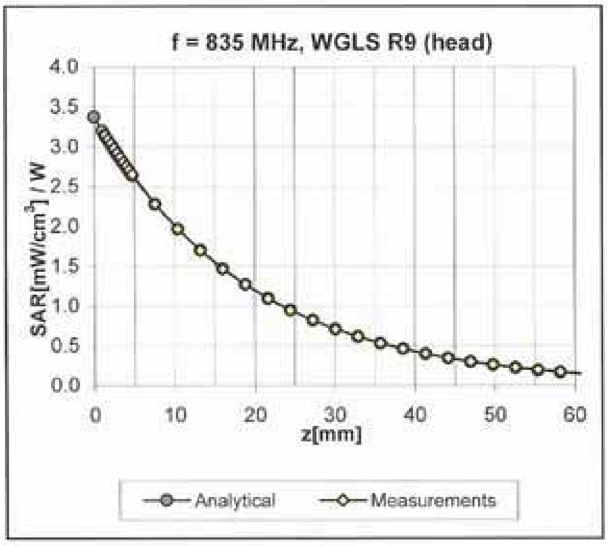
(Waveguide R22, f = 1800 MHz)

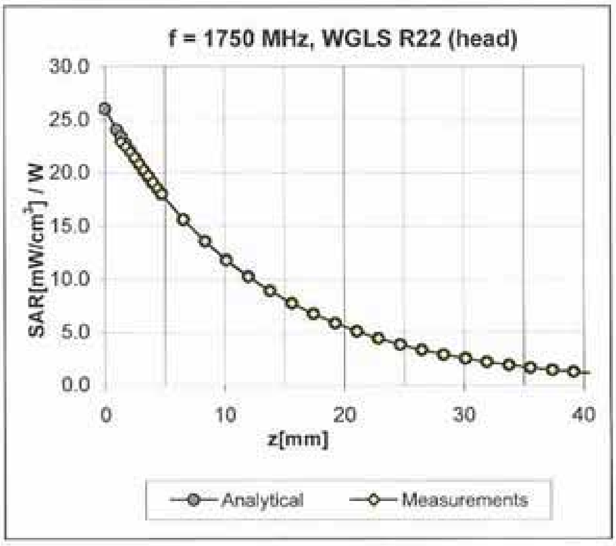




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

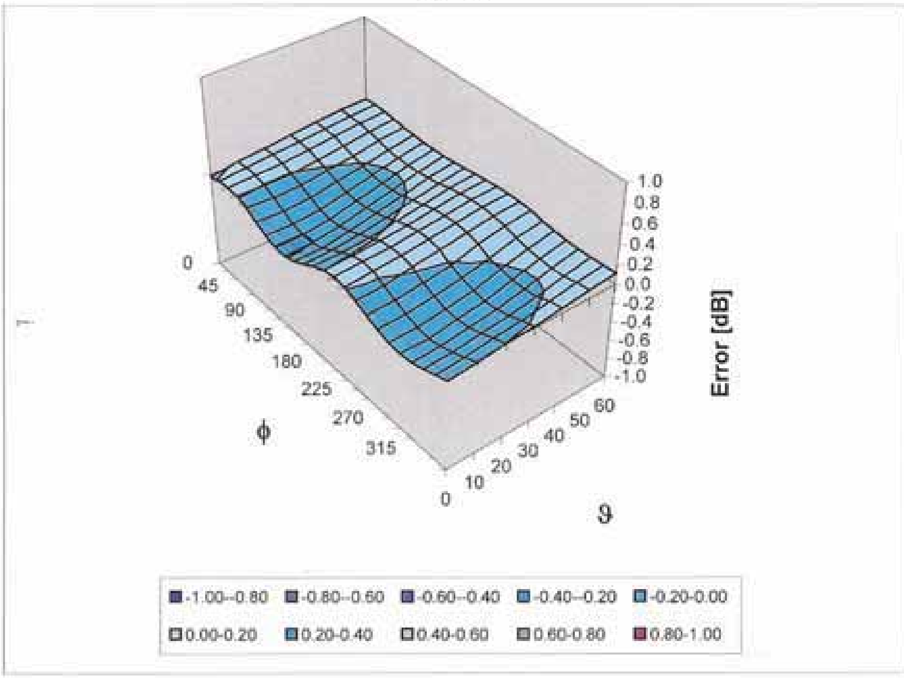
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Other Probe Parameters

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

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Accreditation No.: SCS 108

Client **Digital EMC (Dymstec)**

Certificate No: D835V2-464_Mar10

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 464
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	March 22, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	02-Mar-10 (No. DAE4-601_Mar10)	Mar-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	D. Iliev
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 22, 2010

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

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.9 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.44 mW / g
SAR normalized	normalized to 1W	9.76 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.75 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.59 mW / g
SAR normalized	normalized to 1W	6.36 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.35 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.3 ± 6 %	1.01 mho/m ± 6 %
Body TSL temperature during test	(22.1 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.55 mW / g
SAR normalized	normalized to 1W	10.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.90 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.67 mW / g
SAR normalized	normalized to 1W	6.68 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.53 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.1 Ω - 2.6 jΩ
Return Loss	- 31.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.6 Ω - 5.7 jΩ
Return Loss	- 24.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.382 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 27, 2002

DASY5 Validation Report for Head TSL

Date/Time: 22.03.2010 09:52:40

Test Laboratory: SPEAG, Zurich, Switzerland

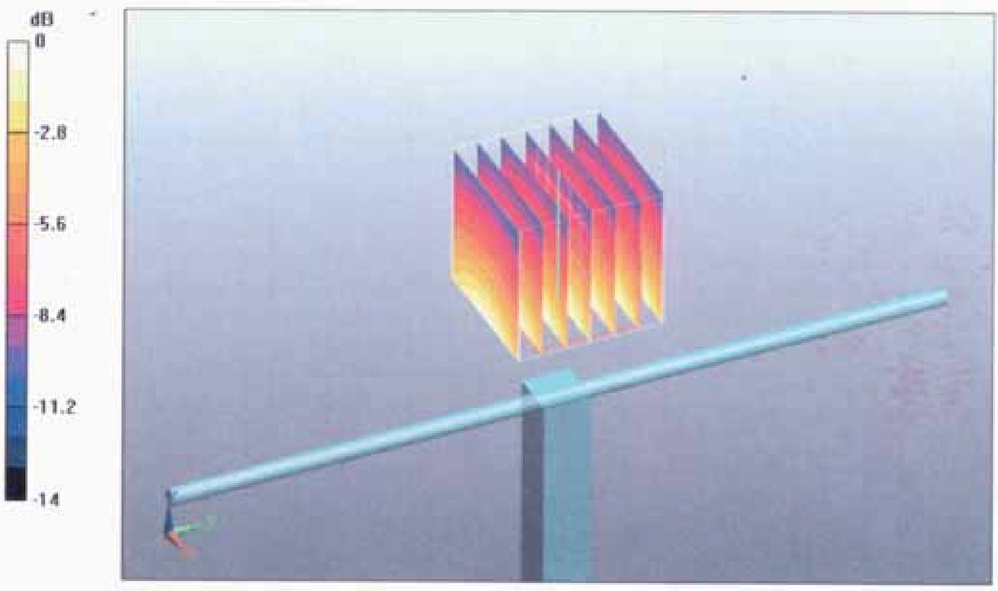
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:464

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL900
Medium parameters used: f = 835 MHz; σ = 0.91 mho/m; ε_r = 42.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

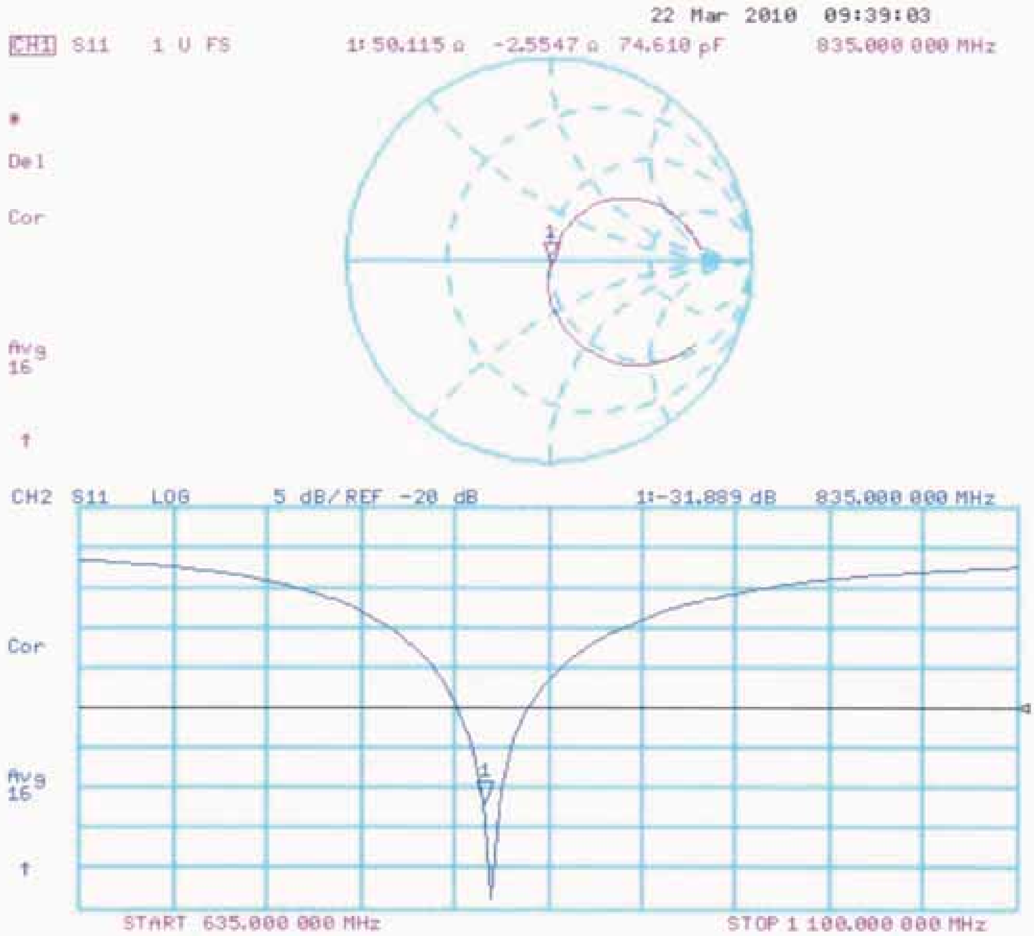
- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.6 V/m; Power Drift = 0.016 dB
Peak SAR (extrapolated) = 3.66 W/kg
SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.59 mW/g
Maximum value of SAR (measured) = 2.85 mW/g



0 dB = 2.85mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body

Date/Time: 22.03.2010 13:46:23

Test Laboratory: SPEAG, Zurich, Switzerland

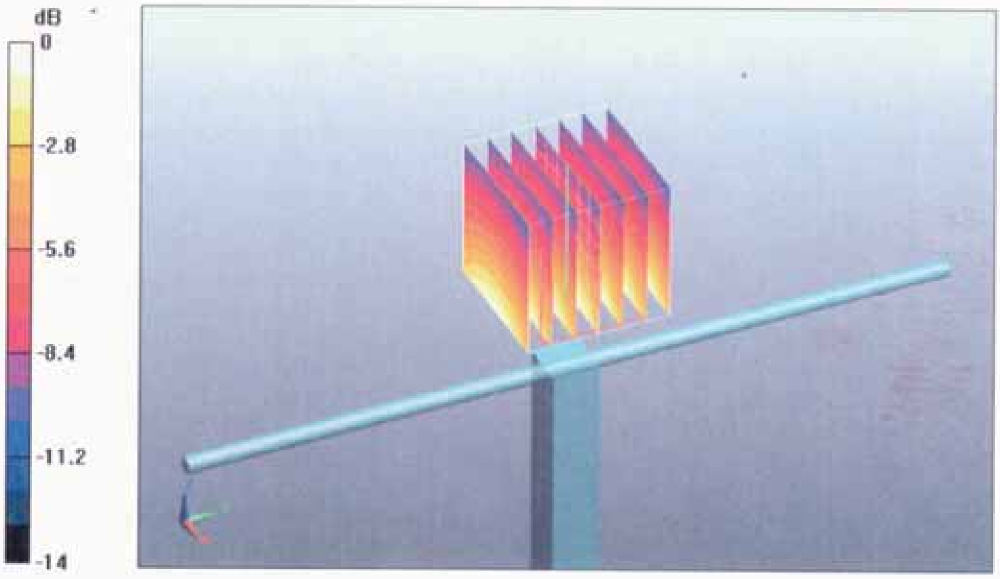
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:464

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL900
Medium parameters used: f = 835 MHz; σ = 1.01 mho/m; ε_r = 55.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

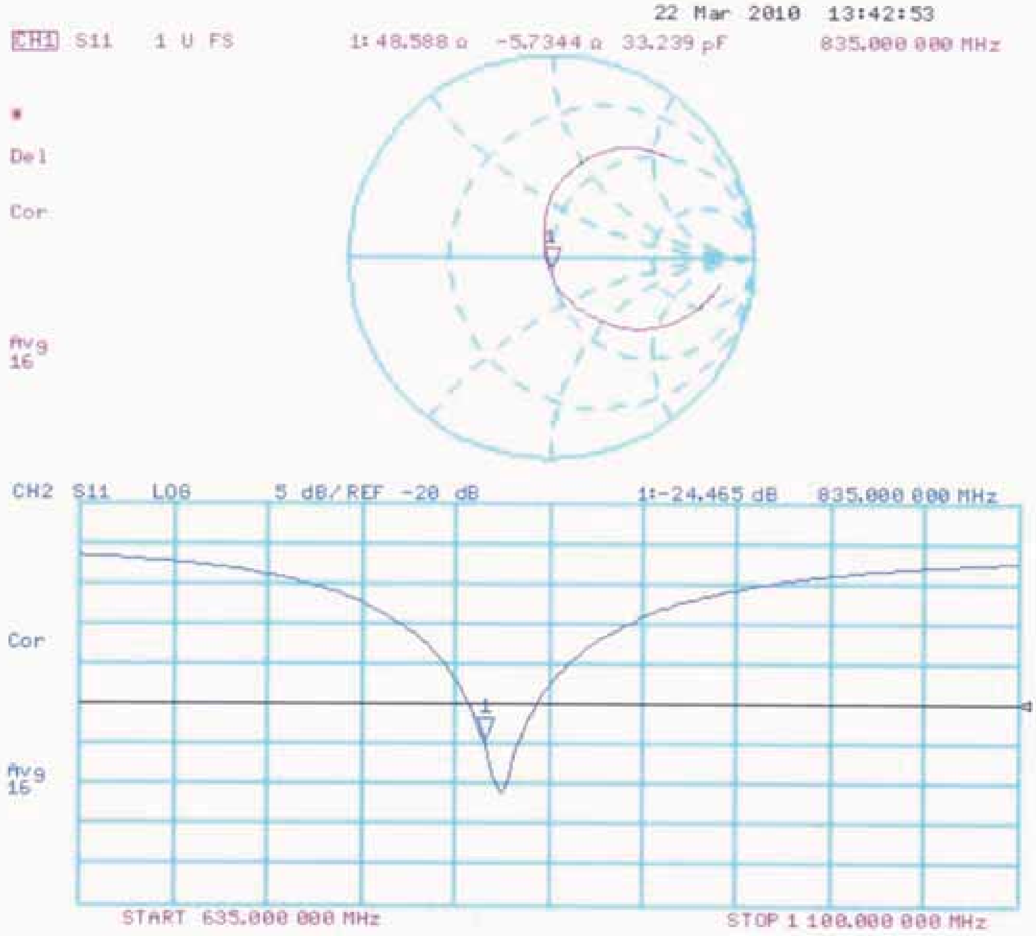
- Probe: ES3DV3 - SN3205; ConvF(5.97, 5.97, 5.97); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Pin250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.8 V/m; Power Drift = 0.034 dB
Peak SAR (extrapolated) = 3.78 W/kg
SAR(1 g) = 2.55 mW/g; SAR(10 g) = 1.67 mW/g
Maximum value of SAR (measured) = 2.98 mW/g



0 dB = 2.98mW/g

Impedance Measurement Plot for Body TSL



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Accreditation No.: **SCS 108**

Client **Digital EMC (Dymstec)**

Certificate No: **D1900V2-5d029_Mar10**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d029
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	March 23, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	02-Mar-10 (No. DAE4-601_Mar10)	Mar-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	D. Iliev
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 23, 2010

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

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.1 ± 6 %	1.45 mho/m ± 6 %
Head TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.0 mW / g
SAR normalized	normalized to 1W	40.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**39.4 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.23 mW / g
SAR normalized	normalized to 1W	20.9 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.8 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.9 ± 6 %	1.58 mho/m ± 6 %
Body TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 mW / g
SAR normalized	normalized to 1W	41.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**40.6 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.50 mW / g
SAR normalized	normalized to 1W	22.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.9 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.7 Ω - 1.4 jΩ
Return Loss	- 36.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.5 Ω - 0.8 jΩ
Return Loss	- 26.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.196 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 17, 2002

DASY5 Validation Report for Head TSL

Date/Time: 23.03.2010 11:39:54

Test Laboratory: SPEAG, Zurich, Switzerland

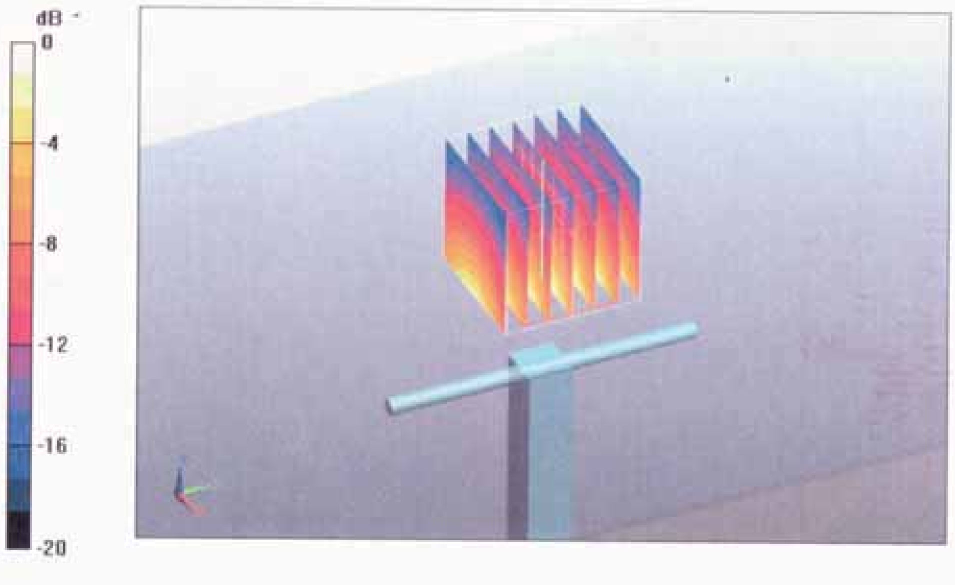
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d029

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL U11 BB
Medium parameters used: f = 1900 MHz; σ = 1.45 mho/m; ε_r = 41.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

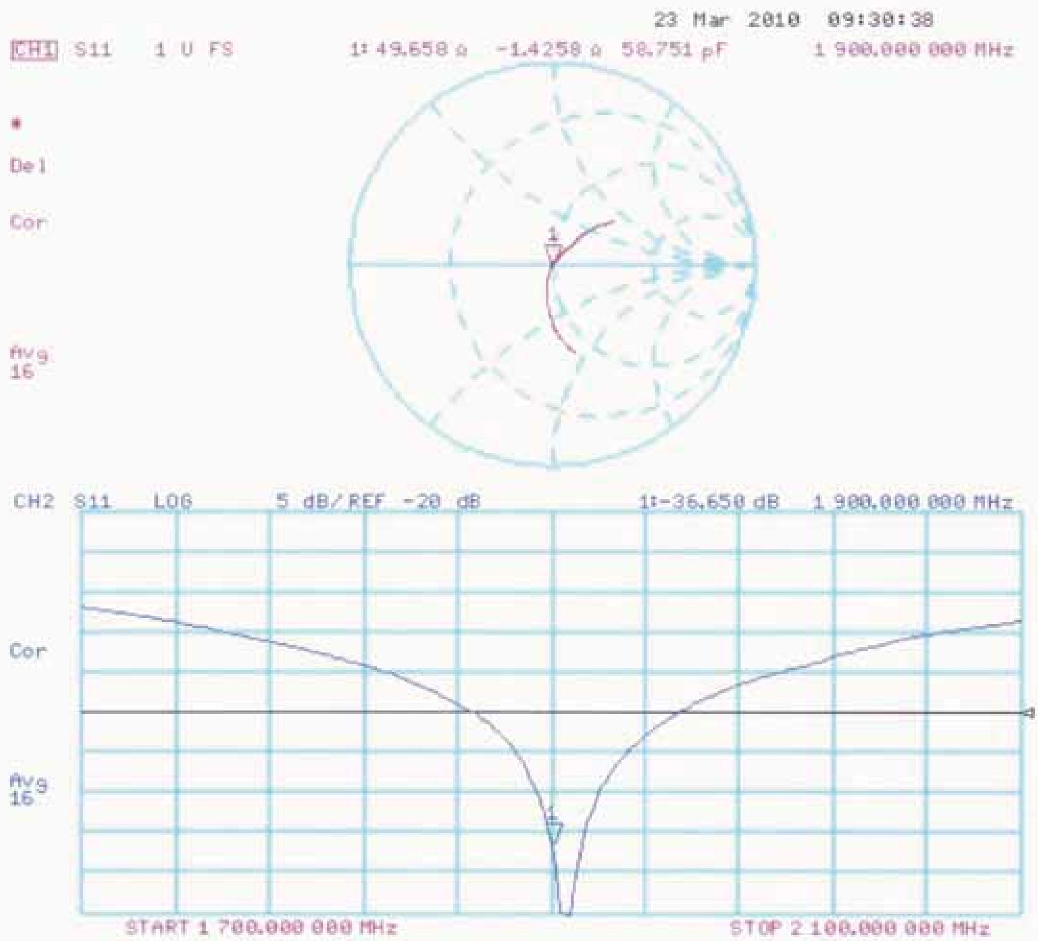
- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.3 V/m; Power Drift = 0.064 dB
Peak SAR (extrapolated) = 18.3 W/kg
SAR(1 g) = 10 mW/g; SAR(10 g) = 5.23 mW/g
Maximum value of SAR (measured) = 12.7 mW/g



0 dB = 12.7mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body

Date/Time: 17.03.2010 12:26:35

Test Laboratory: SPEAG, Zurich, Switzerland

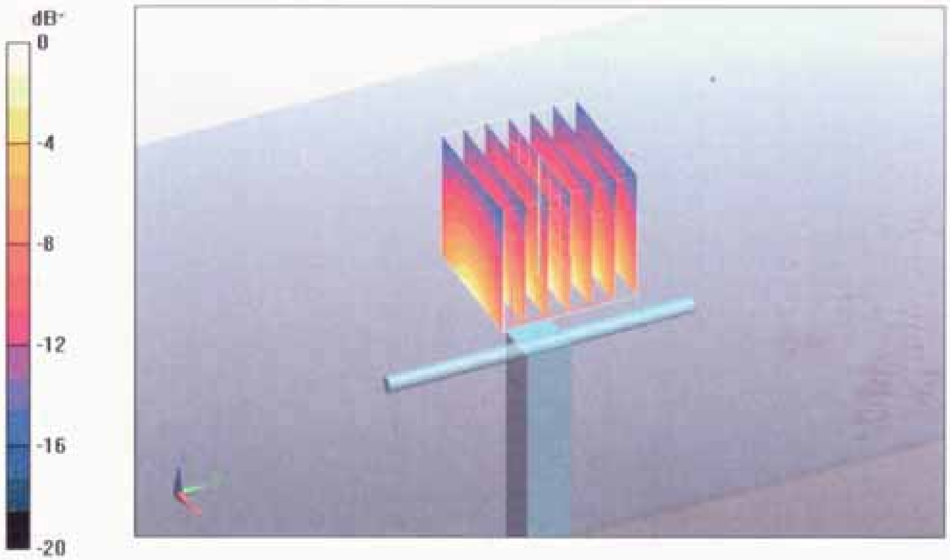
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d029

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: MSL U11 BB
Medium parameters used: f = 1900 MHz; $\sigma = 1.58$ mho/m; $\varepsilon_r = 55$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

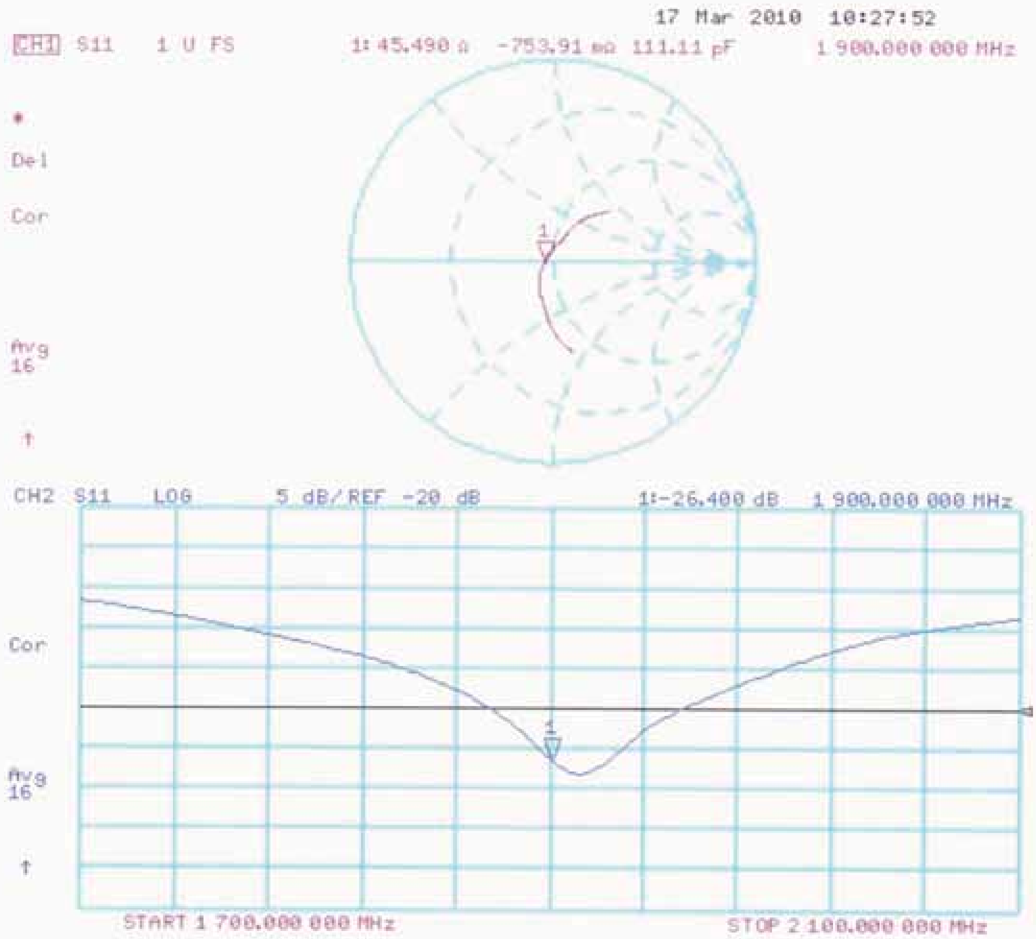
- Probe: ES3DV3 - SN3205; ConvF(4.59, 4.59, 4.59); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Pin250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.6 V/m; Power Drift = 0.082 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.5 mW/g
Maximum value of SAR (measured) = 13 mW/g



0 dB = 13mW/g

Impedance Measurement Plot for Body TSL



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

S **Schweizerischer Kalibrierdienst**
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Accreditation No.: SCS 108

Client **Digital EMC (Dymstec)**

Certificate No: **D2450V2-726_Mar10**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 726
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	March 18, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	02-Mar-10 (No. DAE4-601_Mar10)	Mar-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 22, 2010

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

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.4 ± 6 %	1.80 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR normalized	normalized to 1W	52.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**52.3 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.13 mW / g
SAR normalized	normalized to 1W	24.5 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.4 ± 6 %	2.00 mho/m ± 6 %
Body TSL temperature during test	(21.4 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.9 mW / g
SAR normalized	normalized to 1W	51.6 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**51.3 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.00 mW / g
SAR normalized	normalized to 1W	24.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.0 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω + 2.8 jΩ
Return Loss	- 27.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.8 Ω + 4.2 jΩ
Return Loss	- 27.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.160 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 09, 2003

DASY5 Validation Report for Head TSL

Date/Time: 18.03.2010 10:06:22

Test Laboratory: SPEAG, Zurich, Switzerland

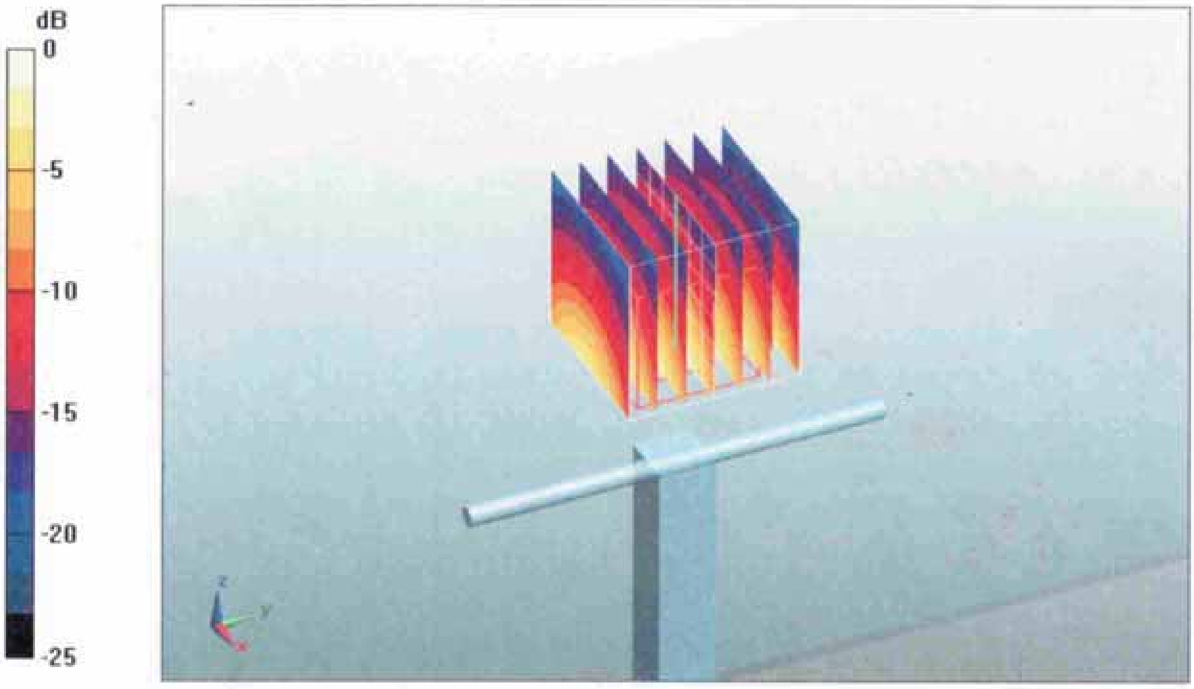
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:726

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U11 BB
Medium parameters used: f = 2450 MHz; σ = 1.8 mho/m; ε_r = 40.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

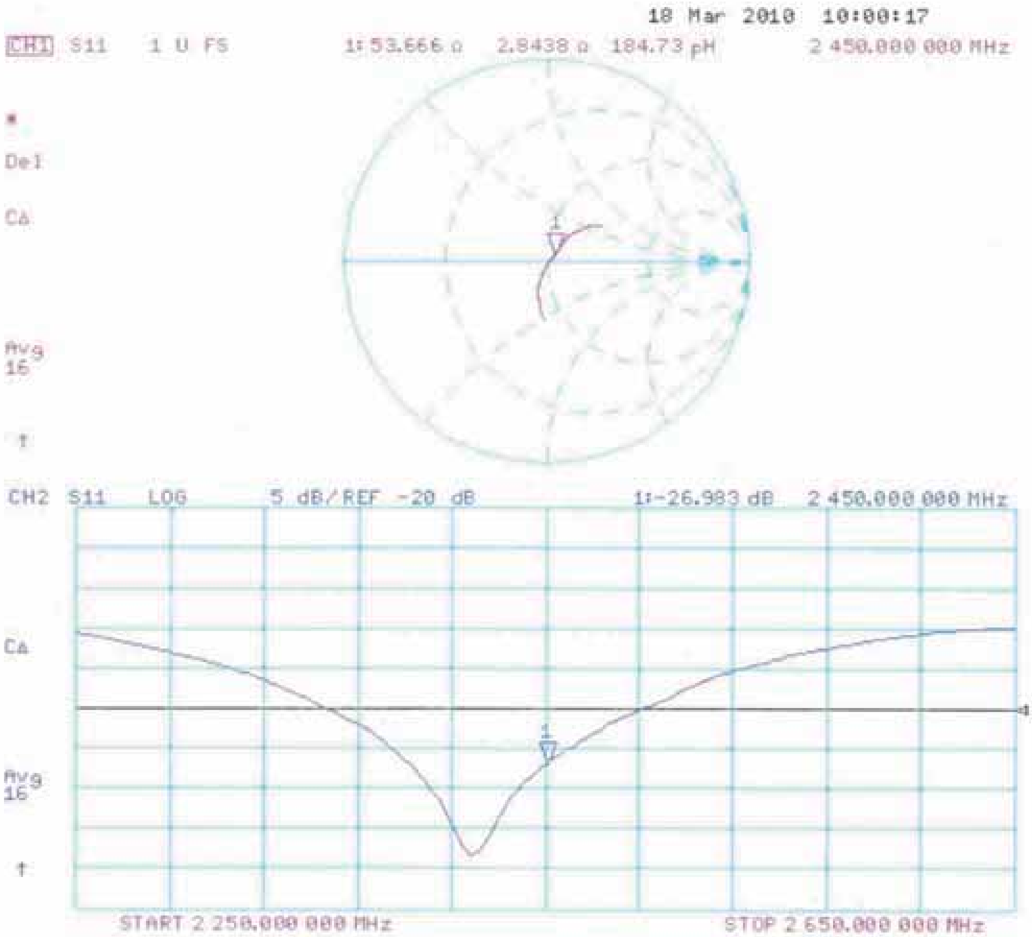
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.8 V/m; Power Drift = 0.099 dB
Peak SAR (extrapolated) = 26.4 W/kg
SAR(1 g) = 13 mW/g; SAR(10 g) = 6.13 mW/g
Maximum value of SAR (measured) = 16.8 mW/g



0 dB = 16.8mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body

Date/Time: 18.03.2010 12:27:16

Test Laboratory: SPEAG, Zurich, Switzerland

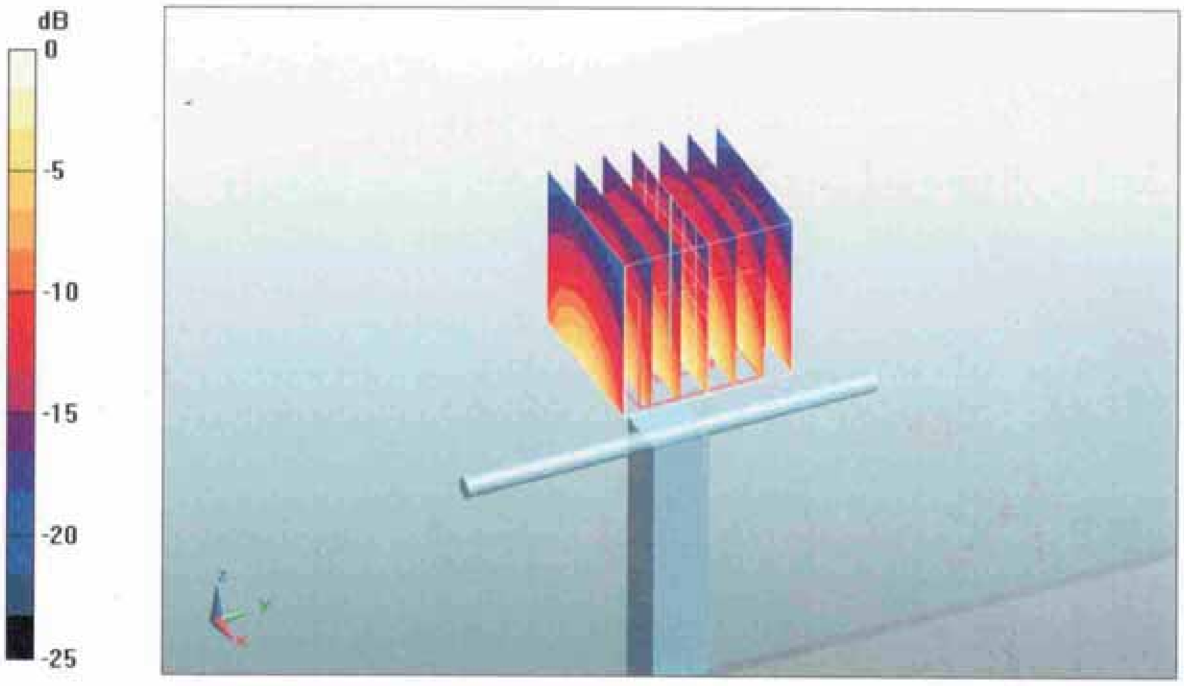
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:726

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U11 BB
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 54.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Pin250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.9 V/m; Power Drift = 0.073 dB
Peak SAR (extrapolated) = 26.6 W/kg
SAR(1 g) = 12.9 mW/g; SAR(10 g) = 6 mW/g
Maximum value of SAR (measured) = 16.9 mW/g



0 dB = 16.9mW/g

Impedance Measurement Plot for Body TSL