ESTECH Co., Ltd.
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SAR Compliace Test Report

APPLICANT NAME & ADDRESS :	DATA & LOCATION OF TESTING
HONEYWELL INTERNATIONAL INC	Dates of testing : 2013-08-05~2013-08-08
9680 OLD BAILES RD FORT MILL SC	Test Site : ESTECH Co., Ltd.
29707 UNITED STATES	97-1, Hoeeok-Ri, Majang-Myeon, Icheon-si, Kyonggi-Do, Korea

Test Device :

Model : Dolphin 6110

FCC ID : HD56110GP

IC Number : 1693B-61A

TYPE : Mobile Computer

Test Report No. :	ESTSAR1308-002	Number of page :	27
Contact person :	Michael Robinson/Principal Engineer	Responsible test Engineer :	In-Ki Hong
Testing has been Carried out in Accordance with :	IEEE 1528(2003) Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate(SAR) in the Human Body Due to Wireless Communications Device : Experimental Techniques		
Applicant Type :	Certification		
FCC CLASSIFICATION :	DTS-Part 15 Digital Transmitter System		
Rule Part(s) :	47CFR §2.1093 ;ANSI/IEEE C95.1(1992) RSS 102 issue 4		
Test results :	The Tested device complies with the requirements in respect of all parameters subject to the test. The test results and statements relate only to the items tested. The test report shall not be reproduced recept in full, without written approval of the laboratory.		

Date and Signatures : 2013-08-16

Report Prepared By : Engineer/ In-Ki Hong (Signature)   Engineering Manager/ Jin-Mo Yang (Signature)

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1. SUMMARY FOR TEST REPORT

FCC ID / IC Number	HD56110GP / 1693B-61A	
Date of test	2013-08-05 ~ 2013-08-08	
Measurement performed by	In-Ki Hong	
Technical Reviewer	Jin-Mo Yang	
EUT Type	Mobile Computer	
Frequency	2.4GHz WLAN	2412 – 2462 MHz
	5.8GHz WLAN	5745 – 5825 MHz
	5.2GHz WLAN	5180 – 5240 MHz
	5.3GHz WLAN	5260 – 5320 MHz
	5.5GHz WLAN	5500 –5700 MHz
	Bluetooth	2402 – 2480 MHz
Duty Cycle	100%	
Max Power (Middle Channel)	2.4GHz 802.11b 15.03dBm,802.11g 14.96dBm,802.11n 14.95dBm	
	5GHz 802.11a 12.24dBm,802.11n 12.34dBm / BT 3.74dBm	
Battery Type	DC 3.8 V(Lithum-ion Battery)	

1.1 Body Worn Configuration (WLAN)

Max. SAR Measurement

Mode	Body Position	EUT Position	Frequency (MHz)	Channel	Power (dBm)	Scaled SAR(mW/g)
802.11b	Flat	Side 2	2462	6	15.03	0.710

1.2 Measurement Uncertainty

Combine Standard Uncertainty	± 11.00 (*k=1*)
Extended Standard Uncertainty	± 22.00 (*k=2*, 95% CONFIDENCE LEVEL)

1.3 Conducted power table for 802.11a/b/g/n

802.11b Average RF Power

Mode	Freq (MHz)	Channel	802.11b (2.4GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			1	2	5.5	11				
802.11b	2412	1	14.99	14.45	14.21	14.62				
802.11b	2437	6	15.03	14.82	14.74	14.86				
802.11b	2462	11	14.98	14.78	14.62	14.82				

802.11g Average RF Power

Mode	Freq (MHz)	Channel	802.11g (2.4GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11g	2412	1	15.15	14.45	14.80	14.95	14.09	13.69	12.88	12.11
802.11g	2437	6	14.96	14.55	14.73	14.39	14.16	14.22	12.98	12.28
802.11g	2462	11	14.96	14.85	14.47	14.84	14.26	14.44	12.34	12.19

802.11n Average RF Power

Mode	Freq (MHz)	Channel	802.11n (2.4GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	20	26	39	52	58	65
802.11n	2412	1	14.69	13.191	14.466	13.586	13.412	12.595	11.819	10.989
802.11n	2437	6	14.95	14.445	14.396	14.076	14.262	12.495	12.409	11.629
802.11n	2462	11	14.93	14.699	14.686	14.046	14.172	12.075	12.149	11.179

Blutooth Average RF Power

Blutooth (2.4GHz) Conducted Power [dBm]				
Mode	Freq(MHz)/channel			
	2412/0	2441/39	2480/79	–
GFSK	2.97	3.73	0.8	–
8DPSK	2.97	3.74	0.79	

802.11a Average RF Power

Mode	Freq (MHz)	Channel	802.11a (5GHz) Conducted Power [dBm] Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	5180	36	12.29	12.05	11.96	11.84	11.97	11.90	11.88	11.82
802.11a	5200	40	12.13	12.05	11.98	11.86	11.81	11.78	11.70	11.68
802.11a	5240	48	11.95	11.85	11.80	11.77	11.81	11.85	11.82	11.92
802.11a	5260	52	12.32	12.15	12.20	12.14	12.08	11.84	11.77	11.50
802.11a	5300	60	12.24	12.18	12.11	12.05	11.94	11.86	11.72	11.69
802.11a	5320	64	12.02	11.92	11.84	11.77	11.89	11.92	11.80	11.97
802.11a	5500	100	10.99	10.78	10.69	10.71	10.66	10.59	10.47	10.41
802.11a	5580	116	10.09	9.94	9.88	9.81	9.77	9.86	9.90	10.02
802.11a	5700	140	9.25	9.15	9.08	9.01	8.95	8.81	8.74	8.48
802.11a	5745	149	9.71	9.61	9.58	9.48	9.44	9.40	9.37	9.34
802.11a	5785	157	10.17	10.08	10.01	9.97	9.86	9.81	9.80	9.73
802.11a	5825	165	9.47	9.44	9.35	9.38	9.29	9.05	9.07	8.80

802.11n Average RF Power

Mode	Freq (MHz)	Channel	802.11n (5GHz) Conducted Power [dBm] Data Rate [Mbps]							
			6.5	13	20	26	39	52	58	65
802.11n	5180	36	12.11	12.08	12.01	11.95	11.84	11.45	11.05	10.79
802.11n	5200	40	11.65	11.52	11.42	11.36	11.10	11.02	10.95	10.77
802.11n	5240	48	11.92	11.74	11.36	11.24	11.10	10.87	10.56	10.33
802.11n	5260	52	12.14	12.01	11.78	11.51	11.24	11.04	10.99	10.88
802.11n	5300	60	12.34	12.14	12.04	11.95	11.84	11.74	11.50	11.10
802.11n	5320	64	11.76	11.15	10.95	10.77	10.45	10.15	10.05	9.88
802.11n	5500	100	11.47	11.31	11.20	10.95	10.74	10.22	10.05	9.35
802.11n	5580	116	9.63	9.41	9.26	9.11	8.78	8.51	8.40	8.21
802.11n	5700	140	9.27	9.09	9.01	8.74	8.62	8.15	7.99	7.27
802.11n	5745	149	9.91	9.74	9.41	9.38	9.24	9.04	8.74	8.67
802.11n	5785	157	10.18	10.05	9.94	9.84	9.74	9.56	9.14	8.46
802.11n	5825	165	9.62	9.55	9.23	9.15	9.02	8.78	8.66	8.14

2. INTRODUCATION

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential azards of RF emissions due to FCC-regulated portable device.

The safety limits used for the environmental evaluation measurements arethe criteria published by the based on American National Standards Institute (ANSI) For localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for safety Levels with Respect to Human Exposure to Radio Frequency Electronic Fields, 3 kHz to 300 GHz. 1992 by the institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. The measurement procedure described in IEEE/ANSIC95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave is used for guidance in measuring SAR due to the RF radiationexposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (IC NIRP) in Biological Effects and Exposure Criteria for Radio Frequency Electromagnetic Fields," IC NIRP Report No. 86 IC NIRP, 1986, Bethesda, MD20814. SAR is ameasure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

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. 2.1.).

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

Figure 2.1 SAR Mathematical Equation

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

$$SAR = \sigma E^2 / \rho$$

Where:

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

3. DESCRIPTION OF THE DEVICE UNDER TEST

The FCC rules for evaluating portable devices for RF exposure compliance are contained in 47 CFR §2.1093. For purposes of RF exposure evaluation, a portable device is defined as a transmitting device designed to be used with any part of its radiating structure in direct contact with the user's body or within 20 cm of the body of a user or bystanders under normal operating conditions. This category of devices would include hand-held that incorporate the radiating antenna into the hand-piece and wireless transmitters
that are carried next to the body. Portable sevices are evaluated with respect to SAR limits for RF exposure. The applicable SAR limit for portable transmitters used by consumers is 1.6 W/kg, which is averaged over any one gram of tissue defined as a tissue volume in the shape of a cube.

3.1 Antenna Description

Type	Internal Antenna
Location	the top of the device
Radiator Material	Copper

3.2 Device Description

Serial numbers	NONE
Exposure environment	Uncontrolled exposure
Device category	Portable device
Mode(s) of Operation	DSSS,OFDM
Modulation Mode(s)	DSSS,OFDM
Duty Cycle	100%
2.4GHz WLAN	2412 – 2462 MHz
5.8GHz WLAN	5745 – 5825 MHz
5.2GHz WLAN	5180 – 5240 MHz
5.3GHz WLAN	5260 – 5320 MHz
5.5GHz WLAN	5500 –5700 MHz
Bluetooth	2402 – 2480 MHz
test signal method	☐ Base station simulator ■ Internal test code

3.3 Battery Options

☑ Standard ☑ Extended
Standard Cpapcity: Li-ion 3.7V/2200mAh
Extended Capacity: Li-ion 3.7V/3300mAh

4. TEST CONDITIONS

4.1 Ambient Conditions

Ambient Temperature (˚C)	23
Tissue simulating liquid temperature (˚C)	23
Humidity (% R.H.)	44

4.2 RF Characteristics of The Test Site

This measurement were performed in a fully enclosed RF Shielded environment

4.3 Test Signal, Frequencies, And Output Power

The Mobile Computer was placed into simulated call mode

In all operation bands the measurements were performed on lowest, middle and highest channels.

The Mobile Computer was placed into simulated call mode was set to maximum power level during the all tests and at the beginning of the each test the battery was fully

DASY4 system measures power drift during SAR testing by comparing e-field in the same location at the beginning and at the end of measurement. These records were used to monitor stability of power output.

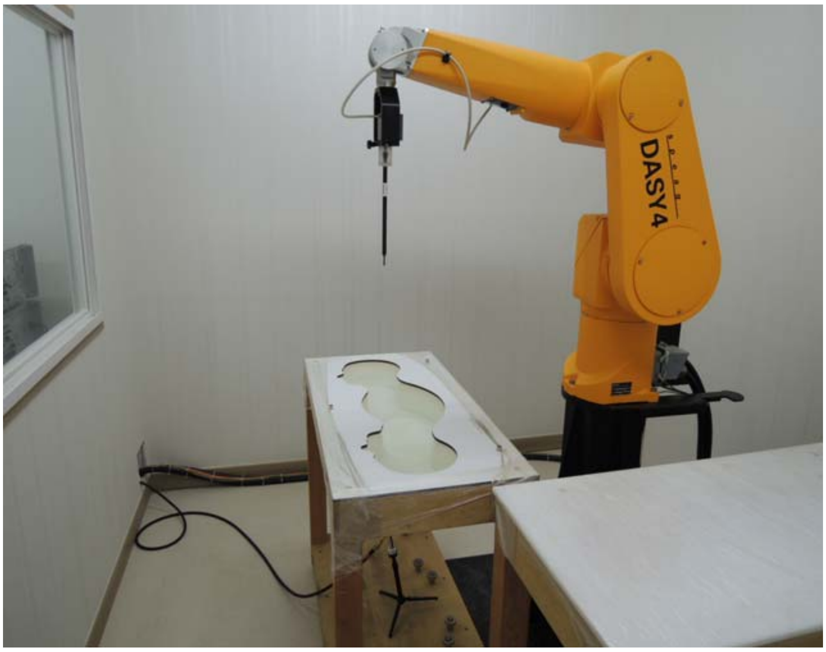

Fig. 4.1 SAR Measurement System

5. DESCRIPTION OF THE TEST EQUIPMENT

An SAR measurement system usually consists of a small diameter isotropic electric field probe, a multiple axis probe positioning system, a test device holder, one or more phantom models, the field probe instrumentation, a computer and other electronic equipment for controlling the probe and making the measurements. Other supporting equipment, such as a network analyzer, power meters and RF signal generators, are also required to measure the dielectric parameters of the simulated tissue media and to verify the measurement accuracy of the SAR system.

5.1 Test System Specifications

Test Equipment	Model	Serial Number	Due Cal. Date
DAE	DAE4	551	2014-02-14
E-Field Probe	ES3DV3	3123	2014-01-22
E-Field Probe	EX3DV4	3882	2013-09-24
Dipole validation kit	D2450V2	741	2014-02-23
Dipole validation kit	D5GHzV2	1107	2015-02-21
Network analyzer	8753ES	US39173718	2013-10-17
Signal generator	SMBV100A	256663	2014-01-25
RF Power meter	EPM-442A	GB37170412	2014-01-27
Power Sensor	8481A	3318A96476	2014-01-27
Power Sensor	8481A	3318A87063	2014-01-27
Dielectric Probe	85070D	US01440154	-
Power Amplifier	BBS3K8CEM	1002	2014-01-27
LP Filter	LA-30N	NONE	2013-09-26
LP Filter	LA-60N	40059	2013-12-15
Attenuator	8491B	21828	2014-01-27
Attenuator	50FH-010-5	74868	2014-01-27
Dual Directional Coupler	772D	3736A22424	2014-01-27

5.2 SAR Measurement Setup

Measurement are performed using the DASY4 dosimetric assessment system. The DASY4 is made by Schmid & Partner Engineering AG(SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, Pentium IV computer, near-field probe, probe alignment sensor, and the SAM twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field(EMF) (see Fig. 5.1) A cell controller system contains the power supply, robot controller, teach pendant(Joystick), and a remote control used to drive the robot motors. The pc consists of the Intel Pentium IV 2.4 GHz computer with WindowsXP system and SAR measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot data acquisition electronic (DAE) circuit that performs the signal amplification, signal multiplexing,
AD-conversion, offset measurements, mechanical surface detection, collision detection, etc.

5. DESCRIPTION OF THE TEST EQUIPMENT(continued)

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.

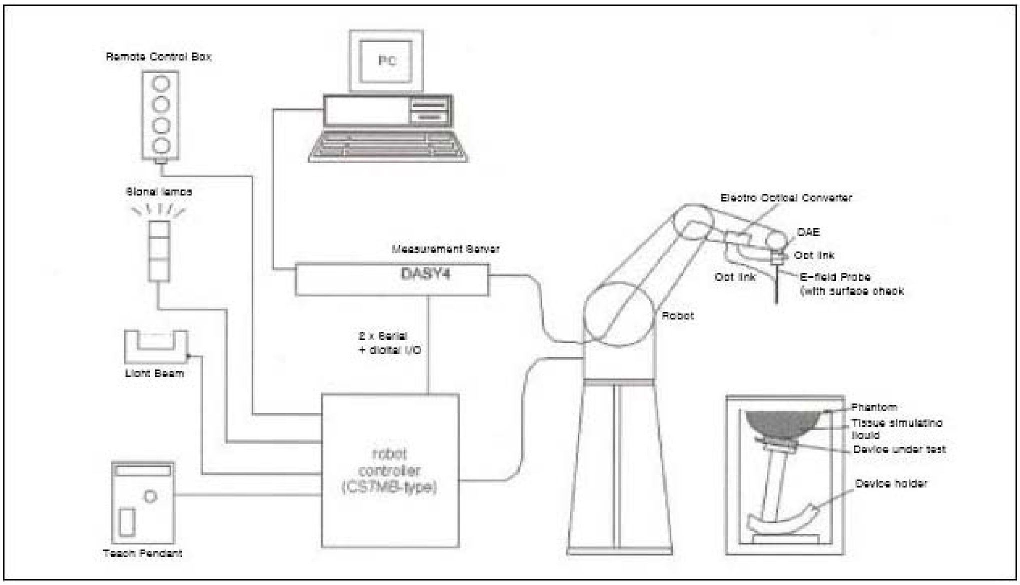

Fig. 5.1 SAR Measurement System Setup

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gainswitching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the Ethernet Card is accomplished through an optical downlink for data and status
information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in.

5.3 DASY4 E-Field Probe System

The SAR measurements were conducted with the dosimetric probe ET3DV6, designed in the classical triangular configuration (see Fig.5.2) and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box in the robot arm and provides an automatic detection transmitter, the other half to a synchronized receiver.

5. DESCRIPTION OF THE TEST EQUIPMENT(continued)

As the probe approach the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches coupling is zero. The distance of the coupling maximum to the surface is probe angle. The DASY4 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting (see Fig. 5.2). The approach is stopped at reaching the maximum.

Isotropic E-Field Probe

Isotropic E-Field Probe for Dosimetric Measurements	
Construction	Symmetrical design with triangular core Interleafed sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycol)
Calibration	In air from 10 MHz to 3 GHz In brain and muscle simulating tissue at frequencies of 450 MHz, 900 MHz and 1.8 GHz (accuracy ± 8%) Calibration for other liquids and frequencies upon request
Frequency	10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.2 dB in brain tissue (rotation around probe axis) ± 0.3 dB in brain tissue (rotation normal to probe axis)
Dynamic Range	5 μW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 20 mm Body diameter: 12 mm Tip diameter: 3.9 mm Distance from probe tip to dipole centers: 2.7 mm

Fig. 5.2 Probe Specifications

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5. DESCRIPTION OF THE TEST EQUIPMENT(continued)

5.4 Phantom & Equivalent Tissues

SAM Phantom

The SAM Twin Phantom V4.0 is constructed of the fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

Head & Muscle simulation Mixture Characterization

The brain and muscle mixtures consist of a viscous gel using hydroxethlcellullose(HEC) gelling agent and saline solution (see Fig 5.3). Preservation with a bactericide 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 specified in IEEE1528(2003) are derived from the issue dielectric parameters computed from the 4-Cole-Cole equations The mixture characterizations used for the brain and muscle tissue simulation liquids are according to the data by C. Gabriel and G. Hartagrove. (see Fig. 5.3)

Frequency	Head		Body	
(MHz)	εr	σ (S/m)	εr	σ (S/m)
150	52.3	0.76	61.9	0.8
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.9	55.2	0.97
900	41.5	0.97	55	1.05
915	41.5	0.98	55	1.06
1450	40.5	1.2	54	1.3
1610	40.3	1.29	53.8	1.4
1800-2000	40	1.4	53.3	1.52
2450	39.2	1.8	52.7	1.95
3000	38.5	2.4	52	2.73
5800	35.3	5.27	48.2	6

Fig.5.3 Head and body tissue parameters by the IEEE SCC-34/SC-2 in P1528

5. DESCRIPTION OF THE TEST EQUIPMENT(continued)

Ingredients (% by weight)	Frequency(MHz)											
	450		750		835		915		1 900		2 450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.2	51.7	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt(NaCl)	3.95	1.49	1.4	1.0	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	57	47.2	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	0.2	0.0	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.2	0.1	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7

Salt: 99 % Pure Sodium Chloride　　Sugar: 98 % Pure Sucrose

Water: De-ionized, 16 M resistivity　　HEC: Hydroxyethyl Cellulose

DGBE: 99 % Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy) ethanol]

Triton X-100(ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)pheny] ether

Fig. 5.4 Composition of the Tissue Equivalent Matter

Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device enables the rotation of the accurately, and repeatably be positioned according to the FCC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

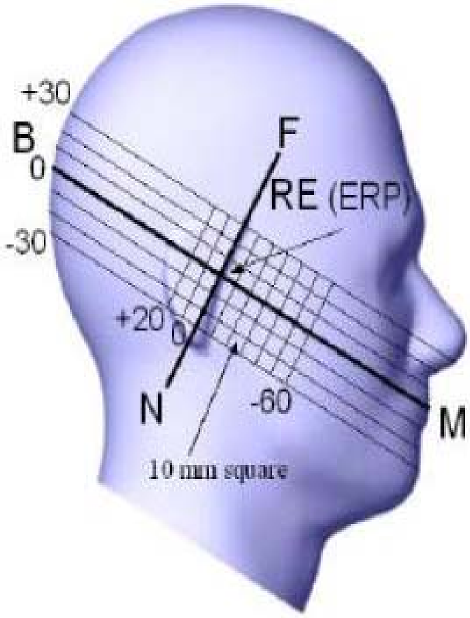
Note : A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produce infinite number of configurations [12]. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

6. DESCRIPTION OF THE TEST PROCEDURE

6.1 Definition of Reference Point

EAR Reference point

The point "M" is the reference point for the center of the mouth, "ERP" is the ear reference point. The ERP are 15mm posterior to the entrance to the ear canal(EEC) along the B-M line (Back-Mouth), as shown is figure 6.1. 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 ERP is called the Reference Pivoting Line (see Figure 6.1) 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].



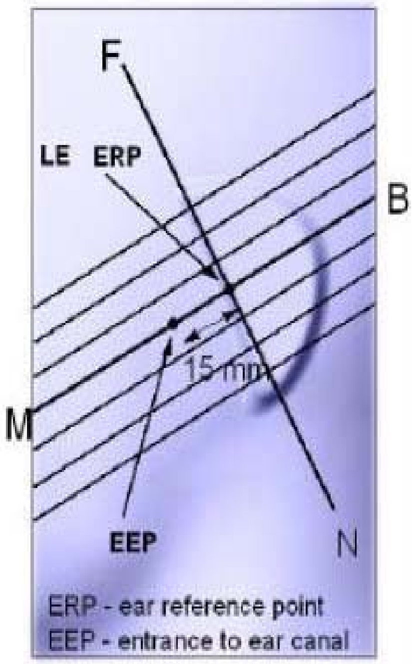


Figure 6.1 Close-up side view of ERP

Handset Reference Points

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point" (see Fig. 6.2). The "test device reference point" was than located at the same level as the center of the ear reference point. The test device was 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 outer surface of the both the left and right head phantoms on the ear reference point" on the outer surface of the both the left and right head phantoms on the ear reference point.

6. DESCRIPTION OF THE TEST PROCEDURE(continued)

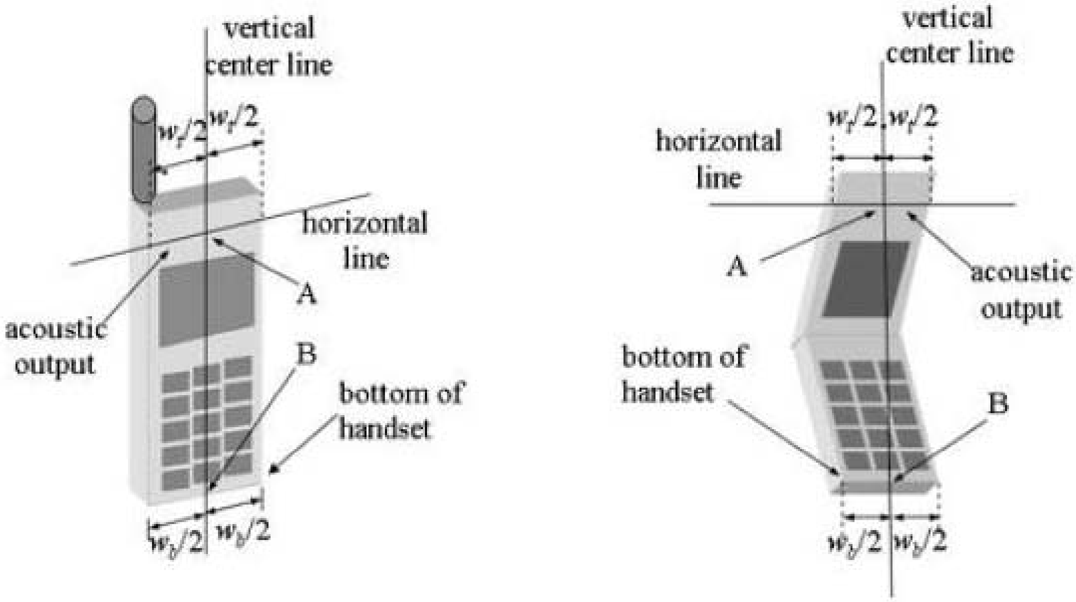


Figure 6.2 Handset Vertical Center & Horizontal Line Reference Points

6.2 Test Configuration Positions

Positioning for Cheek/Touch

1) Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece, open the cover . (If the phone can also be used with the cover closed ,both configurations must be tested.)
2) Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width wt of the handset at the level of the acoustic output (point A on Figures 6.2), and the midpoint of the width wb of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 6.2). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not ecessarily parallel to the front face of the handset (see Figure 6.2), especially for clamshell handsets, handsets with lip pieces, and other irregularly-shaped handsets.
3) Position the handset close to the surface of the phantom touch that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 6.3), 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.

6. DESCRIPTION OF THE TEST PROCEDURE(continued)

4) Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the ear.
5) While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).
6) Rotate the phone around the vertical centerline until the phone (horizontal line) is symmetrical with respect to the line NF.
7) 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, rotate the handset about the line NF until any point on the handset is in contact with a phantom point

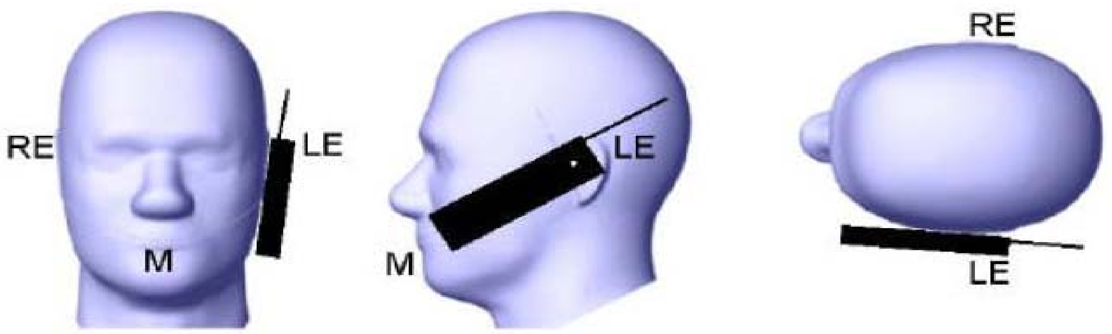


Figure 6.3 “Cheek” or “Touch” Position.

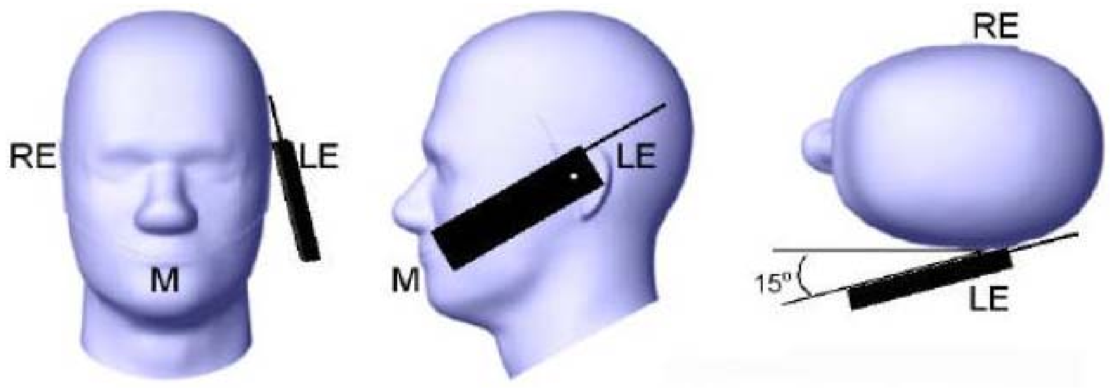


Figure 6.4 “Tilted” Position.

6. DESCRIPTION OF THE TEST PROCEDURE(continued)

Positioning for Ear / 15˚ Tilted

1) Repeat steps 1 to 7 of 6.2(Positioning for Cheek/Touch) to place the device in the "cheek position."
2) While maintaining the orientation of the phone retract the phone parallel to the reference plane far enough to enable a rotation of the phone by 15 degree.
3) Rotate the phone around the horizontal line by 15 degree.
4) While maintaining the orientation of the phone, move the phone parallel to the reference plane until any part of the phone touches the head. (In this position, point A will be located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna, the angle of the phone shall be reduced. The tilted position is obtained if any part of the phone is in contact of the ear as well as a second part of the phone is contact with the head.

Body Holder / Belt Clip Configurations

Body-worn operation configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. A device with a headset output is tested with a headset connected to the device. Body dielectric parameters are used.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are supplied with the device, the device is tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied of 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 is 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 case 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 operation requirements for meeting RF exposure compliance, operation instructing instructions and cautions statements are included in the user's manual.

6. DESCRIPTION OF THE TEST PROCEDURE(continued)

6.3 Scan Procedures

First coarse scans are used for quick determination of the field distribution. Nest cube scan, 5x5x7 points; spacing between each point 5x5x5 mm, is performed around the highest E-field value to determine the averaged SAR-distribution over 1g.

6.4 SAR Averaging Methods

The maximum SAR value is averaged over its volume using interpolation and extrapolation.

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the “Not a Knot” ?condition [W.Gander, Computerma-thematik, p. 141-150](x, y and z directions) [Numerical Recipes in C, Second Edition, p 123].

The extrapolation is based on least square algorithm [W.Gander, Computermathematik, p. 168-180]. Through the points in the first 30 mm in all z-axis, polynomials of order four are calculated. This polynomial is then used to evaluate the points between the surface and the probe tip. The points calculated from the surface, have a distance of 1mm from one another.

7. MEASUREMENT UNCERTAINTY

According to CENELEC [17], typical worst-case uncertainty of field measurements is 5 dB. For well-defined modulation characteristics the uncertainty can be reduced to 3 dB.

ERROR Description	Uncertainty value ±%	Probability Distribution	Divisor	ci 1 1g	Standard unc. (1g)	vi or Veff
MEASUREMENT SYSTEM						
Probe Calibration	± 11.7 %	normal	1	1	± 4.8 %	∞
Axial Isotropy	± 4.7	rectangular	√3	$(1-cp)^{1/2}$	± 1.9%	∞
Hemispherical Isotropy	± 9.6	rectangular	√3	$(cp)^{1/2}$	± 3.9%	∞
Boundary Effects	± 1.0	rectangular	√3	1	± 0.6%	∞
Linearity	± 4.7	rectangular	√3	1	± 2.7%	∞
System 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 Amnient Conditions	± 3.0	rectangular	√3	1	± 1.7%	∞
Probe Positioner Mechanical Tolerance	± 0.4	rectangular	√3	1	± 0.2%	∞
Probe Positioning with respect to Phantom Shell	± 2.9	rectangular	√3	1	± 1.7%	∞
Extrapolation, Interpolation and Integration Algorithms for Max. SAR Evaluation	± 1.0	rectangular	√3	1	± 0.6%	∞
Test Sample Related						
Test Sample Positioning	± 2.9	normal	1	1	± 2.97%	145
Device Holder Uncertainty	± 3.6	normal	0.84	1	± 3.69%	5
Output Power Validation - SAR drift measurement	± 5.0	rectangular	√3	1	± 2.9%	∞
Phantom and Tissue Parameters						
Phantom Uncertainty (shape and thickness tolerances)	± 4.0	rectangular	√3	1	± 2.3%	∞
Liquid conductivity Target - tolerance	± 5.0	rectangular	√3	0.64	± 1.8%	∞
Liquid Conductivity - measurement uncertainty	± 5.0	normal	1	0.64	± 3.2%	∞
Liquid permittivity Target - tolerance	± 5.0	rectangular	√3	0.6	± 1.7%	∞
Liquid Permittivity - measurement uncertainty	± 5.0	normal	1	0.6	± 3.0%	∞
Combined Standard Uncertainty					±11.00 %	330
Coverage Factor for 95%				*K = 2*		
Expanded Standard Uncertainty					± 22.00 %	

8. SYSTEM VERIFICATION

Tissue Verification

Table 8.1 Simulated Tissue Verification [5]

MEASURED TISSUE PARAMETERS										
Liquid Temperature (°C)		23		Liquid Depth(mm)		150				
Date	2013-08-06									
Tissue	2450MHz Body		5200MHz Body		5300MHz Body		5500MHz Body		5800MHz Body	
	Target	Measured	Target	Measured	Target	Measured	Target	Measured		
Dielectric Constant: ε	52.70	51.96	49.00	49.30	48.90	49.20	48.60	48.80	48.20	48.30
Conductivity: σ	1.95	1.93	5.30	5.40	5.42	5.53	5.65	5.80	6.00	6.23
Deviation (%)	ε : -1.4% σ : -1.0%		ε : 0.61% σ : 1.89%		ε : -0.81% σ : 0.37%		ε : 0.61% σ : 2.03%		ε : -1.22% σ : 2.17%	

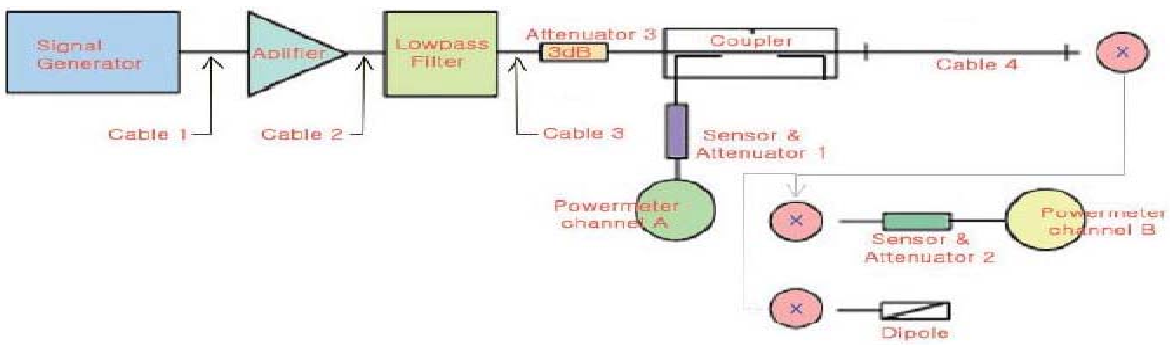
Test System Validation

- Prior to assessment, the system is verified to the ±10% of the specifications at 2450MHz and 5GHz (Graphic Plots Attached)
- The results are nominalized to 1W input power

Table 8.2 System Validation [5]

SYSTEM DIPOLE VALIDATION TARGET & MEASURED						
Tissue	System Validation Kit:	Forward Power (W)	Targeted SAR1g (mW/g)	Measured SAR1g (mW/g)	Deviation (%)	Test Date
2450MHz Body	D2450V2(S/N :741)	1.0	51.2	53.2	3.91%	2013-08-06

Tissue	System Validation Kit:	Forward Power (W)	Targeted SAR1g (mW/g)	Measured SAR1g (mW/g)	Deviation (%)	Test Date
5200MHz Body	D5GHzV2(S/N:1107)	1.0	75	73.7	-1.73%	2013-08-07
5300MHz Body	D5GHzV2(S/N:1107)	1.0	76.7	77.2	0.65%	2013-08-07
5500MHz Body	D5GHzV2(S/N:1107)	1.0	79.2	80.9	2.15%	2013-08-07
5600MHz Body	D5GHzV2(S/N:1107)	1.0	81.8	86.1	5.26%	2013-08-07
5800MHz Body	D5GHzV2(S/N:1107)	1.0	75	76.7	2.27%	2013-08-07



8. SYSTEM VERIFICATION

Tissue Verification

Table 8.1 Simulated Tissue Verification [5]

MEASURED TISSUE PARAMETERS										
Liquid Temperature (°C)			23		Liquid Depth(mm)		150			
Date	2013-08-06									
Tissue	2450MHz Body		5200MHz Body		5300MHz Body		5500MHz Body		5800MHz Body	
	Target	Measured	Target	Measured	Target	Measured	Target	Measured		
Dielectric Constant: ε	52.70	51.96	49.00	49.30	48.90	49.20	48.60	48.80	48.20	48.30
Conductivity: σ	1.95	1.93	5.30	5.40	5.42	5.53	5.65	5.80	6.00	6.23
Deviation (%)	ε : -1.4% σ : -1.0%		ε : 0.61% σ : 1.89%		ε : -0.81% σ : 0.37%		ε : 0.61% σ : 2.03%		ε : -1.22% σ : 2.17%	

Test System Validation

- Prior to assessment, the system is verified to the ±10% of the specifications at 2450MHz and 5GHz (Graphic Plots Attached)
- The results are nominalized to 1W input power

Table 8.2 System Validation [5]

SYSTEM DIPOLE VALIDATION TARGET & MEASURED

Tissue	System Validation Kit:	Forward Power (W)	Targeted SAR1g (mW/g)	Measured SAR1g (mW/g)	Deviation (%)	Test Date
5200MHz Body	D5GHzV2(S/N:1107)	1.0	75	80.1	6.80%	2013-09-23
5300MHz Body	D5GHzV2(S/N:1107)	1.0	76.7	81.2	5.87%	2013-09-23
5500MHz Body	D5GHzV2(S/N:1107)	1.0	79.2	84.5	6.69%	2013-09-23
5600MHz Body	D5GHzV2(S/N:1107)	1.0	81.8	85.1	4.03%	2013-09-23
5800MHz Body	D5GHzV2(S/N:1107)	1.0	75	78.6	4.80%	2013-09-23

9. RESULTS

Ambient TEMPERATURE (C) : 23.0
Relative HUMIDITY (%) : 44
Mixture Type : 2.4GHz Body
Model Name : Dolphin 6110 (scanner D1)

Measurement Results (802.11b Body SAR)

ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population	1.6 W/kg (W/kg) averaged over 1 gram

MEASUREMENT RESULTS (802.11b Body SAR)

Mode	Body/EUT Position	Frequency (MHz)	Channel	Power (dBm)	Power Drift (dBm)	1g SAR (W/Kg)	scaling Factor	Scaled SAR(mW/g)
802.11b	Flat/Back	2437	6	15.03	0.10	0.12	1.02	0.12
802.11b	Flat/Front	2437	6	15.03	0.25	0.17	1.02	0.17
802.11b	Flat/Side 1	2437	6	15.03	-0.08	0.33	1.02	0.34
802.11b	Flat/Side 2	2437	6	15.03	-0.03	0.70	1.02	0.71
802.11b	Flat/Side 3	2437	6	15.03	0.29	0.15	1.02	0.15
802.11b	Flat/Side 4	2437	6	15.03	-0.02	0.02	1.02	0.02
802.11b (Extend battery)	Flat/Side 2	2437	6	15.03	-0.17	0.51	1.02	0.52

Notes:

1. The test data reported are the worst-case SAR value according to test procedures specified in IEEE 1528(2003) FCC KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements. A standard battery was used for all testing.
3. All modes of operation were investigated and the worst-case are reported.(worst case-11b:1 Mbps)
4. Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
5. Tissue parameters and temperatures are listed on the SAR plot.
6. For 2.4 GHz WLAN, Highest average power channel for the lowest data rate was selected for SAR evaluation base on KDB 248227. Other channels are not necessary because 1g-average SAR<0.8 W/kg and peak SAR < 1.6 W/kg per KDB 248227.
7. According to the 865664 D01 SAR Measurement 100MHz to 6GHz v01r01, This device not need to measure repeatability
8. Minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

9. RESULTS(continued)

Ambient TEMPERATURE (C) : 23.0
Relative HUMIDITY (%) : 44
Mixture Type : 2.4GHz Body
Model Name : Model Name : Dolphin 6110 (scanner D2)

Measurement Results (802.11b Body SAR)

ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population	1.6 W/kg (W/kg) averaged over 1 gram

MEASUREMENT RESULTS (802.11b Body SAR)

Mode	Body/EUT Position	Frequency (MHz)	Channel	Power (dBm)	Power Drift (dBm)	1g SAR (W/Kg)	scaling Factor	Scaled SAR(mW/g)
802.11b	Flat/Back	2437	6	15.03	0.03	0.12	1.02	0.12
802.11b	Flat/Front	2437	6	15.03	0.34	0.16	1.02	0.17
802.11b	Flat/Side 1	2437	6	15.03	-0.24	0.32	1.02	0.32
802.11b	Flat/Side 2	2437	6	15.03	-0.06	0.49	1.02	0.49
802.11b	Flat/Side 3	2437	6	15.03	0.14	0.07	1.02	0.07
802.11b	Flat/Side 4	2437	6	15.03	0.15	0.03	1.02	0.03
802.11b (Extend battery)	Flat/Side 2	2437	6	15.03	-0.30	0.48	1.02	0.49

Notes:

1. The test data reported are the worst-case SAR value according to test procedures specified in IEEE 1528(2003) KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements. A standard battery was used for all testing.
3. All modes of operation were investigated and the worst-case are reported.(worst case-11b:1 Mbps)
4. Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
5. Tissue parameters and temperatures are listed on the SAR plot.
6. For 2.4 GHz WLAN, Highest average power channel for the lowest data rate was selected for SAR evaluation base on KDB 248227. Other channels are not necessary because 1g-average SAR<0.8 W/kg and peak SAR < 1.6 W/kg per KDB 248227.
7. According to the 865664 D01 SAR Measurement 100MHz to 6GHz v01r01, This device not need to measure repeatability
8. Minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

9. RESULTS(continued)

Ambient TEMPERATURE (C) : 23.0
Relative HUMIDITY (%) : 44
Mixture Type : 5GHz Body
Model Name : Dolphin 6110 (scanner D1)

Measurement Results (802.11a/n BODY SAR)

ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population	1.6 W/kg (W/kg) averaged over 1 gram

MEASUREMENT RESULTS (802.11a/n BODY SAR)

Mode	Body/EUT Position	Frequency (MHz)	Channel	Power (dBm)	Power Drift (dBm)	1g SAR (W/Kg)	scaling Factor	Scaled SAR(mW/g)
802.11a	Flat/Front	5200	40	12.13	0.11	0.13	1.22	0.16
802.11a	Flat/Back	5200	40	12.13	0.24	0.11	1.22	0.13
802.11a	Flat/Side1	5200	40	12.13	0.22	0.48	1.22	0.58
802.11a	Flat/Side2	5200	40	12.13	0.13	0.07	1.22	0.08
802.11a	Flat/Side3	5200	40	12.13	-0.12	0.38	1.22	0.46
802.11a	Flat/Side4	5200	40	12.13	0.05	0.07	1.22	0.08
802.11a	Flat/Side1	5300	60	12.24	-0.14	0.40	1.19	0.47
802.11a	Flat/Side1	5580	116	10.09	0.43	0.51	1.23	0.63
802.11a	Flat/Side1	5785	157	10.17	0.64	0.20	1.21	0.25
802.11n	Flat/Side1	5500	100	11.47	-0.73	0.23	1.01	0.23

Notes:

1. The test data reported are the worst-case SAR value according to test procedures specified in IEEE 1528(2003) FCC KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements. A standard battery was used for all testing.
3. All modes of operation were investigated and the worst-case are reported.(worst case-11n:6.5 Mbps)
4. Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
5. Tissue parameters and temperatures are listed on the SAR plot.
6. For 5 GHz WLAN, Highest average power channel for the lowest data rate was selected for SAR evaluation base on KDB 248227. Other channels are not necessary because 1g-average SAR<0.8 W/kg and peak SAR < 1.6 W/kg per KDB 248227.
7. According to the 865664 D01 SAR Measurement 100MHz to 6GHz v01r01, This device not need to measure repeatability
8. Minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

9. RESULTS(continued)

Ambient TEMPERATURE (C) : 23.0
Relative HUMIDITY (%) : 44
Mixture Type : 5GHz Body
Model Name : Dolphin 6110 (scanner D2)

Measurement Results (802.11a/n BODY SAR)

ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population	1.6 W/kg (W/kg) averaged over 1 gram

MEASUREMENT RESULTS (802.11a/n BODY SAR)

Mode	Body/EUT Position	Frequency (MHz)	Channel	Power (dBm)	Power Drift (dBm)	1g SAR (W/Kg)	scaling Factor	Scaled SAR(mW/g)
802.11a	Flat/Front	5200	40	12.13	0.48	0.12	1.22	0.14
802.11a	Flat/Back	5200	40	12.13	-0.53	0.11	1.22	0.13
802.11a	Flat/Side1	5200	40	12.13	0.11	0.52	1.22	0.63
802.11a	Flat/Side2	5200	40	12.13	0.24	0.08	1.22	0.10
802.11a	Flat/Side3	5200	40	12.13	-0.18	0.38	1.22	0.46
802.11a	Flat/Side4	5200	40	12.13	-0.09	0.06	1.22	0.07
802.11a	Flat/Side1	5300	60	12.24	0.43	0.46	1.19	0.55
802.11a	Flat/Side1	5580	116	10.09	-0.98	0.22	1.23	0.27
802.11a	Flat/Side1	5785	157	10.17	1.20	0.21	1.21	0.25
802.11n	Flat/Side1	5500	100	11.47	0.12	0.23	1.01	0.23

Notes:

1. The test data reported are the worst-case SAR value according to test procedures specified in IEEE 1528(2003) FCC KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements. A standard battery was used for all testing.
3. All modes of operation were investigated and the worst-case are reported.(worst case-11n:6.5 Mbps)
4. Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
5. Tissue parameters and temperatures are listed on the SAR plot.
6. For 5 GHz WLAN, Highest average power channel for the lowest data rate was selected for SAR evaluation base on KDB 248227. Other channels are not necessary because 1g-average SAR<0.8 W/kg and peak SAR < 1.6 W/kg per KDB 248227.
7. According to the 865664 D01 SAR Measurement 100MHz to 6GHz v01r01, This device not need to measure repeatability
8. Minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

10. Simulataneous Transmission Analysis

Simultaneous transmission

This device WIFI/BT 2.4GHz and 5GHz cannot operate at simultaneously

11. REFERENCE

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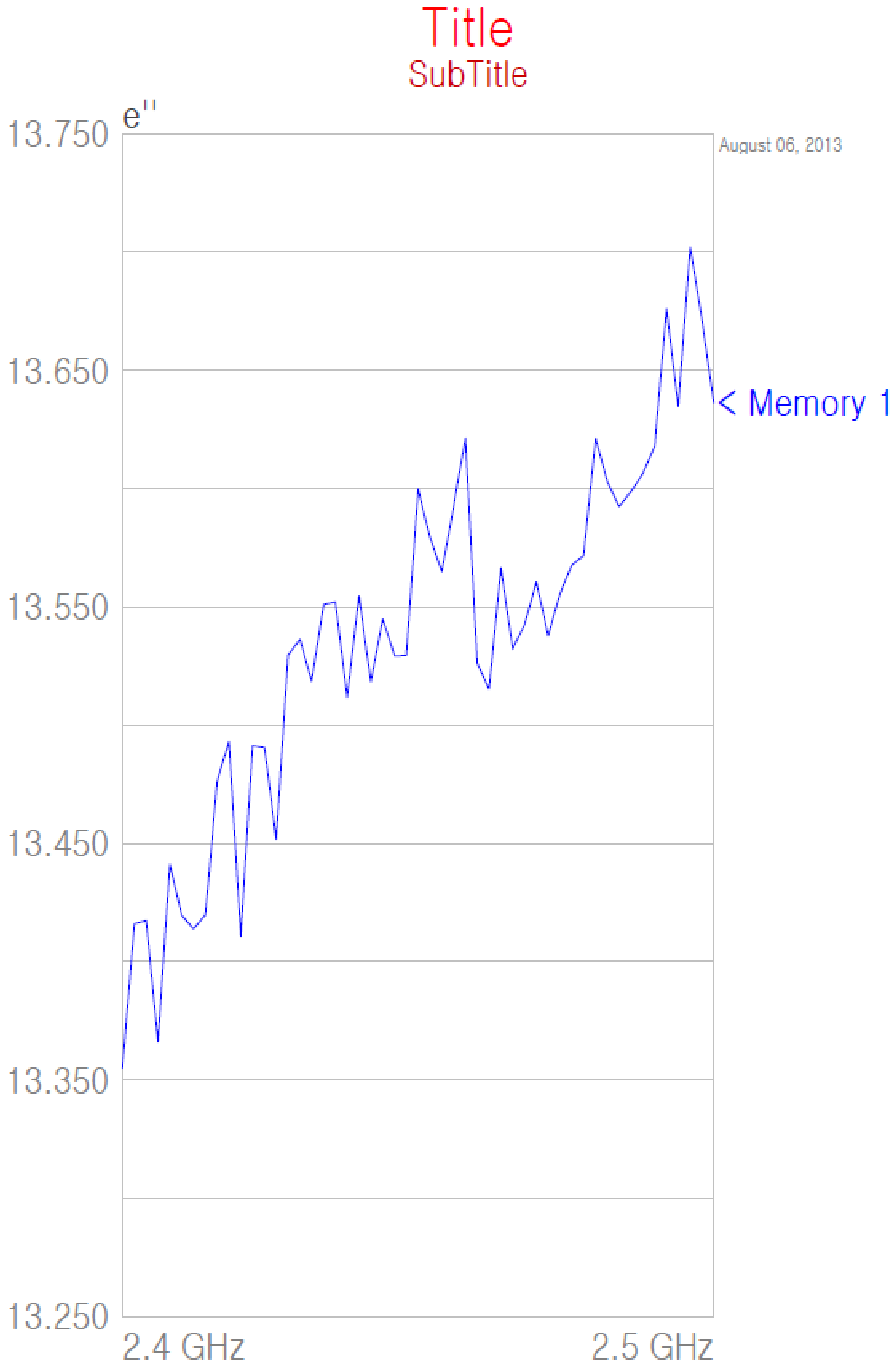
[21] SAR Evaluation of Handsets with Multiple Transmitters and Antennas #KDB 648474.

[22] SAR Measurement Procedure for 802.11 a/b/g Transmitters #KDB 248227.

APPENDIX A : Validation Test Data of Tissue

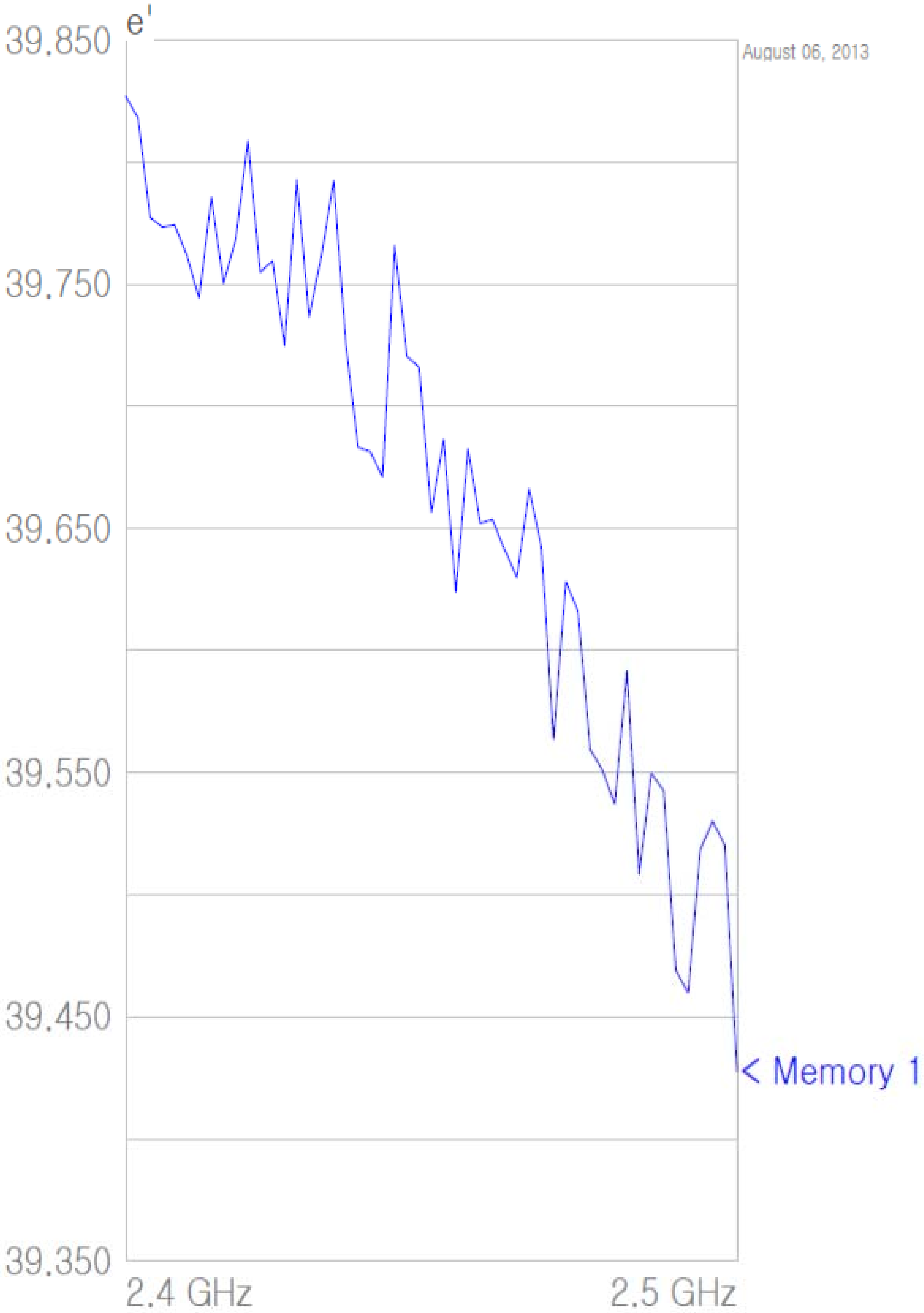
– Body Tissue(2450MHz)



ESTECH Co., Ltd.
Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea
TEL: 82-2-867-3201
FAX: 82-2-867-3204

Title

SubTitle



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FAX: 82-2-867-3204

Title

SubTitle

August 06, 2013

Frequency	e'	e''
2,400000000 GHz	39,8270	13,3550
2,401963461 GHz	39,8182	13,4160
2,403926921 GHz	39,7774	13,4173
2,405890382 GHz	39,7734	13,3662
2,407853843 GHz	39,7743	13,4410
2,409817303 GHz	39,7619	13,4197
2,411788795 GHz	39,7444	13,4138
2,413760288 GHz	39,7857	13,4197
2,415731780 GHz	39,7504	13,4761
2,417703272 GHz	39,7686	13,4929
2,419674764 GHz	39,8088	13,4106
2,421654321 GHz	39,7550	13,4913
2,423633878 GHz	39,7596	13,4904
2,425613435 GHz	39,7249	13,4516
2,427592991 GHz	39,7928	13,5296
2,429572548 GHz	39,7366	13,5363
2,431560202 GHz	39,7614	13,5184
2,433547856 GHz	39,7924	13,5511
2,435535511 GHz	39,7260	13,5523
2,437523165 GHz	39,6833	13,5116
2,439510819 GHz	39,6816	13,5548
2,441506604 GHz	39,6713	13,5182
2,443502388 GHz	39,7660	13,5450
2,445498173 GHz	39,7206	13,5292
2,447493958 GHz	39,7162	13,5295
2,449489743 GHz	39,6566	13,5999
2,451493691 GHz	39,6866	13,5796
2,453497640 GHz	39,6239	13,5649
2,455501589 GHz	39,6827	13,5925
2,457505537 GHz	39,6522	13,6213
2,459509486 GHz	39,6538	13,5260
2,461521632 GHz	39,6412	13,5151
2,463533778 GHz	39,6298	13,5665
2,465545923 GHz	39,6664	13,5321
2,467558069 GHz	39,6425	13,5425
2,469570215 GHz	39,5635	13,5606
2,471590592 GHz	39,6282	13,5378
2,473610968 GHz	39,6160	13,5557
2,475631345 GHz	39,5594	13,5678
2,477651722 GHz	39,5509	13,5717
2,479672098 GHz	39,5371	13,6213
2,481700739 GHz	39,5916	13,6029
2,483729380 GHz	39,5083	13,5925
2,485758021 GHz	39,5496	13,5988
2,487786662 GHz	39,5426	13,6063
2,489815303 GHz	39,4689	13,6179
2,491852243 GHz	39,4598	13,6760
2,493889182 GHz	39,5183	13,6347
2,495926121 GHz	39,5300	13,7021
2,497963061 GHz	39,5203	13,6712
2,500000000 GHz	39,4276	13,6361

ESTECH Co., Ltd.
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5GHZ Body

Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MBBL3500-5800V5)**
Product No.	SL AAM 501 (Charge: 120917-2)
Manufacturer	SPEAG

Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

Setup Validation

Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

Test Condition

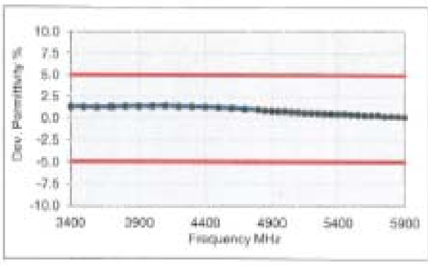
Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	20-Sep-12
Operator	CL

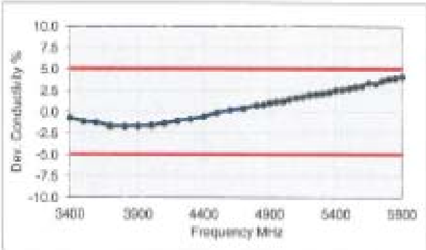
Additional Information

TSL Density

TSL Heat-capacity

	Measured			Target		Diff.to Target [%]	
f [MHz]	HP-e'	HP-e''	sigma	eps	sigma	Δ-eps	Δ-sigma
3400	52.1	16.79	3.17	51.5	3.20	1.3	-0.7
3500	52.0	16.83	3.28	51.3	3.31	1.3	-1.1
3600	51.8	16.92	3.39	51.2	3.43	1.3	-1.2
3700	51.7	16.95	3.49	51.1	3.55	1.3	-1.6
3800	51.6	17.04	3.60	50.9	3.66	1.4	-1.7
3900	51.5	17.14	3.72	50.8	3.78	1.4	-1.6
4000	51.4	17.24	3.84	50.6	3.90	1.4	-1.6
4100	51.2	17.37	3.96	50.5	4.01	1.4	-1.3
4200	51.1	17.50	4.09	50.4	4.13	1.4	-1.0
4300	50.9	17.61	4.21	50.2	4.25	1.4	-0.9
4400	50.8	17.73	4.34	50.1	4.37	1.3	-0.6
4500	50.6	17.88	4.48	50.0	4.48	1.3	-0.1
4600	50.4	18.00	4.61	49.8	4.60	1.2	0.2
4700	50.2	18.11	4.73	49.7	4.72	1.1	0.4
4800	50.1	18.23	4.87	49.6	4.83	1.0	0.8
4850	49.9	18.28	4.93	49.5	4.89	0.9	0.8
4900	49.9	18.34	5.00	49.4	4.95	0.9	1.0
4950	49.8	18.40	5.07	49.4	5.01	0.8	1.2
5000	49.7	18.44	5.13	49.3	5.07	0.8	1.2
5050	49.6	18.51	5.20	49.2	5.12	0.8	1.5
5100	49.5	18.57	5.27	49.2	5.18	0.7	1.6
5150	49.4	18.61	5.33	49.1	5.24	0.7	1.7
5200	49.3	18.68	5.40	49.0	5.30	0.6	2.0
5250	49.2	18.72	5.47	48.9	5.36	0.6	2.1
5300	49.2	18.77	5.53	48.9	5.42	0.6	2.2
5350	49.1	18.82	5.60	48.8	5.47	0.5	2.3
5400	49.0	18.88	5.67	48.7	5.53	0.5	2.5
5450	48.9	18.92	5.74	48.7	5.59	0.5	2.6
5500	48.8	18.97	5.80	48.6	5.65	0.4	2.7
5550	48.7	19.03	5.88	48.5	5.71	0.4	2.9
5600	48.6	19.07	5.94	48.5	5.77	0.4	3.0
5650	48.6	19.16	6.02	48.4	5.82	0.3	3.4
5700	48.5	19.16	6.08	48.3	5.88	0.4	3.3
5750	48.4	19.25	6.16	48.3	5.94	0.2	3.6
5800	48.3	19.32	6.23	48.2	6.00	0.2	3.9
5850	48.2	19.36	6.30	48.1	6.06	0.2	4.0
5900	48.1	19.41	6.37	48.1	6.12	0.2	4.1





APPENDIX B：Validation Test Data

ESTECH Co., Ltd.
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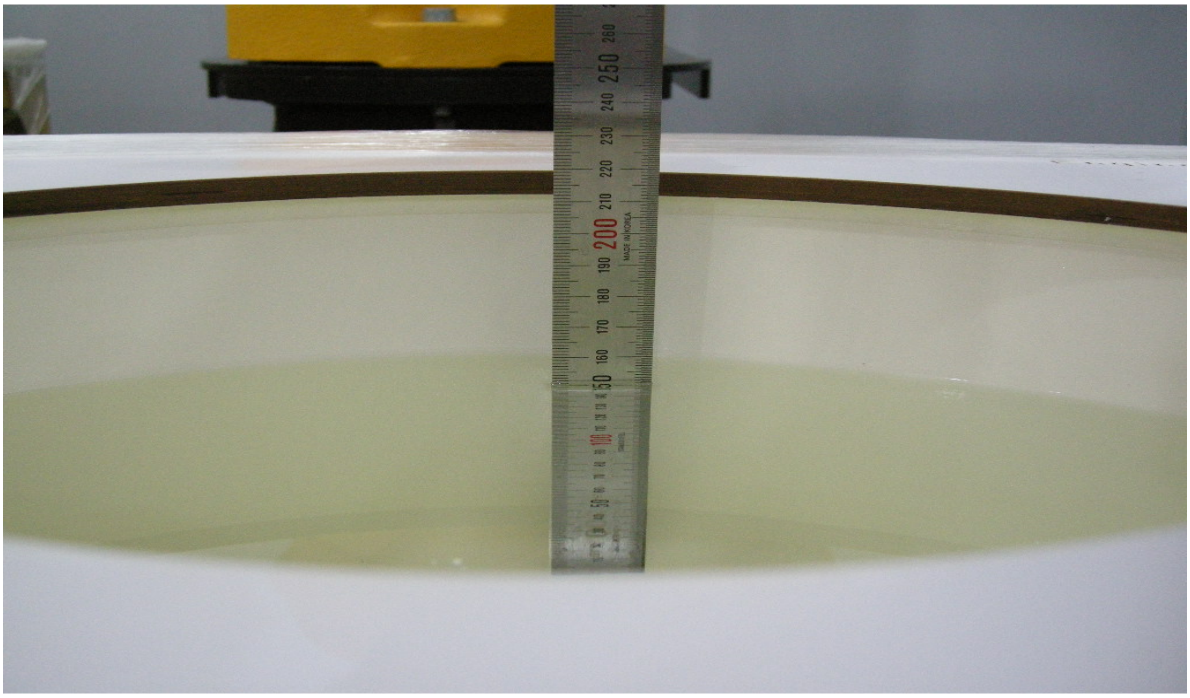
TEL: 82-2-867-3201
FAX: 82-2-867-3204

Dipole Validation

Liquid depth



– 2450MHz Validation (Body)

Date: 2013-08-06

Test Laboratory: ESTECH

VALIDATION 2450

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

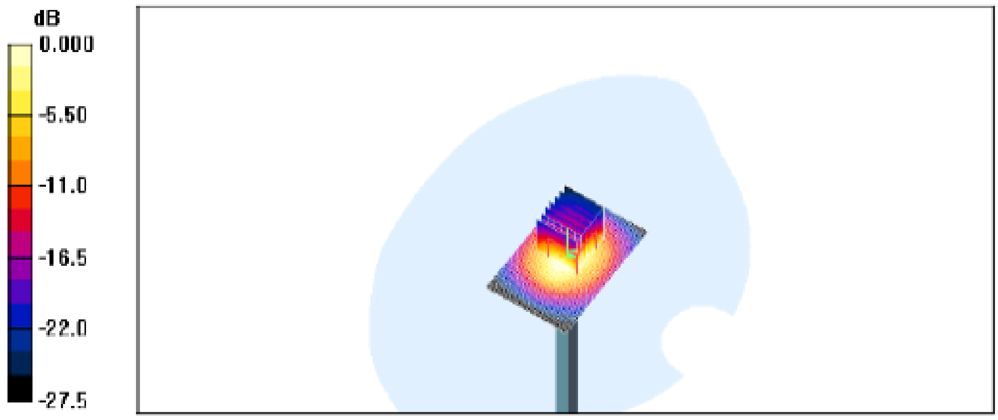
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.93 mho/m; ε_r = 51.96; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.49, 4.49, 4.49); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 16.2 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.9 V/m; Power Drift = -0.021 dB
Peak SAR (extrapolated) = 30.0 W/kg
SAR(1 g) = 13.3 mW/g
Maximum value of SAR (measured) = 15.0 mW/g



0 dB = 15.0mW/g

– 5200MHz Validation (Body)

Date: 2013-08-07

Test Laboratory: ESTECH

VALIDATION 5G_5200

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

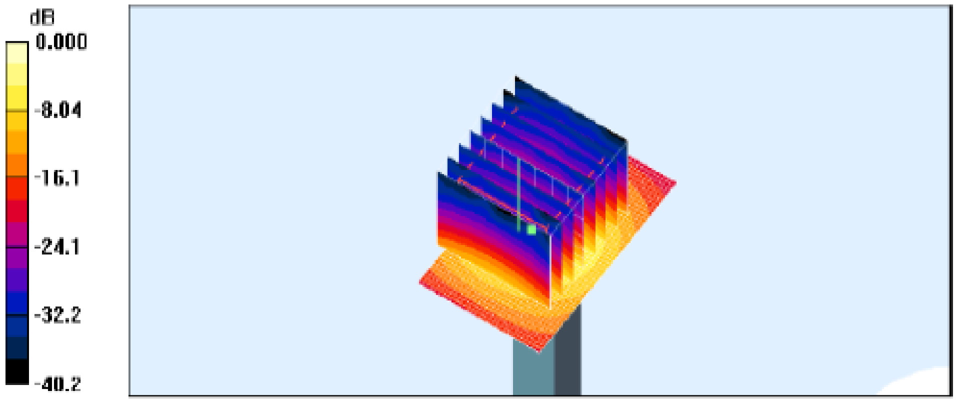
Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5200 MHz; σ = 5.4 mho/m; ε_r = 49.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3882; ConvF(4.75, 4.75, 4.75); Calibrated: 2012-09-24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL900_12_03_23; Type: TP-1262
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5200 MHz/Area Scan (31x51x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 20.3 mW/g

d=10mm, Pin=100mW, f=5200 MHz/Zoom Scan (3x3x2mm, graded), dist=2mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.3 V/m; Power Drift = -0.053 dB
Peak SAR (extrapolated) = 32.1 W/kg
SAR(1 g) = 7.37 mW/g
Maximum value of SAR (measured) = 17.6 mW/g



0 dB = 17.6mW/g

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– 5300MHz Validation (Body)

Date: 2013-08-07

Test Laboratory: ESTECH

VALIDATION 5G_5300

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

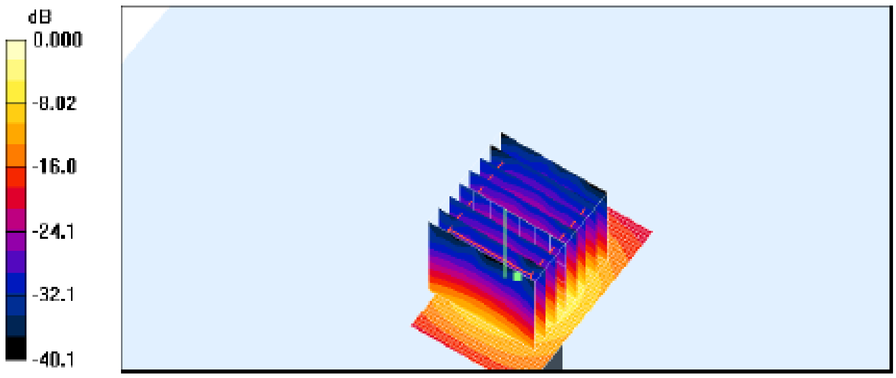
Communication System: CW; Frequency: 5300 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5300 MHz; σ = 5.53 mho/m; ε_r = 49.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3882; ConvF(4.49, 4.49, 4.49); Calibrated: 2012-09-24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL900_12_03_23; Type: TP-1262
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5300 MHz/Area Scan (31x51x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 21.1 mW/g

d=10mm, Pin=100mW, f=5300 MHz/Zoom Scan (3x3x2mm, graded), dist=2mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.2 V/m; Power Drift = -0.053 dB
Peak SAR (extrapolated) = 32.5 W/kg
SAR(1 g) = 7.72 mW/g
Maximum value of SAR (measured) = 18.3 mW/g



0 dB = 18.3mW/g

– 5500MHz Validation (Body)

Date: 2013-08-07

Test Laboratory: ESTECH

VALIDATION 5G_5500

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

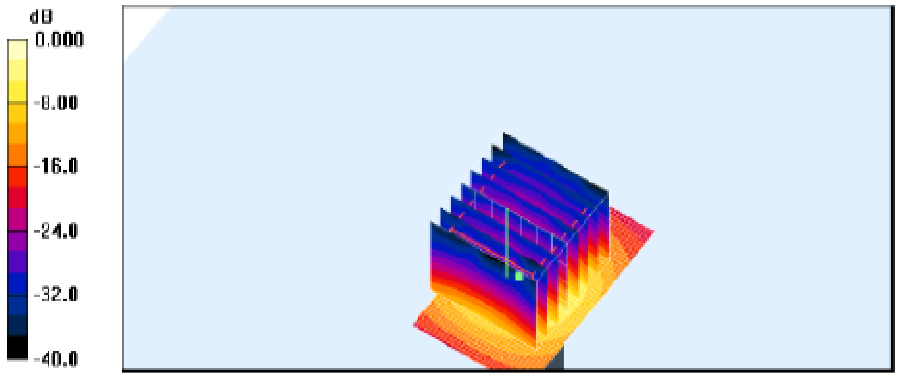
Communication System: CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5500 MHz; σ = 5.8 mho/m; ε_r = 48.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3882; ConvF(4.39, 4.39, 4.39); Calibrated: 2012-09-24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL900_12_03_23; Type: TP-1262
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5500 MHz/Area Scan (31x51x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 22.0 mW/g

d=10mm, Pin=100mW, f=5500 MHz/Zoom Scan (3x3x2mm, graded), dist=2mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.9 V/m; Power Drift = -0.053 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 8.09 mW/g
Maximum value of SAR (measured) = 19.0 mW/g



0 dB = 19.0mW/g

– 5600MHz Validation (Body)

Date: 2013-08-07

Test Laboratory: ESTECH

VALIDATION 5G_5600

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

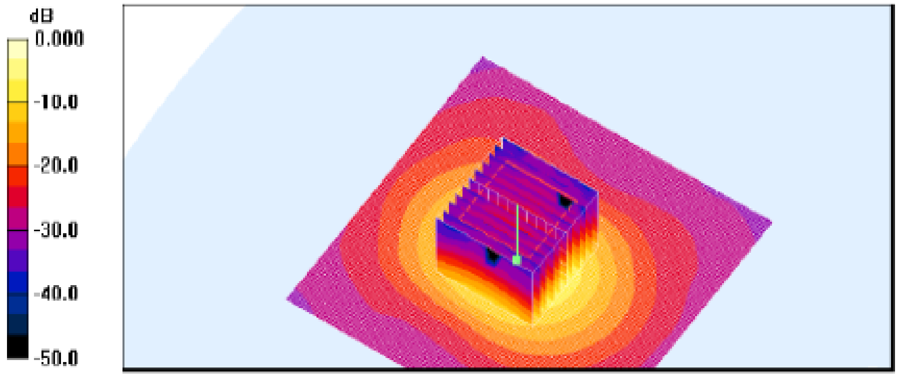
Communication System: CW; Frequency: 5600 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5600 MHz; σ = 5.94 mho/m; ε_r = 48.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3882; ConvF(4.18, 4.18, 4.18); Calibrated: 2012-09-24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL900_12_03_23; Type: TP-1262
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5600 MHz/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 22.3 mW/g

d=10mm, Pin=100mW, f=5600 MHz/Zoom Scan (3x3x2mm, graded), dist=2mm (11x11x6)/Cube 0: Measurement grid: dx=3mm, dy=3mm, dz=2mm
Reference Value = 68.0 V/m; Power Drift = -0.003 dB
Peak SAR (extrapolated) = 37.8 W/kg
SAR(1 g) = 8.61 mW/g
Maximum value of SAR (measured) = 22.4 mW/g



0 dB = 22.4mW/g

– 5800MHz Validation (Body)

Date: 2013-08-07

Test Laboratory: ESTECH

VALIDATION 5G_5800

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

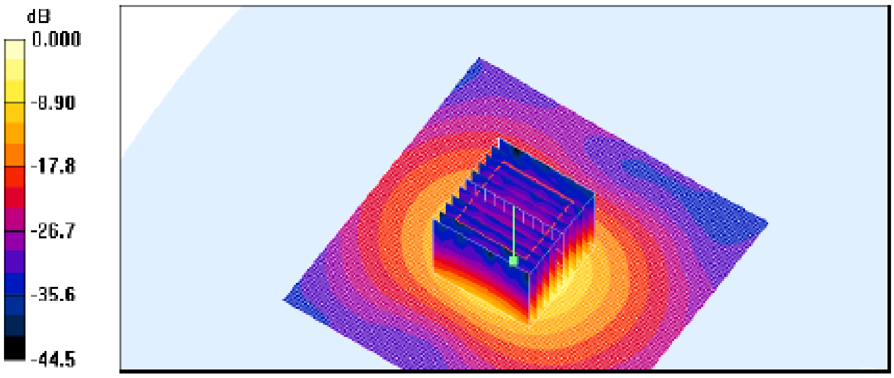
Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5800 MHz; σ = 6.23 mho/m; ε_r = 48.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3882; ConvF(4.12, 4.12, 4.12); Calibrated: 2012-09-24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL900_12_03_23; Type: TP-1262
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5800 MHz/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 20.5 mW/g

d=10mm, Pin=100mW, f=5800 MHz/Zoom Scan (3x3x2mm, graded), dist=2mm (11x11x6)/Cube 0: Measurement grid: dx=3mm, dy=3mm, dz=2mm
Reference Value = 63.3 V/m; Power Drift = -0.039 dB
Peak SAR (extrapolated) = 36.0 W/kg
SAR(1 g) = 7.67 mW/g
Maximum value of SAR (measured) = 20.4 mW/g



0 dB = 20.4mW/g

– 5200MHz Validation (Body)

Date: 2013-09-23

Test Laboratory: ESTECH

VALIDATION 5G_5200

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

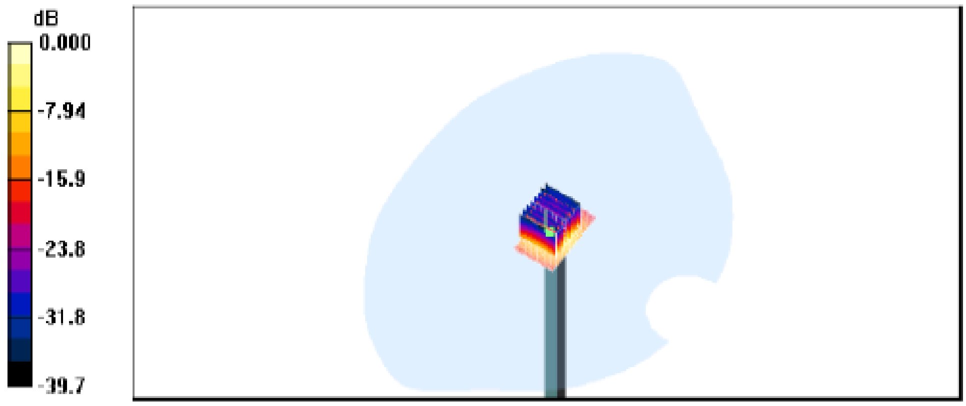
Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.4 mho/m; ε_r = 49.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3916; ConvF(4.68, 4.68, 4.68); Calibrated: 2013-04-29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL900_12_03_23; Type: TP-1262
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5200 MHz/Area Scan (31x51x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 23.4 mW/g

d=10mm, Pin=100mW, f=5200 MHz/Zoom Scan (3x3x2mm, graded), dist=2mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.4 V/m; Power Drift = -0.053 dB
Peak SAR (extrapolated) = 33.1 W/kg
SAR(1 g) = 8.01 mW/g
Maximum value of SAR (measured) = 20.3 mW/g



0 dB = 20.3mW/g

– 5300MHz Validation (Body)

Date: 2013-09-23

Test Laboratory: ESTECH

VALIDATION 5G_5300

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

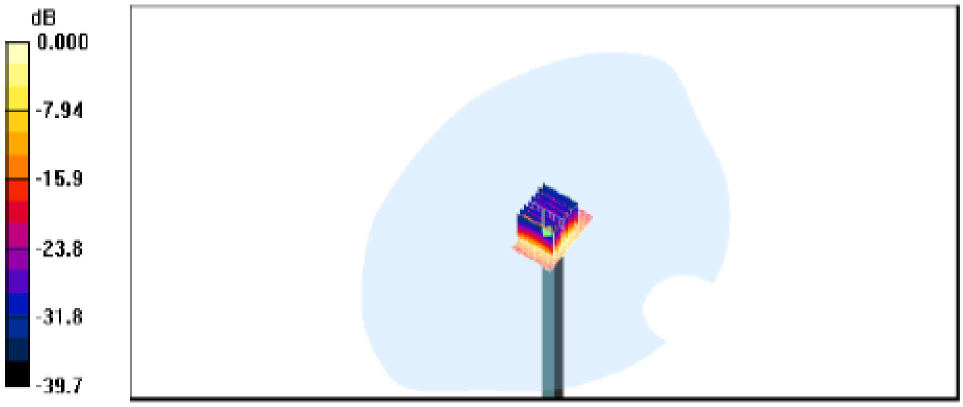
Communication System: CW; Frequency: 5300 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5300 MHz; σ = 5.53 mho/m; ε_r = 49.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3916; ConvF(4.68, 4.68, 4.68); Calibrated: 2013-04-29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL900_12_03_23; Type: TP-1262
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5200 MHz/Area Scan (31x51x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 25.1 mW/g

d=10mm, Pin=100mW, f=5200 MHz/Zoom Scan (3x3x2mm, graded), dist=2mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.0 V/m; Power Drift = -0.053 dB
Peak SAR (extrapolated) = 35.5 W/kg
SAR(1 g) = 8.12 mW/g
Maximum value of SAR (measured) = 21.8 mW/g



0 dB = 21.8mW/g

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– 5500MHz Validation (Body)

Datee: 2013-09-23

Test Laboratory: ESTECH

VALIDATION 5G_5500

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

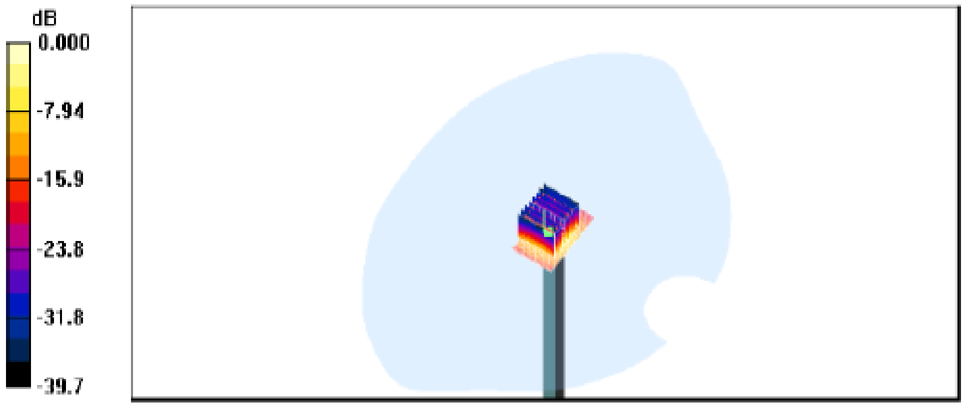
Communication System: CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5500 MHz; σ = 5.8 mho/m; ε_r = 48.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3916; ConvF(4.68, 4.68, 4.68); Calibrated: 2013-04-29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL900_12_03_23; Type: TP-1262
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5200 MHz/Area Scan (31x51x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 28.4 mW/g

d=10mm, Pin=100mW, f=5200 MHz/Zoom Scan (3x3x2mm, graded), dist=2mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.7 V/m; Power Drift = -0.053 dB
Peak SAR (extrapolated) = 40.1 W/kg
SAR(1 g) = 8.45 mW/g
Maximum value of SAR (measured) = 24.6 mW/g



0 dB = 24.6mW/g

– 5600MHz Validation (Body)

Date: 2013-09-23

Test Laboratory: ESTECH

VALIDATION 5G_5600

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

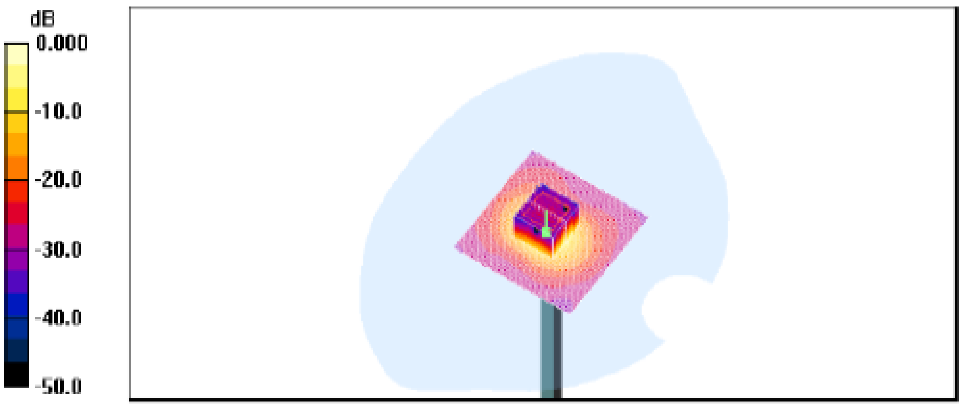
Communication System: CW; Frequency: 5600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; σ = 5.94 mho/m; ε_r = 48.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3916; ConvF(4.68, 4.68, 4.68); Calibrated: 2013-04-29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL900_12_03_23; Type: TP-1262
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5500 MHz/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 28.5 mW/g

d=10mm, Pin=100mW, f=5500 MHz/Zoom Scan (3x3x2mm, graded), dist=2mm (11x11x6)/Cube 0: Measurement grid: dx=3mm, dy=3mm, dz=2mm
Reference Value = 73.9 V/m; Power Drift = -0.003 dB
Peak SAR (extrapolated) = 45.7 W/kg
SAR(1 g) = 8.51 mW/g
Maximum value of SAR (measured) = 28.7 mW/g



0 dB = 28.7mW/g

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– 5800MHz Validation (Body)

Date: 2013-09-23

Test Laboratory: ESTECH

VALIDATION 5G_5800

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx

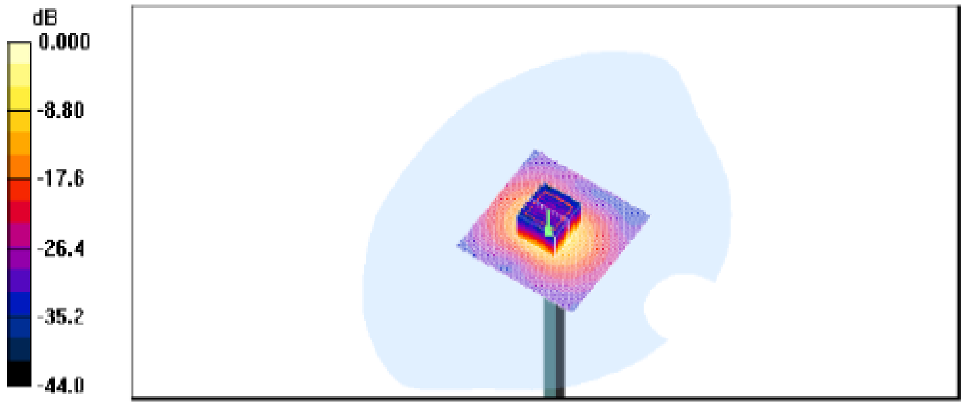
Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; σ = 6.23 mho/m; ε_r = 48.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3916; ConvF(4.68, 4.68, 4.68); Calibrated: 2013-04-29
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL900_12_03_23; Type: TP-1262
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=100mW, f=5800 MHz/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 23.1 mW/g

d=10mm, Pin=100mW, f=5800 MHz/Zoom Scan (3x3x2mm, graded), dist=2mm (11x11x6)/Cube 0: Measurement grid: dx=3mm, dy=3mm, dz=2mm
Reference Value = 65.5 V/m; Power Drift = -0.039 dB
Peak SAR (extrapolated) = 37.2 W/kg
SAR(1 g) = 7.86 mW/g
Maximum value of SAR (measured) = 23.1 mW/g



0 dB = 23.1mW/g

APPENDIX C：SAR Test Data

- 2437 MHz 802.11b Body Back (D1)

Date: 2013-08-06

Test Laboratory: ESTECH

BACK 802.11b CH6

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

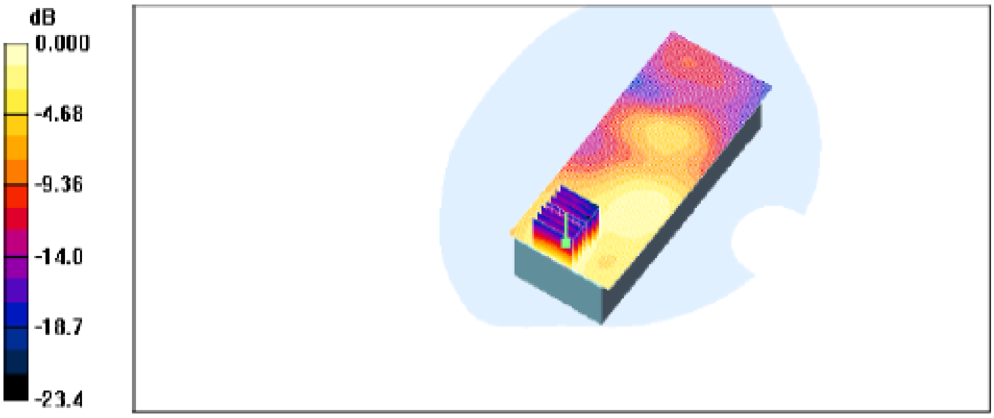
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; $\sigma = 1.91$ mho/m; $\varepsilon_r = 52$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (51x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.129 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.10 V/m; Power Drift = 0.100 dB
Peak SAR (extrapolated) = 0.244 W/kg
SAR(1 g) = 0.122 mW/g
Maximum value of SAR (measured) = 0.134 mW/g



0 dB = 0.134mW/g

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– 2437 MHz 802.11b Body Front (D1)

Date: 2013-08-06

Test Laboratory: ESTECH

FRONT 802.11b CH6

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

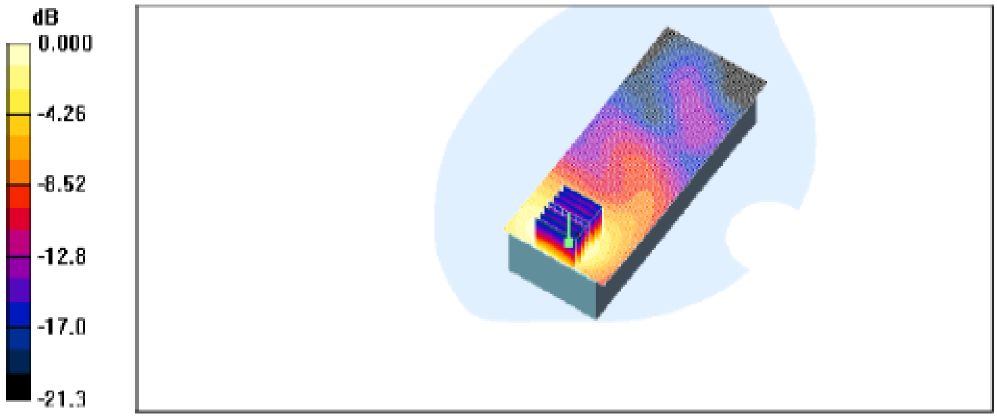
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (51x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.187 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.23 V/m; Power Drift = 0.254 dB
Peak SAR (extrapolated) = 0.343 W/kg
SAR(1 g) = 0.169 mW/g
Maximum value of SAR (measured) = 0.183 mW/g



0 dB = 0.183mW/g

- 2437 MHz 802.11b Body Side 1 (D1)

Date: 2013-08-06

Test Laboratory: ESTECH

802.11b CH6 SIDE 1

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

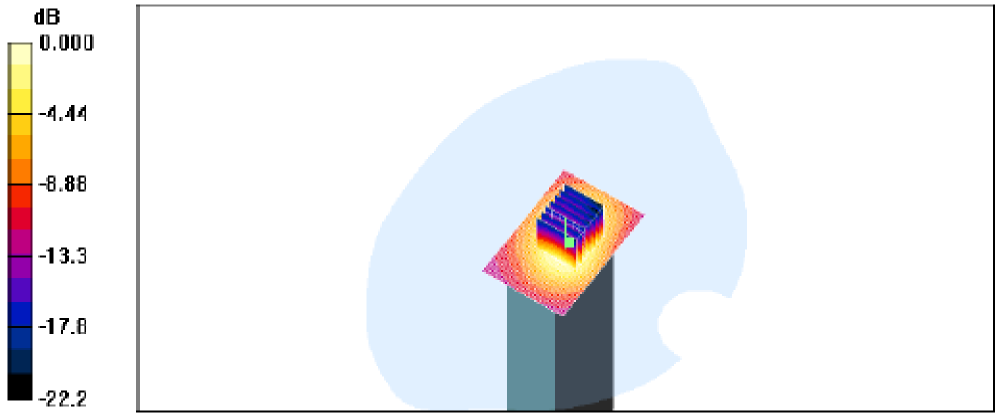
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.365 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.6 V/m; Power Drift = -0.075 dB
Peak SAR (extrapolated) = 0.685 W/kg
SAR(1 g) = 0.331 mW/g
Maximum value of SAR (measured) = 0.362 mW/g



0 dB = 0.362mW/g

- 2437 MHz 802.11b Body Side 2 (D1)

Date: 2013-08-06

Test Laboratory: ESTECH

802.11b CH6 SIDE 2

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

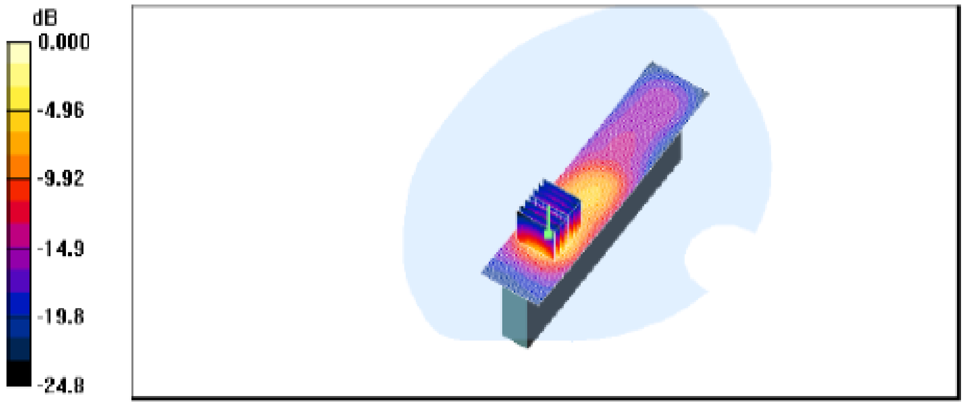
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (31x131x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.783 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.49 V/m; Power Drift = -0.047 dB
Peak SAR (extrapolated) = 1.67 W/kg
SAR(1 g) = 0.702 mW/g
Maximum value of SAR (measured) = 0.806 mW/g



0 dB = 0.806mW/g

- 2437 MHz 802.11b Body Side 3 (D1)

Date: 2013-08-06

Test Laboratory: ESTECH

802.11b CH6 SIDE 3

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

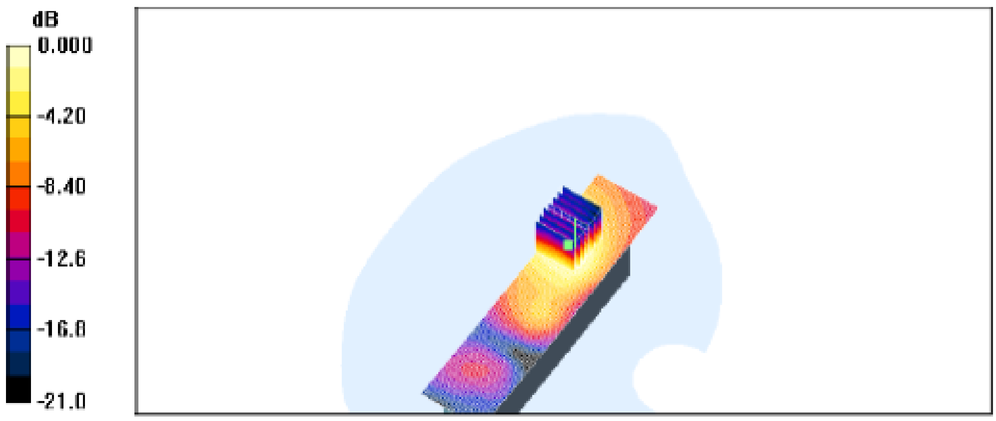
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (31x131x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.161 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.20 V/m; Power Drift = 0.235 dB
Peak SAR (extrapolated) = 0.292 W/kg
SAR(1 g) = 0.151 mW/g
Maximum value of SAR (measured) = 0.164 mW/g



0 dB = 0.164mW/g

- 2437 MHz 802.11b Body Side 4 (D1)

Date: 2013-08-06

Test Laboratory: ESTECH

802.11b CH6 SIDE 4

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

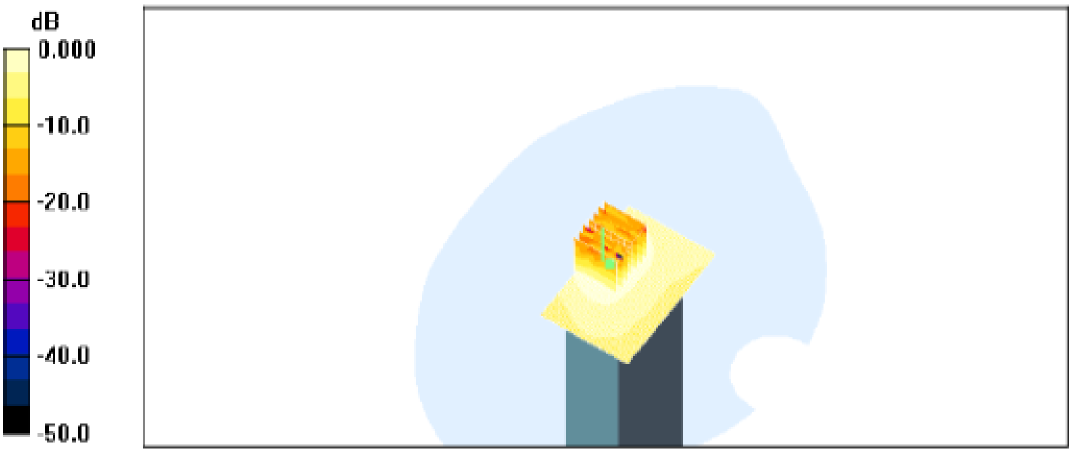
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.018 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.43 V/m; Power Drift = -0.021 dB
Peak SAR (extrapolated) = 0.036 W/kg
SAR(1 g) = 0.018 mW/g
Maximum value of SAR (measured) = 0.019 mW/g



0 dB = 0.019mW/g

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– 2437 MHz 802.11b Body Side 2 (D1) Extend battery

Date: 2013-08-06

Test Laboratory: ESTECH

802.11b CH6 SIDE 2 EX BATTERY

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

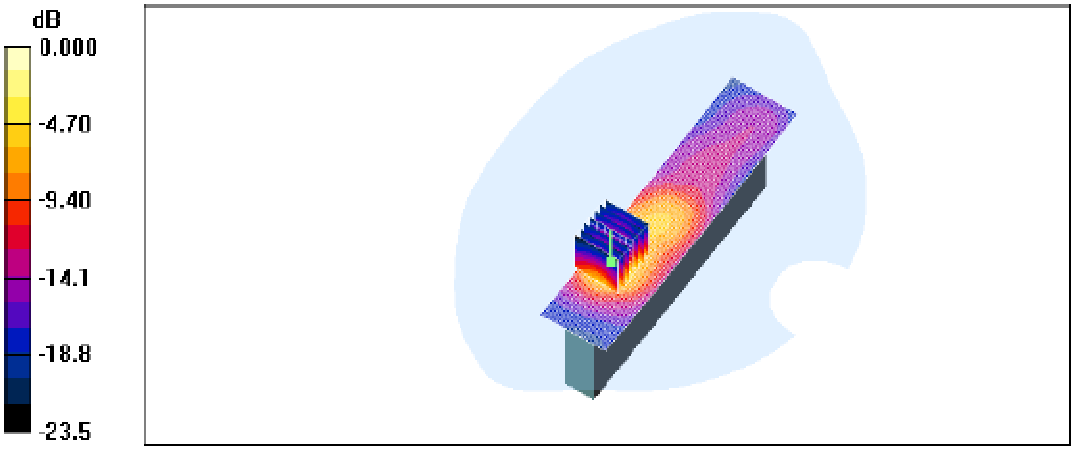
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (31x131x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.566 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.91 V/m; Power Drift = -0.171 dB
Peak SAR (extrapolated) = 1.16 W/kg
SAR(1 g) = 0.511 mW/g
Maximum value of SAR (measured) = 0.579 mW/g



0 dB = 0.579mW/g

– 2437 MHz 802.11b Body Back (D2)

Date: 2013-08-06

Test Laboratory: ESTECH

BACK 802.11b CH6

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

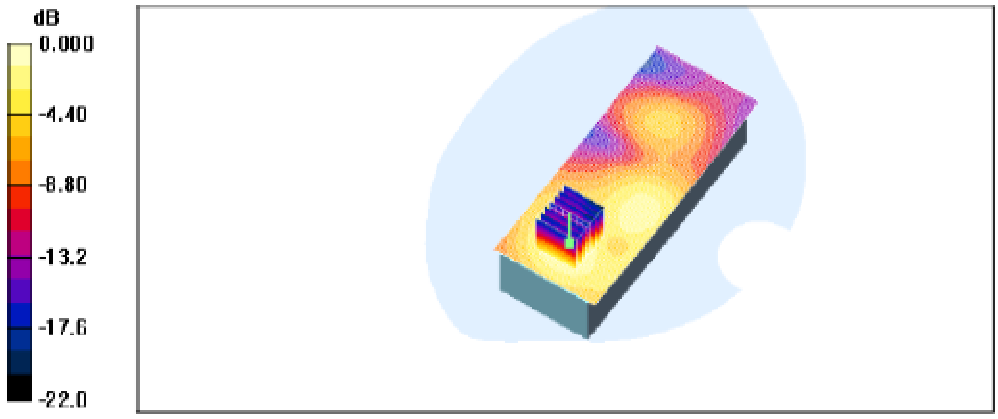
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (51x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.129 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.09 V/m; Power Drift = 0.027 dB
Peak SAR (extrapolated) = 0.245 W/kg
SAR(1 g) = 0.123 mW/g
Maximum value of SAR (measured) = 0.133 mW/g



0 dB = 0.133mW/g

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- 2437 MHz 802.11b Body Front (D2)

Date: 2013-08-06

Test Laboratory: ESTECH

802.11b CH6

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

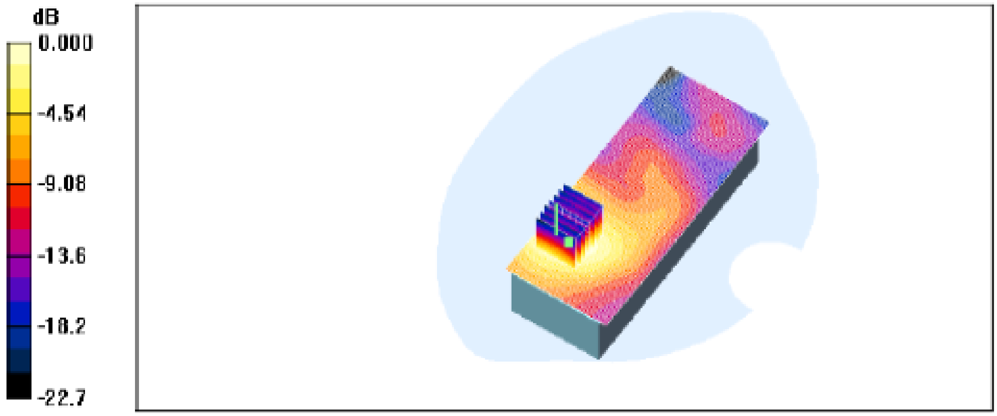
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (51x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.169 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.29 V/m; Power Drift = 0.096 dB
Peak SAR (extrapolated) = 0.335 W/kg
SAR(1 g) = 0.163 mW/g
Maximum value of SAR (measured) = 0.176 mW/g



0 dB = 0.176mW/g

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– 2437 MHz 802.11b Body Side 1 (D2)

Date: 2013-08-06

Test Laboratory: ESTECH

802.11b CH6 SIDE 1

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

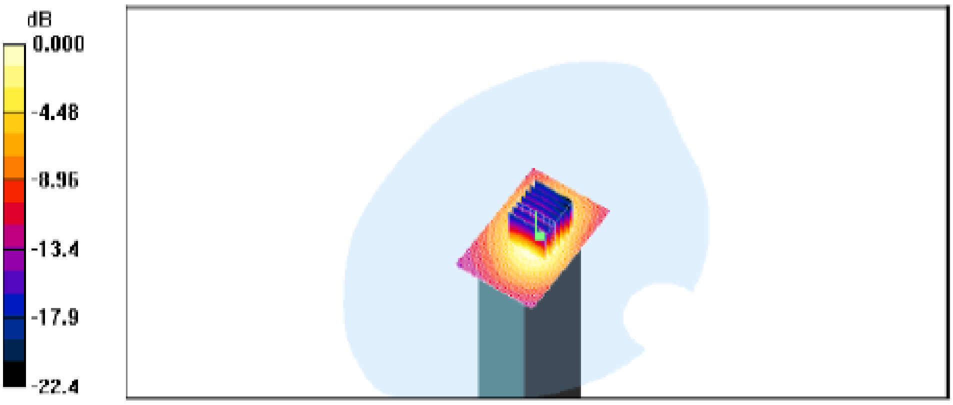
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.356 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.7 V/m; Power Drift = -0.236 dB
Peak SAR (extrapolated) = 0.648 W/kg
SAR(1 g) = 0.317 mW/g
Maximum value of SAR (measured) = 0.345 mW/g



0 dB = 0.345mW/g

- 2437 MHz 802.11b Body Side 2 (D2)

Date: 2013-08-06

Test Laboratory: ESTECH

802.11b CH6 SIDE 2

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

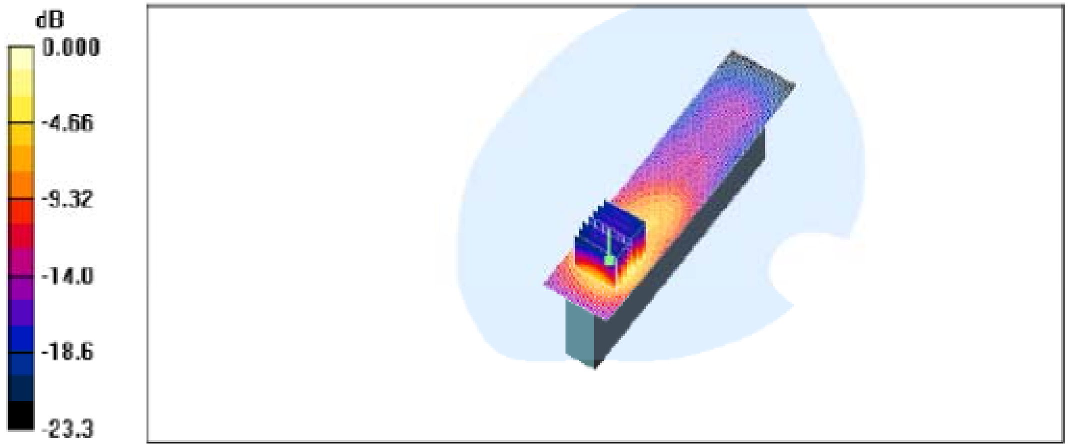
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (31x131x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.525 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.57 V/m; Power Drift = -0.058 dB
Peak SAR (extrapolated) = 1.10 W/kg
SAR(1 g) = 0.487 mW/g
Maximum value of SAR (measured) = 0.553 mW/g



0 dB = 0.553mW/g

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- 2437 MHz 802.11b Body Side 3 (D2)

Date: 2013-08-06

Test Laboratory: ESTECH

802.11b CH6 SIDE 3

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

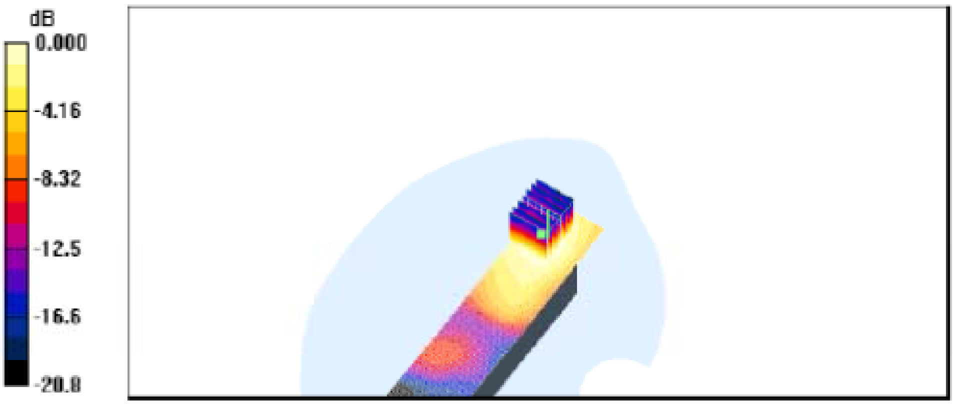
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (31x131x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.075 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.53 V/m; Power Drift = 0.002 dB
Peak SAR (extrapolated) = 0.137 W/kg
SAR(1 g) = 0.072 mW/g
Maximum value of SAR (measured) = 0.077 mW/g



0 dB = 0.077mW/g

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– 2437 MHz 802.11b Body Side 4 (D2)

Date: 2013-08-06

Test Laboratory: ESTECH

802.11b CH6 SIDE 4

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

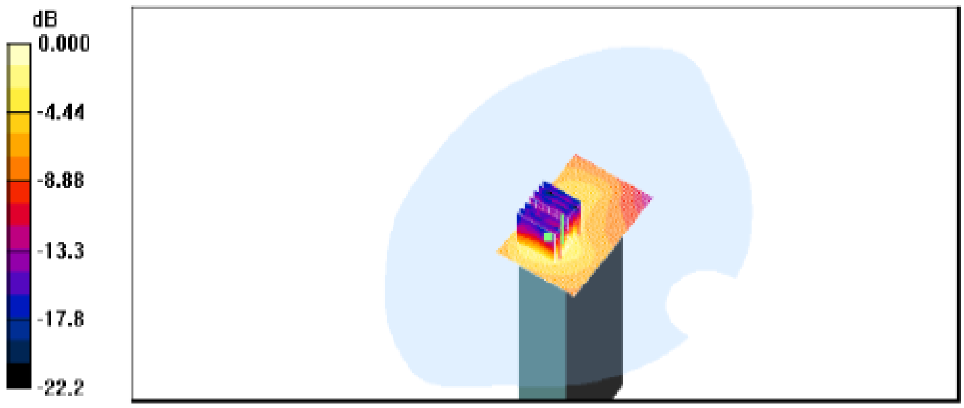
Communication System: Wirless; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.25, 4.25, 4.25); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.023 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.87 V/m; Power Drift = 0.146 dB
Peak SAR (extrapolated) = 0.063 W/kg
SAR(1 g) = 0.029 mW/g
Maximum value of SAR (measured) = 0.031 mW/g



0 dB = 0.031mW/g

- 2437 MHz 802.11b Body Side 2 (D2) Extend battery

Date: 2013-08-06

Test Laboratory: ESTECH

802.11b CH6 SIDE 2 HI BATTERY

DUT: Dolphin 6110; Type: BAR TYPE; Serial: NONE

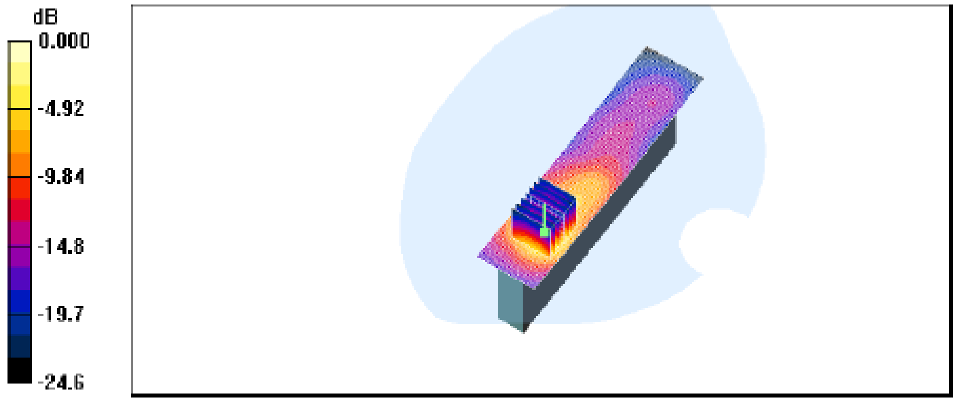
Communication System: Wirless; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.91 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.49, 4.49, 4.49); Calibrated: 2013-01-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2013-02-14
- Phantom: HSL1900_12_03_23; Type: TP-1263
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Area Scan (31x131x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.531 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.89 V/m; Power Drift = -0.296 dB
Peak SAR (extrapolated) = 1.10 W/kg
SAR(1 g) = 0.484 mW/g
Maximum value of SAR (measured) = 0.553 mW/g



0 dB = 0.553mW/g