SAR TEST REPORT

HCT CO., LTD

EUT Type:	USB Dongle		
FCC ID:	XHG-U602		
Model:	U602	Trade Name	Franklin
Date of Issue:	Aug. 23, 2011		
Test report No.:	HCTA1108FS05		
Test Laboratory:	**HCT CO., LTD.** 105-1, Jangam-ri, Majang-myeon, Icheon-si,Gyeonggi-do,Korea 467-811 TEL: +82 31 645 6485 FAX: +82 31 645 6401		
Applicant :	**Franklin Technology Inc.** 906 JEI Platz, 459-11, Gasan-Dong, Gumcheon-Gu, Seoul,Korea 153-803		
Testing has been carried out in accordance with:	47CFR §2.1093 FCC OET Bulletin 65(Edition 97-01), Supplement C (Edition 01-01) ANSI/ IEEE C95.1 – 1992 IEEE 1528-2003 KDB 615223 D01 802 16e WiMax SAR Guidance v01 KDB 447498 D02 SAR Procedures for Dongle v02		
Test result:	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 except in full, without written approval of the laboratory.		
Signature	Report prepared by : Sun-Hee Kim Test Engineer of SAR Part	Approved by : Jae-Sang So Manager of SAR Part	

Table of Contents

1. INTRODUCTION

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 hazards of RF emissions due to FCC-regulated portable devices.

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-2005 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic 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/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave is used for guidance in measuring SAR due to the RF radiation exposure 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 (NCRP) in Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86 NCRP, 1986, Bethesda, MD 20814. SAR is a measure 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 of the incremental electromagnetic energy (d*W*) absorbed by (dissipated in) an incremental mass (d*m*) contained in a volume element (d*V*) of a given density (*r*). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body.

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

Figure 2. 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/m^3)

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 the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.

2. DESCRIPTION OF DEVICE

Environmental evaluation measurements of specific absorption rate (SAR) distributions in emulated human head and body tissues exposed to radio frequency (RF) radiation from wireless portable devices for compliance with the rules and regulations of the U.S. Federal Communications Commission (FCC).

EUT Type	USB Dongle
FCC ID	XHG-U602
Model(s)	U602
Trade Name	Franklin
Serial Number(s)	#1
Application Type	Certification
Modulation(s)	WIMAX 2600
Tx Frequency	2 498.5 MHz – 2 687.5 MHz (5 MHz Bandwidth) 2 501.0 MHz – 2 685.0 MHz (10 MHz Bandwidth)
Rx Frequency	2 498.5 MHz – 2 687.5 MHz (5 MHz Bandwidth) 2 501.0 MHz – 2 685.0 MHz (10 MHz Bandwidth)
FCC Classification	Licensed Non-Broadcast Station Transmitter (TNB)
Production Unit or Identical Prototype	Prototype
Max. Scaled SAR	1.30 W/kg WIMAX2600 Body SAR
Date(s) of Tests	Aug. 12, 2011 ~ Aug. 13, 2011
Antenna Type	Intenna

Modes of operation Tested

	Tx1	Tx2
824-849 MHz Cellular	Refer to Separate PCB SAR Report	Refer to Separate PCB SAR Report
1850-1910 MHz PCS	Refer to Separate PCB SAR Report	Refer to Separate PCB SAR Report
2498.5 - 2687.5 MHz Wimax	Tested	Tested
2501 - 2685 MHz Wimax	Tested	Tested

Simultaneous Operation

– Simultaneous operation is not possible. Only 1 transmitter with 1 mode can operate at a time. Data only. Voice transmission is not supported.

	824-849 MHz Cellular 1xEVDO	1850-1910 MHz PCS 1xEVDO	2498.5 - 2687.5 MHz Wimax	2501-2685 MHz Wimax
824-849 MHz Cellular 1xEVDO	X	N/A	N/A	N/A
1850-1910 MHz PCS 1xEVDO	N/A	X	N/A	N/A
2498.5 - 2687.5 MHz Wimax	N/A	N/A	X	N/A
2501 - 2685 MHz Wimax	N/A	N/A	N/A	X

NOTE :

1. This is a data modem. Therefore, there is no voice transmission.

The device was tested only EVDO Rev.0 mode, because 1xRTT and EVDO Rev.A output power is not greater than 0.25 dB of EVDO Rev.0

2. There is no simultaneous transmission between CDMA and Wimax.

3. Wimax Tx antenna have a just one path. Therefore, Tx1 & Tx2 cannot transmit simultaneously. Only it can be operated by a switched internally.

3. DESCRIPTION OF TEST EQUIPMENT

3.1 SAR MEASUREMENT SETUP

These measurements are performed using the DASY4 automated dosimetric assessment system. It is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland. It consists of high precision robotics system (Staubli), robot controller, Pentium III computer, near-field probe, probe alignment sensor, and the generic 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 Figure.3.1).

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The PC consists of the HP Pentium IV 3.0 GHz computer with Windows XP system and SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, 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.

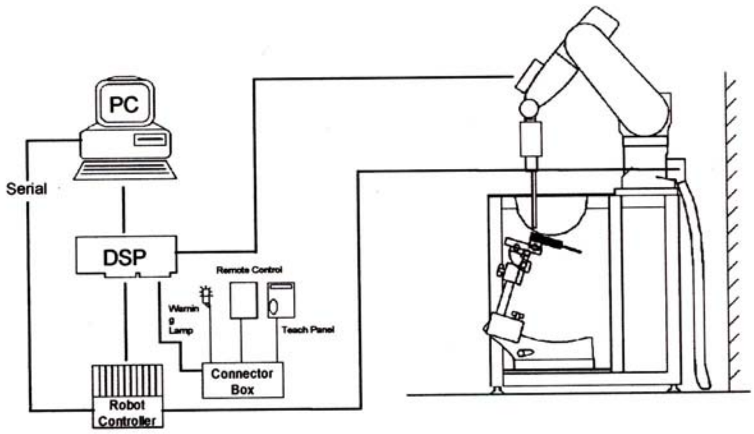


Figure 3.1 HCT SAR Lab. Test Measurement Set-up

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-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.

3.2 DASY E-FIELD PROBE SYSTEM

3.2.1 ET3DV6 Probe Specification

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection System Built-in shielding against static charges
Calibration	In air from 10 MHz to 2.5 GHz In brain and muscle simulating tissue at Frequencies of 450 MHz, 900 MHz and 1.8 GHz (accuracy: 8 %)
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) ± 0.4 dB in brain tissue (rotation normal probe axis)
Dynamic	5 ㎼/g to > 100 mW/g;
Range Linearity:	± 0.2 dB
Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces.
Dimensions	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application	General dissymmetry up to 3 GHz Compliance tests of mobile GSM/WCDMA Phones Fast automatic scanning in arbitrary phantoms

Figure 3.2 Photograph of the probe and the Phantom

Figure 3.3 EX3DV4 E-field

The SAR measurements were conducted with the dosimetric probe EX3DV4, designed in the classical triangular configuration 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 on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches a maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approach and looks for the maximum using a 2^{nd} order fitting. The approach is stopped at reaching the maximum.

3.3 PROBE CALIBRATION PROCESS

3.3.1 E-Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with an accuracy better than ± 10 %. The spherical isotropy was evaluated with the proper procedure and found to be better than ± 0.25 dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a waveguide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

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 rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

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

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;

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

where:

σ = simulated tissue conductivity,

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

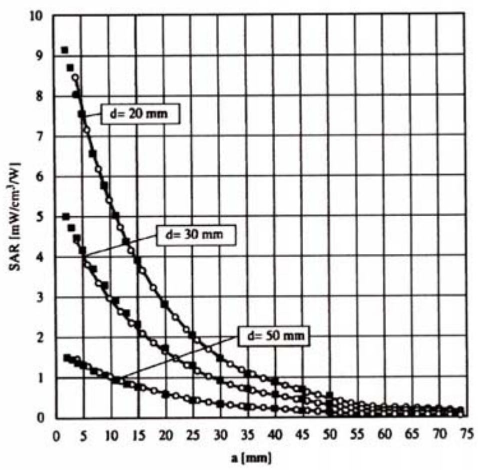


Figure 3.4 E-Field and Temperature measurements at 900 MHz

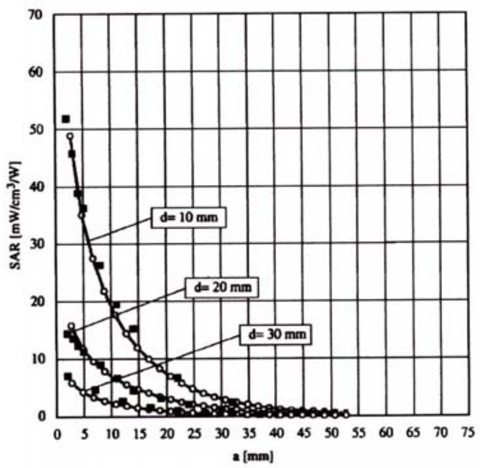


Figure 3.5 E-Field and temperature measurements at 1.8 GHz

3.3.2 Data Extrapolation

The DASY4 software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given like below;

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

with V_i = compensated signal of channel i (i=x,y,z)
U_i = input signal of channel i (i=x,y,z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

with V_i = compensated signal of channel i (i = x,y,z)
$Norm_i$ = sensor sensitivity of channel i (i = x,y,z) $\mu V/(V/m)^2$ for E-field probes
ConvF = sensitivity of enhancement in solution
E_i = electric field strength of channel i in V/m

The RSS value of the field components gives the total field strength (Hermetian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with SAR = local specific absorption rate in W/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{3770}$$

with P_{pwe} = equivalent power density of a plane wave in W/cm^2
E_{tot} = total electric field strength in V/m

3.4 SAM Phantom

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Figure 3.6 SAM Phantom

Shell Thickness	2.0 mm
Filling Volume	about 25 L
Dimensions	1 000 mm x 500 mm (L x W)

3.5 Device Holder for Transmitters

In combination with the SAM Phantom V 4.0, the Mounting Device (POM) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatable positioned according to the FCC and CENELEC 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 produced infinite number of configurations. To produce the Worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Figure 3.7 Device Holder

3.6 Brain & Muscle Simulating Mixture Characterization

The brain and muscle mixtures consist of a viscous gel using hydrox-ethyl cellulose (HEC) gelling agent and saline solution (see Table 3.1). 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 mixture characterizations used for the brain and muscle tissue simulating liquids are according to the data by C. Gabriel and G. Hartsgrove.

Ingredients (% by weight)	Frequency (MHz)											
	450		835		915		1 900		2 450		2600	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2	60.8	69.83
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04	0.3	0.00
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0	38.9	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7	0.0	30.17

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

Water: De-ionized, 16M 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)phenyl] ether

Table 3.1 Composition of the Tissue Equivalent Matter

3.7 SAR TEST EQUIPMENT

Manufacturer	Type / Model	S/N	Calib. Date	Calib.Interval	Calib.Due
SPEAG	SAM Phantom	-	N/A	N/A	N/A
Staubli	Robot RX90L	F01/5K09A1/A/01	N/A	N/A	N/A
Staubli	Robot ControllerCS7MB	F99/5A82A1/C/01	N/A	N/A	N/A
HP	Pavilion t000_puffer	KRJ51201TV	N/A	N/A	N/A
SPEAG	Light Alignment Sensor	265	N/A	N/A	N/A
Staubli	Teach Pendant (Joystick)	D221340.01	N/A	N/A	N/A
SPEAG	DAE4	869	Sep. 21, 2010	Annual	Sep. 21, 2011
SPEAG	E-Field Probe EX3DV4	3797	July 25, 2011	Annual	July 25, 2012
SPEAG	Validation Dipole D2600V2	1015	Mar. 24, 2011	Annual	Mar. 24, 2012
Agilent	Power Meter(F) E4419B	MY41291386	Nov. 05, 2010	Annual	Nov. 05, 2011
Agilent	Power Sensor(G) 8481	MY41090870	Nov. 05, 2010	Annual	Nov. 05, 2011
HP	Dielectric Probe Kit 85070C	00721521	N/A	N/A	N/A
HP	Dual Directional Coupler	16072	Nov. 05, 2010	Annual	Nov. 05, 2011
R&S	Base Station CMU200	110740	July 26, 2011	Annual	July 26, 2012
Agilent	Base Station E5515C	GB44400269	Feb. 10, 2011	Annual	Feb. 10, 2012
HP	Signal Generator E4438C	MY42082646	Nov. 11, 2010	Annual	Nov. 11, 2011
HP	Network Analyzer 8753ES	JP39240221	Mar. 30, 2011	Annual	Mar. 30, 2012
R&S	Spectrum N9020A	MY51110020	April 16, 2011	Annual	April 16, 2012

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

4. SAR MEASUREMENT PROCEDURE

The evaluation was performed with the following procedure:

1. The SAR value at a fixed location above the ear point was measured and was used as a reference value for assessing the power drop.

2. The SAR distribution at the exposed side of the head was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 20 mm x 20 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

3. Around this point, a volume of 32 mm x 32 mm x 30 mm was assessed by measuring 5 x 5 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

   a. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points 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 spatial volumes (1 g or 10 g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions. The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.
   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

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

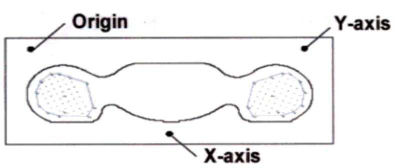


Figure 4.1 SAR Measurement Point in Area Scan

5. DESCRIPTION OF TEST POSITION

5.1 Test Configurations

According to KDB 447498, the device that can be connected to a host through a cable must be tested with the device positioned in all applicable orientations against the flat phantom. And a separation distance ≤ 0.5 cm is required for USB-dongle transmitters.

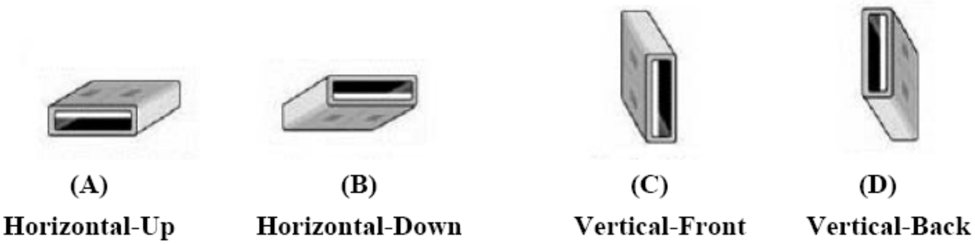


Figure 5.3 USB Connector Orientations Implemented on Laptop Computers

Therefore, the EUT was tested in following orientations;

1) Configuration 1: Front side of the EUT was tested with the direct-connection to the host device with Horizontal-Up (A), and separation distance between EUT and Phantom is 5 mm.

2) Configuration 2: Back side of the EUT was connected to the host device with Horizontal-Down (B) using a USB cable, and separation distance between EUT and Phantom is 5 mm.

3) Configuration 3: Right side of the EUT was connected to the host device with Vertical-Front (C)using a USB cable, and separation distance between EUT and Phantom is 5 mm.

4) Configuration 4: Left side of the EUT was tested with the direct-connection to the host device with Vertical-Back (D), and separation distance between EUT and Phantom is 5 mm.

5) Configuration 5: Top side of the EUT was tested with the direct-connection to the host device, and separation distance between EUT and Phantom is 5 mm.

Note;

This USB cable was used to operate this unit in the highest RF performance capability for SAR testing.

6. MEASUREMENT UNCERTAINTY

Error Description	Tol (± %)	Prob. dist.	Div.	c_i	Standard Uncertainty (± %)	v_{eff}
1. Measurement System						
Probe Calibration	6.00	N	1	1	6.00	∞
Axial Isotropy	4.70	R	1.73	0.7	1.90	∞
Hemispherical Isotropy	9.60	R	1.73	0.7	3.88	∞
Boundary Effects	1.00	R	1.73	1	0.58	∞
Linearity	4.70	R	1.73	1	2.71	∞
System Detection Limits	1.00	R	1.73	1	0.58	∞
Readout Electronics	0.30	N	1.00	1	0.30	∞
Response Time	0.8	R	1.73	1	0.46	∞
Integration Time	2.6	R	1.73	1	1.50	∞
RF Ambient Conditions	3.00	R	1.73	1	1.73	∞
Probe Positioner	0.40	R	1.73	1	0.23	∞
Probe Positioning	2.90	R	1.73	1	1.67	∞
Max SAR Eval	1.00	R	1.73	1	0.58	∞
2.Test Sample Related						
Device Positioning	2.90	N	1.00	1	2.90	145
Device Holder	3.60	N	1.00	1	3.60	5
Power Drift	5.00	R	1.73	1	2.89	∞
3.Phantom and Setup						
Phantom Uncertainty	4.00	R	1.73	1	2.31	∞
Liquid Conductivity(target)	5.00	R	1.73	0.64	1.85	∞
Liquid Conductivity(meas.)	2.07	N	1	0.64	1.32	9
Liquid Permitivity(target)	5.00	R	1.73	0.6	1.73	∞
Liquid Permitivity(meas.)	5.02	N	1	0.6	3.01	9
Combind Standard Uncertainty					11.13	
Coverage Factor for 95 %					$k=2$	
Expanded STD Uncertainty					22.25	

Table 6.1 835 MHz – 2700 MHz

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

HUMAN EXPOSURE	UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT Occupational (W/kg) or (mW/g)
SPATIAL PEAK SAR * (Brain)	1.60	8.00
SPATIAL AVERAGE SAR ** (Whole Body)	0.08	0.40
SPATIAL PEAK SAR *** (Hands / Feet / Ankle / Wrist)	4.00	20.00

Table 7.1 Safety Limits for Partial Body Exposure

NOTES:

* The Spatial Peak value of the SAR averaged over any 1 g of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

** The Spatial Average value of the SAR averaged over the whole-body.

*** The Spatial Peak value of the SAR averaged over any 10 g of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

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).

8. SYSTEM VERIFICATION

8.1 Tissue Verification

Freq. [MHz]	Date	Liquid	Liquid Temp.[°C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
2 600	Aug.12,2011	Body	21.3	εr	52.5	51.4	- 2.10	± 5
				σ	2.16	2.16	0.00	± 5
2 600	Aug.13,2011	Body	21.2	εr	52.5	51.9	- 1.14	± 5
				σ	2.16	2.14	- 0.93	± 5

The dielectronic parameters of the liquids were verified prior to the SAR evaluation using an Agilent 85070C Dielectronic Probe Kit and Agilent Network Analyzer.

8.2 System Validation

Prior to assessment, the system is verified to the ± 10 % of the specifications at 2 600 MHz by using the system validation kit. (Graphic Plots Attached)

* *Input Power: 100 mW

Freq. [MHz]	Date	Probe(SN)	Liquid	Liquid Temp. [°C]	SAR Average	Target Value (SPEAG) (mW/g)	* Measured Value (mW/g)	Deviation [%]	Limit [%]
2 600	Aug.12,2011	3797	Body	21.3	1 g	58.7	5.92	+ 0.85	± 10
2 600	Aug.13,2011	3797	Body	21.2	1 g	58.7	5.96	+ 1.53	± 10

8.3 System Validation Procedure

SAR measurement was Prior to assessment, the system is verified to the ± 10 % of the specifications at 2 600 MHz by using the system validation kit. (Graphic Plots Attached)

- Cabling the system, using the validation kit equipments.
- Generate about 100 mW Input Level from the Signal generator to the Dipole Antenna.
- Dipole Antenna was placed below the Flat phantom.
- The measured one-gram SAR at the surface of the phantom above the dipole feed-point should be within 10 % of the target reference value.

9.Devices with WIMAX

9.1 802.16e/WiMAX Device and System Operating Parameters

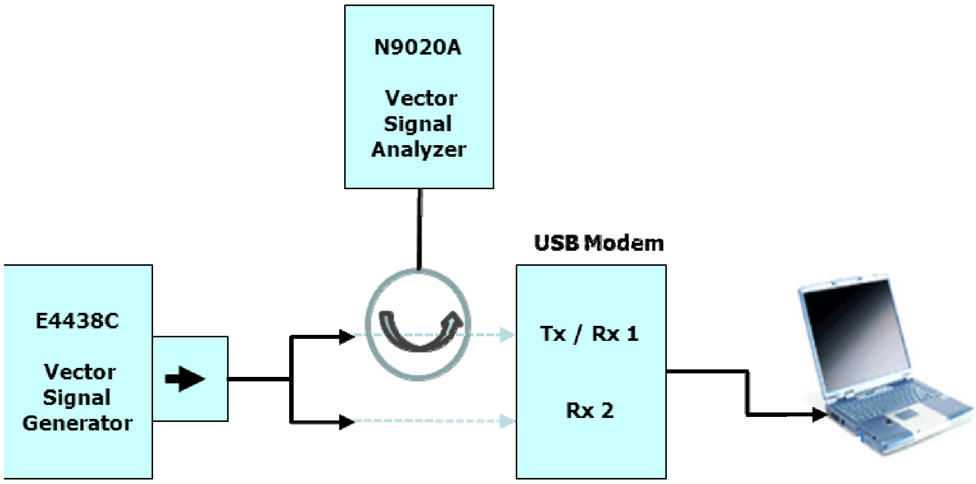
Table 1: 802.16e/WiMAX Device and System Operating Parameters

Description	Parameter		Comment
FCC ID	XHG-U602		Identify all related FCC ID
Radio Service	Part 27 subpart M		Rule parts
Transmit Frequency Range (MHz)	2496MHz-2690MHz		System parameter
System/Channel Bandwidth (MHz)	5MHz	10MHz	System parameter
System Profile	Revision 1.7.0		Defined by WiMax Forum
Modulation Schemes	QPSK, 16QAM		Identify all applicable UL modulations
Sampling Factor	28/25		System parameter
Sampling Frequency (MHz)	5.6MHz	11.2MHz	(F_s)
Sample Time (ns)	178.58ns	89.3ns	($1/F_s$)
FFT Size (N_{FFT})	512	1024	(N_{FFT})
Sub-Carrier Spacing (MHz)	0.01094		(Δf)
Useful Symbol time (µs)	91.43µs		($T_b=1/\Delta f$)
Guard Time (µs)	11.43us		($T_g=T_b/cp$); cp = cyclic prefix
OFDMA Symbol time (µs)	102.857us		($T_s=T_b+T_g$)
Frame Size (ms)	5ms		System parameter
TTG + RTG (us or number of symbols)	165.72µs		Idle time, system parameter
Number of DL OFDMA symbols per Frame	29		Identify the allowed & maximum symbols, including both traffic & control symbols
Number of UL OFDMA Symbols per Frame	18		
DL:UL Symbol Ratios	29:18		Identify all applicable DL:UL ratios; used to determine UL duty factor
Power Class (dBm)	Power Class 2, 23±0.5dBm		Identify power class and tolerance
Wave1 / Wave2	Wave2, 2Rx+1Tx Diversity		Describe antenna diversity info and MIMO requirements separately
UL Zone Types (FUSC, PUSC, OFUSC, OPUSC, AMC, TUSC1, TUSC2)	PUSC		Describe separately the symbol and sub-carrier/sub-channel structures applicable to each zone type
Maximum Number of UL Sub-carriers	840	420	Identify the allowed and tested or to be tested parameters; include separated explanations on the control symbol configuration used in the power measurements and show the maximum power level is determined for the control symbols
Measured UL Burst Maximum Average Power	5 MHz QPSK 1/2: 23.16 dBm 10 MHz QPSK 1/2: 23.25 dBm		
UL Control Symbol Configuration	3 PUSC symbols (used for ranging, CQICH and ACK/NACK)		
UL Control Symbol Maximum Average Power	65.85 mW	31.99 mW	
UL Burst Peak-to-Average Power Ratio (PAR)	For 5 MHz Channel BW is between 6.14~6.59 dB(ANT1) 6.23~6.52 dB(ANT2) For 10 MHz Channel BW is between 6.17~6.49 dB(ANT1) 6.28~6.46 dB(ANT2)		Identify the expected range and measured/tested PAR; explain separately the methods used or to be used to address SAR probe calibration and measurement error issues
Frame Averaged UL Transmission Duty Factor (%)	Frame averaged Duty Cycle: 15/48=0.3125 Duty Cycle: 1/0.3125=3.2		Show calculations separately and explain how the applicable *cf factor (duty factor)* used or to be use in the SAR measurements is derived and how the control symbols are accounted for

9.2. Information on Test Equipment and Measurement Results

Test Software

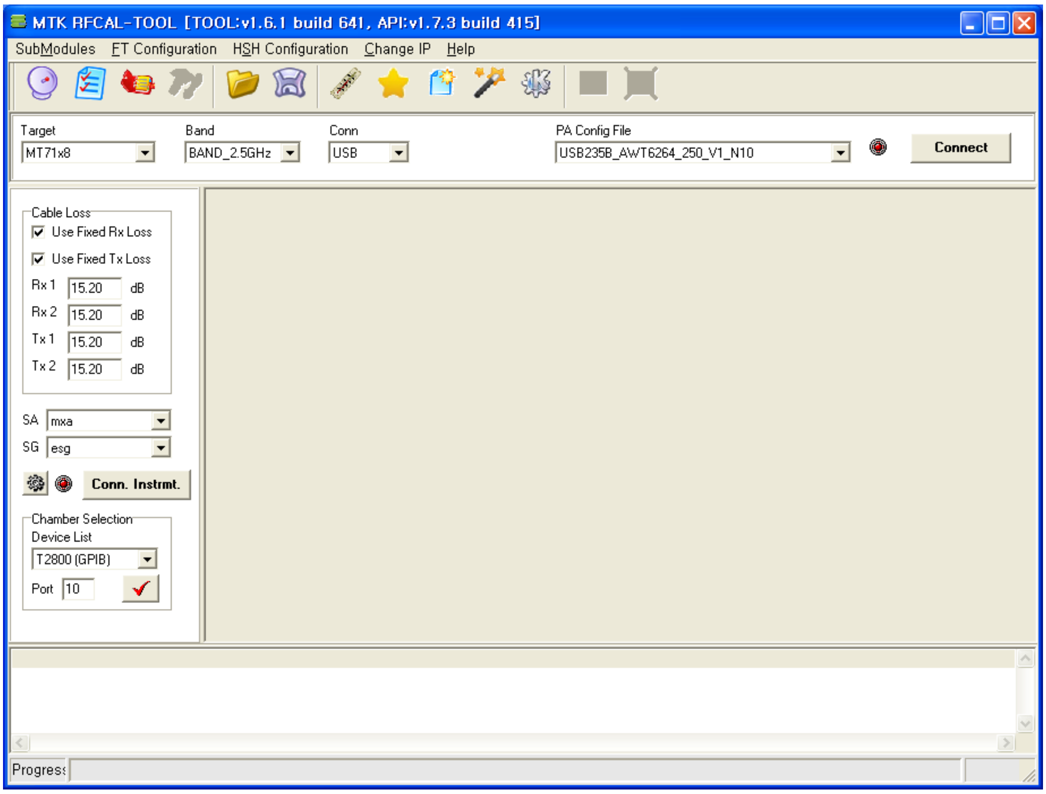
For the purposes of measuring SAR an Agilent Signal Generator (specify model number) is used to emulate the Base Station. The signal generator is loaded with a frame that simulates the Base station downlink. A drawing of the setup is shown below.

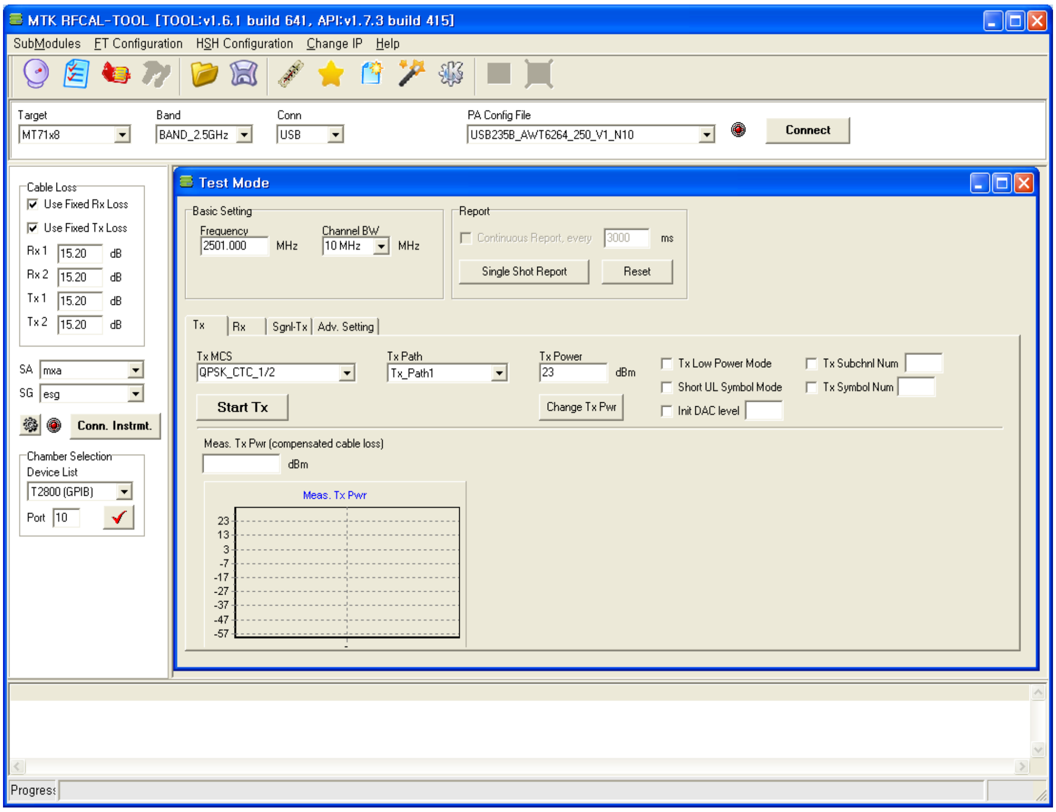


1. Drawing of test setup

The DUT receives and demodulates the DL frame. This frame instructs the DUT to transmit during the UL frame, with a specified data burst size, in a specific zone (PUSC) and a specific modulation (QPSK ½ ¾ or 16QAM ½ ¾).

The DUT is configured using the Mediatek Control Panel. This is a software tool which runs on the laptop that is connected to the USB modem. The MTK Control panel instructs the USB modem to transmit at maximum power and tells the USB modem which antenna to transmit with (Antenna 1 or Antenna 2).





MTK Control Panel

2. Screen dump of the MTK Diagnostic Control Panel

Signal Generator

Frame Profile loaded in Vector Signal Generator:

Test Vector File Name	BW	DL/UL Symbols
10M_QPSK_CTC_12	10 MHz	29:18
10M_QPSK_CTC_34	10 MHz	29:18
10M_16QAM_CTC_12	10 MHz	29:18
10M_16QAM_CTC_34	10 MHz	29:18
5M_QPSK_CTC_12	5 MHz	29:18
5M_QPSK_CTC_34	5 MHz	29:18
5M_16QAM_CTC_12	5 MHz	29:18
5M_16QAM_CTC_34	5 MHz	29:18

Agilent ESG Vector Signal Generator / Model :E4438C is used in conjunction with FTI supplied radio profile to configure the FTI WiMAX modem for the SAR evaluation. ESG Vector Signal Generator is loaded with the downlink signal, containing the respective FCH, DL- MAP and UL-MAP required by the test device to configure the uplink transmission. The waveform is configured for a DL:UL symbol ratio of 29:18 , the effective power is only across 15 data symbols. On the PC and downloaded to the VSG. The test device can synchronize itself to the signal received from VSG, both in frequency and time. It then modulates the DL-MAP and UL-MAP transmitted in the downlink sub-frame and determine the DL:UL symbol ratio. The downlink burst is repeated in each frame, every 5ms, to simulate the normal transmission from a WiMAX base station. The UL-MAP received by the device is used to configure the uplink burst with all data symbols and sub-channels active. For TDD systems, both uplink and downlink transmissions are at the same frequency. The output power of the VSG is kept at least 80 dB lower than the test device to avoid interfering with the SAR measurements. The ESG is connected directly into the WiMAX card so as to allow the card to enter into transmit mode.

Communication Test Set

Modulation and channel bandwidth selection is loaded to Vector Signal Generator. when evaluating QPSK/16QAM with 10MHz channel Bandwidth, radio profile name "10M_QPSK_CTC_12, 10M_QPSK_CTC_34, 10M_16QAM_CTC_12, 10M_16QAM_CTC_34" is active on the Vector Signal Generator. when evaluating QPSK/16QAM with 5MHz channel Bandwidth, radio profile name "5M_QPSK_CTC_12, 5M_QPSK_CTC_34, 5M_16QAM_CTC_12, 5M_16QAM_CTC_34" is active on the Vector Signal Generator.

Parameter Value	Frame definition for 10 MHz RCT	
	Test Vector Name	
	10M_QPSK_CTC_12	10M_16QAM_CTC_12
Band Width	10MHz	10MHz
FFT size	1024	1024
DL/UL ratio	29:18	29:18
Down link		
Zone profiles	Zone 1 – PUSC	Zone 1 – PUSC
Burst profile / MCS	MCS: QPSK R1/2	MCS: QAM16 R1/2
Up Link		
Zone profiles	Zone 1 – PUSC	Zone 1 – PUSC
Burst profile / MCS	MCS: QPSK R1/2	MCS: QAM16 R1/2

Parameter Value	Frame definition for 5 MHz RCT	
	Test Vector Name	
	5M_QPSK_CTC_12	5M_16QAM_CTC_12
Band Width	5MHz	5MHz
FFT size	512	512
DL/UL ratio	29:18	29:18
Down link		
Zone profiles	Zone 1 – PUSC	Zone 1 – PUSC
Burst profile / MCS	MCS: QPSK R1/2	MCS:QAM16 R1/2
Up Link		
Zone profiles	Zone 1 – PUSC	Zone 1 – PUSC
Burst profile / MCS	MCS: QPSK R1/2	MCS:QAM16 R1/2

SAR Test Signal Characteristics and Structure

The Test frame loaded into the Signal Generator has the structure 29:18 corresponding the DL:UL ratio used by operators in the US. The UL consists of 15 symbols with data burst. There are a total of 16 (4x2x2) different frames corresponding to the allowed modulation (QPSK ½, QPSK 3/4, 16QAM ½, 16QAM 3/4) and zone (PUSC) and bandwidths (5 MHz /10 MHz).

The testing was done using a common 29:18 ratio. The 29 indicates the number of downlink (from the base station) symbols and the 18 indicates the number of uplink (transmitted from the MS) symbols. Inside the uplink, 15 of the symbols are used for data. The correct duty factor should be 31.25 %. Using this calculation method eliminates all the other transmit time, guard time, etc, and only uses the transmit time.

The DUT does not transmit during the control symbols. Hence a correction needs to be applied to the SAR measurements to account for this.

Output Power Measurement

The maximum average conducted output power was measured at uplink burst-on period with different modulation. The same setup and device operation configurations were used for SAR & EMC power Measurements. Power was Measured with a spectrum analyzer (N9020A) and the device was connected to the vector signal generator through a circulator.

Please refer to the PEAK TO AVERAGE Conducted Power RATIO table.

Note:

Spectrum Analyzer with Channel Power function and Gate On Peak power: RBW=300 kHz; VBW = 1 MHz with Peak detection, sweep time = 50 ms, Average power: RBW=300 kHz; VBW = 1 MHz with Average detection, sweep time = 50 ms

The conducted Output power is similar between Antenna1 and 2. So we performed the SAR testing both of Antenna1 and 2 to find the worst configuration.

9.3 Scaling Factor

	ANT	Maximum Power of 3 Control Symbol	Correction Factor
5 MHz	1	65.85	(65.85 * 3 + Maximum radiated output power * 15)/ (Actual Measured Output Power *15)
	2	65.85	(65.85 * 3 + Maximum radiated output power * 15)/ (Actual Measured Output Power *15)
10 MHz	1	31.99	(31.99 * 3 + Maximum radiated output power * 15)/ (Actual Measured Output Power * 15)
	2	31.99	(31.99 * 3 + Maximum radiated output power * 15)/ (Actual Measured Output Power * 15)

For example;

The maximum power tolerance is 23.0±0.5 dBm

Max radiated output power of **5 MHz** is 23.5 dBm = 223.9 mW

The maximum power in 5 MHz control traffic is 65.85 mW (5/17 of 223.9 mW)

At 2498.5 MHz, QPSK 1/2

Scaled factor for 5 MHz bandwidth = (65.85 mW * 3 + 15 * 223.9 mW)/(15 * 207.0 mW) = **1.145**

Max radiated output power of **10 MHz** is 23.5 dBm = 223.9 mW

The maximum power in 10 MHz control traffic is 31.99 mW (5/35 of 223.9 mW)

At 2685 MHz, QPSK 1/2

Scaled factor for 10 MHz bandwidth = (31.99 mW * 3 + 15 * 223.9 mW)/(15 * 211.3 mW) = **1.090**

BW 5 MHz

TX antenna		ANT 1		ANT 2	
Channel (MHz)	Modulation	Measured Average Power (dBm)	Scaling Factor	Measured Average Power (dBm)	Scaling Factor
2498.5	QPSK 1/2	**23.16**	**1.145**	**23.14**	**1.151**
	16QAM 1/2	23.03	1.180	22.98	1.194
2593	QPSK 1/2	22.87	1.224	22.97	1.196
	16QAM 1/2	22.92	1.210	23.01	1.185
2687.5	QPSK 1/2	23.06	1.172	22.88	1.222
	16QAM 1/2	23.10	1.161	23.09	1.164

BW 10 MHz

TX antenna		ANT 1		ANT 2	
Channel (MHz)	Modulation	Measured Average Power (dBm)	Scaling Factor	Measured Average Power (dBm)	Scaling Factor
2501	QPSK 1/2	22.91	1.178	23.09	1.131
	16QAM 1/2	23.06	1.138	23.08	1.133
2593	QPSK 1/2	23.09	1.131	23.08	1.133
	16QAM 1/2	23.07	1.136	23.07	1.136
2685	QPSK 1/2	**23.21**	**1.100**	**23.25**	**1.090**
	16QAM 1/2	23.12	1.123	23.21	1.100

9.4 Duty Cycle & Time Vector Slots

5 MHz Channel BW (Tx 1)			
Channel	**Frequency (MHz)**	**QPSK 1/2 (%)**	**16QAM 1/2 (%)**
low	2498.5	31.41	31.41
10 MHz Channel BW (Tx 2)			
Channel	**Frequency (MHz)**	**QPSK 1/2 (%)**	**16QAM 1/2 (%)**
high	2685	31.41	31.41

Duty Cycle calculated formula = (mark 2 – Mark 1) / (Mark 3 – Mark 1) * 100 %

Spectrum Analyzer setting

Sweep time 6 ms

RBW 8 MHz

VBW 3 MHz

Span 0 Hz

Note;

For this device, the 3 Control symbols are invisible in the Time Vector plots. 15 traffic symbol s are transmitting at max. power and 3 control symbols are not active. So measured SAR was scaled with accordingly.

Also, we indicated the control symbol duration with red portion in the each Time Vector plots.

For example,

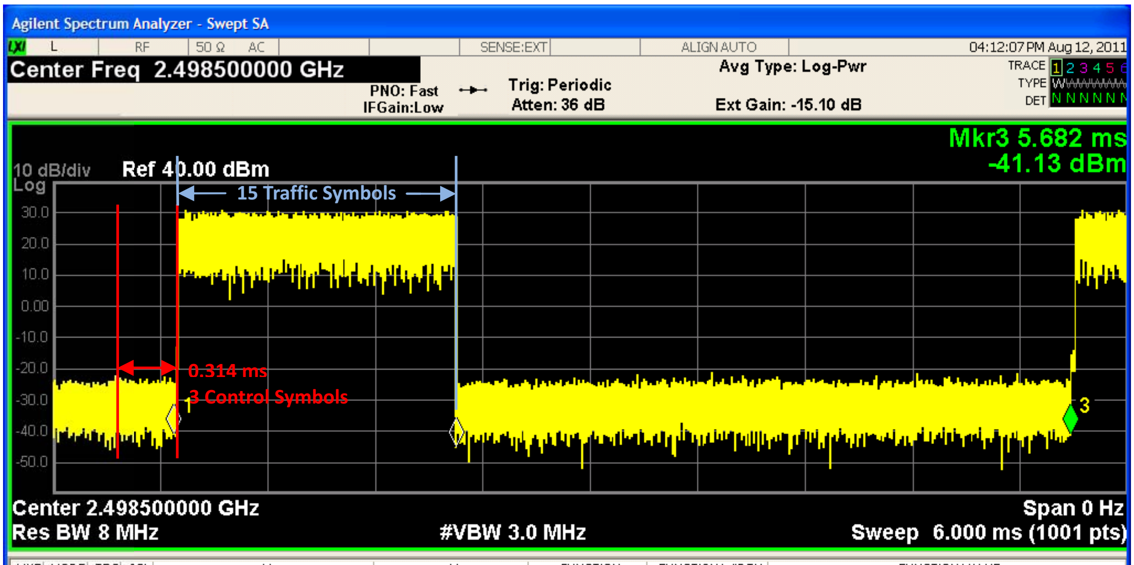
Ant1 5 MHz 2498.5 MHz configuration;

Frame length = Mark3- Mark1=5.460-0.456= 5.004 ms = about 5 ms

UL Data Symbols = Mark2- Mark1= 15 symbols UL time = 2.25-0.678 = 1.572 ms

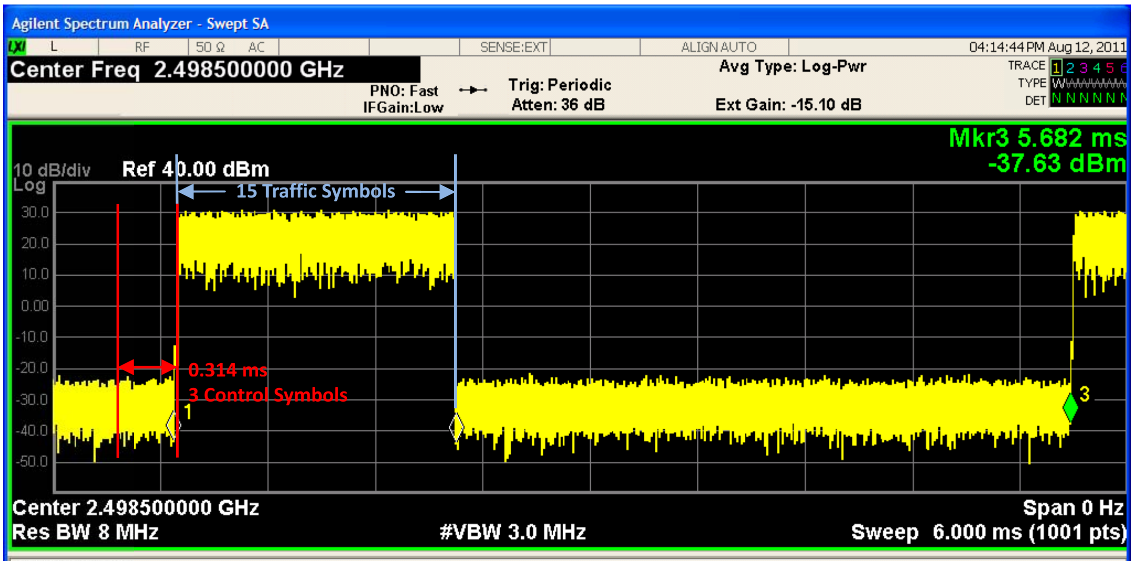
Duty Cycle=1.572/5.004 *100% = 31.41 %

5 MHz 2498.5 MHz QPSK 1/2 (Tx1)



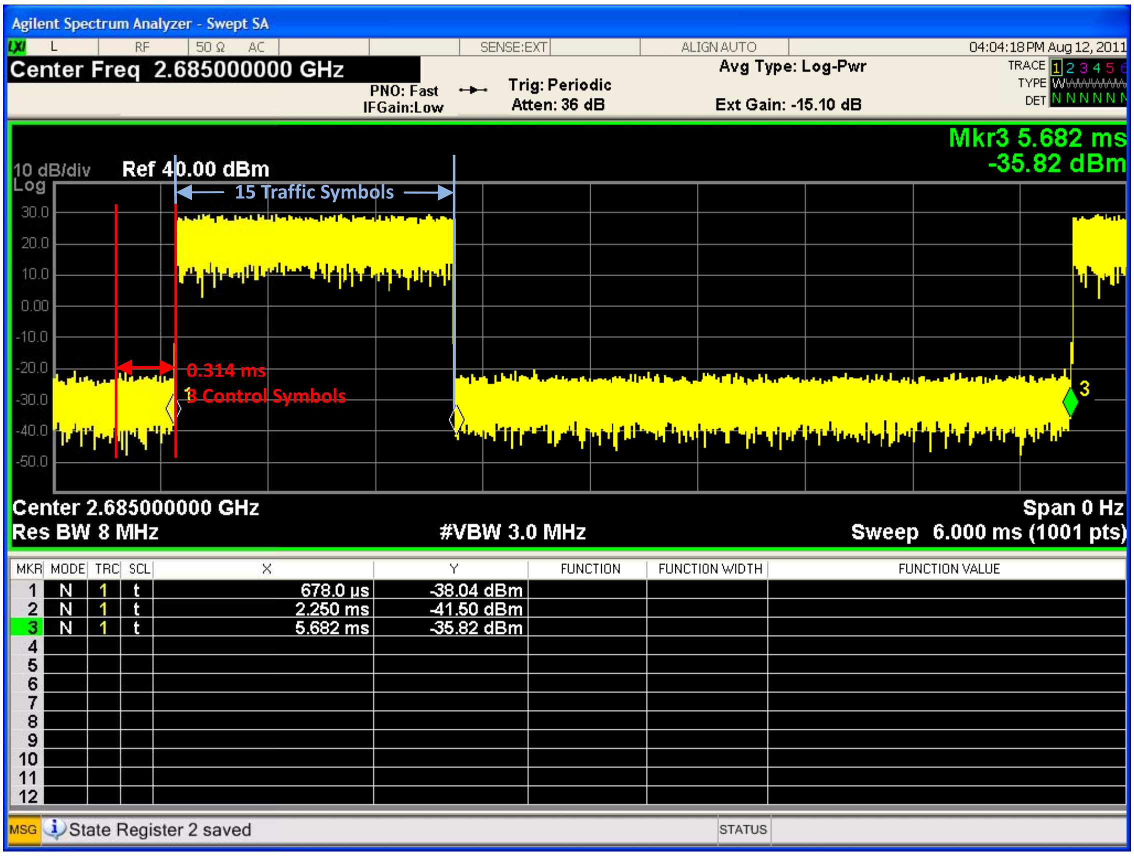
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	t	678.0 μs	-41.03 dBm			
2	N	1	t	2.250 ms	-45.26 dBm			
3	N	1	t	5.682 ms	-41.13 dBm			

5MHz 2498.5 MHz 16QAM 1/2 (Tx1)

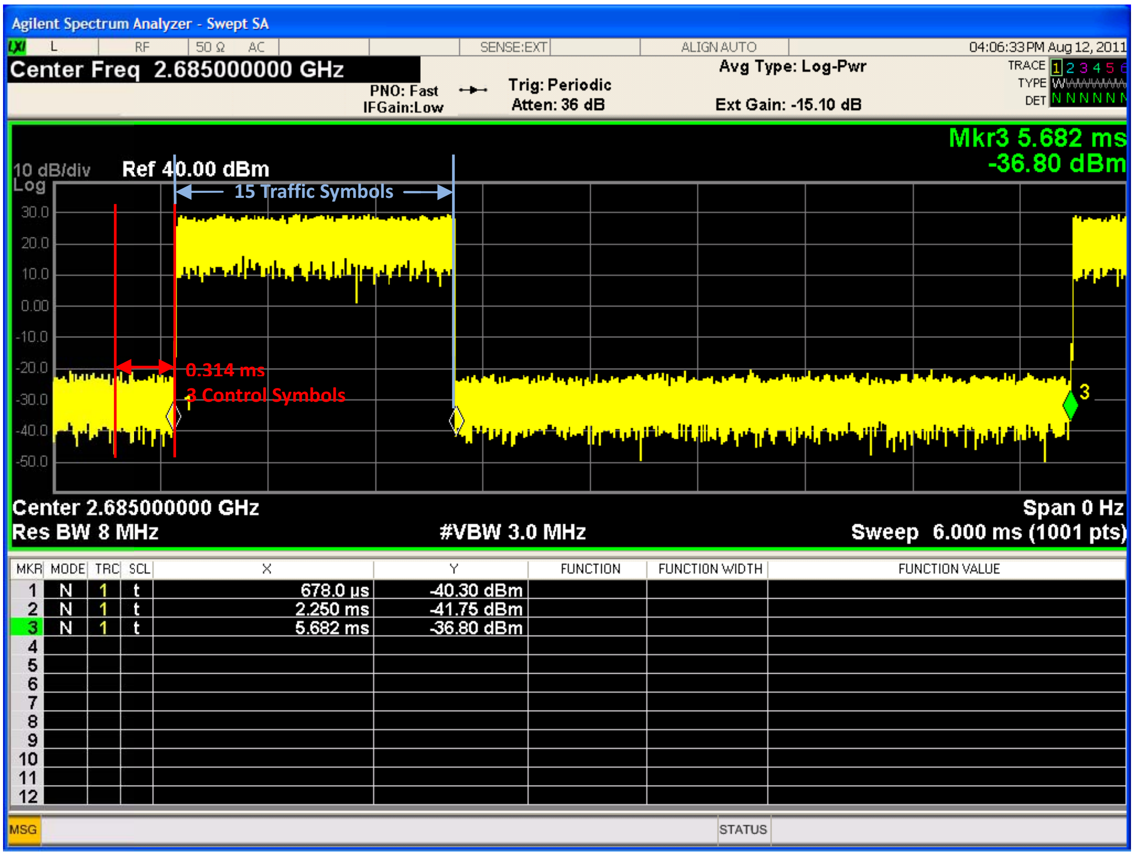


MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	t	678.0 μs	-40.65 dBm			
2	N	1	t	2.250 ms	-40.72 dBm			
3	N	1	t	5.682 ms	-45.39 dBm			

10MHz 2685 MHz QPSK 1/2 (Tx2)



10MHz 2685 MHz 16QAM 1/2 (Tx2)



9.5 PAPR and SAR Error Considerations

9.5.1 PEAK TO AVERAGE Conducted Power RATIO

BW 5 MHz

TX Antenna		ANT 1			ANT 2		
Channel (GHz)	Modulation	Average Power (dBm)	Peak Power (dBm)	PAR (dB)	Average Power dBm)	Peak Power (dBm)	PAR (dB)
2498.5	QPSK 1/2	**23.16**	29.49	6.33	**23.14**	29.5	6.36
	16QAM 1/2	23.03	29.20	6.17	22.98	29.29	6.31
2593	QPSK 1/2	22.87	29.20	6.33	22.97	29.44	6.47
	16QAM 1/2	22.92	29.31	6.39	23.01	29.29	6.28
2687.5	QPSK 1/2	23.06	29.53	6.47	22.88	29.28	6.40
	16QAM 1/2	23.10	29.69	6.59	23.09	29.44	6.35

BW 10 MHz

TX Antenna		ANT 1			ANT 2		
Channel (GHz)	Modulation	Average Power (dBm)	Peak Power (dBm)	PAR (dB)	Average Power dBm)	Peak Power (dBm)	PAR (dB)
2501	QPSK 1/2	22.91	29.31	6.40	23.09	29.46	6.37
	16QAM 1/2	23.06	29.38	6.32	23.08	29.45	6.37
2593	QPSK 1/2	23.09	29.53	6.44	23.08	29.39	6.31
	16QAM 1/2	23.07	29.24	6.17	23.07	29.49	6.42
2685	QPSK 1/2	**23.21**	29.46	6.25	**23.25**	29.53	6.28
	16QAM 1/2	23.12	29.39	6.27	23.21	29.51	6.30

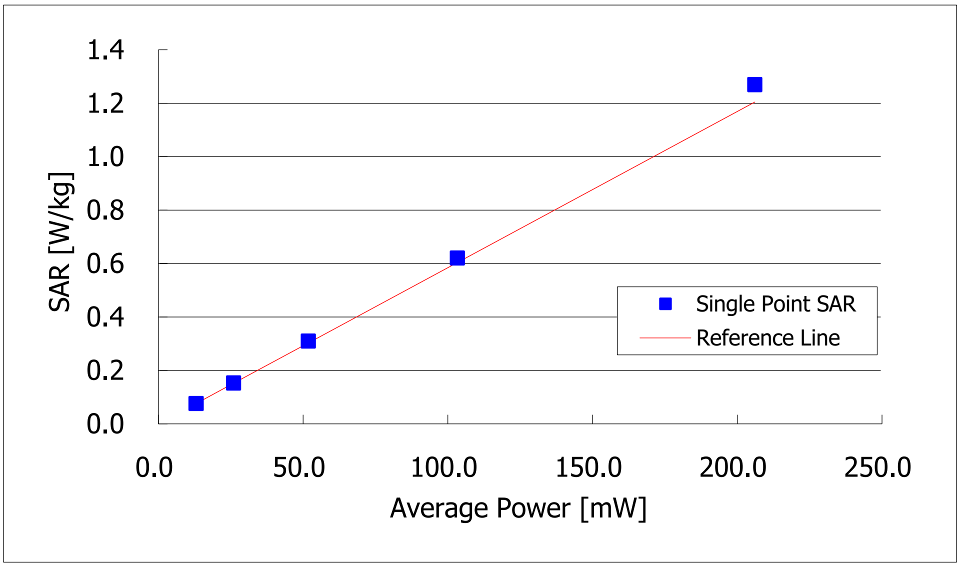
9.5.2 SAR Error Considerations

The SAR probe used in the measurements is calibrated with a sinusoidal CW signal. Since the DL:UL symbol ratio configuration used in the SAR tests provides a periodic uplink burst, the duty factor can be compensated by selecting the correct conversion factor (cf) for the SAR measurements. If the duty factor were non-periodic, compensation is typically not possible and substantial SAR measurement error could be expected. The high PAPR of OFDM/OFDMA is expected to introduce additional SAR measurement errors because the SAR probe is not calibrated for this type of random noise-like signals with large amplitude and phase variations within the bursts. The SAR error is also expected to vary with the average power and average PAPR at each measurement point, both temporally and spatially. In order to estimate the measurement error due to PAPR issues, the configuration with the highest SAR in each channel bandwidth and frequency band is measured at various power levels, from approximately 12.5 mW, in 3 dB steps, until the maximum power level is reached. As shown by the results and plot below, SAR is linear to power only when the probe sensors are operating within the square-law region. The results demonstrate that there is no SAR underestimation

Test Configuration: Horizontal B

Tx1 5 MHz QPSK 1/2 2593 MHz

Average Power (mW)	13.0	25.9	51.8	103.3	206.1
Single Point SAR (W/kg)	0.076	0.153	0.310	0.621	1.270
Reference Line (W/kg)	0.076	0.152	0.303	0.604	1.205
Deviation (%) from Ref. Line	0.00	0.90	2.46	2.87	5.44



According to the linearity calculation, estimated SAR value was calculated as follow;

Estimated SAR (mW/g)

2nd reference point = 0.076*(25.9/13) = 0.152

3rd reference point = 0.076*(51.8/13) = 0.303

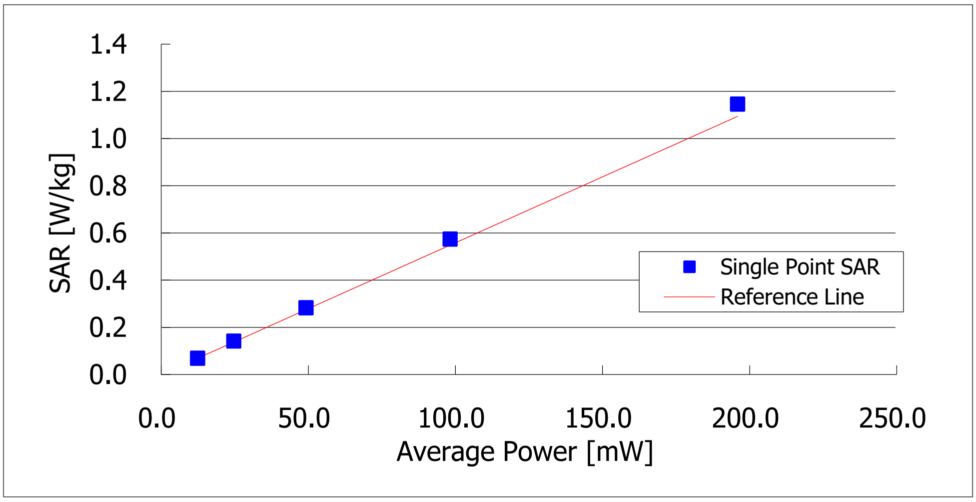
4nd reference point = 0.076*(103.3/13) = 0.604

5nd reference point = 0.076*(206.1/13) = 1.205

Test Configuration: Horizontal B

Tx1 5 MHz 16QAM 1/2 2593 MHz

Average Power (mW)	12.4	24.7	49.2	98.2	195.9
Single Point SAR (W/kg)	0.069	0.142	0.283	0.574	1.146
Reference Line (W/kg)	0.069	0.138	0.275	0.548	1.094
Deviation (%) from Ref. Line	0.00	3.14	3.02	4.73	4.79



According to the linearity calculation, estimated SAR value was calculated as follow;

Estimated SAR (mW/g)

2nd reference point = 0.069*(24.7/12.4) = 0.138

3rd reference point = 0.069*(49.2/12.4) = 0.275

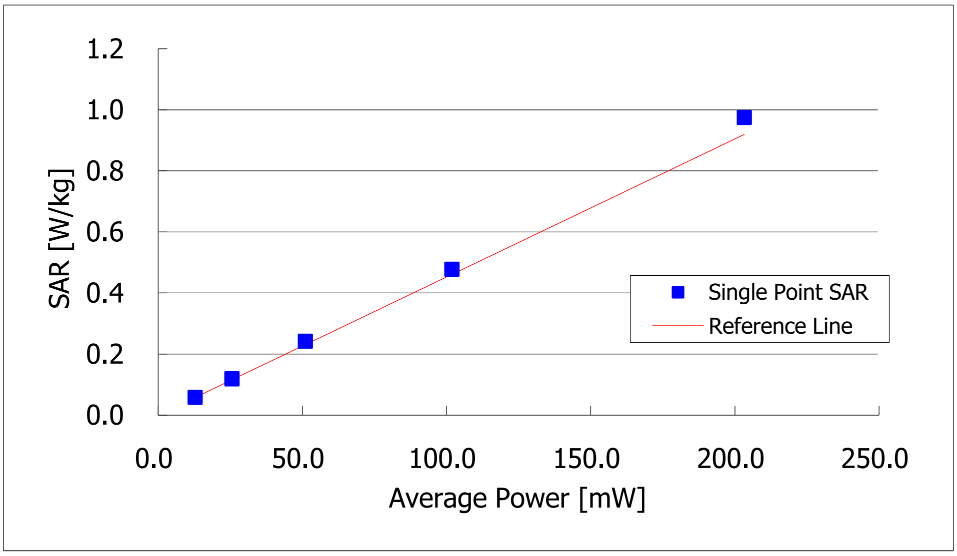
4nd reference point = 0.069*(98.2/12.4) = 0.548

5nd reference point = 0.069*(195.9/12.4) = 1.094

Test Configuration: Horizontal B

Tx 2 10 MHz QPSK 1/2 2593 MHz

Average Power (mW)	12.8	25.6	51.1	101.9	203.2
Single Point SAR (W/kg)	0.058	0.119	0.242	0.478	0.975
Reference Line (W/kg)	0.058	0.116	0.231	0.461	0.919
Deviation (%) from Ref. Line	0.00	2.83	4.81	3.75	6.07



According to the linearity calculation, estimated SAR value was calculated as follow;

Estimated SAR (mW/g)

2nd reference point = 0.058*(25.6/12.8) = 0.116

3rd reference point = 0.058*(51.1/12.8) = 0.231

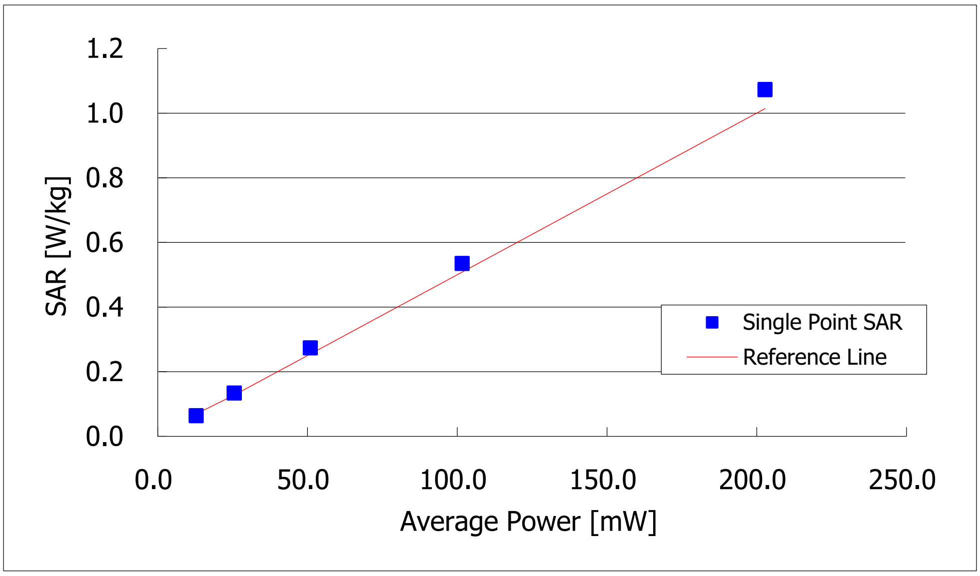
4nd reference point = 0.058*(101.9/12.8) = 0.461

5nd reference point = 0.058*(203.2/12.8) = 0.919

Test Configuration: Horizontal B

Tx2 10 MHz 16QAM 1/2 2593 MHz

Average Power (mW)	12.8	25.5	50.9	101.6	202.8
Single Point SAR (W/kg)	0.064	0.134	0.274	0.535	1.073
Reference Line (W/kg)	0.069	0.128	0.255	0.508	1.014
Deviation (%) from Ref. Line	0.00	4.94	7.54	5.24	5.78



According to the linearity calculation, estimated SAR value was calculated as follow;

Estimated SAR (mW/g)

2nd reference point = 0.078*(24.5/12.3) = 0.156

3nd reference point = 0.078*(49/12.3) = 0.311

4nd reference point = 0.078*(97.7/12.3) = 0.620

5nd reference point = 0.078*(195/12.3) = 1.236

SAR Linearity Test Setup description

- Placing USB dongle with 0.5 cm air-gap separation distance.
- The Probe was moved to the location of Maximum SAR.
- Then, perform single point SAR measurement using "multi-meter job" from around 12.5 mW with 3dB step until the max. power is achieved.

10. SAR TEST DATA SUMMARY

10.1 Measurement Results (WIMAX2600 5MHz QPSK 1/2) Ant 1

Frequency	Conducted Power (dBm)		Configuration	Separation Distance	Antenna Type	Measured SAR(mW/g)	Scaling Factor	Scaled SAR(mW/g)
MHz	Begin	End						
2 498.5	23.16	23.25	Horizontal up	5 mm	Intenna	0.215	1.145	0.246
2 498.5	23.16	22.99	Horizontal down	5 mm	Intenna	0.966	1.145	1.106
2 593	22.87	22.81	Horizontal down	5 mm	Intenna	1.01	1.224	1.236
2 687.5	23.06	23.05	Horizontal down	5 mm	Intenna	0.687	1.172	0.805
2 498.5	23.16	23.02	Vertical front	5 mm	Intenna	0.14	1.145	0.160
2 498.5	23.16	23.06	Vertical back	5 mm	Intenna	0.487	1.145	0.558
2 498.5	23.16	23.15	Top	5 mm	Intenna	0.219	1.145	0.251
ANSI/ IEEE C95.1 1992 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population					**Body 1.6 W/kg (mW/g)** Averaged over 1 gram			

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Power Supply Power supplied through host device (TOSHIBA)
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 All side of the device were tested.
8 Test Configuration ☐ With Holster ☒ Without Holster
The EUT was fixed by using a Styrofoam to avoid perturbation due to the device holder clamps.
9 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
10 Justification for Reduced test configurations per Oct. 2010 TCB Workshop:
Test each channel bandwidth and modulation independently
- Use the lowest coding rate for each modulation when the same rated maximum output applies to all coding rates in a modulation.
- Test higher coding rates only if the rated maximum output is higher
- Use the scaled SAR to determine test reduction (<0.8 W/kg etc.)
- For each channel bandwidth, if QPSK SAR is < 0.8 W/kg and maximum power > 16 QAM, test highest output channel for 16 QAM.
- QPSK SAR is between 0.8 and 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK
- QPSK SAR is > 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK; and if the 16QAM SAR is > 1.2, test all channels in 16QAM
11 Simultaneous CDMA+Wimax operation is not possible.
12 KDB447498 D02 V02 and KDB 615223 D01 V01 were applied for SAR evaluation of the device.

10.2 Measurement Results (WIMAX2600 5MHz 16QAM 1/2) Ant 1

Frequency	Conducted Power (dBm)		Configuration	Separation Distance	Antenna Type	Measured SAR(mW/g)	Scaling Factor	Scaled SAR(mW/g)
MHz	Begin	End						
2 498.5	23.03	22.96	Horizontal down	5 mm	Intenna	0.999	1.180	1.179
2 593	22.92	22.75	Horizontal down	5 mm	Intenna	1.07	1.210	1.295
2 687.5	23.10	22.97	Horizontal down	5 mm	Intenna	0.704	1.161	0.817
ANSI/ IEEE C95.1 1992 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population					**Body 1.6 W/kg (mW/g)** Averaged over 1 gram			

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Power Supply Power supplied through host device (TOSHIBA)
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 All side of the device were tested.
8 Test Configuration ☐ With Holster ☒ Without Holster
The EUT was fixed by using a Styrofoam to avoid perturbation due to the device holder clamps.
9 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
10 Justification for Reduced test configurations per Oct. 2010 TCB Workshop:
Test each channel bandwidth and modulation independently
- Use the lowest coding rate for each modulation when the same rated maximum output applies to all coding rates in a modulation.
- Test higher coding rates only if the rated maximum output is higher
- Use the scaled SAR to determine test reduction (<0.8 W/kg etc.)
- For each channel bandwidth, if QPSK SAR is < 0.8 W/kg and maximum power > 16 QAM, test highest output channel for 16 QAM.
- QPSK SAR is between 0.8 and 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK
- QPSK SAR is > 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK; and if the 16QAM SAR is > 1.2, test all channels in 16QAM
11 Simultaneous CDMA+Wimax operation is not possible.
12 KDB447498 D02 V02 and KDB 615223 D01 V01 were applied for SAR evaluation of the device.

10.3 Measurement Results (WIMAX2600 10MHz QPSK 1/2) Ant 1

Frequency	Conducted Power (dBm)		Configuration	Separation Distance	Antenna Type	Measured SAR(mW/g)	Scaling Factor	Scaled SAR(mW/g)
MHz	Begin	End						
2685	23.21	23.16	Horizontal up	5 mm	Intenna	0.289	1.100	0.318
2685	23.21	23.17	Horizontal down	5 mm	Intenna	0.677	1.100	0.745
2685	23.21	23.24	Vertical front	5 mm	Intenna	0.074	1.100	0.081
2685	23.21	23.17	Vertical back	5 mm	Intenna	0.274	1.100	0.301
2685	23.21	23.24	Top	5 mm	Intenna	0.198	1.100	0.218
ANSI/ IEEE C95.1 1992 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population					**Body 1.6 W/kg (mW/g)** Averaged over 1 gram			

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Power Supply Power supplied through host device (TOSHIBA)
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 All side of the device were tested.
8 Test Configuration ☐ With Holster ☒ Without Holster
The EUT was fixed by using a Styrofoam to avoid perturbation due to the device holder clamps.
9 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
10 Justification for Reduced test configurations per Oct. 2010 TCB Workshop:
Test each channel bandwidth and modulation independently
- Use the lowest coding rate for each modulation when the same rated maximum output applies to all coding rates in a modulation.
- Test higher coding rates only if the rated maximum output is higher
- Use the scaled SAR to determine test reduction (<0.8 W/kg etc.)
- For each channel bandwidth, if QPSK SAR is < 0.8 W/kg and maximum power > 16 QAM, test highest output channel for 16 QAM.
- QPSK SAR is between 0.8 and 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK
- QPSK SAR is > 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK; and if the 16QAM SAR is > 1.2, test all channels in 16QAM
11 Simultaneous CDMA+Wimax operation is not possible.
12 KDB447498 D02 V02 and KDB 615223 D01 V01 were applied for SAR evaluation of the device.

10.4 Measurement Results (WIMAX2600 5MHz QPSK 1/2) Ant 2

Frequency	Conducted Power (dBm)		Configuration	Separation Distance	Antenna Type	Measured SAR(mW/g)	Scaling Factor	Scaled SAR(mW/g)
MHz	Begin	End						
2 498.5	23.14	23.21	Horizontal up	5 mm	Intenna	0.339	1.151	0.390
2 498.5	23.14	23.07	Horizontal down	5 mm	Intenna	1.08	1.151	1.243
2 593	22.97	22.88	Horizontal down	5 mm	Intenna	0.896	1.196	1.072
2 687	22.88	22.90	Horizontal down	5 mm	Intenna	0.849	1.222	1.037
2 498.5	23.14	22.95	Vertical front	5 mm	Intenna	0.428	1.151	0.493
2 498.5	23.14	23.15	Vertical back	5 mm	Intenna	0.097	1.151	0.112
2 498.5	23.14	23.20	Top	5 mm	Intenna	0.049	1.151	0.056
ANSI/ IEEE C95.1 1992 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population					**Body 1.6 W/kg (mW/g)** Averaged over 1 gram			

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Power Supply   Power supplied through host device (TOSHIBA)
6 Test Signal Call Mode   ☐ Manual Test cord   ☒ Base Station Simulator
7 All side of the device were tested.
8 Test Configuration   ☐ With Holster   ☒ Without Holster
The EUT was fixed by using a Styrofoam to avoid perturbation due to the device holder clamps.
9 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
10 Justification for Reduced test configurations per Oct. 2010 TCB Workshop:
Test each channel bandwidth and modulation independently
- Use the lowest coding rate for each modulation when the same rated maximum output applies to all coding rates in a modulation.
- Test higher coding rates only if the rated maximum output is higher
- Use the scaled SAR to determine test reduction (<0.8 W/kg etc.)
- For each channel bandwidth, if QPSK SAR is < 0.8 W/kg and maximum power > 16 QAM, test highest output channel for 16 QAM.
- QPSK SAR is between 0.8 and 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK
- QPSK SAR is > 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK; and if the 16QAM SAR is > 1.2, test all channels in 16QAM

11 Simultaneous CDMA+Wimax operation is not possible.
12 KDB447498 D02 V02 and KDB 615223 D01 V01 were applied for SAR evaluation of the device.

10.5 Measurement Results (WIMAX2600 5MHz 16QAM 1/2) Ant 2

Frequency	Conducted Power (dBm)		Configuration	Separation Distance	Antenna Type	Measured SAR(mW/g)	Scaling Factor	Scaled SAR(mW/g)
MHz	Begin	End						
2 498.5	22.98	22.90	Horizontal down	5 mm	Intenna	0.832	1.194	0.993
ANSI/ IEEE C95.1 1992 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population					**Body 1.6 W/kg (mW/g)** Averaged over 1 gram			

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Power Supply Power supplied through host device (TOSHIBA)
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 All side of the device were tested.
8 Test Configuration ☐ With Holster ☒ Without Holster
The EUT was fixed by using a Styrofoam to avoid perturbation due to the device holder clamps.
9 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
10 Justification for Reduced test configurations per Oct. 2010 TCB Workshop:
Test each channel bandwidth and modulation independently
- Use the lowest coding rate for each modulation when the same rated maximum output applies to all coding rates in a modulation.
- Test higher coding rates only if the rated maximum output is higher
- Use the scaled SAR to determine test reduction (<0.8 W/kg etc.)
- For each channel bandwidth, if QPSK SAR is < 0.8 W/kg and maximum power > 16 QAM, test highest output channel for 16 QAM.
- QPSK SAR is between 0.8 and 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK
- QPSK SAR is > 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK; and if the 16QAM SAR is > 1.2, test all channels in 16QAM
11 Simultaneous CDMA+Wimax operation is not possible.
12 KDB447498 D02 V02 and KDB 615223 D01 V01 were applied for SAR evaluation of the device.

10.6 Measurement Results (WIMAX2600 10MHz QPSK 1/2) Ant 2

Frequency	Conducted Power (dBm)		Configuration	Separation Distance	Antenna Type	Measured SAR(mW/g)	Scaling Factor	Scaled SAR(mW/g)
MHz	Begin	End						
2685	23.05	23.05	Horizontal up	5 mm	Intenna	0.516	1.090	0.562
2501	23.09	23.07	Horizontal down	5 mm	Intenna	0.856	1.131	0.968
2593	23.08	23.05	Horizontal down	5 mm	Intenna	0.869	1.133	0.985
2685	23.05	22.94	Horizontal down	5 mm	Intenna	0.838	1.090	0.913
2685	23.05	23.02	Vertical front	5 mm	Intenna	0.609	1.090	0.664
2685	23.05	23.07	Vertical back	5 mm	Intenna	0.073	1.090	0.080
2685	23.05	22.91	Top	5 mm	Intenna	0.127	1.090	0.138
ANSI/ IEEE C95.1 1992 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population					**Body 1.6 W/kg (mW/g)** Averaged over 1 gram			

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Power Supply Power supplied through host device (TOSHIBA)
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 All side of the device were tested.
8 Test Configuration ☐ With Holster ☒ Without Holster
The EUT was fixed by using a Styrofoam to avoid perturbation due to the device holder clamps.
9 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
10 Justification for Reduced test configurations per Oct. 2010 TCB Workshop:
Test each channel bandwidth and modulation independently
- Use the lowest coding rate for each modulation when the same rated maximum output applies to all coding rates in a modulation.
- Test higher coding rates only if the rated maximum output is higher
- Use the scaled SAR to determine test reduction (<0.8 W/kg etc.)
- For each channel bandwidth, if QPSK SAR is < 0.8 W/kg and maximum power > 16 QAM, test highest output channel for 16 QAM.
- QPSK SAR is between 0.8 and 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK
- QPSK SAR is > 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK; and if the 16QAM SAR is > 1.2, test all channels in 16QAM
11 Simultaneous CDMA+Wimax operation is not possible.
12 KDB447498 D02 V02 and KDB 615223 D01 V01 were applied for SAR evaluation of the device.

10.7 Measurement Results (WIMAX2600 10MHz 16QAM 1/2) Ant 2

Frequency	Conducted Power (dBm)		Configuration	Separation Distance	Antenna Type	Measured SAR(mW/g)	Scaling Factor	Scaled SAR(mW/g)
MHz	Begin	End						
2593	23.07	23.04	Horizontal down	5 mm	Intenna	0.839	1.136	0.953
ANSI/ IEEE C95.1 1992 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population					**Body 1.6 W/kg (mW/g)** Averaged over 1 gram			

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Power Supply Power supplied through host device (TOSHIBA)
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 All side of the device were tested.
8 Test Configuration ☐ With Holster ☒ Without Holster
The EUT was fixed by using a Styrofoam to avoid perturbation due to the device holder clamps.
9 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
10 Justification for Reduced test configurations per Oct. 2010 TCB Workshop:
Test each channel bandwidth and modulation independently
- Use the lowest coding rate for each modulation when the same rated maximum output applies to all coding rates in a modulation.
- Test higher coding rates only if the rated maximum output is higher
- Use the scaled SAR to determine test reduction (<0.8 W/kg etc.)
- For each channel bandwidth, if QPSK SAR is < 0.8 W/kg and maximum power > 16 QAM, test highest output channel for 16 QAM.
- QPSK SAR is between 0.8 and 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK
- QPSK SAR is > 1.2 W/kg, test 16QAM using the highest SAR channel in QPSK; and if the 16QAM SAR is > 1.2, test all channels in 16QAM
11 Simultaneous CDMA+Wimax operation is not possible.
12 KDB447498 D02 V02 and KDB 615223 D01 V01 were applied for SAR evaluation of the device.

11. CONCLUSION

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the ANSI/ IEEE C95.1 1992.

These measurements are taken to simulate the RF effects exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests.

12. REFERENCES

[1] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields, July 2001.

[2] IEEE Standards Coordinating Committee 34 – IEEE Std. 1528-2003, IEE Recommended Practice or Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices.

[3] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radio frequency Radiation, Aug. 1996.

[4] ANSI/IEEE C95.1 - 1991, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 kHz to 100 GHz, New York: IEEE, Aug. 1992

[5] ANSI/IEEE C95.3 - 1991, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, 1992.

[6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for Radio Frequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 120-124.

[9]K. Pokoviº, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Head Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300 MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[13] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectro magnetics, Canada: 1987, pp. 29-36.

[14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[15] W. Gander, Computer mathematick, Birkhaeuser, Basel, 1992.

[16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[17] Federal Communications Commission, OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. Supplement C, Dec. 1997.

[18] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[19] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10 kHz-300 GHz, Jan. 1995.

[20] Prof. Dr. Niels Kuster, ETH, EidgenØssische Technische Hoschschule Zòrich, Dosimetric Evaluation of the Cellular Phone.

[21] Mobile and Portable Device RF Exposure Equipment Authorization Procedures #447498.

Attachment 1. – SAR Test Plots

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: Bar; Serial: #1

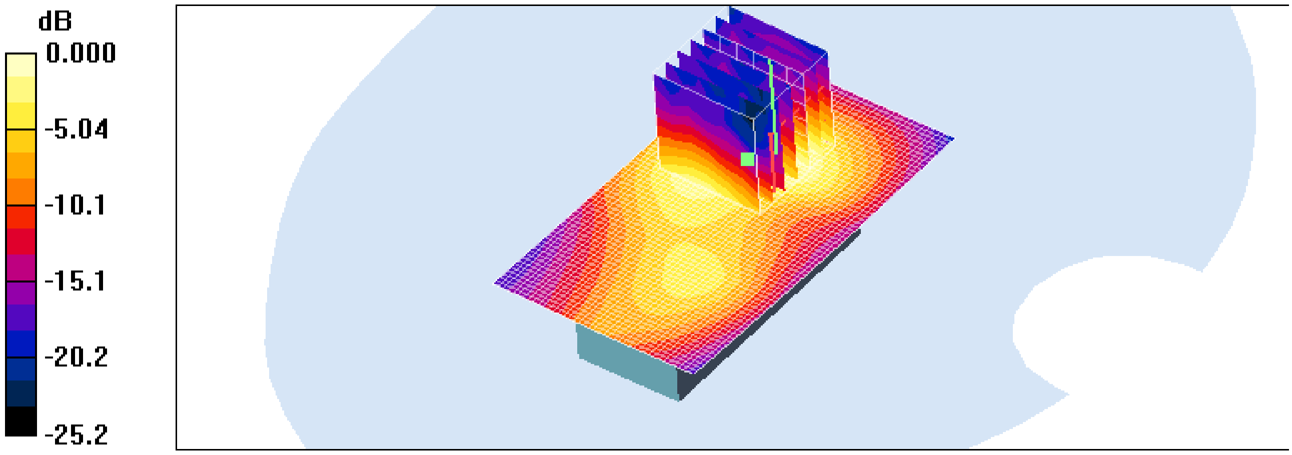
Communication System: WiMAX 2600MHz FCC; Frequency: 2498.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2498.5 MHz; σ = 2.02 mho/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx1 5M QPSK 1/2 Horizontal Up 2498.5MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.237 mW/g

WIMAX Tx1 5M QPSK 1/2 Horizontal Up 2498.5MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.85 V/m; Power Drift = 0.094 dB
Peak SAR (extrapolated) = 0.518 W/kg
SAR(1 g) = 0.215 mW/g; SAR(10 g) = 0.087 mW/g
Maximum value of SAR (measured) = 0.251 mW/g



0 dB = 0.251mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2498.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2498.5 MHz; σ = 2.02 mho/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

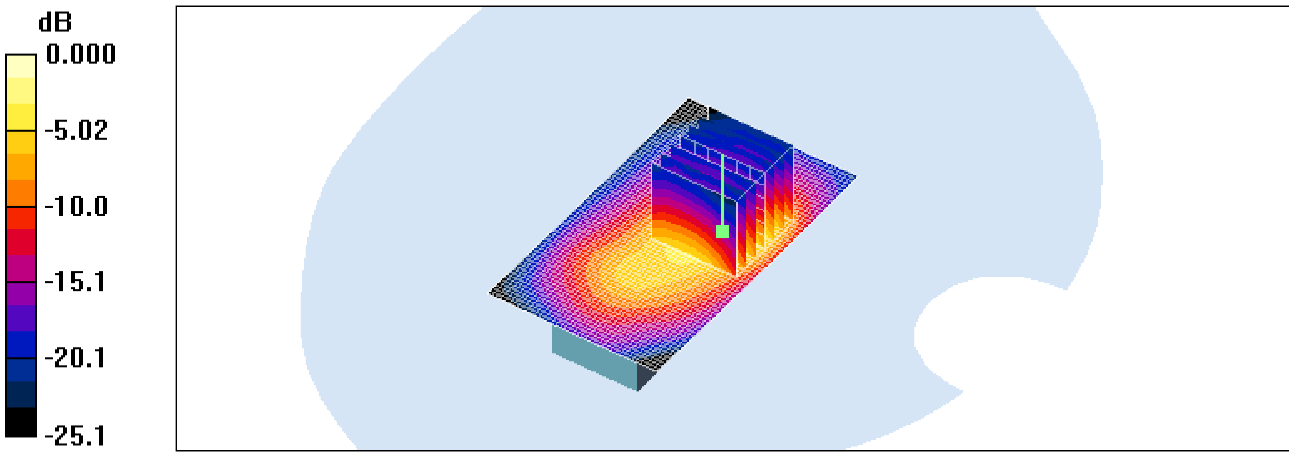
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx1 5M QPSK 1/2 Horizontal Down 2498.5MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.20 mW/g

WIMAX Tx1 5M QPSK 1/2 Horizontal Down 2498.5MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.6 V/m; Power Drift = -0.173 dB
Peak SAR (extrapolated) = 2.35 W/kg
SAR(1 g) = 0.966 mW/g; SAR(10 g) = 0.398 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.11 mW/g



0 dB = 1.11mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2593 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2593 MHz; σ = 2.15 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

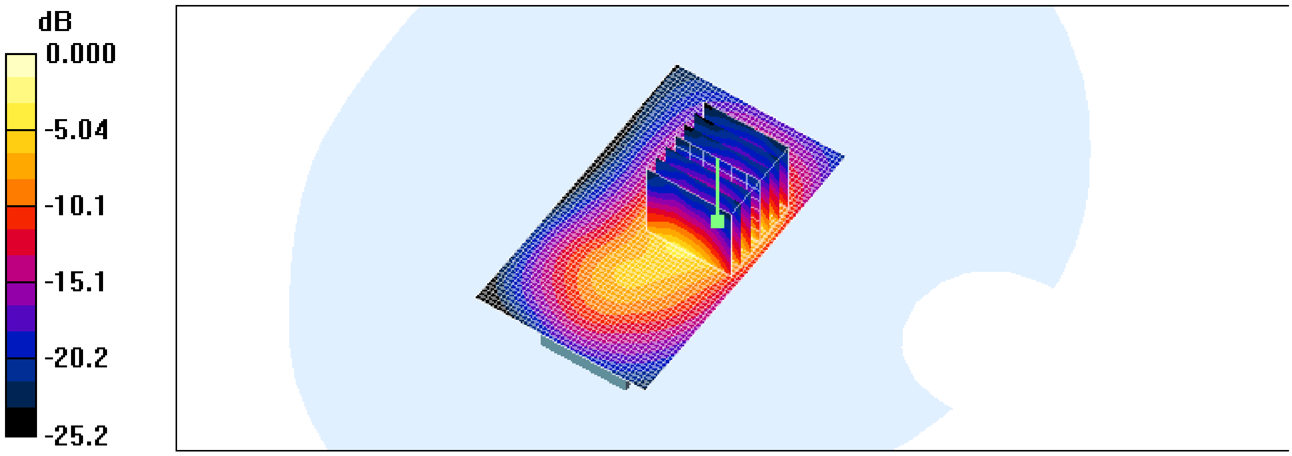
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx1 5M QPSK 1/2 Horizontal Down 2593MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.20 mW/g

WIMAX Tx1 5M QPSK 1/2 Horizontal Down 2593MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.87 V/m; Power Drift = -0.064 dB
Peak SAR (extrapolated) = 2.50 W/kg
SAR(1 g) = 1.01 mW/g; SAR(10 g) = 0.408 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.24 mW/g



0 dB = 1.24mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2687.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2687.5 MHz; σ = 2.28 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

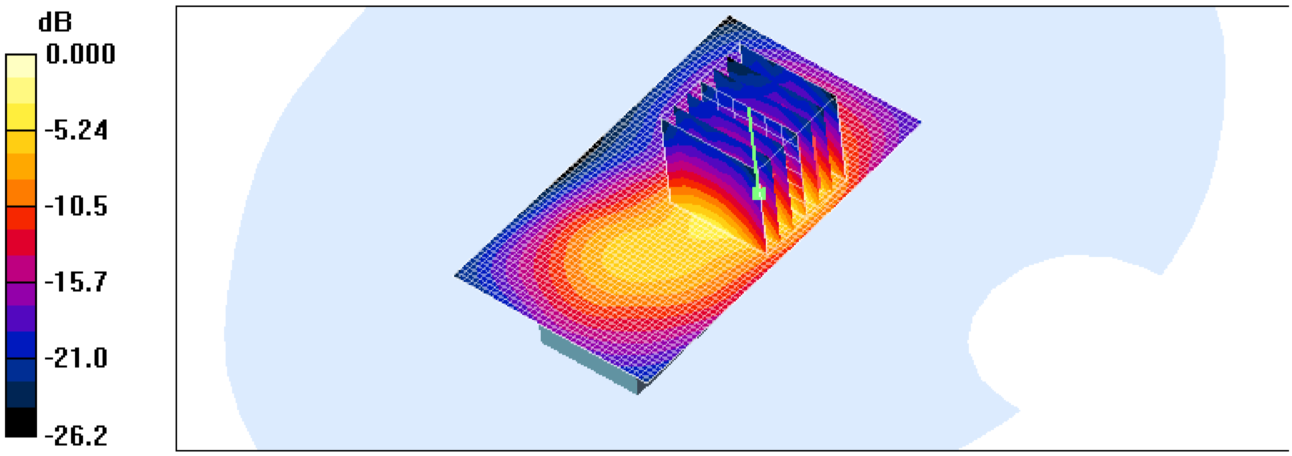
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx1 5M QPSK 1/2 Horizontal Down 2687MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.777 mW/g

WIMAX Tx1 5M QPSK 1/2 Horizontal Down 2687MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.12 V/m; Power Drift = -0.010 dB
Peak SAR (extrapolated) = 1.68 W/kg
SAR(1 g) = 0.687 mW/g; SAR(10 g) = 0.270 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.807 mW/g



0 dB = 0.807mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: side; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2498.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2498.5 MHz; σ = 2.02 mho/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

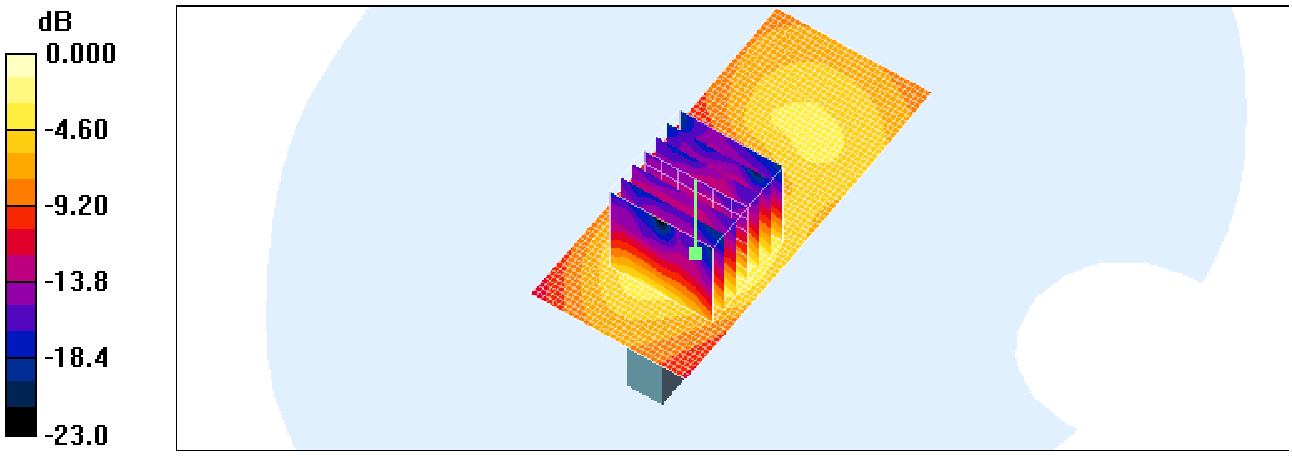
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Wimax Tx1 5M QPSK 1/2 Vertical Front 2498.5MHz/Area Scan (31x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.164 mW/g

Wimax Tx1 5M QPSK 1/2 Vertical Front 2498.5MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.23 V/m; Power Drift = -0.143 dB
Peak SAR (extrapolated) = 0.281 W/kg
SAR(1 g) = 0.140 mW/g; SAR(10 g) = 0.067 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.158 mW/g



0 dB = 0.158mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: side; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2498.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2498.5 MHz; σ = 2.02 mho/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

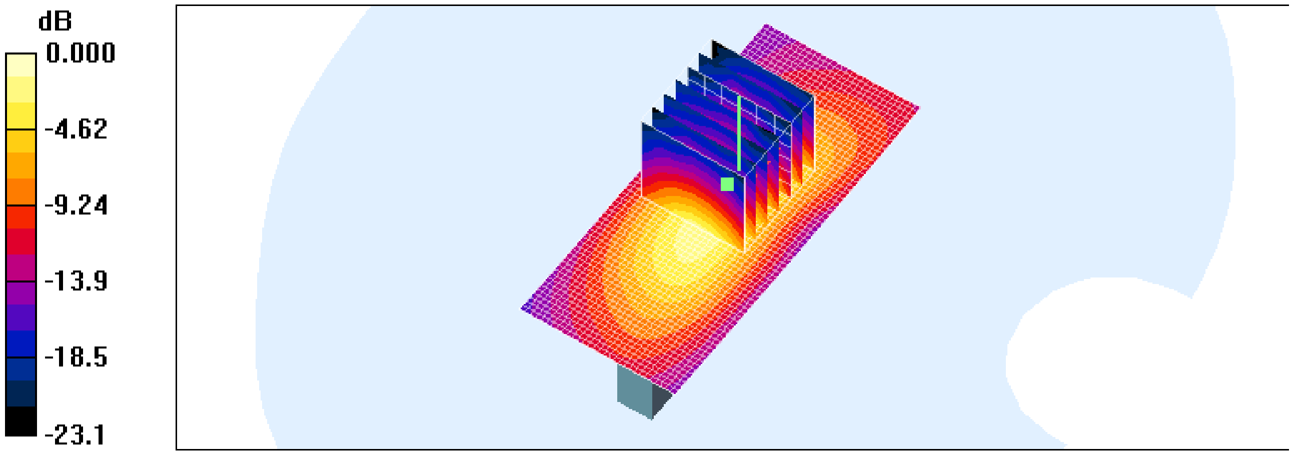
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Wimax Tx1 5M QPSK 1/2 Vertical Back 2498.5MHz/Area Scan (31x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.528 mW/g

Wimax Tx1 5M QPSK 1/2 Vertical Back 2498.5MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.0 V/m; Power Drift = -0.098 dB
Peak SAR (extrapolated) = 1.17 W/kg
SAR(1 g) = 0.487 mW/g; SAR(10 g) = 0.200 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.568 mW/g



0 dB = 0.568mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2498.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2498.5 MHz; σ = 2.02 mho/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

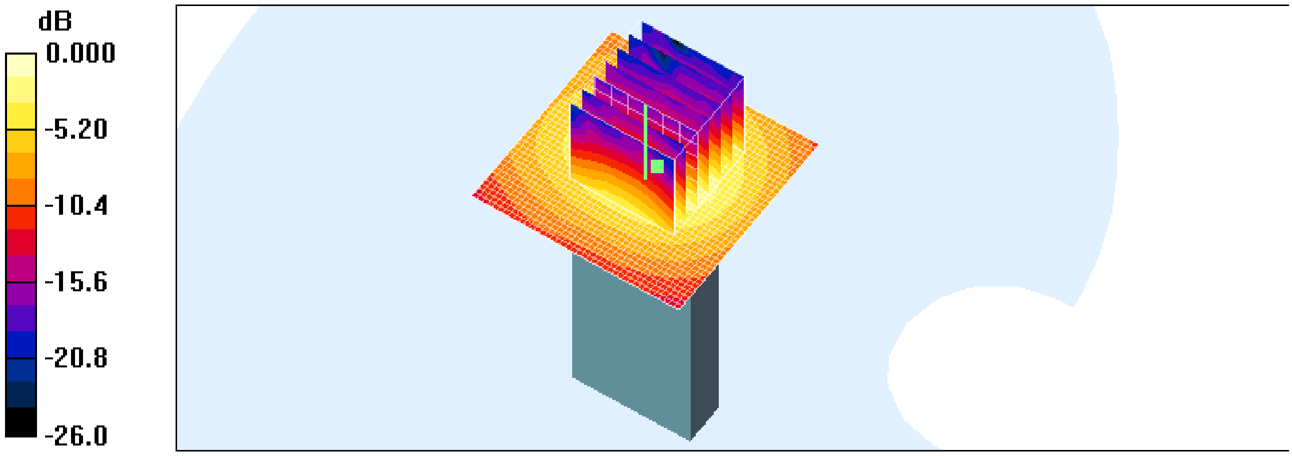
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Wimax Tx1 5M QPSK 1/2 Top 2495.5MHz/Area Scan (41x41x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.242 mW/g

Wimax Tx1 5M QPSK 1/2 Top 2495.5MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.1 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 0.433 W/kg
SAR(1 g) = 0.219 mW/g; SAR(10 g) = 0.105 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.255 mW/g



0 dB = 0.255mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	USB Dongle
Liquid Temperature:	21.3 ℃
Ambient Temperature:	21.5 ℃
Test Date:	Aug.12, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2498.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2498.5 MHz; σ = 2.02 mho/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

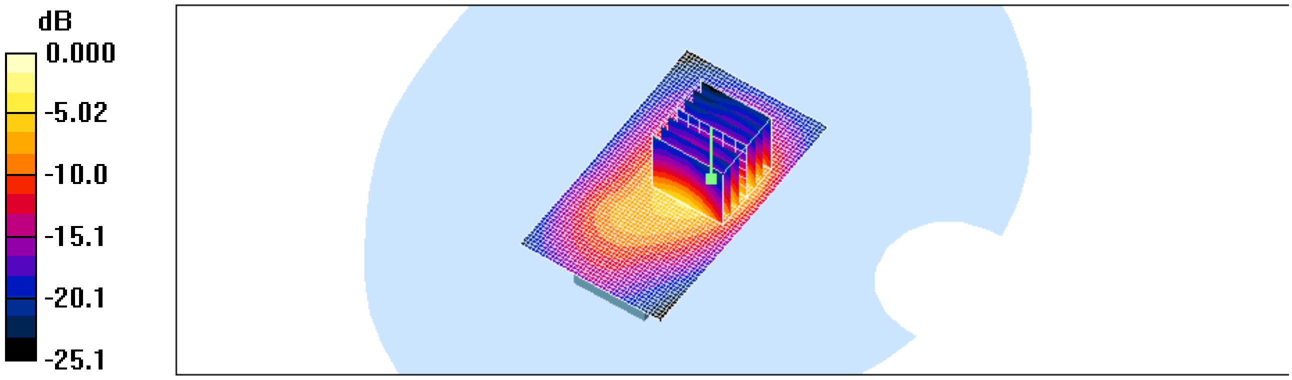
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx1 5M 16QAM 1/2 Horizontal Down 2498.5MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.18 mW/g

WIMAX Tx1 5M 16QAM 1/2 Horizontal Down 2498.5MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.6 V/m; Power Drift = -0.072 dB
Peak SAR (extrapolated) = 2.45 W/kg
SAR(1 g) = 0.999 mW/g; SAR(10 g) = 0.405 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.17 mW/g



0 dB = 1.17mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2593 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2593 MHz; σ = 2.15 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

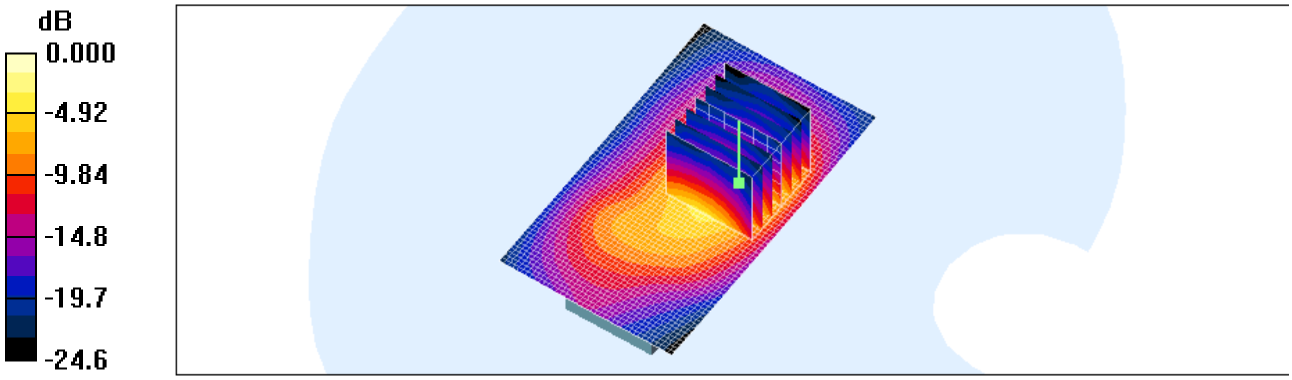
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx1 5M 16QAM 1/2 Horizontal Down 2593MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.24 mW/g

WIMAX Tx1 5M 16QAM 1/2 Horizontal Down 2593MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.4 V/m; Power Drift = -0.167 dB
Peak SAR (extrapolated) = 2.70 W/kg
SAR(1 g) = 1.07 mW/g; SAR(10 g) = 0.417 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.26 mW/g



0 dB = 1.26mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	USB Dongle
Liquid Temperature:	21.3 ℃
Ambient Temperature:	21.5 ℃
Test Date:	Aug.12, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2687.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2687.5 MHz; σ = 2.28 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

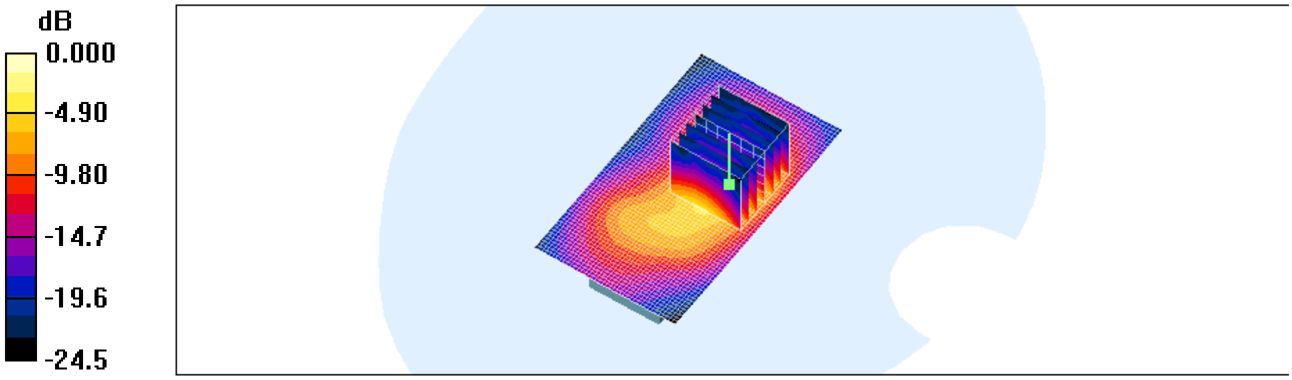
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx1 5M 16QAM 1/2 Horizontal Down 2687MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.731 mW/g

WIMAX Tx1 5M 16QAM 1/2 Horizontal Down 2687MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.42 V/m; Power Drift = -0.130 dB
Peak SAR (extrapolated) = 1.82 W/kg
SAR(1 g) = 0.704 mW/g; SAR(10 g) = 0.272 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.829 mW/g



0 dB = 0.829mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2685 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2685 MHz; σ = 2.28 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

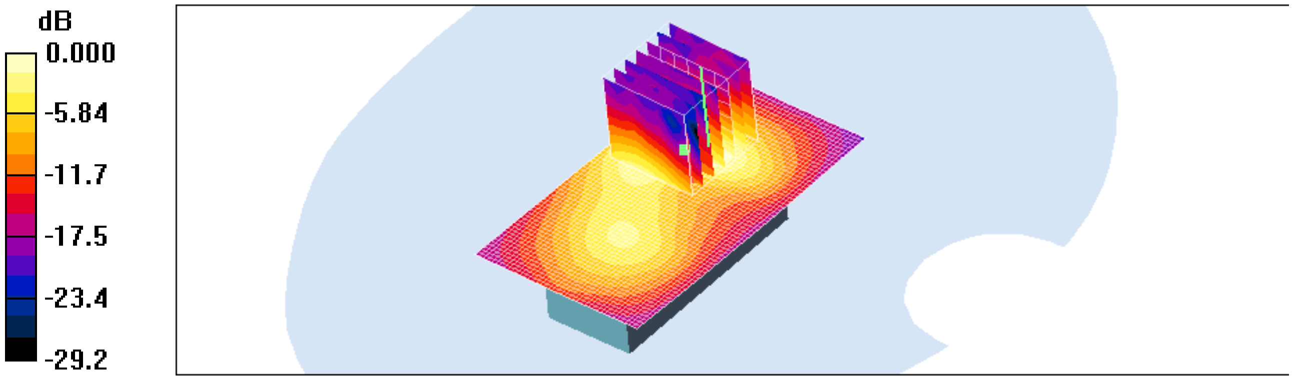
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx1 10M QPSK 1/2 Horizontal Up 736ch/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.356 mW/g

WIMAX Tx1 10M QPSK 1/2 Horizontal Up 736ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.5 V/m; Power Drift = -0.047 dB
Peak SAR (extrapolated) = 0.702 W/kg
SAR(1 g) = 0.289 mW/g; SAR(10 g) = 0.117 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.357 mW/g



0 dB = 0.357mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2685 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2685 MHz; σ = 2.28 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

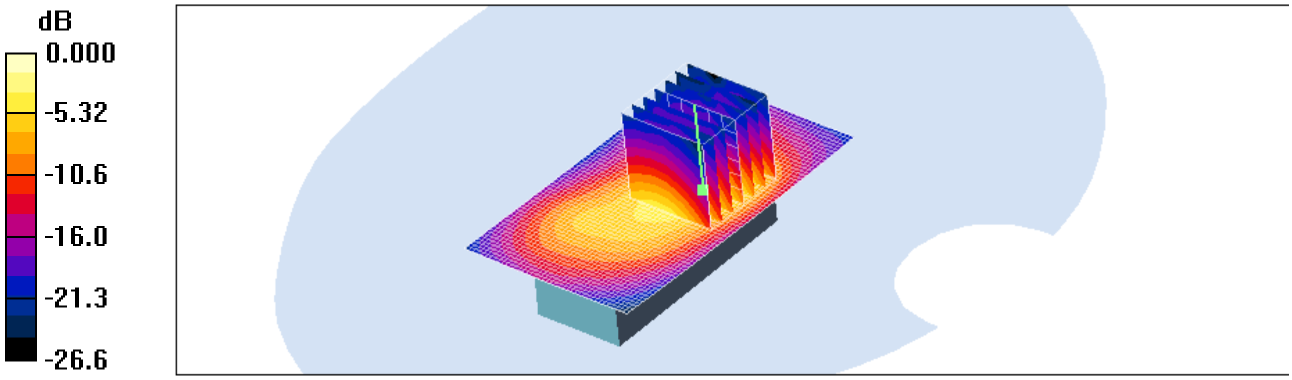
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx1 10M QPSK 1/2 Horizontal Down 736ch/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.721 mW/g

WIMAX Tx1 10M QPSK 1/2 Horizontal Down 736ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.99 V/m; Power Drift = -0.038 dB
Peak SAR (extrapolated) = 1.74 W/kg
SAR(1 g) = 0.677 mW/g; SAR(10 g) = 0.267 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.795 mW/g



0 dB = 0.795mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: side; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2685 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2685 MHz; σ = 2.28 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

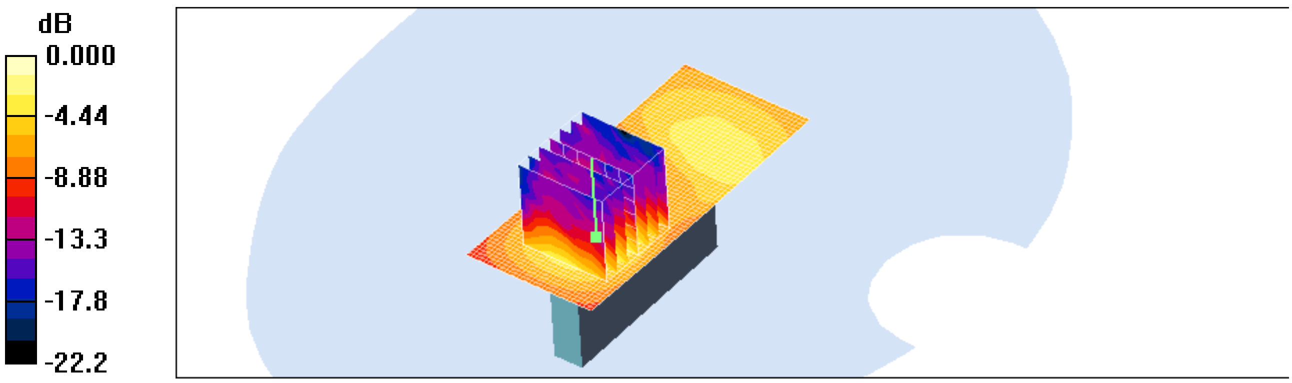
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Wimax Tx1 10M QPSK 1/2 Vertical front 2501MHz/Area Scan (31x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.074 mW/g

Wimax Tx1 10M QPSK 1/2 Vertical front 2501MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.68 V/m; Power Drift = 0.028 dB
Peak SAR (extrapolated) = 0.166 W/kg
SAR(1 g) = 0.074 mW/g; SAR(10 g) = 0.034 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.082 mW/g



0 dB = 0.082mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: side; Serial: #1

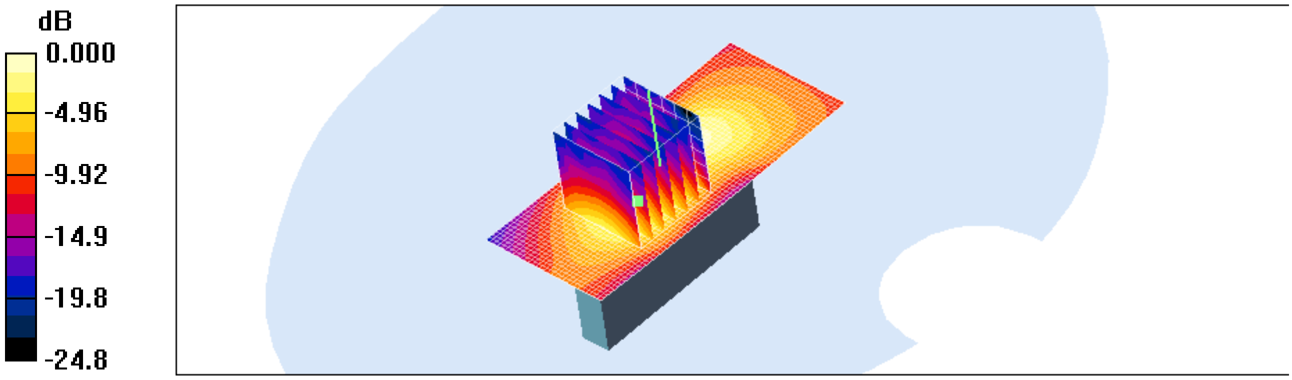
Communication System: WiMAX 2600MHz FCC; Frequency: 2685 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2685 MHz; σ = 2.28 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Wimax Tx1 10M QPSK 1/2 Vertical Back 736ch/Area Scan (31x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.340 mW/g

Wimax Tx1 10M QPSK 1/2 Vertical Back 736ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.6 V/m; Power Drift = -0.039 dB
Peak SAR (extrapolated) = 0.633 W/kg
SAR(1 g) = 0.274 mW/g; SAR(10 g) = 0.128 mW/g
Maximum value of SAR (measured) = 0.314 mW/g



0 dB = 0.314mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2685 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2685 MHz; σ = 2.28 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

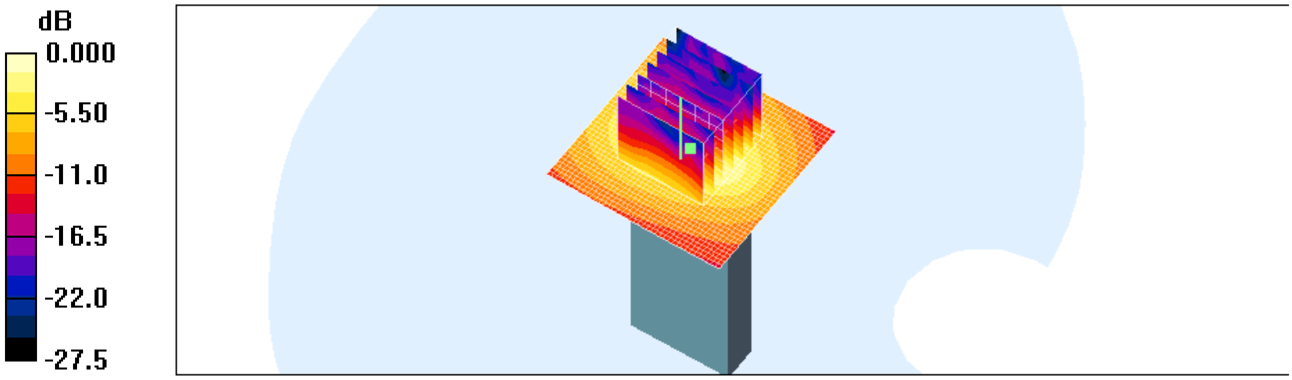
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Wimax Tx1 10M QPSK 1/2 Top 736ch/Area Scan (41x41x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.227 mW/g

Wimax Tx1 10M QPSK 1/2 Top 736ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.90 V/m; Power Drift = 0.028 dB
Peak SAR (extrapolated) = 0.440 W/kg
SAR(1 g) = 0.198 mW/g; SAR(10 g) = 0.085 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.223 mW/g



0 dB = 0.223mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: Bar; Serial: #1

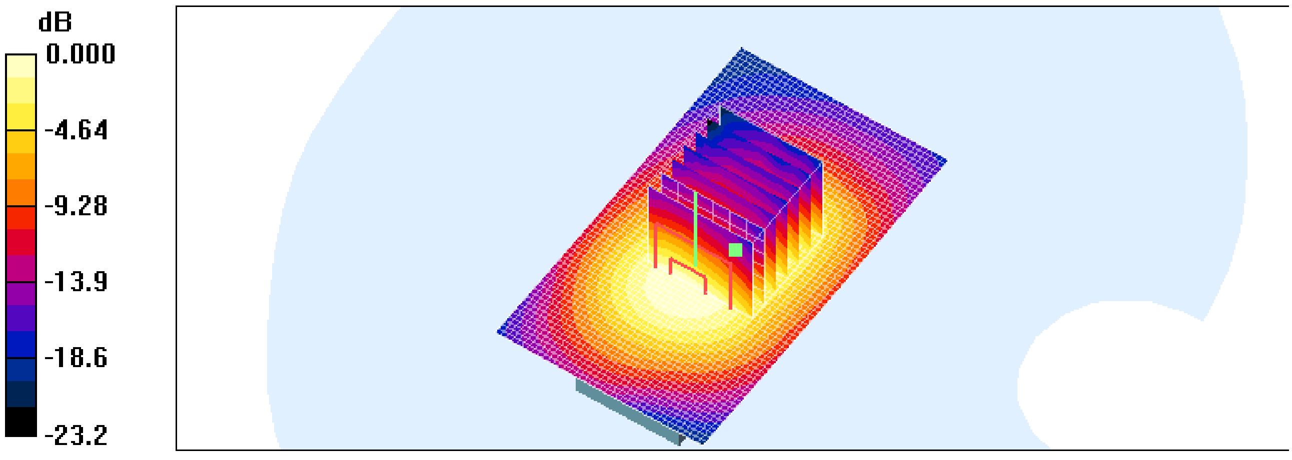
Communication System: WiMAX 2600MHz FCC; Frequency: 2498.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2498.5 MHz; σ = 2 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx2 5M QPSK 1/2 Horizontal up 2498.5MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.428 mW/g

WIMAX Tx2 5M QPSK 1/2 Horizontal up 2498.5MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.67 V/m; Power Drift = 0.068 dB
Peak SAR (extrapolated) = 0.617 W/kg
SAR(1 g) = 0.339 mW/g; SAR(10 g) = 0.181 mW/g
Maximum value of SAR (measured) = 0.373 mW/g



0 dB = 0.373mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2498.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2498.5 MHz; σ = 2 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

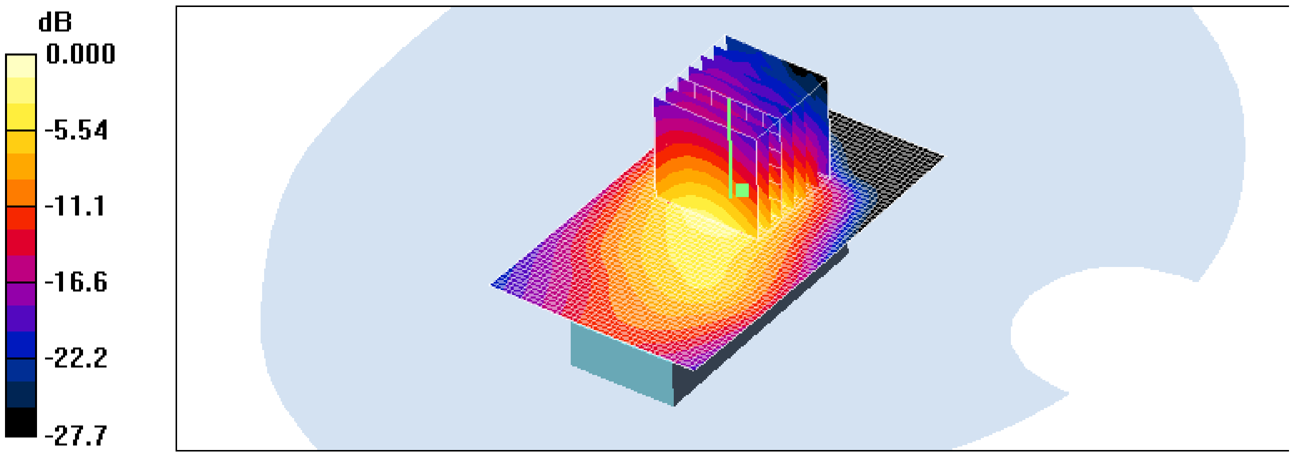
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx2 5M QPSK 1/2 Horizontal Down 2498.5MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.44 mW/g

WIMAX Tx2 5M QPSK 1/2 Horizontal Down 2498.5MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.0 V/m; Power Drift = -0.073 dB
Peak SAR (extrapolated) = 2.35 W/kg
SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.466 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.24 mW/g



0 dB = 1.24mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2593 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2593 MHz; σ = 2.14 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

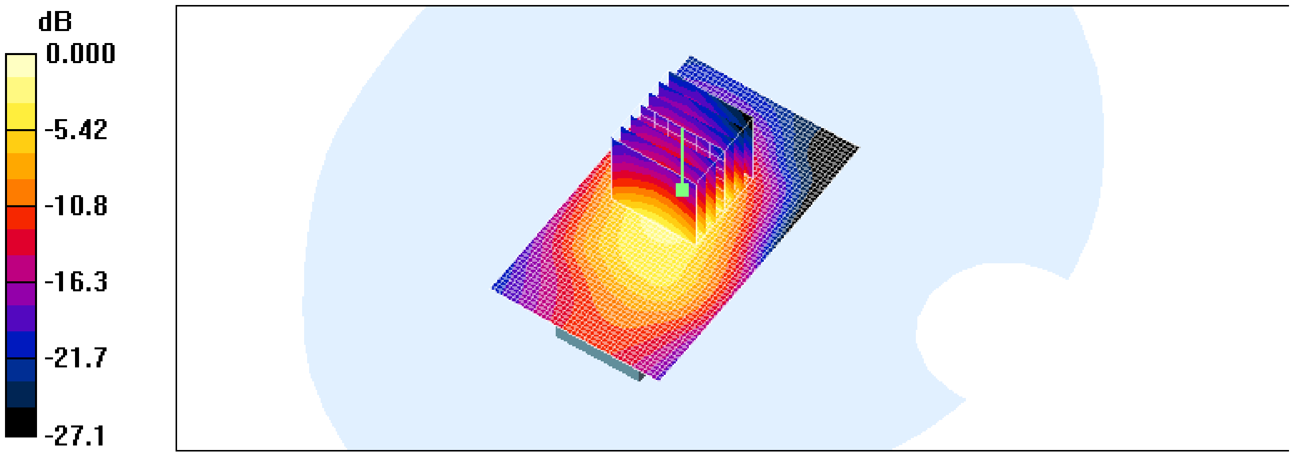
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx2 5M QPSK 1/2 Horizontal Down 2593MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.03 mW/g

WIMAX Tx2 5M QPSK 1/2 Horizontal Down 2593MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.4 V/m; Power Drift = -0.091 dB
Peak SAR (extrapolated) = 1.90 W/kg
SAR(1 g) = 0.896 mW/g; SAR(10 g) = 0.395 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.05 mW/g



0 dB = 1.05mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2687.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2687.5 MHz; σ = 2.26 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

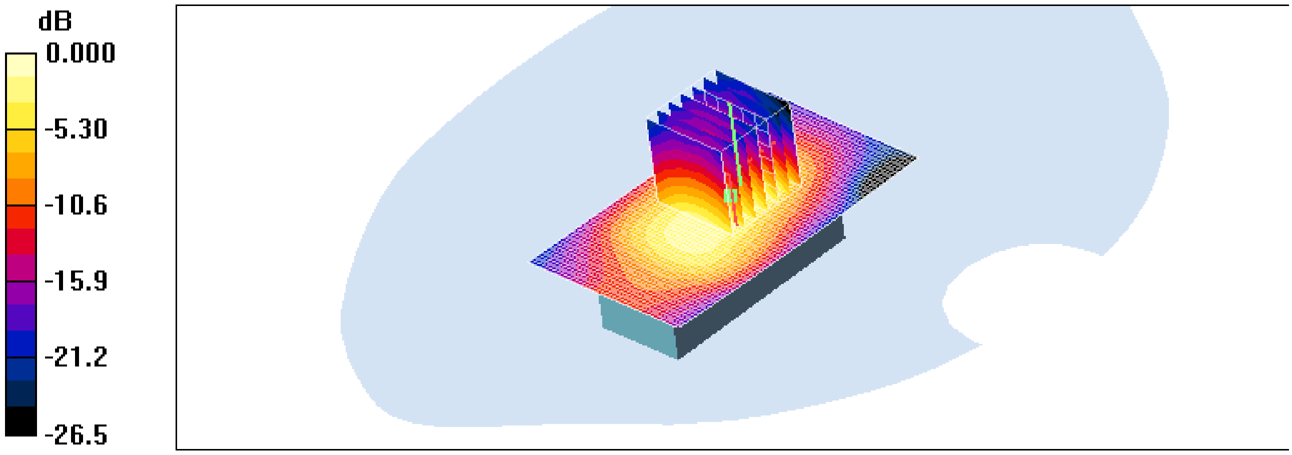
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx2 5M QPSK 1/2 Horizontal Down 2687MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.989 mW/g

WIMAX Tx2 5M QPSK 1/2 Horizontal Down 2687MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.6 V/m; Power Drift = 0.022 dB
Peak SAR (extrapolated) = 1.86 W/kg
SAR(1 g) = 0.849 mW/g; SAR(10 g) = 0.378 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.934 mW/g



0 dB = 0.934mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: side; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2498.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2498.5 MHz; σ = 2 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

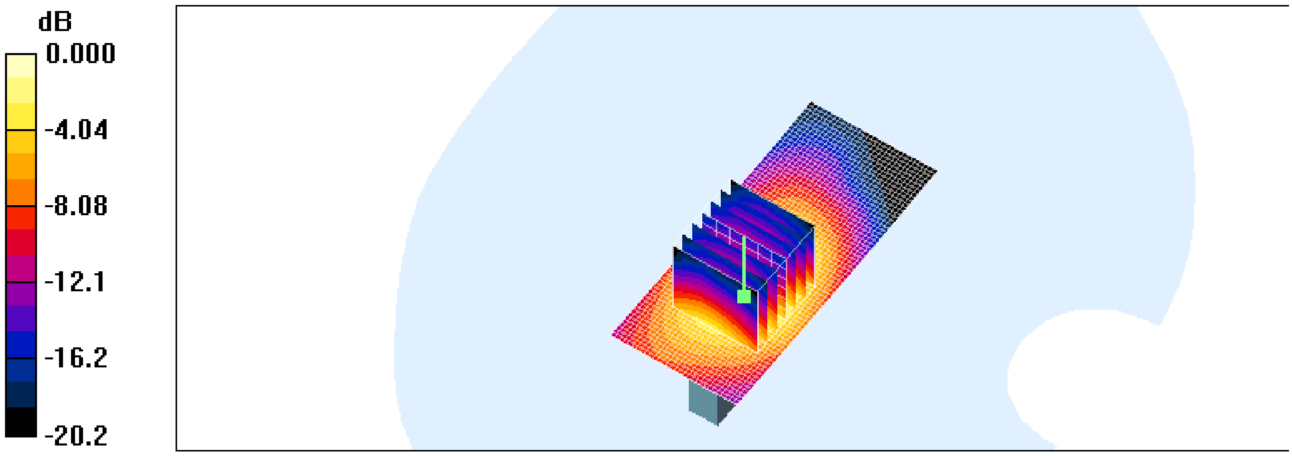
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Wimax Tx2 5M QPSK 1/2 Vertical Front 2498.5MHz/Area Scan (31x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.475 mW/g

Wimax Tx2 5M QPSK 1/2 Vertical Front 2498.5MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.06 V/m; Power Drift = -0.189 dB
Peak SAR (extrapolated) = 0.807 W/kg
SAR(1 g) = 0.428 mW/g; SAR(10 g) = 0.213 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.483 mW/g



0 dB = 0.483mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: side; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2498.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2498.5 MHz; σ = 2 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

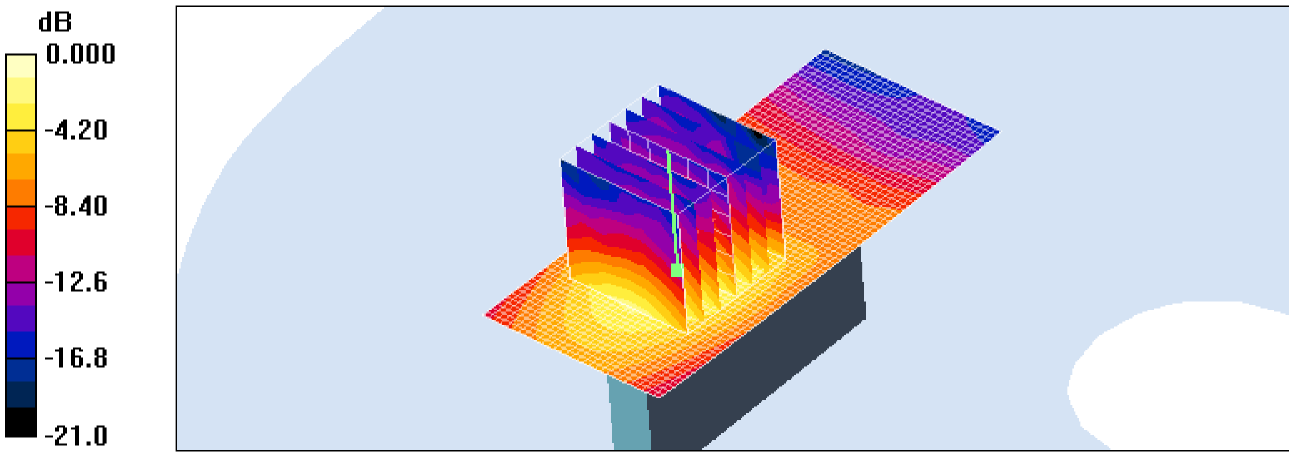
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Wimax Tx2 5M QPSK 1/2 Vertical Back 2498.5MHz/Area Scan (31x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.101 mW/g

Wimax Tx2 5M QPSK 1/2 Vertical Back 2498.5MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.23 V/m; Power Drift = 0.006 dB
Peak SAR (extrapolated) = 0.189 W/kg
SAR(1 g) = 0.097 mW/g; SAR(10 g) = 0.048 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.109 mW/g



0 dB = 0.109mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: Bar; Serial: #1

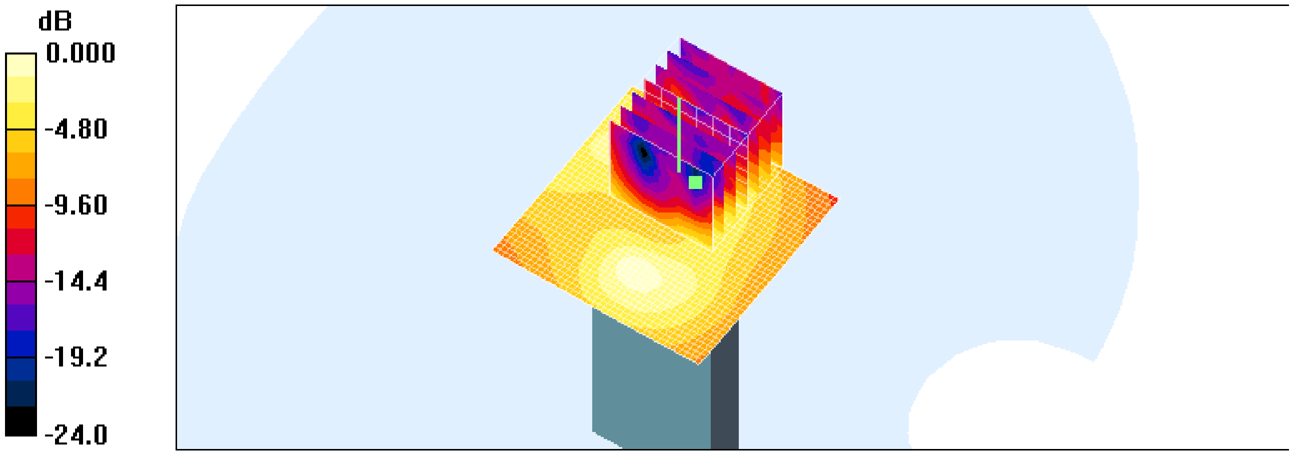
Communication System: WiMAX 2600MHz FCC; Frequency: 2498.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2498.5 MHz; σ = 2 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Wimax Tx2 5M QPSK 1/2 Top 2495.5MHz/Area Scan (41x41x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.050 mW/g

Wimax Tx2 5M QPSK 1/2 Top 2495.5MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.68 V/m; Power Drift = 0.058 dB
Peak SAR (extrapolated) = 0.097 W/kg
SAR(1 g) = 0.049 mW/g; SAR(10 g) = 0.023 mW/g
Maximum value of SAR (measured) = 0.053 mW/g



0 dB = 0.053mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2498.5 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2498.5 MHz; σ = 2 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

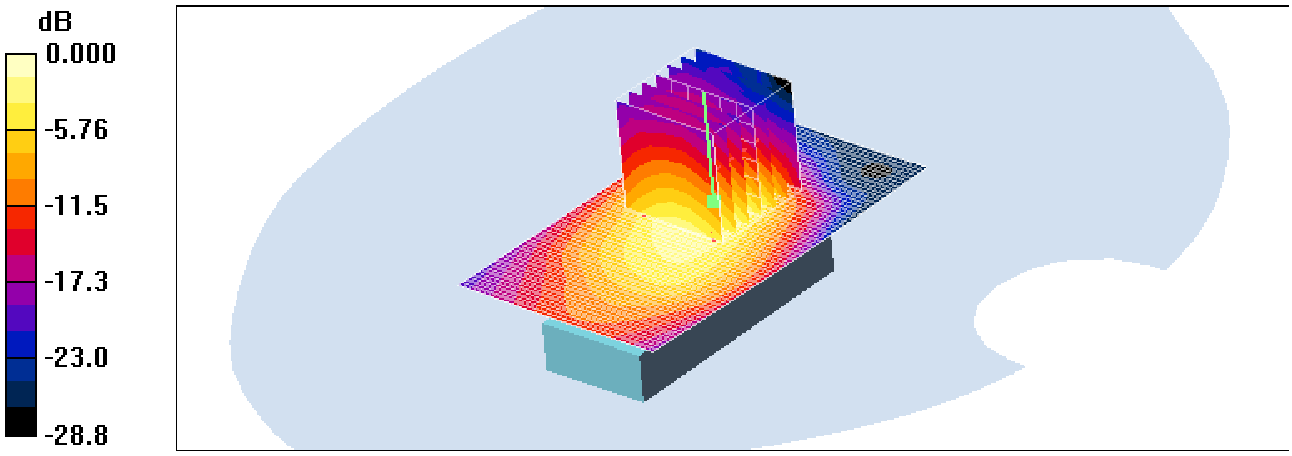
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx2 5M 16QAM 1/2 Horizontal Down 2498.5MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.992 mW/g

WIMAX Tx2 5M 16QAM 1/2 Horizontal Down 2498.5MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.0 V/m; Power Drift = -0.081 dB
Peak SAR (extrapolated) = 1.79 W/kg
SAR(1 g) = 0.832 mW/g; SAR(10 g) = 0.369 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.948 mW/g



0 dB = 0.948mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2685 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2685 MHz; σ = 2.26 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

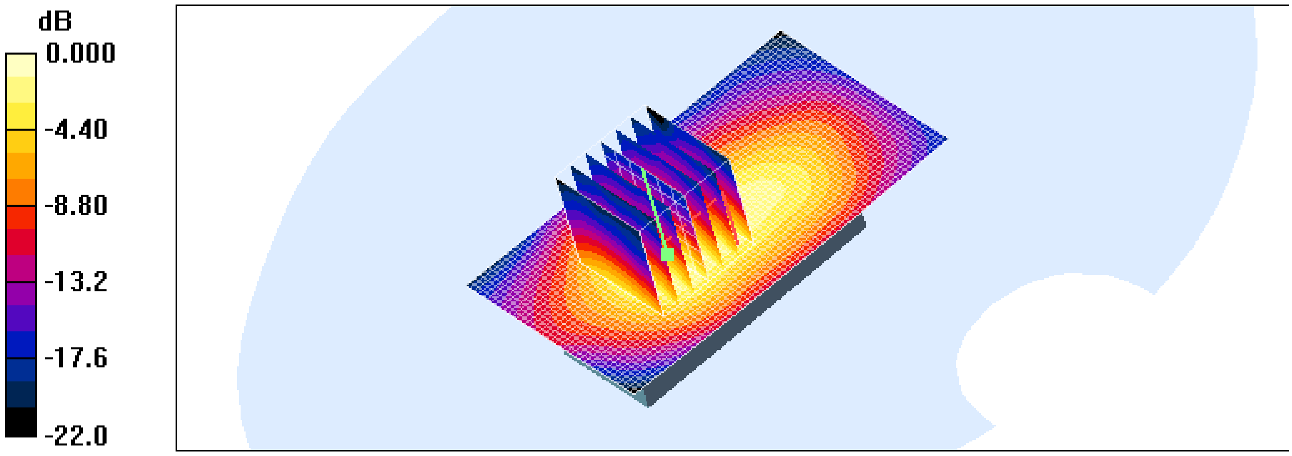
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx2 10M QPSK 1/2 Horizontal up 736ch/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.583 mW/g

WIMAX Tx2 10M QPSK 1/2 Horizontal up 736ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.55 V/m; Power Drift = -0.004 dB
Peak SAR (extrapolated) = 1.06 W/kg
SAR(1 g) = 0.516 mW/g; SAR(10 g) = 0.252 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.565 mW/g



0 dB = 0.565mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2501 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2501 MHz; σ = 2.01 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

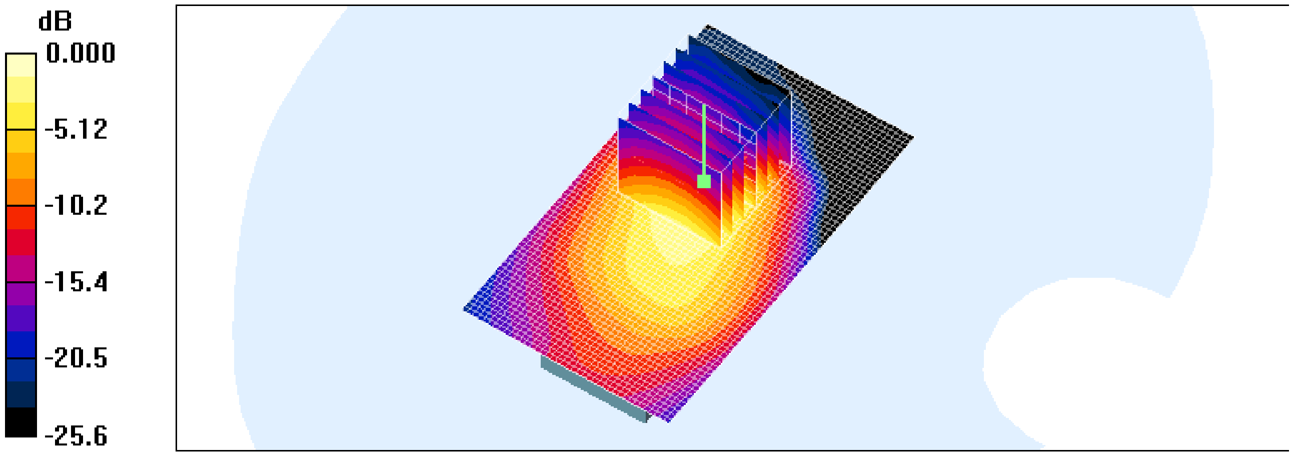
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx2 10M QPSK 1/2 Horizontal Down 0ch/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.980 mW/g

WIMAX Tx2 10M QPSK 1/2 Horizontal Down 0ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.9 V/m; Power Drift = -0.024 dB
Peak SAR (extrapolated) = 1.87 W/kg
SAR(1 g) = 0.856 mW/g; SAR(10 g) = 0.376 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.970 mW/g



0 dB = 0.970mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2593 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2593 MHz; σ = 2.14 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

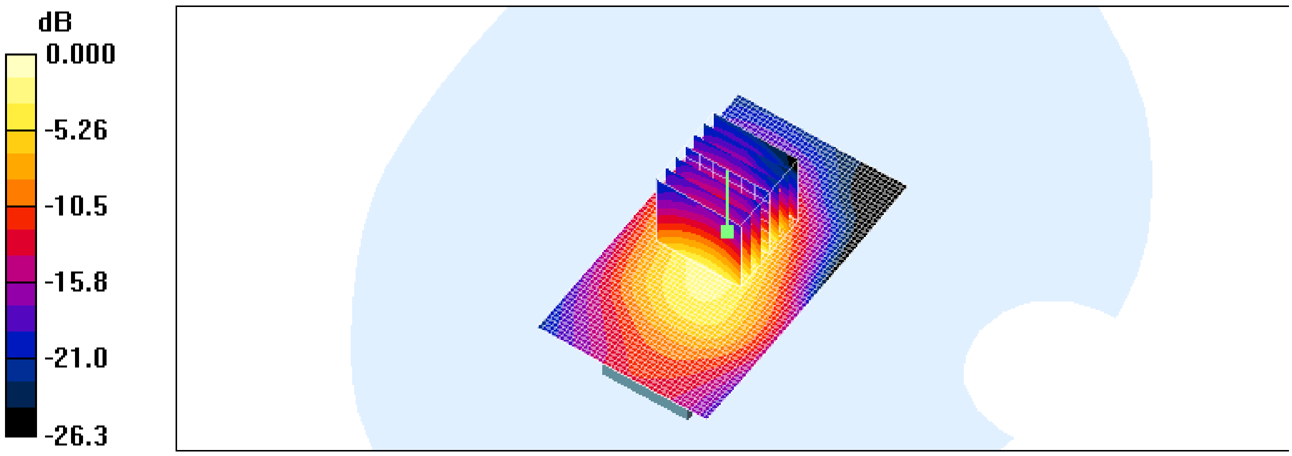
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx2 10M QPSK 1/2 Horizontal Down 368ch/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.950 mW/g

WIMAX Tx2 10M QPSK 1/2 Horizontal Down 368ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.1 V/m; Power Drift = -0.032 dB
Peak SAR (extrapolated) = 1.88 W/kg
SAR(1 g) = 0.869 mW/g; SAR(10 g) = 0.381 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.976 mW/g



0 dB = 0.976mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2685 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2685 MHz; σ = 2.26 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

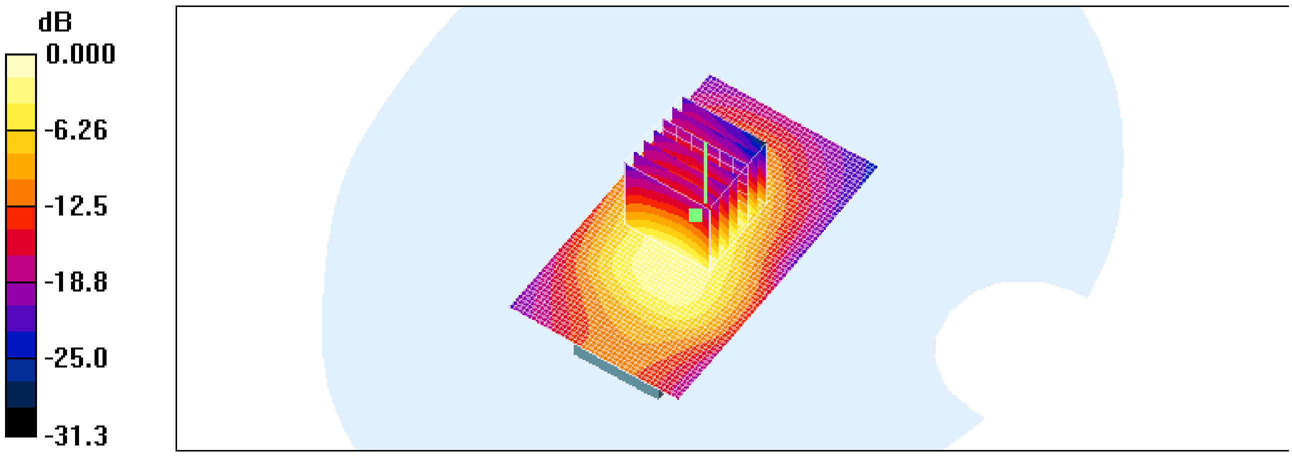
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx2 10M QPSK 1/2 Horizontal Down 736ch/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.968 mW/g

WIMAX Tx2 10M QPSK 1/2 Horizontal Down 736ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.8 V/m; Power Drift = -0.110 dB
Peak SAR (extrapolated) = 1.86 W/kg
SAR(1 g) = 0.838 mW/g; SAR(10 g) = 0.372 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.927 mW/g



0 dB = 0.927mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: side; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2685 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2685 MHz; σ = 2.26 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

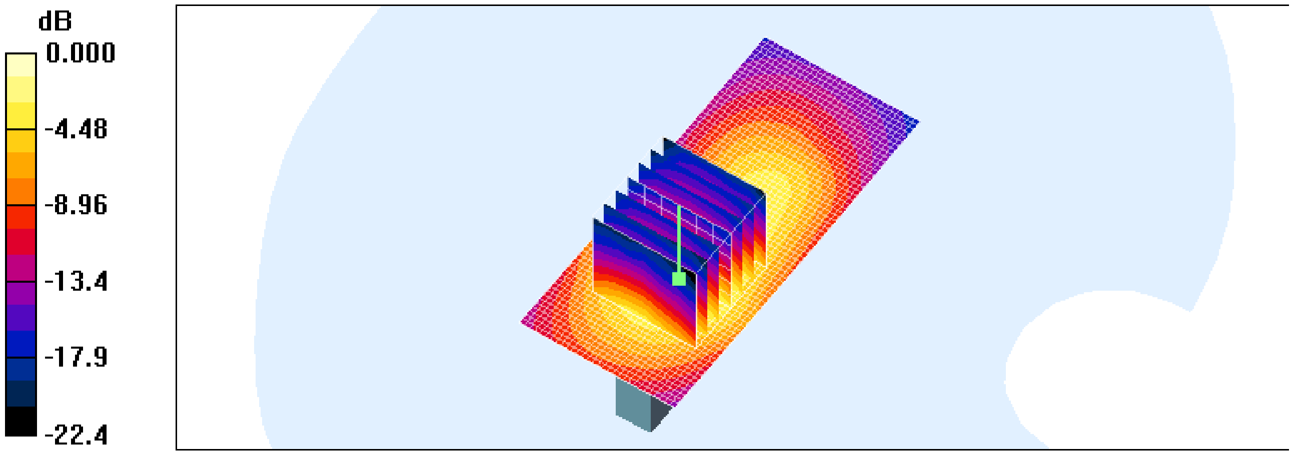
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Wimax Tx2 10M QPSK 1/2 Vertical Front 736ch/Area Scan (31x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.693 mW/g

Wimax Tx2 10M QPSK 1/2 Vertical Front 736ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.8 V/m; Power Drift = -0.031 dB
Peak SAR (extrapolated) = 1.17 W/kg
SAR(1 g) = 0.609 mW/g; SAR(10 g) = 0.293 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.667 mW/g



0 dB = 0.667mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: side; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2685 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2685 MHz; σ = 2.26 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

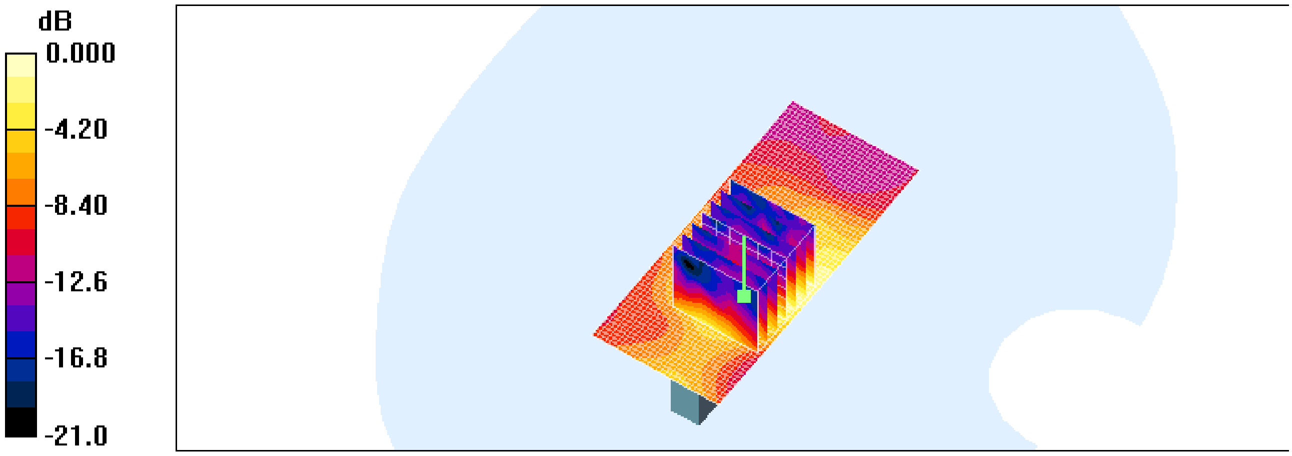
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Wimax Tx2 10M QPSK 1/2 Vertical Back 736ch/Area Scan (31x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.089 mW/g

Wimax Tx2 10M QPSK 1/2 Vertical Back 736ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.97 V/m; Power Drift = 0.022 dB
Peak SAR (extrapolated) = 0.151 W/kg
SAR(1 g) = 0.073 mW/g; SAR(10 g) = 0.035 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.079 mW/g



0 dB = 0.079mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2685 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2685 MHz; σ = 2.26 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

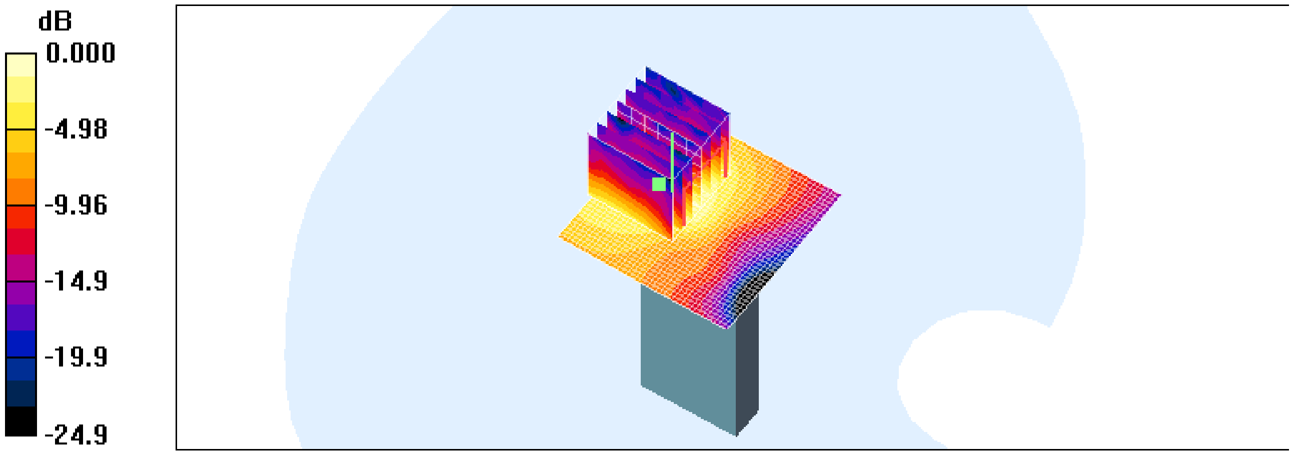
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Wimax Tx2 10M QPSK 1/2 Top 736ch/Area Scan (41x41x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.132 mW/g

Wimax Tx2 10M QPSK 1/2 Top 736ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.73 V/m; Power Drift = -0.136 dB
Peak SAR (extrapolated) = 0.262 W/kg
SAR(1 g) = 0.127 mW/g; SAR(10 g) = 0.061 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.140 mW/g



0 dB = 0.140mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.2 ℃
Ambient Temperature: 21.4 ℃
Test Date: Aug.13, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2593 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2593 MHz; σ = 2.14 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

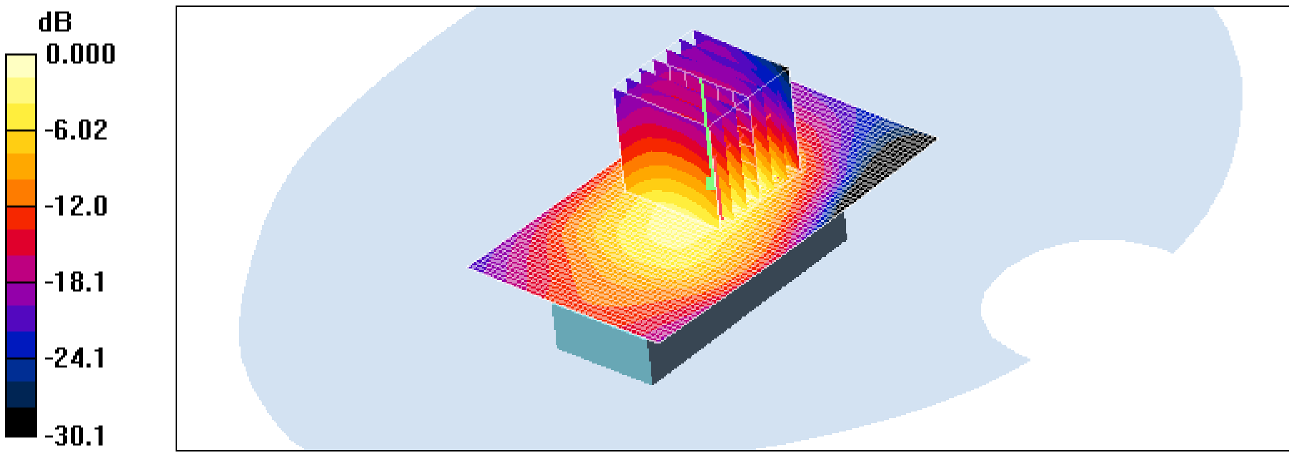
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx2 10M 16QAM1/2 Horizontal Down 368ch/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.941 mW/g

WIMAX Tx2 10M 16QAM1/2 Horizontal Down 368ch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.9 V/m; Power Drift = -0.031 dB
Peak SAR (extrapolated) = 1.85 W/kg
SAR(1 g) = 0.839 mW/g; SAR(10 g) = 0.367 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.941 mW/g



0 dB = 0.941mW/g

Test Laboratory: HCT CO., LTD
EUT Type: USB Dongle
Liquid Temperature: 21.3 ℃
Ambient Temperature: 21.5 ℃
Test Date: Aug.12, 2011

DUT: U602; Type: Bar; Serial: #1

Communication System: WiMAX 2600MHz FCC; Frequency: 2593 MHz;Duty Cycle: 1:3.2
Medium parameters used (interpolated): f = 2593 MHz; σ = 2.15 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

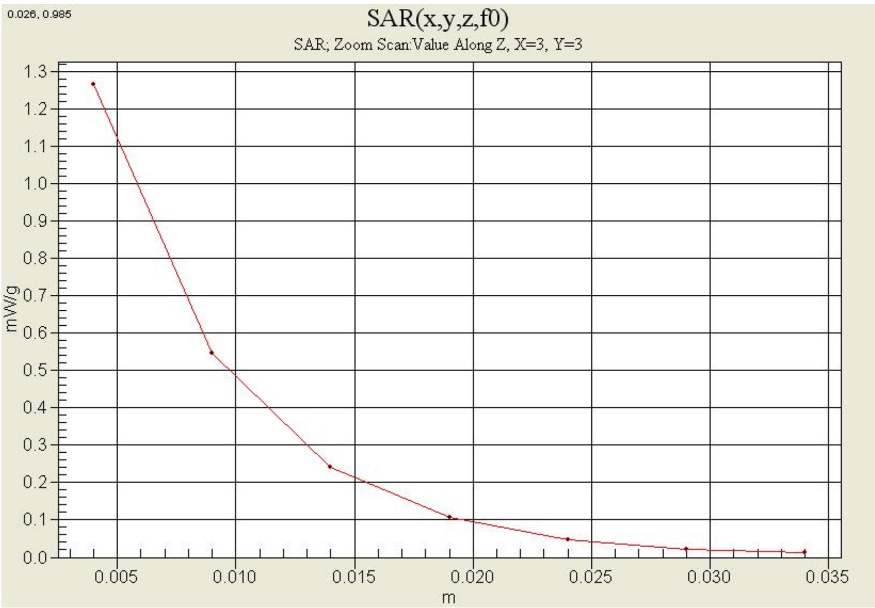
DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

WIMAX Tx1 5M 16QAM 1/2 Horizontal Down 2593MHz/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.24 mW/g

WIMAX Tx1 5M 16QAM 1/2 Horizontal Down 2593MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.4 V/m; Power Drift = -0.167 dB
Peak SAR (extrapolated) = 2.70 W/kg
SAR(1 g) = 1.07 mW/g; SAR(10 g) = 0.417 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.26 mW/g



Attachment 2. – Dipole Validation Plots

■ Validation Data (2600 MHz Body)

Test Laboratory: HCT CO., LTD

Input Power 100 mW (20 dBm)

Liquid Temp: 21.3 ℃

Test Date: Aug. 12, 2011

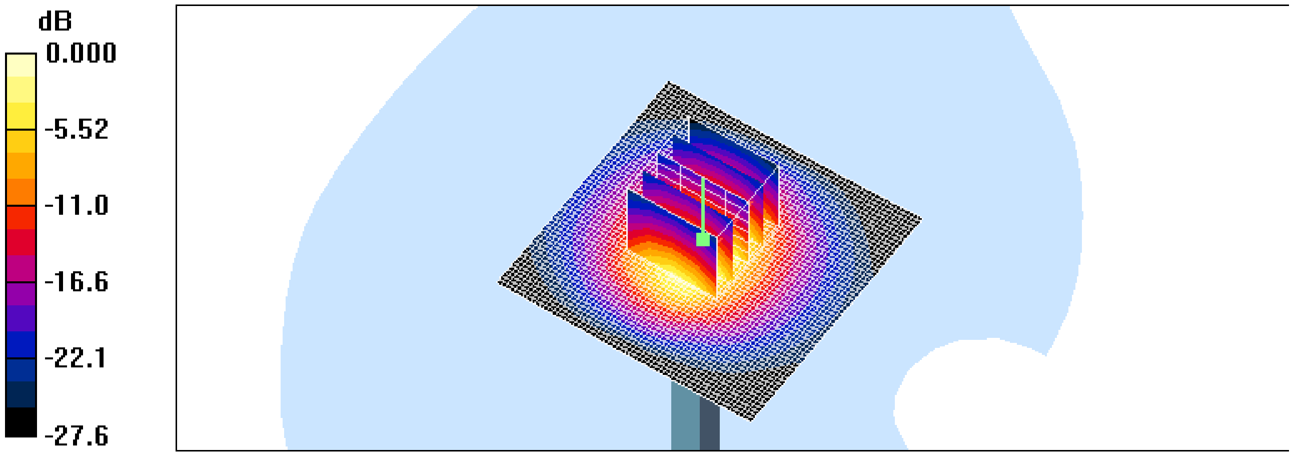
DUT: Dipole 2600MHz; Type: D2600V2; Serial: D2600V2 - SN:1015

Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; σ = 2.16 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 2600MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.84 mW/g

Validation 2600MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 55.5 V/m; Power Drift = -0.022 dB
Peak SAR (extrapolated) = 13.6 W/kg
SAR(1 g) = 5.92 mW/g; SAR(10 g) = 2.52 mW/g
Maximum value of SAR (measured) = 6.62 mW/g



0 dB = 6.62mW/g

■ Validation Data (2600 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.2 ℃
Test Date: Aug. 13, 2011

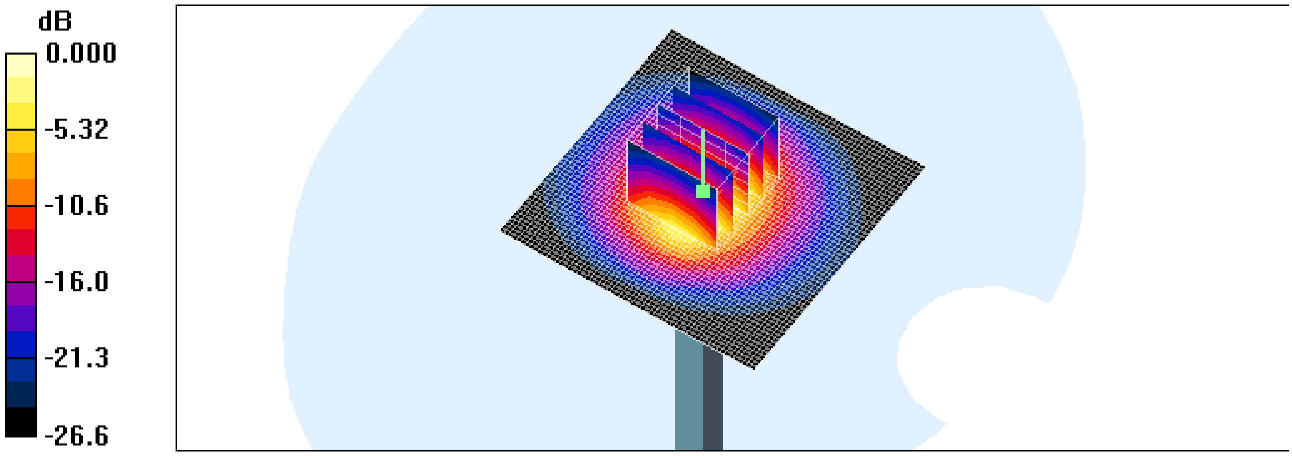
DUT: Dipole 2600MHz; Type: D2600V2; Serial: D2600V2 - SN: 1015

Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; σ = 2.14 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: EX3DV4 - SN3797; ConvF(6.9, 6.9, 6.9); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 2600MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.88 mW/g

Validation 2600MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 55.7 V/m; Power Drift = -0.003 dB
Peak SAR (extrapolated) = 13.7 W/kg
SAR(1 g) = 5.96 mW/g; SAR(10 g) = 2.53 mW/g
Maximum value of SAR (measured) = 6.76 mW/g



0 dB = 6.76mW/g

■ Dielectric Parameter (2600 MHz Body)

Title	U602
SubTitle	WiMAX 2600 MHz
Test Date	Aug. 12, 2011

Frequency	e'	e''
2490000000	51.8013	14.5131
2500000000	51.7582	14.5141
2510000000	51.7239	14.4954
2520000000	51.6633	14.5440
2530000000	51.6084	14.5806
2540000000	51.5389	14.6509
2550000000	51.5014	14.7220
2560000000	51.4451	14.7983
2570000000	51.4225	14.8826
2580000000	51.4064	14.9017
2590000000	51.4051	14.9256
2600000000	51.4034	14.9062
2610000000	51.3850	14.9152
2620000000	51.3622	14.9197
2630000000	51.2895	14.9534
2640000000	51.2323	14.9834
2650000000	51.1675	15.0365
2660000000	51.0961	15.1218
2670000000	51.0412	15.1773
2680000000	51.0094	15.2208
2690000000	50.9982	15.2712

■ Dielectric Parameter (2600 MHz Body)

Title	U602
SubTitle	WiMAX 2600 MHz
Test Date	Aug. 13, 2011

Frequency	e'	e''
2490000000	52.2560	14.3945
2500000000	52.2129	14.4263
2510000000	52.1790	14.4541
2520000000	52.1393	14.4878
2530000000	52.1126	14.5482
2540000000	52.0545	14.5821
2550000000	52.0169	14.6298
2560000000	51.9764	14.6757
2570000000	51.9489	14.7257
2580000000	51.9273	14.7683
2590000000	51.8989	14.7963
2600000000	51.8717	14.8173
2610000000	51.8383	14.8397
2620000000	51.8180	14.8773
2630000000	51.7608	14.9029
2640000000	51.7281	14.9367
2650000000	51.6951	14.9742
2660000000	51.6496	15.0308
2670000000	51.6060	15.0720
2680000000	51.5703	15.1064
2690000000	51.5264	15.1417

Attachment 3. – Probe Calibration Data

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

ilac-MRA | SWISS CALIBRATION

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **HCT (Dymstec)**

Certificate No: **EX3-3797_Jul11**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3797
Calibration procedure(s)	QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	July 25, 2011

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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
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-10)	In house check: Oct-11

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

Issued: July 25, 2011

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

Certificate No: EX3-3797_Jul11 Page 1 of 11

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
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 affect 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.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *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:3797

Manufactured: April 5, 2011
Calibrated: July 25, 2011

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

EX3DV4– SN:3797 July 25, 2011

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.63	0.59	0.57	± 10.1 %
DCP (mV)[B]	94.6	95.3	96.6	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	96.0	±2.5 %
			Y	0.00	0.00	1.00	126.8	
			Z	0.00	0.00	1.00	126.7	

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 max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	9.29	9.29	9.29	0.80	0.68	± 12.0 %
835	41.5	0.90	8.93	8.93	8.93	0.80	0.67	± 12.0 %
900	41.5	0.97	8.83	8.83	8.83	0.80	0.66	± 12.0 %
1450	40.5	1.20	8.30	8.30	8.30	0.59	0.78	± 12.0 %
1750	40.1	1.37	7.88	7.88	7.88	0.77	0.62	± 12.0 %
1900	40.0	1.40	7.60	7.60	7.60	0.80	0.60	± 12.0 %
1950	40.0	1.40	7.44	7.44	7.44	0.78	0.61	± 12.0 %
2300	39.5	1.67	7.30	7.30	7.30	0.75	0.62	± 12.0 %
2450	39.2	1.80	6.94	6.94	6.94	0.74	0.62	± 12.0 %
2600	39.0	1.96	7.16	7.16	7.16	0.59	0.72	± 12.0 %
5200	36.0	4.66	4.73	4.73	4.73	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.44	4.44	4.44	0.42	1.80	± 13.1 %
5500	35.6	4.96	4.48	4.48	4.48	0.42	1.80	± 13.1 %
5600	35.5	5.07	4.16	4.16	4.16	0.42	1.80	± 13.1 %
5800	35.3	5.27	4.26	4.26	4.26	0.45	1.80	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

EX3DV4– SN:3797 July 25, 2011

DASY/EASY - Parameters of Probe: EX3DV4- SN:3797

Calibration Parameter Determined in Body Tissue Simulating Media

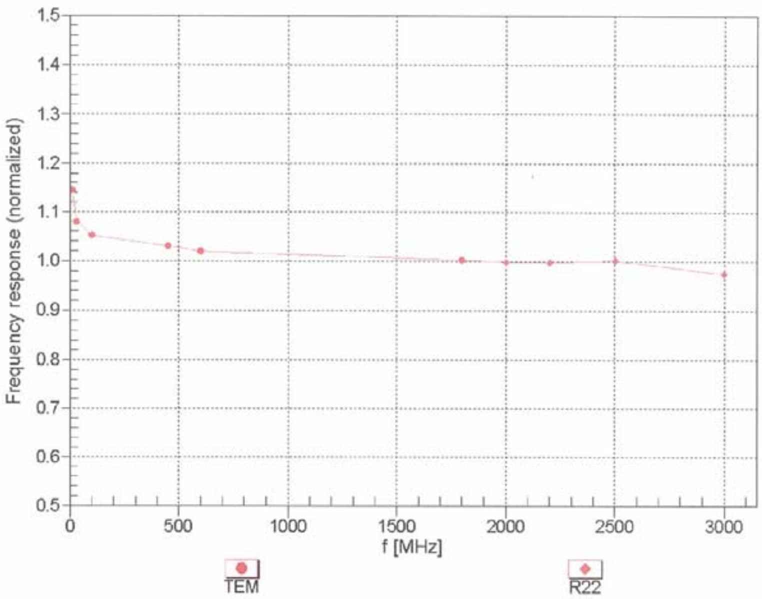
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	9.22	9.22	9.22	0.80	0.70	± 12.0 %
835	55.2	0.97	9.14	9.14	9.14	0.80	0.69	± 12.0 %
1750	53.4	1.49	7.69	7.69	7.69	0.80	0.66	± 12.0 %
1900	53.3	1.52	7.26	7.26	7.26	0.80	0.64	± 12.0 %
2300	52.9	1.81	7.18	7.18	7.18	0.80	0.62	± 12.0 %
2450	52.7	1.95	6.96	6.96	6.96	0.80	0.50	± 12.0 %
2600	52.5	2.16	6.90	6.90	6.90	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.10	4.10	4.10	0.50	1.90	± 13.1 %
5300	48.9	5.42	3.83	3.83	3.83	0.55	1.90	± 13.1 %
5500	48.6	5.65	3.72	3.72	3.72	0.55	1.90	± 13.1 %
5600	48.5	5.77	3.60	3.60	3.60	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.75	3.75	3.75	0.60	1.90	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Certificate No: EX3-3797_Jul11 Page 6 of 11

EX3DV4– SN:3797 July 25, 2011

Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



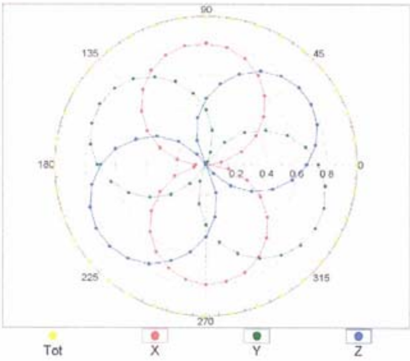
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Certificate No: EX3-3797_Jul11 Page 7 of 11

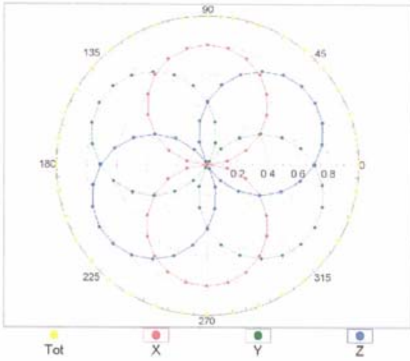
EX3DV4– SN:3797 July 25, 2011

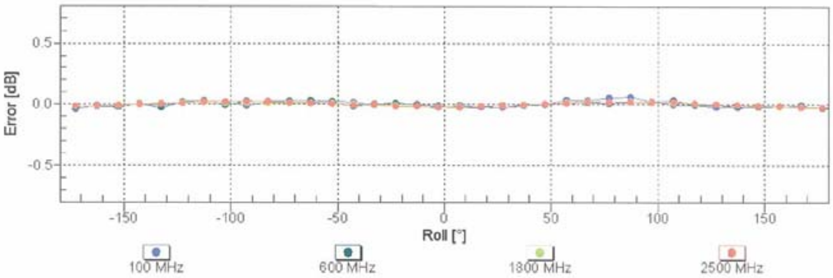
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

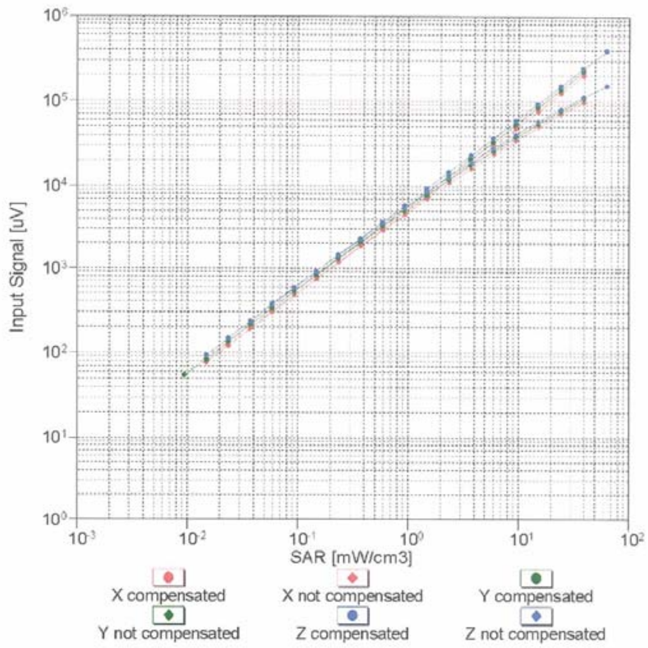


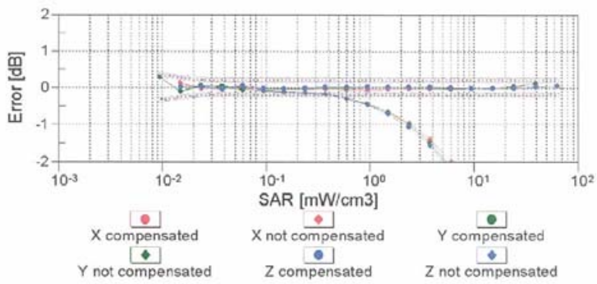


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV4– SN:3797 July 25, 2011

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)





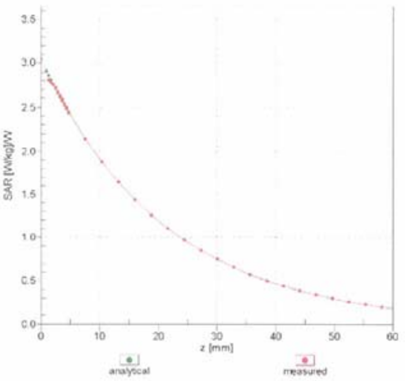
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Certificate No: EX3-3797_Jul11 Page 9 of 11

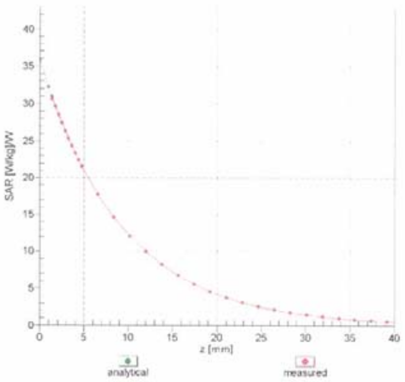
EX3DV4– SN:3797 July 25, 2011

Conversion Factor Assessment

f = 750 MHz,WGLS R9 (H_convF)

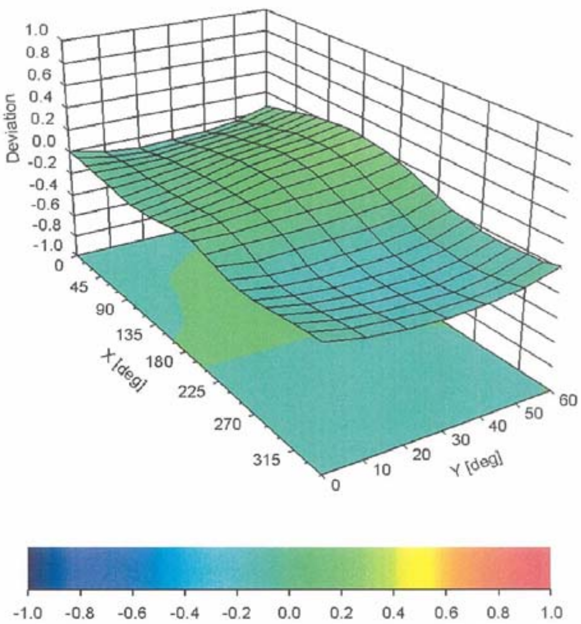


f = 2600 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

Certificate No: EX3-3797_Jul11 Page 10 of 11

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

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

Attachment 4. – Dipole Calibration Data

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
 Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **HCT (Dymstec)**

Certificate No: **D2600V2-1015_Mar11**

CALIBRATION CERTIFICATE

Object	D2600V2 - SN: 1015
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits
Calibration date:	March 24, 2011

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-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-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-10)	In house check: Oct-11

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

Issued: March 24, 2011

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

Certificate No: D2600V2-1015_Mar11 Page 1 of 9

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
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	V52.6.2
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	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.2 ± 6 %	2.01 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	14.9 mW / g
SAR normalized	normalized to 1W	59.6 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**58.5 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.60 mW / g
SAR normalized	normalized to 1W	26.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**26.2 mW / g ± 16.5 % (k=2)**

Certificate No: D2600V2-1015_Mar11 Page 3 of 9

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.1 ± 6 %	2.19 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 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	14.8 mW / g
SAR normalized	normalized to 1W	59.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**58.7 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.51 mW / g
SAR normalized	normalized to 1W	26.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**25.9 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.0 Ω - 3.5 jΩ
Return Loss	- 29.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.5 Ω - 2.0 jΩ
Return Loss	- 27.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.150 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	October 30, 2007

DASY5 Validation Report for Head TSL

Date/Time: 24.03.2011 11:30:16

Test Laboratory: SPEAG, Zurich, Switzerland

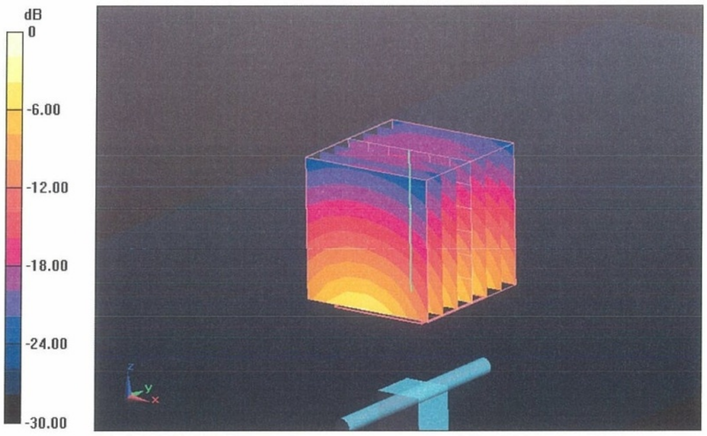
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1015

Communication System: CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: HSL BB1.9
Medium parameters used: f = 2600 MHz; σ = 2.02 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.47, 4.47, 4.47); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

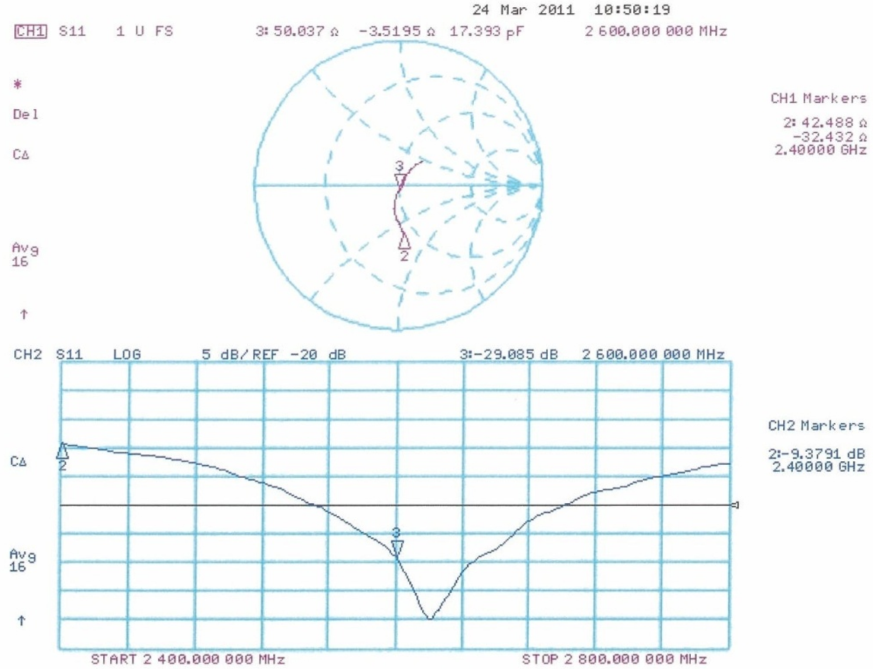
Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.9 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 32.578 W/kg
SAR(1 g) = 14.9 mW/g; SAR(10 g) = 6.6 mW/g
Maximum value of SAR (measured) = 19.402 mW/g



0 dB = 19.400mW/g

Certificate No: D2600V2-1015_Mar11 Page 6 of 9

Impedance Measurement Plot for Head TSL



Certificate No: D2600V2-1015_Mar11 Page 7 of 9

DASY5 Validation Report for Body TSL

Date/Time: 24.03.2011 11:51:27

Test Laboratory: SPEAG, Zurich, Switzerland

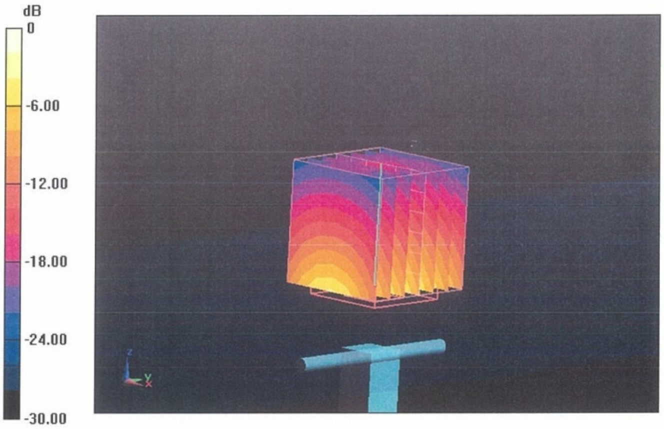
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1015

Communication System: CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: MSL BB1.9
Medium parameters used: f = 2600 MHz; σ = 2.19 mho/m; εr = 52.1; ρ = 1000 kg/m3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

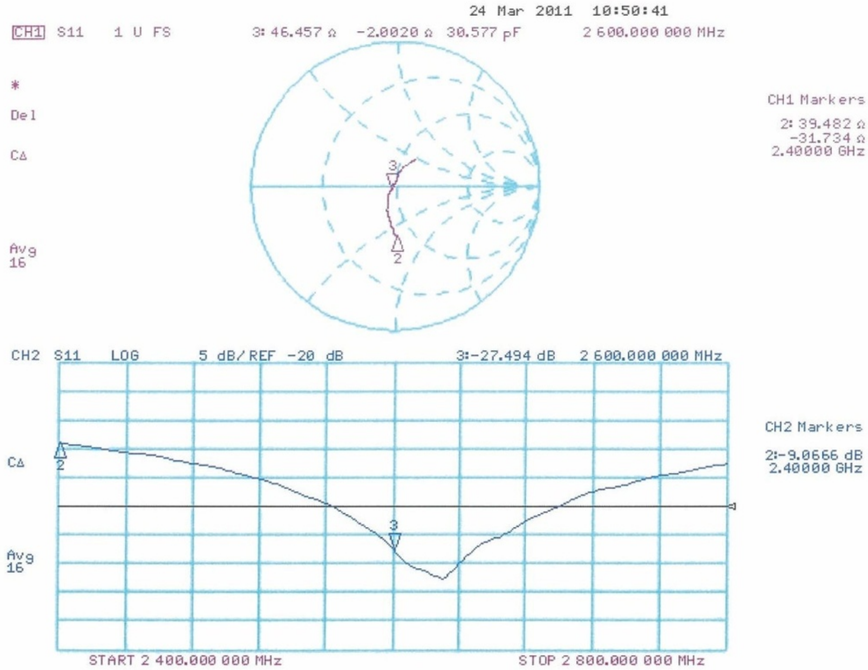
- Probe: ES3DV3 - SN3205; ConvF(4.18, 4.18, 4.18); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

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 = 97.362 V/m; Power Drift = -0.0055 dB
Peak SAR (extrapolated) = 33.375 W/kg
SAR(1 g) = 14.8 mW/g; SAR(10 g) = 6.51 mW/g
Maximum value of SAR (measured) = 19.880 mW/g



0 dB = 19.880mW/g

Impedance Measurement Plot for Body TSL



Certificate No: D2600V2-1015_Mar11 Page 9 of 9