SAR TEST REPORT

(CO-LOCATED)

REPORT NO.: SA990210L08-6

MODEL NO.: PC36100

RECEIVED: Feb. 23, 2010

TESTED: Mar. 22, 2010

ISSUED: Mar. 25, 2010

APPLICANT: HTC Corporation

ADDRESS: No. 23, Xinghua Rd., Taoyuan City, 330, Taiwan, R.O.C.

ISSUED BY: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Hsiang, Taipei Hsien 244, Taiwan, R.O.C.

TEST LOCATION: No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

This test report consists of 28 pages in total except Appendix. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by TAF or any government agencies. The test results in the report only apply to the tested sample.

Testing Laboratory
2021

TABLE OF CONTENTS

1. CERTIFICATION

PRODUCT: Smart Phone
MODEL: PC36100
BRAND: HTC
APPLICANT: HTC Corporation
TESTED: Mar. 22, 2010
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: **FCC Part 2 (Section 2.1093)**
FCC OET Bulletin 65, Supplement C (01-01)
RSS-102

The above equipment (model: PC36100) have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Pettie Chen , **DATE :** Mar.25. 2010
Pettie Chen / Specialist

TECHNICAL ACCEPTANCE : Mason Chang , **DATE :** Mar.25. , 2010
Responsible for RF
Mason Chang / Engineer

APPROVED BY : Gary Chang , **DATE :** Mar.25. , 2010
Gary Chang / Assistant Manager

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Smart Phone
MODEL NO.	PC36100
FCC ID	NM8PC36100
POWER SUPPLY	3.7Vdc from rechargeable lithium battery 5.0Vdc from power adapter 5.0Vdc from host equipment
CLASSIFICATION	Portable device, production unit
MODULATION TYPE	**CDMA:** OQPSK, HPSK **WIMAX:** QPSK1/2, QPSK 3/4, 16QAM1/2, 16QAM 3/4
OPERATING FREQUENCY	**CDMA:** 824MHz ~ 849MHz ; 1850MHz ~ 1910MHz **WIMAX:** 2498.5MHz ~ 2687.5MHz
MAXIMUM SAR (1g)	**Body:** 0.907W/kg
DATA CABLE	Refer to NOTE as below
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Refer to NOTE

NOTE:

1. The EUT is a Smart Phone. The functions of EUT listed as below:

	REFERENCE REPORT
WLAN 802.11b/g	SA990210L08
WIMAX	SA990210L08-1
BLUETOOTH	SA990210L08-2
CDMA 850 + CDMA 1900	SA990210L08-3
HAC	SA990210L08-4
T-Coil	SA990210L08-5
CDMA850 + WIMAX (CO-LOCATED)	SA990210L08-6

2. The EUT has following accessories.

<table>
<tr><th>NO.</th><th>PRODUCT</th><th>BRAND</th><th>MANU-FACTURE</th><th>MODEL</th><th>DESCRIPTION</th></tr>
<tr><td>1</td><td rowspan="2">Power Adapter</td><td rowspan="2">hTC</td><td>Delta</td><td>TC U250</td><td rowspan="2">I/P: 100-240Vac, 50-60Hz, 200mA
O/P: 5Vdc, 1A</td></tr>
<tr><td>2</td><td>Emerson</td><td>TC U250</td></tr>
<tr><td>3</td><td rowspan="2">USB cable</td><td>MEC</td><td>-</td><td rowspan="2">DC M410</td><td rowspan="2">1.4m shielded cable without core
(For data transmission & charging use)</td></tr>
<tr><td>4</td><td>Foxlink</td><td>-</td></tr>
<tr><td>5</td><td rowspan="2">Battery</td><td>HT ENERGY</td><td>-</td><td rowspan="2">RHOD160</td><td rowspan="2">Rating: 3.7Vdc, 1500mAh</td></tr>
<tr><td>6</td><td>Formosa</td><td>-</td></tr>
</table>

3. MEID code: A100000D98.
4. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

2.2 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to the specifications of the manufacturer, this product must comply with the requirements of the following standards:

FCC 47 CFR Part 2 (2.1093)

FCC OET Bulletin 65, Supplement C (01- 01)

RSS-102

IEEE 1528-2003

All test items have been performed and recorded as per the above standards.

2.3 GENERAL INOFRMATION OF THE SAR SYSTEM

DASY5 (software 5.0 Build 125) consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY5 software defined. The DASY5 software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.

EX3DV4 ISOTROPIC E-FIELD PROBE

CONSTRUCTION	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
FREQUENCY	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
DIRECTIVITY	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
DYNAMIC RANGE	10 μW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μW/g)
DIMENSIONS	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
APPLICATION	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

NOTE

1. The Probe parameters have been calibrated by the SPEAG. Please reference “APPENDIX D” for the Calibration Certification Report.
2. For frequencies above 800MHz, calibration in a rectangular wave-guide is used, because wave-guide size is manageable.
3. For frequencies below 800MHz, temperature transfer calibration is used because the wave-guide size becomes relatively large.

TWIN SAM V4.0

CONSTRUCTION	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, EN 62209-1 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.
SHELL THICKNESS	2 ± 0.2mm
FILLING VOLUME	Approx. 25liters
DIMENSIONS	Height: 810mm; Length: 1000mm; Width: 500mm

SYSTEM VALIDATION KITS:

CONSTRUCTION	Symmetrical dipole with l/4 balun enables measurement of feedpoint impedance with NWA matched for use near flat phantoms filled with brain simulating solutions. Includes distance holder and tripod adaptor
CALIBRATION	Calibrated SAR value for specified position and input power at the flat phantom in brain simulating solutions
FREQUENCY	850MHz, 1900MHz
RETURN LOSS	> 20dB at specified validation position
POWER CAPABILITY	> 100W (f < 1GHz); > 40W (f > 1GHz)
OPTIONS	Dipoles for other frequencies or solutions and other calibration conditions upon request

DEVICE HOLDER FOR SAM TWIN PHANTOM

CONSTRUCTION

The device holder for the mobile phone device is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles. The holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε =3 and loss tangent δ =0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered. The device holder for the portable device makes up of the polyethylene foam. The dielectric parameters of material close to the dielectric parameters of the air.

DATA ACQUISITION ELECTRONICS

CONSTRUCTION

The data acquisition electronics (DAE3) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplex, a fast 16 bit AD converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The mechanical probe is mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

2.4 TEST EQUIPMENT

FOR SAR MEASURENENT

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	SAM Phantom	S & P	QD000 P40 CA	TP-1150	NA	NA
2	Signal Generator	Anritsu	68247B	984703	May 21, 2009	May 20, 2010
3	E-Field Probe	S & P	EX3DV3	3504	Jan. 26, 2010	Jan. 25, 2011
4	DAE	S & P	DAE	510	Dec. 16, 2009	Dec. 15, 2010
5	Robot Positioner	Staubli Unimation	NA	NA	NA	NA
6	Validation Dipole	S & P	D835V2	4d021	May 25, 2009	May 24, 2010
7	Validation Dipole	S & P	D2600V2	1020	Jan. 27, 2010	Jan. 26, 2011

NOTE: Before starting, all test equipment shall be warmed up for 30min.

FOR TISSUE PROPERTY

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	Network Analyzer	Agilent	E5071C	MY46104190	Apr. 10, 2009	Apr. 09, 2010
2	Dielectric Probe	Agilent	85070D	US01440176	NA	NA

NOTE:

1. Before starting, all test equipment shall be warmed up for 30min.
2. The tolerance (k=1) specified by Agilent for general dielectric measurements, deriving from inaccuracies in the calibration data, analyzer drift, and random errors, are usually ±2.5% and ±5% for measured permittivity and conductivity, respectively. However, the tolerances for the conductivity is smaller for material with large loss tangents, i.e., less than ±2.5% (k=1). It can be substantially smaller if more accurate methods are applied

2.5 GENERAL DESCRIPTION OF THE SPATIAL PEAK SAR EVALUATION

The DASY5 post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the micro-volt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	dcp_i
Device parameters:	- Frequency	F
	- Crest factor	Cf
Media parameters:	- Conductivity	σ
	- Density	ρ

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 as:

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

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:

$$\text{E-fieldprobes: } E_i = \sqrt{\frac{V_1}{Norm_i \cdot ConvF}}$$

$$\text{H-fieldprobes: } H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$$

V_i	=compensated signal of channel I	(i = x, y, z)
$Norm_i$	=sensor sensitivity of channel i µV/(V/m)2 for E-field Probes	(i = x, y, z)
ConvF	= sensitivity enhancement in solution	
a_{ij}	= sensor sensitivity factors for H-field probes	
F	= carrier frequency [GHz]	
E_i	= electric field strength of channel i in V/m	
H_i	= magnetic field strength of channel i in A/m	

The RSS value of the field components gives the total field strength (Hermitian 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.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

SAR	= local specific absorption rate in mW/g
E_{tot}	= total field strength in V/m
σ	= conductivity in [mho/m] or [Siemens/m]
ρ	= equivalent tissue density in g/cm3

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid. The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. The extraction of the measured data (grid and values) from the Zoom Scan
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1 g and 10 g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within -2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

3. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.
1	Universal Radio Communication Tester	R&S	CMU200	NA

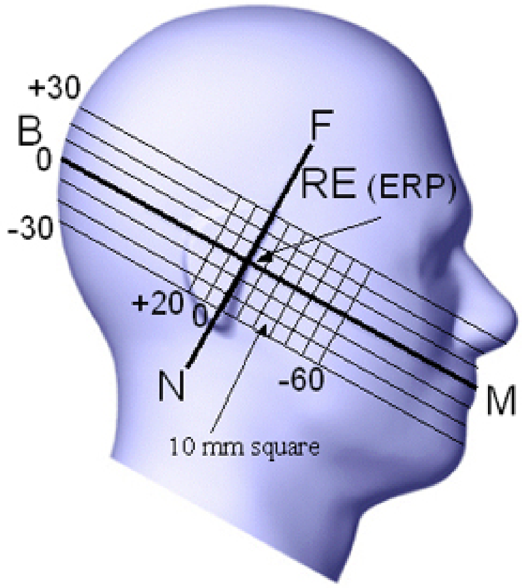
NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA

NOTE:

1. All power cords of the above support units are non shielded (1.8m).
2. Item 1 was provided by the client.

4. DESCRIPTION OF TEST POSITION

4.1 DESCRIPTION OF TEST POSITION



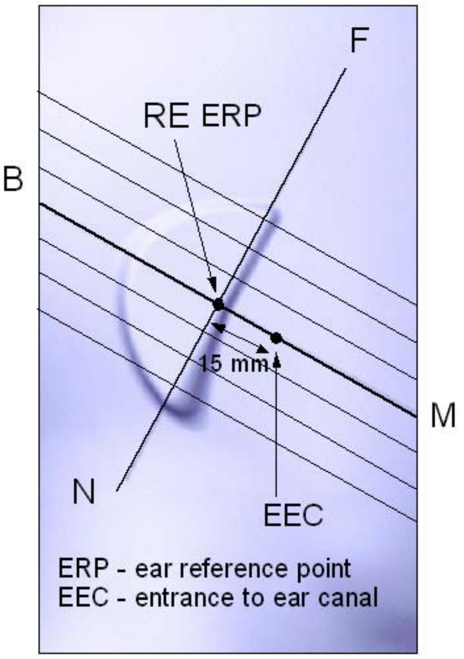


FIGURE 3.1

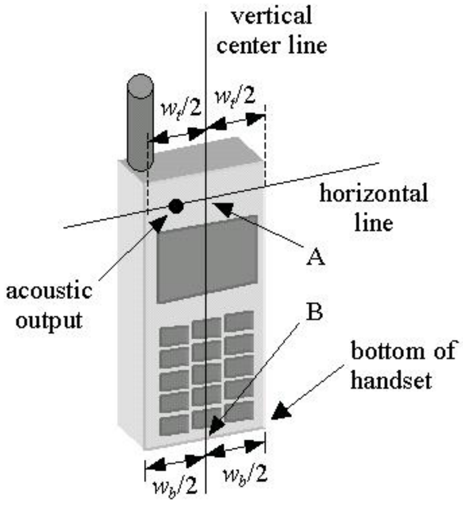


FIGURE 3.1a

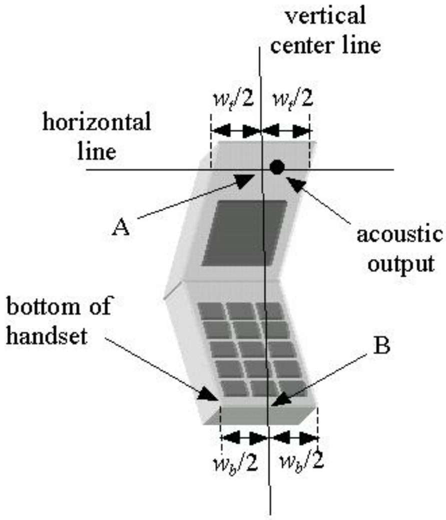
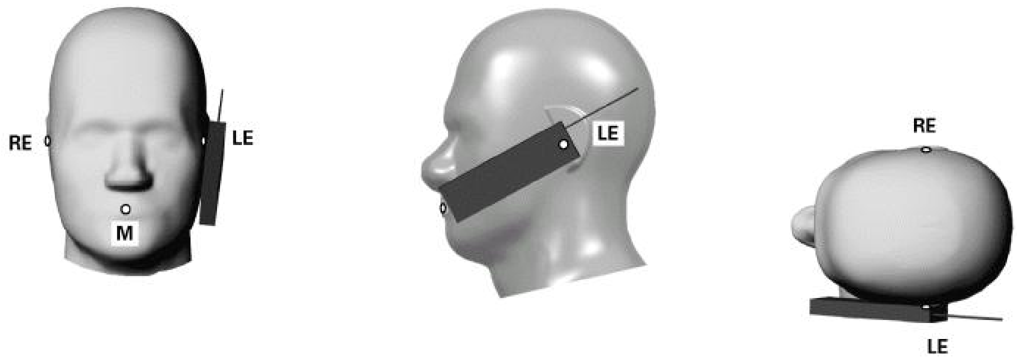


FIGURE 3.1b

4.1.1 TOUCH/CHEEK TEST POSITION

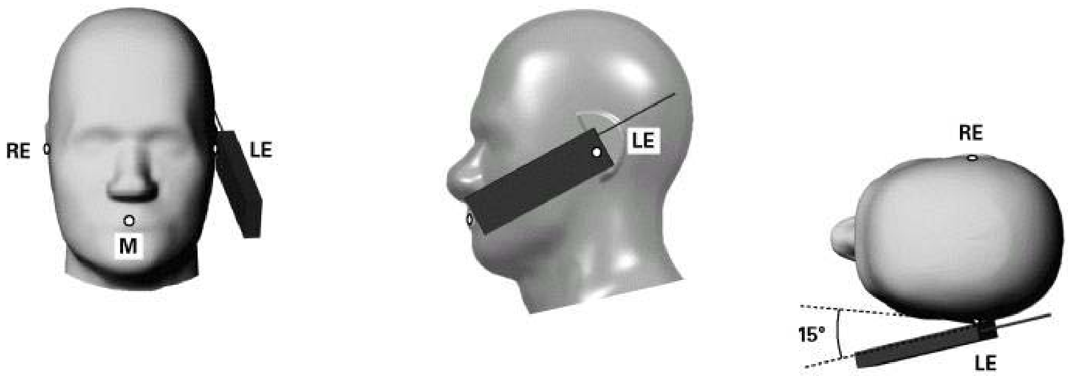
The head position in Figure 3.1, the ear reference points ERP are 15mm above entrance to ear canal along the B-M line. The line N-F (Neck-Front) is perpendicular to the B-M (Back Mouth) line. The handset device in Figure 3.1a and 3.1b,The vertical centerline pass through two points on the front side of handset: the midpoint of the width wt of the handset at the level of the acoustic output (point A) and the midpoint of the width Wb of the bottom of the handset (point B). The vertical centerline is perpendicular to the horizontal line and pass through the center of the acoustic output. The point A touches the ERP and the vertical centerline of the handset is parallel to the B-M line. While maintaining the point A contact with the ear(ERP), rotate the handset about the line NF until any point on handset is in contact with the cheek of the phantom



TOUCH/CHEEK POSITION FIGURE

4.1.2 TILT TEST POSITION

Adjust the device in the cheek position. While maintaining a point of the handset contact in the ear, move the bottom of the handset away from the mouth by an angle of 15 degrees.



TILT POSITION FIGURE

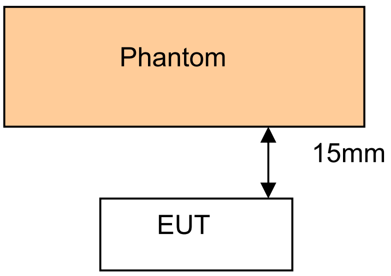
4.1.3 BODY-WORN CONFIGURATION

The EUT is parallel with phantom and keep 15mm distance.

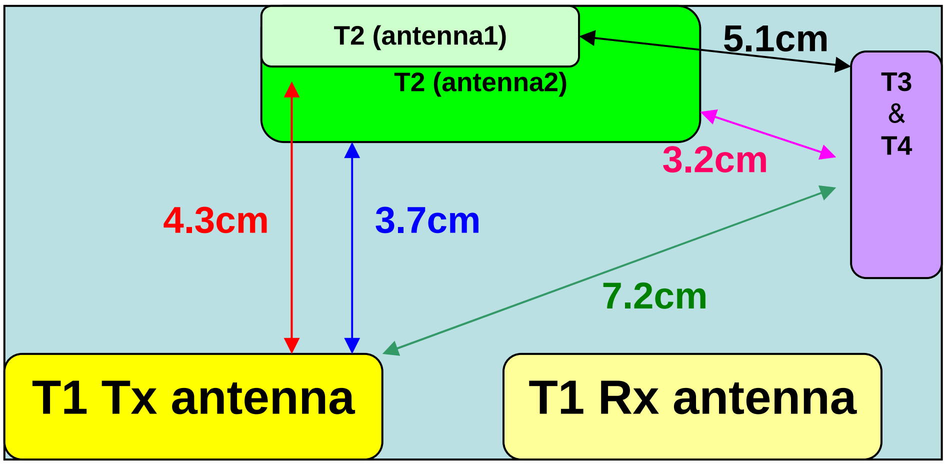
2 modes are tested

1) Front side faces to phantom

2) Back side faces to phantom



4.2 SIMULTANEOUS SAR EVALUATION



T1: CDMA main antenna for Tx

T2: WiMAX antenna 1 & 2 with Tx diversity function

T3: WLAN antenna , T4: Bluetooth antenna.

WLAN (T3) and Bluetooth (T4) use the same antenna, but they can NOT transmit at the same time.

Table1-1: stand-alone Haed SAR

Device, mode, *f* , *antenna*	***P*, mW**	**single SAR, W/kg**	**Remarks**
T1, CDMA,850,main	248.89	0.455	Routine eval.
T1, CDMA,1900, main	246.60	1.030	Routine eval.
T2, WiMAX, 2600, antenna 1	239.88	0.130	$\{P_2 > 2{*}P_{Ref}\}$
T2, WiMAX, 2600, antenna 2	245.47	0.151	$\{P_2 > 2{*}P_{Ref}\}$
T3, WLAN, 2450, Tx	141.25	0.094	$\{P_3 > 2{*}P_{Ref}\}$
T4, Bluetooth,2412, Tx		:=0	$\{d_{24}$ > 2.5 cm,<5cm$\}$,$\{P_4 \le P_{Ref}\}$ $\{d_{14}$ > 5cm$\}$
Σ_{all} SAR$_{1g}$		0.7	CDMA 850 + WiFi + WiMAX
		1.211	CDMA 1900 + WiFi + WiMAX

Table1-2: stand-alone Body SAR

Device, mode, *f* , *antenna*	***P*, mW**	**single SAR, W/kg**	**Remarks**
T1, CDMA,850,main	248.89	0.636	Routine eval.
T1, CDMA,1900, main	246.60	0.961	Routine eval.
T2, WiMAX, 2600, antenna 1	239.88	0.172	$\{P_2 > 2{*}P_{Ref}\}$
T2, WiMAX, 2600, antenna 2	245.47	0.385	$\{P_2 > 2{*}P_{Ref}\}$
T3, WLAN, 2450, Tx	141.25	0.078	$\{P_3 > 2{*}P_{Ref}\}$
T4, Bluetooth,2412, Tx		:=0	$\{d_{24}$ > 2.5 cm,<5cm$\}$,$\{P_4 \le P_{Ref}\}$ $\{d_{14}$ > 5cm$\}$
Σ_{all} SAR$_{1g}$		1.099	CDMA 850 + WiFi + WiMAX
		1.424	CDMA 1900 + WiFi + WiMAX

Table 2-1: Simultaneous Head SAR

(x, y) Mode	d_{xy}, cm	L_{xy}, cm	$SPLSR_{xy}$	Sim-Tx SAR	Remark
(1,2)	4.3	5.675	0.103	N	CDMA850+WiMAX antenna 1 {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(1,2)	4.3	7.443	0.156	N	CDMA1900+WiMAX antenna 1 {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(1,2)	3.7	6.978	0.087	N	CDMA850+WiMAX antenna 2 {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(1,2)	3.7	8.72	0.128	N	CDMA1900+WiMAX antenna 2 {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(1,3)	7.2	6.36	0.086	N	CDMA850+WLAN {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(1,3)	7.2	8.627	0.123	N	CDMA1900+WLAN {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(1,4)	7.2	-	-	N	{no stand-alone SAR}
(2,3)	5.1	2.195	0.102	N	WiMAX antenna1+WLAN {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(2,3)	3.2	2.272	0.108	N	WiMAX antenna2+WLAN {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(2,4)	5.1	-	-	N	{no stand-alone SAR}

Table 2-2: Simultaneous Body SAR

(x, y) Mode	d_{xy}, cm	L_{xy}, cm	$SPLSR_{xy}$	Sim-Tx SAR	Remark
(1,2)	4.3	3.566	0.227	N	CDMA850+WiMAX antenna 1 {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(1,2)	4.3	6.949	0.163	N	CDMA1900+WiMAX antenna 1 {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(1,2)	3.7	3.093	**0.330**	**Y**	CDMA850+WiMAX antenna 2 {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ > 0.3}
(1,2)	3.7	6.661	0.202	N	CDMA1900+WiMAX antenna 2 {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(1,3)	7.2	5.229	0.137	N	CDMA850+WLAN {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(1,3)	7.2	10.445	0.099	N	CDMA1900+WLAN {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(1,4)	7.2	-	-	N	{no stand-alone SAR}
(2,3)	5.1	5.279	0.047	N	WiMAX antenna1+WLAN {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(2,3)	3.2	5.101	0.091	N	WiMAX antenna2+WLAN {Σ_{all} SAR_{1g} < 1.6 W/kg} {$SPLSR_{xy}$ < 0.3}
(2,4)	5.1	-	-	N	{no stand-alone SAR}

SPLSR of CDMA and WIMAX antenna 2 is higher than 0.3. Therefore, simultaneous transmission for this mode is necessary.

5. TEST RESULTS

5.1 TEST PROCEDURES

The EUT makes a phone call to the communication simulator station. Establish the simulation communication configuration rather the actual communication. Then the EUT could continuous the transmission mode. Adjust the PCL of the base station could controlled the EUT to transmitted the maximum output power. The base station also could control the transmission channel. The SAR value was calculated via the 3D spline interpolation algorithm that has been implemented in the software of DASY5 SAR measurement system manufactured and calibrated by SPEAG. According to the IEEE 1528 / EN 62209-1, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- Power reference measurement
- Verification of the power reference measurement
- Volume scan
- Power reference measurement

Volume Scans are used to assess peak SAR and averaged SAR measurement in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan

In the volume scan, the distance between the measurement point at the probe sensor location (geometric center behind the probe tip) and the phantom surface is 3mm.The scan size is 19 x 31 x 9 points and the grid space is 5mm.

The measurement time is 0.5s at each point of the volume scan. The probe boundary effect compensation shall be applied during the SAR test. Because of the tip of the probe to the Phantom surface separated distances are longer than half a tip probe diameter

Multiband Data Extractions

In order to extract and process measurements within different frequency bands, the SEMCAD X Postprocessor allows the user to combine and subsequently superpose these measurement data using the Tools menu. Using combined Multi Band Averaged SAR of tools menu to get the multiband SAR value.

5.2 MEASURED SAR RESULTS

CDMA850+WiMAX antenna 2 BODY POSITION

	FREQ. (MHz)	VOLUME SAR(W/kg)	Multi Band Result (W/kg)
CDMA 850	836.52	0.630	0.907
WiMAX	2593.0	0.450	

NOTE:

1. Test configuration of each mode is described in section 4.1.
2. In this testing, the limit for General Population Spatial Peak averaged over **1g, 1.6W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

5.3 RECIPES FOR TISSUE SIMULATING LIQUIDS

For the measurement of the field distribution inside the SAM phantom, the phantom must be filled with 25 litters of tissue simulation liquid.

The following are some common ingredients：

- **WATER-** Deionized water (pure H20), resistivity _16 M - as basis for the liquid
- **SUGAR-** Refined sugar in crystals, as available in food shops - to reduce relative permittivity
- **SALT-** Pure NaCl - to increase conductivity
- **CELLULOSE-** Hydroxyethyl-cellulose, medium viscosity (75-125mPa.s, 2% in water, 20_C),
  CAS # 54290 - to increase viscosity and to keep sugar in solution
- **PRESERVATIVE-** Preventol D-7 Bayer AG, D-51368 Leverkusen, CAS # 55965-84-9 - to prevent the spread of bacteria and molds
- **DGMBE-** Diethylenglycol-monobuthyl ether (DGMBE), Fluka Chemie GmbH, CAS # 112-34-5 - to reduce relative permittivity

THE RECIPES FOR 835MHz SIMULATING LIQUID TABLE

INGREDIENT	HEAD SIMULATING LIQUID 835MHz (HSL-835)	BODY SIMULATING LIQUID 835MHz (MSL-835)
Water	40.28%	50.07%
Cellulose	02.41%	NA
Salt	01.38%	0.94%
Preventtol D-7	00.18%	0.09%
Sugar	57.97%	48.2%
Dielectric Parameters at 22℃	f = 835MHz ε= 41.5 ± 5% σ= 0.97 ± 5% S/m	f= 835MHz ε= 55.0 ± 5% σ= 1.05 ± 5% S/m

THE RECIPES FOR 2600MHz SIMULATING LIQUID TABLE

Ingredient	BODY SIMULATING LIQUID 2600MHz (MSL-2600)
Water	69.83%
DGMBE	30.17%
Salt	NA
Dielectric Parameters at 22℃	f= 2600MHz ε= 52.5 ± 5% σ= 2.16 ± 5% S/m

Testing the liquids using the Agilent Network Analyzer E8358A and Agilent Dielectric Probe Kit 85070D.The testing procedure is following as

1. Turn Network Analyzer on and allow at least 30min. warm up.
2. Mount dielectric probe kit so that interconnecting cable to Network Analyzer will not be moved during measurements or calibration.
3. Pour de-ionized water and measure water temperature (±1°).
4. Set water temperature in Agilent-Software (Calibration Setup).
5. Perform calibration.
6. Validate calibration with dielectric material of known properties (e.g. polished ceramic slab with >8mm thickness ε'=10.0, ε''=0.0). If measured parameters do not fit within tolerance, repeat calibration (±0.2 for ε': ±0.1 for ε'').
7. Conductivity can be calculated from ε'' by $\sigma = \omega \varepsilon_0 \varepsilon'' = \varepsilon'' f [GHz] / 18$.
8. Measure liquid shortly after calibration. Repeat calibration every hour.
9. Stir the liquid to be measured. Take a sample (~ 50ml) with a syringe from the center of the liquid container.
10. Pour the liquid into a small glass flask. Hold the syringe at the bottom of the flask to avoid air bubbles.
11. Put the dielectric probe in the glass flask. Check that there are no air bubbles in front of the opening in the dielectric probe kit.
12. Perform measurements.
13. Adjust medium parameters in DASY5 for the frequencies necessary for the measurements (‘Setup Config’, select medium (e.g. Brain 900MHz) and press ‘Option’-button.
14. Select the current medium for the frequency of the validation (e.g. Setup Medium Brain 900MHz).

FOR CDMA850 BAND SIMULATING LIQUID

LIQUID TYPE		MSL-835			
SIMULATING LIQUID TEMP.		22.6 ℃			
TEST DATE		Mar. 22, 2010			
TESTED BY		Sam Onn			
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)	LIMIT(%)
835	Permitivity (ε)	55.2	55.9	1.27	±5
836.52		55.2	55.9	1.27	
835	Conductivity (σ) S/m	0.97	0.95	-2.06	
836.52		0.97	0.96	-1.03	

FOR WIMAX BAND SIMULATING LIQUID

LIQUID TYPE		MSL-2600			
SIMULATING LIQUID TEMP.		22.6 ℃			
TEST DATE		Mar. 22, 2010			
TESTED BY		Sam Onn			
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)	LIMIT(%)
2593	Permitivity (ε)	52.6	53.8	2.28	±5
2600		52.5	53.2	1.33	
2593	Conductivity (σ) S/m	2.25	2.16	-4.00	
2600		2.26	2.16	-4.42	

6. SYSTEM VALIDATION

The system validation was performed in the flat phantom with equipment listed in the following table. Since the SAR value is calculated from the measured electric field, dielectric constant and conductivity of the body tissue and the SAR is proportional to the square of the electric field. So, the SAR value will be also proportional to the RF power input to the system validation dipole under the same test environment. In our system validation test, 250mW RF input power was used.

6.1 TEST PROCEDURE

Before the system performance check, we need only to tell the system which components (probe, medium, and device) are used for the system performance check; the system will take care of all parameters. The dipole must be placed beneath the flat section of the SAM Twin Phantom with the correct distance holder in place. The distance holder should touch the phantom surface with a light pressure at the reference marking (little cross) and be oriented parallel to the long side of the phantom. Accurate positioning is not necessary, since the system will search for the peak SAR location, except that the dipole arms should be parallel to the surface. The device holder for mobile phones can be left in place but should be rotated away from the dipole.

1. The ”Power Reference Measurement” and ”Power Drift Measurement” jobs are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the amplifier output power. If it is too high (above ±0.1 dB), the system performance check should be repeated; some amplifiers have very high drift during warm-up. A stable amplifier gives drift results in the DASY system below ±0.02dB.

2. The ”Surface Check” job tests the optical surface detection system of the DASY system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ±0.1mm). In that case it is better to abort the system performance check and stir the liquid.

3. The ”Area Scan” job measures the SAR above the dipole on a plane parallel to the surface. It is used to locate the approximate location of the peak SAR. The proposed scan uses large grid spacing for faster measurement; due to the symmetric field, the peak detection is reliable. If a finer graphic is desired, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result.

4. The ”Zoom Scan” job measures the field in a volume around the peak SAR value assessed in the previous ”Area Scan” job (for more information see the application note on SAR evaluation).

About the validation dipole positioning uncertainty, the constant and low loss dielectric spacer is used to establish the correct distance between the top surface of the dipole and the bottom surface of the phantom, the error component introduced by the uncertainty of the distance between the liquid (i.e., phantom shell) and the validation dipole in the DASY5 system is less than ±0.1mm.

$$SAR_{tolerance}[\%] = 100 \times \left(\frac{(a+d)^2}{a^2} - 1\right)$$

As the closest distance is 10mm, the resulting tolerance $SAR_{tolerance}[\%]$ is <2%.

6.2 VALIDATION RESULTS

SYSTEM VALIDATION TEST OF SIMULATING LIQUID					
FREQUENCY (MHz)	**REQUIRED SAR (mW/g)**	**MEASURED SAR (mW/g)**	**DEVIATION (%)**	**SEPARATION DISTANCE**	**TESTED DATE**
MSL835	2.54 (1g)	2.42	-4.72	15mm	Mar. 22, 2010
MSL2600	13.90 (1g)	12.9	-7.19	10mm	Mar. 22, 2010
TESTED BY	Sam Onn				

NOTE: Please see Appendix for the photo of system validation test.

6.3 SYSTEM VALIDATION UNCERTAINTIES

In the table below, the system validation uncertainty with respect to the analytically assessed SAR value of a dipole source as given in the IEEE 1528 standard is given. This uncertainty is smaller than the expected uncertainty for mobile phone measurements due to the simplified setup and the symmetric field distribution.

Error Description	Tolerance (±%)	Probability Distribution	Divisor	(C_i) (1g)	(C_i) (10g)	Standard Uncertainty (±%) (1g)	Standard Uncertainty (±%) (10g)	(v_i)
Measurement System								
Probe Calibration	5.50	Normal	1	1	1	5.50	5.50	∞
Axial Isotropy	4.70	Rectangular	$\sqrt{3}$	0.7	0.7	1.90	1.90	∞
Hemispherical Isotropy	9.60	Rectangular	$\sqrt{3}$	0.7	0.7	3.88	3.88	∞
Boundary effects	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	4.70	Rectangular	$\sqrt{3}$	1	1	2.71	2.71	∞
System Detection Limits	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	0.30	Normal	1	1	1	0.30	0.30	∞
Response Time	0.80	Rectangular	$\sqrt{3}$	1	1	0.46	0.46	∞
Integration Time	2.60	Rectangular	$\sqrt{3}$	1	1	1.50	1.50	∞
RF Ambient Noise	3.00	Rectangular	$\sqrt{3}$	1	1	1.73	1.73	∞
RF Ambient Reflections	3.00	Rectangular	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe Positioner	0.40	Rectangular	$\sqrt{3}$	1	1	0.23	0.23	∞
Probe Positioning	2.90	Rectangular	$\sqrt{3}$	1	1	1.67	1.67	∞
Max. SAR Eval.	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Dipole Related								
Dipole Axis to Liquid Distance	2.00	Rectangular	$\sqrt{3}$	1	1	1.15	1.15	145
Input Power Drift	5.00	Rectangular	$\sqrt{3}$	1	1	2.89	2.89	∞
Phantom and Tissue parameters								
Phantom Uncertainty	4.00	Rectangular	$\sqrt{3}$	1	1	2.31	2.31	∞
Liquid Conductivity (target)	5.00	Rectangular	$\sqrt{3}$	0.64	0.43	1.85	1.24	∞
Liquid Conductivity (measurement)	4.10	Normal	1	0.64	0.43	2.62	1.76	∞
Liquid Permittivity (target)	5.00	Rectangular	$\sqrt{3}$	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	3.83	Normal	1	0.6	0.49	2.30	1.88	∞
Combined Standard Uncertainty						**10.11**	**9.69**	
Coverage Factor for 95%						**Kp=2**		
Expanded Uncertainty (K=2)						**20.23**	**19.38**	

NOTE: About the system validation uncertainty assessment, please reference the section 7.

7. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:
Tel: 886-3-3183232
Fax: 886-3-3185050

Web Site: www.adt.com.tw

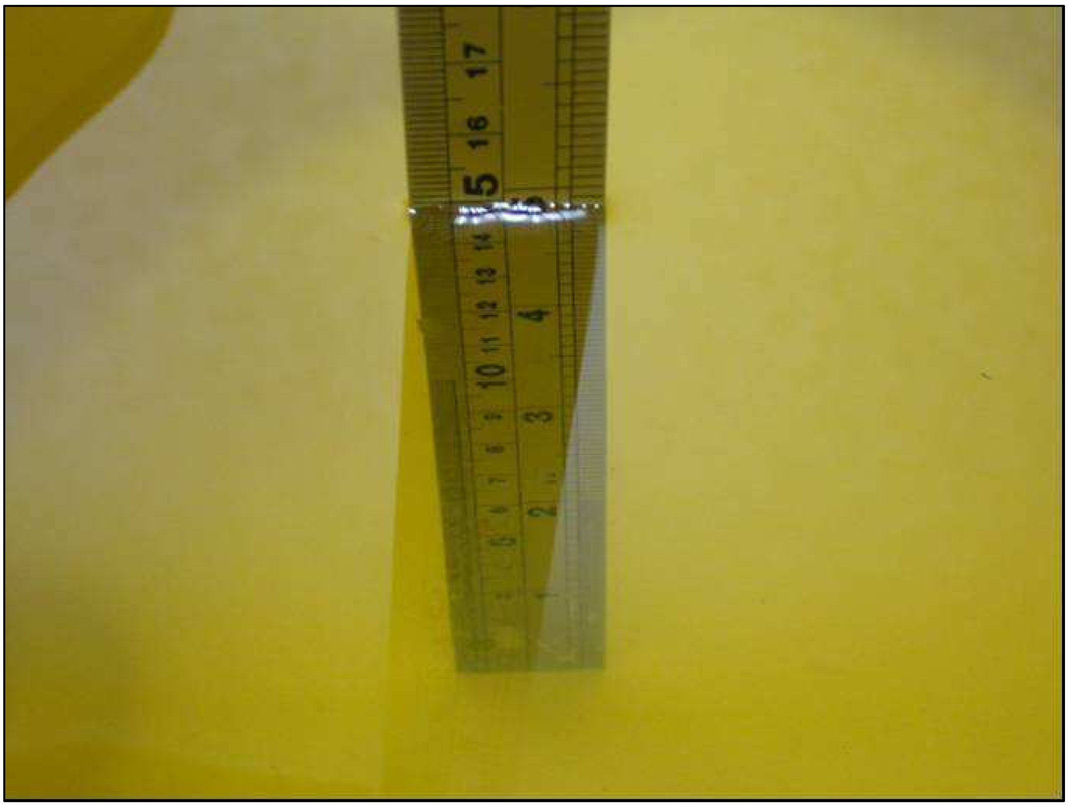
The address and road map of all our labs can be found in our web site also.

---END---

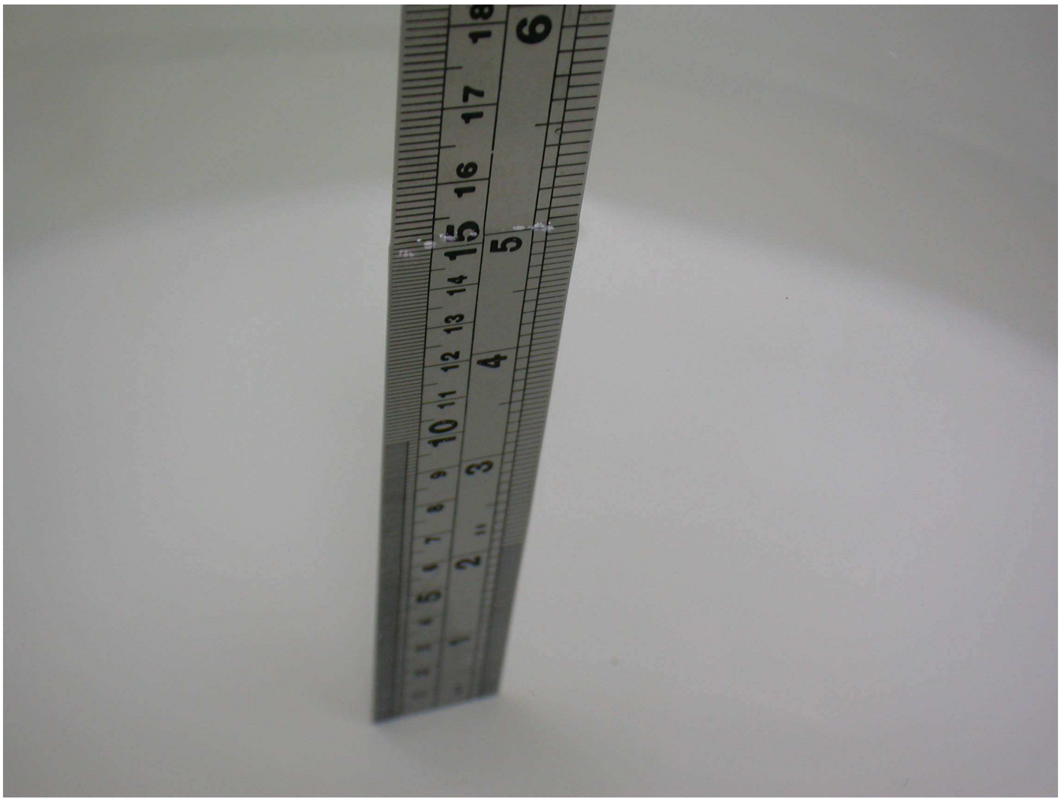
APPENDIX A: TEST DATA

Liquid Level Photo

Tissue HSL835MHz D=150mm



Tissue MSL2600MHz D=152mm

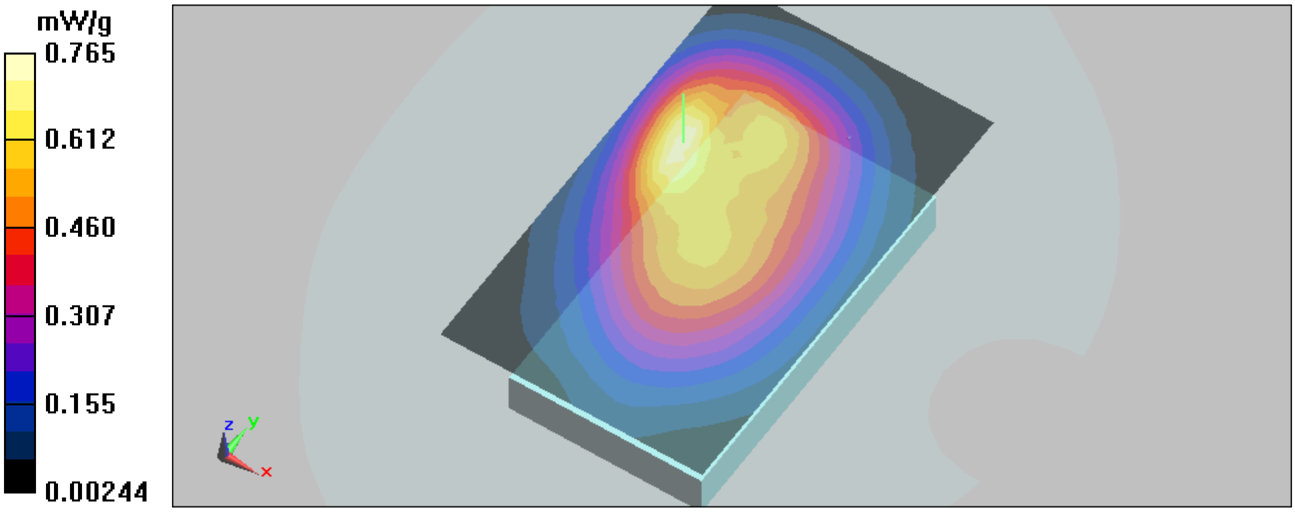


Date/Time: 2010/3/22 21:17:37

Test Laboratory: BV-ADT

Body-Volume CDMA_850 Ch384 836.52MHz

Flat-Section MSL Back 15mm/Flat Section 15mm Mid. Ch384 VOLUME/Volume Scan (19x31x9): Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 27.2 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 0.997 W/kg
SAR(1 g) = 0.630 mW/g; SAR(10 g) = 0.412 mW/g
Total Absorbed Power = 0.0565253 W
Maximum value of SAR (measured) = 0.765 mW/g

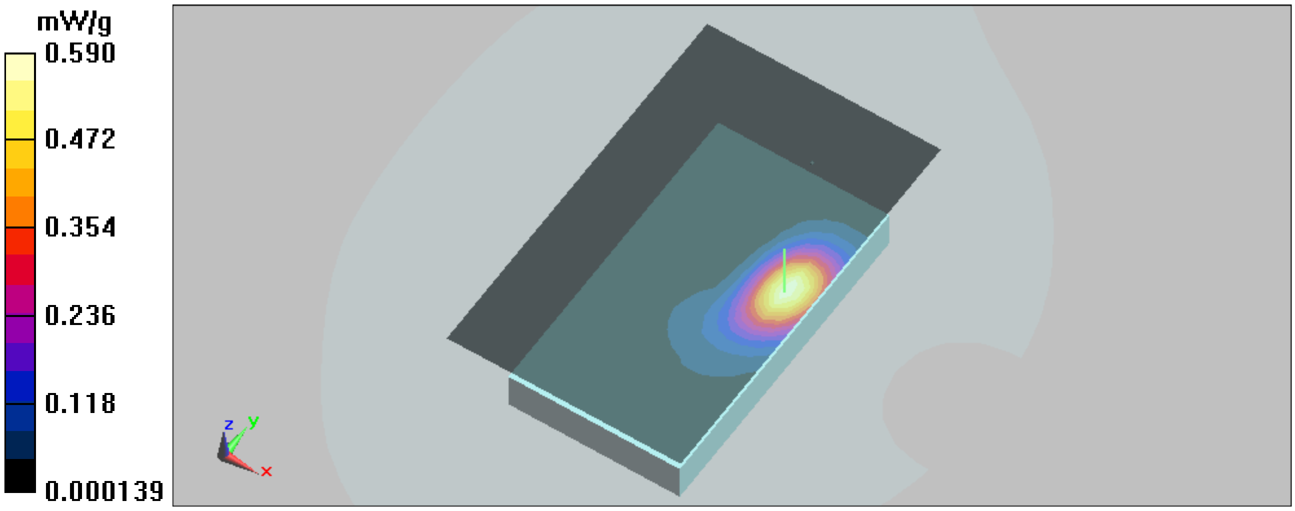


Date/Time: 2010/3/22 17:17:23

Test Laboratory: BV-ADT

Body-Volume _5M_AUX Antenna (2593MHz)

Flat-Section WiMax_5M Ant0_Back 15mm/Flat Section 15mm Mid. Ch378_Ant 0_SAR Charging QPSK1/2/Volume Scan (19x31x9): Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 15.3 V/m; Power Drift = -0.107 dB
Peak SAR (extrapolated) = 0.951 W/kg
SAR(1 g) = 0.450 mW/g; SAR(10 g) = 0.204 mW/g
Total Absorbed Power = 0.00581047 W
Maximum value of SAR (measured) = 0.590 mW/g



Body-CDMA_850 +Wimax QPSK1/2

DASY Configuration for Program/Flat Section 15mm Mid. Ch384 VOLUME/Volume Scan:

Date/Time: 2010/3/22
Test Laboratory: The name of your organization
File Name: V-Body-CDMA_Cellular.da52:0
DUT: Pocket PC Phone; Type: PB31600;
Communication System: CDMA 1x; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium: MSL900 Medium parameters used (interpolated): f = 836.52 MHz; σ = 0.96 mho/m; ε_r = 55.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

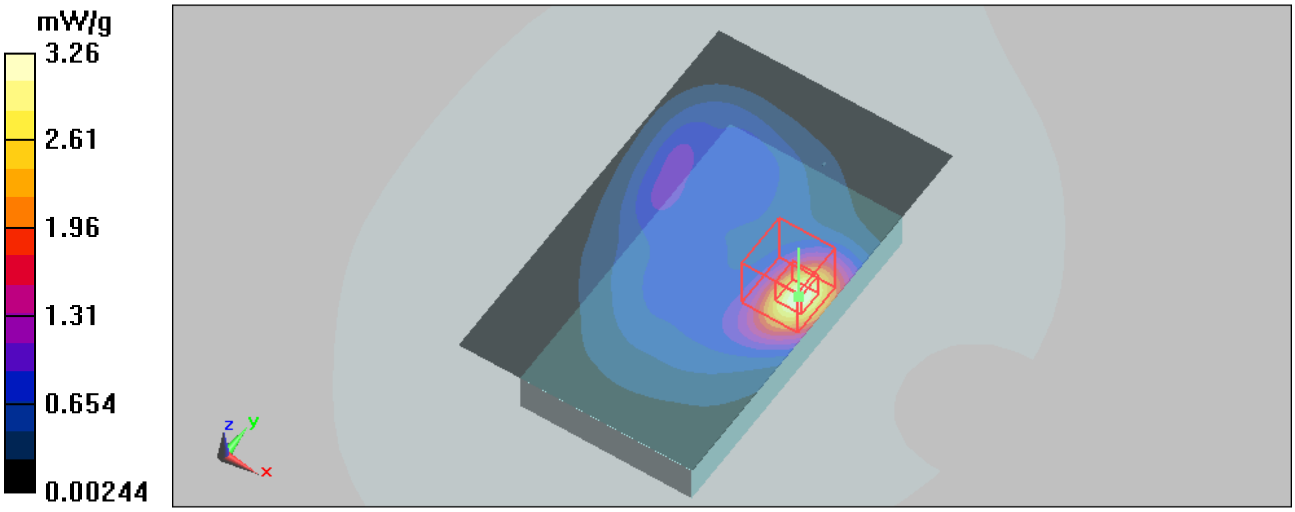
- Probe: EX3DV3 - SN3504; ConvF(9.83, 9.83, 9.83); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 157

DASY Configuration for Program/Flat Section 15mm Mid. Ch378_Ant 0_SAR Charging QPSK1/2/Volume Scan:

Date/Time: 2010/3/22
Test Laboratory: The name of your organization
File Name: V-Body-CTC_5M_Ant 0 (Mid. Ch).da52:0
DUT: Pocket PC Phone; Type: PC31600;
Communication System: WiMax; Frequency: 2593 MHz; Duty Cycle: 1:3.2434
Medium: MSL2600 Medium parameters used: f = 2593 MHz; σ = 2.16 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

- Probe: EX3DV3 - SN3504; ConvF(7.8, 7.8, 7.8); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 157

Multi Band Result:
SAR(1 g) = 0.907 mW/g; SAR(10 g) = 0.446 mW/g
Maximum value of SAR (measured) = 3.26 mW/g


mW/g
3.26
2.61
1.96
1.31
0.654
0.00244
z
y
x

Date/Time: 2010/3/22 18:03:58

Test Laboratory: Bureau Veritas ADT

System PerformanceCheck-MSL835 MHz

DUT: Dipole 835 MHz ; Type: D835V2 ; Serial: 4d021 ; Test Frequency: 835 MHz

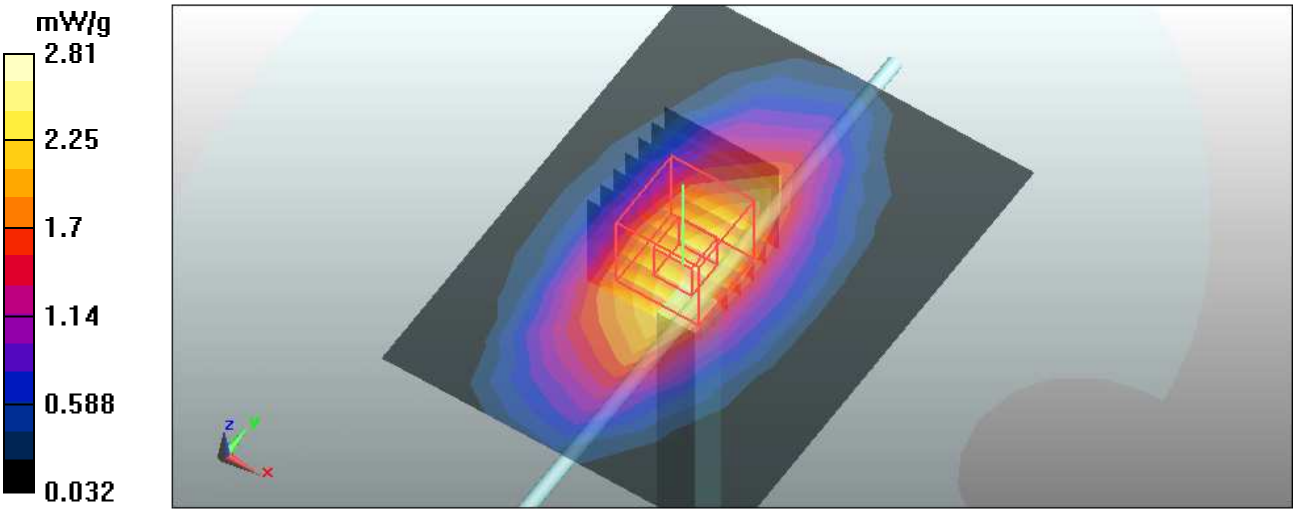
Communication System: CW ; Frequency: 835 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: MSL900;Medium parameters used: f = 835 MHz; σ = 0.95 mho/m; ε_r = 55.9; ρ = 1000 kg/m^3 ;
Liquid level : 150 mm
Phantom section: Flat Section ; Separation distance : 15 mm (The feetpoint of the dipole to the Phantom)Air temp. : 23 degrees ; Liquid temp. : 22.6 degrees

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(9.83, 9.83, 9.83) ; Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

System Performance Check at Frequencies 835 MHz/d=15mm, Pin=250 mW, dist=3.0mm /Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.67 mW/g

System Performance Check at Frequencies 835 MHz/d=15mm, Pin=250 mW, dist=3.0mm /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.8 V/m; Power Drift = 0.0168 dB
Peak SAR (extrapolated) = 3.62 W/kg
SAR(1 g) = 2.42 mW/g; SAR(10 g) = 1.56 mW/g
Maximum value of SAR (measured) = 2.81 mW/g



Date/Time: 2010/3/22 14:30:55

Test Laboratory: Bureau Veritas ADT

System PerformanceCheck-MSL2600MHz

DUT: Dipole 2600 MHz ; Type: D2600V2 ; Serial: 1020 ; Test Frequency: 2600 MHz

Communication System: CW ; Frequency: 2600 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: MSL2600;Medium parameters used: f = 2600 MHz; σ = 2.16 mho/m; ε_r = 53.2; ρ = 1000 kg/m^3 ; Liquid level : 152 mm
Phantom section: Flat Section ; Separation distance : 10 mm (The feetpoint of the dipole to the Phantom)Air temp. : 23.1 degrees ; Liquid temp. : 22.6 degrees

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.8, 7.8, 7.8); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

System Performance Check/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 17.9 mW/g
System Performance Check/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.5 V/m; Power Drift = -0.124 dB
Peak SAR (extrapolated) = 29.6 W/kg
SAR(1 g) = 12.9 mW/g; SAR(10 g) = 5.71 mW/g
Maximum value of SAR (measured) = 17.6 mW/g