SAR TEST REPORT
(MOBILE)

REPORT NO.: SA981217L06-1

MODEL NO.: PB31200

RECEIVED: Dec. 17, 2009

TESTED: Dec. 18 ~ Dec. 22, 2009

ISSUED: Jan. 05, 2010

APPLICANT: HTC Corporation

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

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1. CERTIFICATION

PRODUCT:	Smartphone
MODEL NO.:	PB31200
BRAND:	HTC
APPLICANT:	HTC Corporation
TESTED:	Dec. 18 ~ Dec. 22, 2009
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: PB31200) has 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 : Rennie Wang / Supervisor , **DATE:** Jan. 08, 2010

TECHNICAL ACCEPTANCE : Mason Chang / Engineer , **DATE:** Jan. 08, 2010
Responsible for RF

APPROVED BY : Gary Chang / Assistant Manager , **DATE:** Jan. 08, 2010

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>EUT</td><td colspan="2">Smartphone</td></tr>
<tr><td>MODEL NO.</td><td colspan="2">PB31200</td></tr>
<tr><td>FCC ID</td><td colspan="2">NM8PB31200</td></tr>
<tr><td>POWER SUPPLY</td><td colspan="2">3.7Vdc from rechargeable lithium battery
5.0Vdc from power adapter
5.0Vdc from host equipment</td></tr>
<tr><td>MODULATION TYPE</td><td colspan="2">OQPSK, HPSK</td></tr>
<tr><td>FREQUENCY RANGE</td><td colspan="2">824MHz ~ 849MHz ; 1850MHz ~ 1910MHz</td></tr>
<tr><td rowspan="6">CHANNEL FREQUENCIES UNDER TEST AND ITS CONDUCTED OUTPUT POWER</td><td colspan="2">CDMA850 BAND:</td></tr>
<tr><td>SO55 RC3</td><td>24.17dBm / 824.7MHz for channel 1013
24.18dBm / 836.5MHz for channel 384
24.21dBm / 848.3MHz for channel 777</td></tr>
<tr><td>TDSO SO32 RC3</td><td>24.30dBm / 836.5MHz for channel 384</td></tr>
<tr><td colspan="2">CDMA1900 BAND:</td></tr>
<tr><td>SO55 RC3</td><td>23.53dBm / 1851.25MHz for channel 25
23.87dBm / 1880.00MHz for channel 600
23.57dBm / 1908.75MHz for channel 1175</td></tr>
<tr><td>TDSO SO32 RC3</td><td>23.89dBm / 1880.00MHz for channel 600</td></tr>
<tr><td rowspan="2">MAX. AVERAGE SAR (1g)</td><td>HEAD:</td><td>1.390W/kg</td></tr>
<tr><td>BODY:</td><td>0.693W/kg</td></tr>
<tr><td>ANTENNA TYPE</td><td colspan="2">PIFA antenna</td></tr>
<tr><td>ANTENNA GAIN</td><td colspan="2">CDMA850 BAND: 0.5dBi
CDMA1900 BAND: 1.0dBi</td></tr>
<tr><td>DATA CABLE</td><td colspan="2">Refer to NOTE</td></tr>
<tr><td>I/O PORTS</td><td colspan="2">Refer to user's manual</td></tr>
<tr><td>ACCESSORY DEVICES</td><td colspan="2">Refer to NOTE</td></tr>
</table>

NOTE:

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

	REFERENCE REPORT
WLAN 802.11b/g	SA981217L06
CDMA 850 + CDMA 1900	SA981217L06-1
BLUETOOTH	SA981217L06-2

2. The EUT has following accessories.

NO.	PRODUCT	BRAND	MODEL	DESCRIPTION	REMARK
1	Power Adapter	Delta	TC P300	I/P: 100-240Vac, 50-60Hz, 0.2A O/P: 5Vdc, 1A	-
2			TC U250		-
3		Emerson	TC U250		-
4	USB cable	MEC	DC M410	1.4m shielded cable without core (For data transmission & charging use)	For TC P300 only
5		Foxlink			For TC U250 only
6	Battery	HT ENERGY	BB96100	Rating: 3.7Vdc, 1300mAh	See NOTE*
7			BTR6300B		
8		Formosa	BB96100		
9			BTR6300B		
NOTE*: Two models of battery are electrically identical, different model names are for marketing purpose. Therefore, we pre-tested two manufacturers and HT ENERGY battery was found to be the worst case for final test.					

3. MEID code: A1000007EE
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 SAR MEASUREMENT CONDITIONS FOR CDMA

The following procedures were followed according to FCC "SAR Measurement Procedures 3G Devices", Oct. 2007.

- **Output Power Verification**

Maximum output power is verified on the High, Middle and Low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. Results for at least steps 3, 4 and 10 of the power measurement procedures should be tabulated in the SAR report. Steps 3 and 4 should be measured using SO55 with power control bits in "All Up" condition. TDSO / SO32 may be used instead of SO55 for step 4. Step 10 should be measured using TDSO / SO32 with power control bits in the "Bits Hold" condition (i.e. alternative Up/Down Bits). All power measurements defined in C.S0011/TIA-98-E that are inapplicable to the DUT or cannot be measured due to technical or equipment limitations should be clearly identified in the test report.6

- **Head SAR Measurement**

SAR for head exposure configurations is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option SO55. SAR for RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3.

- **Body SAR Measurements**

SAR for body exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCHn) is not required when the maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCHn) with FCH at full rate and SCH0 enabled at 9600 bps using the exposure configuration that results in the highest SAR for that channel with FCH only.

When multiple code channels are enabled, the DUT output may shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts. Body SAR in RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate, using the body exposure configuration that results in the highest SAR for that channel in RC3.

- **Handsets with Ev-Do**

For handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev. 0 is less than ¼ dB higher than that measured in RC3 (1x RTT), body SAR for Ev-Do is not required. Otherwise, SAR for Rev. 0 is measured on the maximum output channel at **153.6 kbps** using the body exposure configuration that results in the highest SAR for that channel in RC3. SAR for Rev. A is not required when the maximum average output of each channel is less than that measured in Rev. 0 or less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel for Rev. A using a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations. A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots should be configured in the downlink for both Rev. 0 and Rev. A.

CDMA850 BAND:

WORST CASE CONDUCTED POWER OF 1x EV-DO								
CHANNEL	FREQ. (MHz)	Revision A	Release 0	CORR. FACTOR (dB)	Revision A		Release 0	
		RAW VALUE (dBm)			OUTPUT POWER			
					dBm	mW	dBm	mW
1013	824.7	19.01	19.25	4.20	23.21	209.4	23.45	221.3
384	836.5	19.11	19.35	4.20	23.31	214.3	23.55	226.5
777	848.3	19.38	19.41	4.20	23.58	228.0	23.61	229.6

CONDUCTED POWER (1x EV-DO)							
CHANNEL	FREQ. (MHz)	Revision A			Release 0		
		RETAP: 128kbps (dBm)	RETAP: 2048kbps (dBm)	RETAP: 12288kbps (dBm)	EVDO-UL: 9.6kbps (dBm)	EVDO-UL: 38.4kbps (dBm)	EVDO-UL: 153.6kbps (dBm)
1013	824.7	23.39	23.18	23.21	23.42	23.45	23.52
384	836.5	23.32	23.25	23.31	23.51	23.55	23.48
777	848.3	23.41	23.43	23.58	23.56	23.61	23.61

CDMA 2000 CONDUCTED POWER													
CHAN.	FREQ. (MHz)	CDMA	RAW VALUE (dBm)					CORR. FACTOR (dB)	OUTPUT POWER (dBm)				
		RC	SO2	SO55	TDSO SO32 (FCH)	TDSO SO32 (FCH+ SCH)	SO3		SO2	SO55	TDSO SO32 (FCH)	TDSO SO32 (FCH+ SCH)	SO3
1013	824.7	RC1	19.85	19.92	-	-	19.94	4.20	24.05	24.12	-	-	24.14
		RC3	19.96	19.97	19.99	19.94	19.98	4.20	24.16	24.17	24.19	24.14	24.18
384	836.5	RC1	19.95	19.85	-	-	19.89	4.20	24.15	24.05	-	-	24.09
		RC3	19.98	19.98	20.10	20.00	19.99	4.20	24.18	24.18	24.30	24.20	24.19
777	848.3	RC1	20.02	19.92	-	-	20.00	4.20	24.22	24.12	-	-	24.20
		RC3	20.00	20.01	20.03	19.99	20.00	4.20	24.20	24.21	24.23	24.19	24.20

CDMA1900 BAND:

WORST CASE CONDUCTED POWER OF 1x EV-DO								
CHANNEL	FREQ. (MHz)	Revision A	Release 0	CORR. FACTOR (dB)	Revision A		Release 0	
		RAW VALUE (dBm)			OUTPUT POWER			
					dBm	mW	dBm	mW
25	1851.25	18.50	18.60	4.50	23.00	199.5	23.10	204.2
600	1880.00	18.70	18.80	4.50	23.20	208.9	23.30	213.8
1175	1908.75	18.50	18.50	4.50	23.00	199.5	23.00	199.5

CONDUCTED POWER (1x EV-DO)							
CHANNEL	FREQ. (MHz)	Revision A			Release 0		
		RETAP: 128kbps (dBm)	RETAP: 2048kbps (dBm)	RETAP: 12288kbps (dBm)	EVDO-UL: 9.6kbps (dBm)	EVDO-UL: 38.4kbps (dBm)	EVDO-UL: 153.6kbps (dBm)
25	1851.25	23.00	23.00	22.90	23.00	23.10	23.00
600	1880.00	23.20	23.10	23.10	23.20	23.30	23.30
1175	1908.75	23.00	23.00	22.90	23.00	23.00	23.10

CDMA 2000 CONDUCTED POWER														
CHAN.	FREQ. (MHz)	CDMA 2000	RAW VALUE (dBm)					CORR. FACTOR (dB)	OUTPUT POWER (dBm)					
		RC	SO2	SO55	TDSO SO32 (FCH)	TDSO SO32 (FCH+ SCH)	SO3		SO2	SO55	TDSO SO32 (FCH)	TDSO SO32 (FCH+ SCH)	SO3
25	1851.25	RC1	18.82	18.92	-	-	19.11	4.50	23.32	23.42	-	-	23.61
		RC3	19.03	19.03	19.04	19.02	18.93	4.50	23.53	23.53	23.54	23.52	23.43
600	1880.00	RC1	19.32	19.32	-	-	19.22	4.50	23.82	23.82	-	-	23.72
		RC3	19.36	19.37	19.39	19.23	19.31	4.50	23.86	23.87	23.89	23.73	23.81
1175	1908.75	RC1	18.84	19.02	-	-	18.92	4.50	23.34	23.52	-	-	23.42
		RC3	19.04	19.07	19.08	18.96	18.93	4.50	23.54	23.57	23.58	23.46	23.43

2.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC 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.

2.4 GENERAL INOFRMATION OF THE SAR SYSTEM

DASY4 **(Software 4.7 Build 80)** 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 DASY4 software defined. The DASY4 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 > 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	835, 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.

2.5 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	Agilent	E8257C	MY43320668	Dec. 31, 2008	Dec. 30, 2009
3	E-Field Probe	S & P	EX3DV3	3504	Jan. 21, 2009	Jan. 20, 2010
4	DAE	S & P	DAE3	579	Jul. 17, 2009	Jul. 16, 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	D1900V2	5d022	Mar. 17, 2009	Mar. 16, 2010

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	E8358A	US41480538	Dec. 03, 2009	Dec. 02, 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

2.6 GENERAL DESCRIPTION OF THE SPATIAL PEAK SAR EVALUATION

The DASY4 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 1g and 10g 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 1g and 10g.

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.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7 x 7 x 7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 30 x 30 x 30mm contains about 30g of tissue. The first procedure is an extrapolation (incl. boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume in a 1mm grid (42875 points). In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

3. DESCRIPTION OF SUPPORT UNITS

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
1	Universal Radio Communication Tester	R&S	CMU200	104484	Feb. 02, 2010

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

NOTE: All power cords of the above support units are non shielded (1.8m).

4. DESCRIPTION OF TEST MODES AND CONFIGURATIONS

4.1. DESCRIPTION OF TEST POSITION

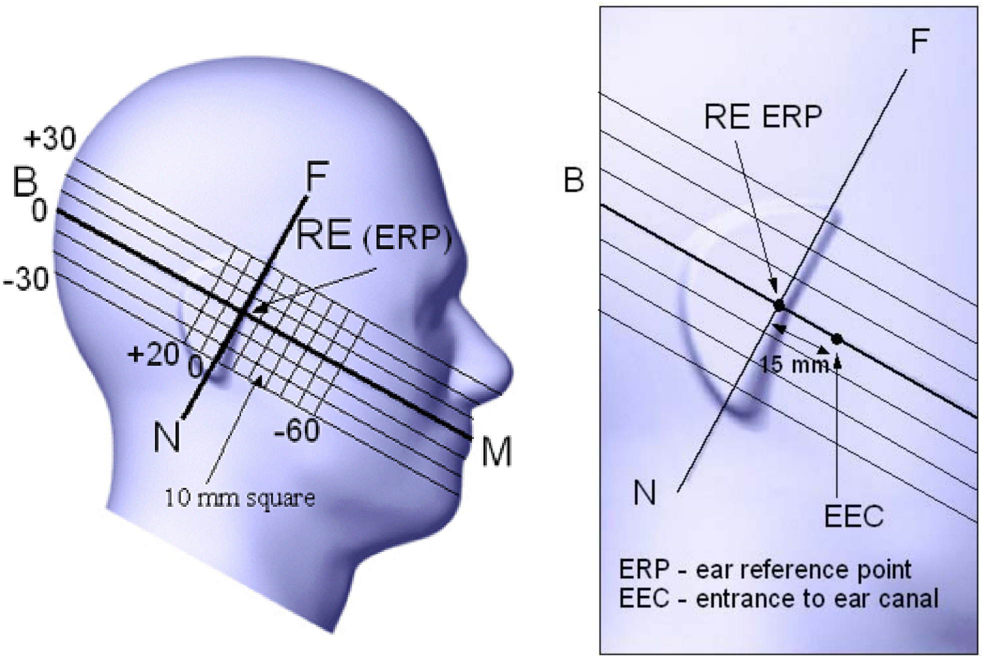


FIGURE 3.1

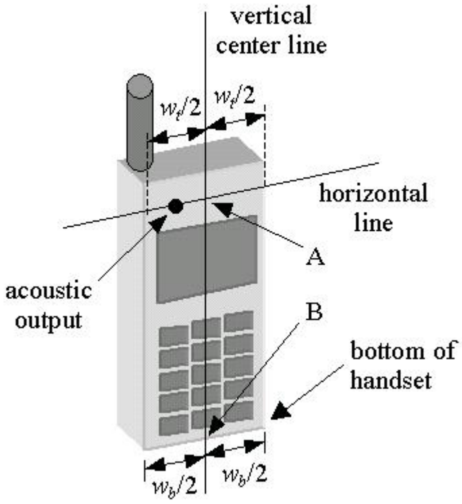


FIGURE 3.1a

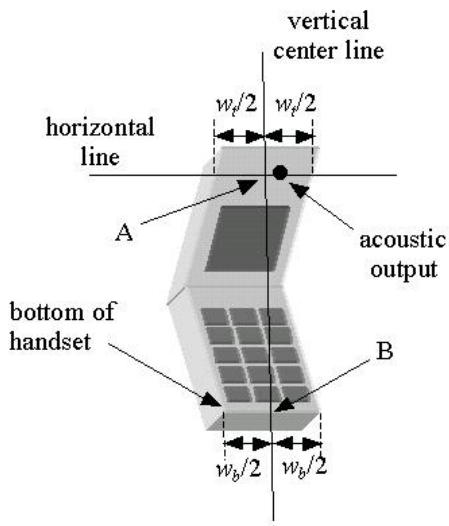
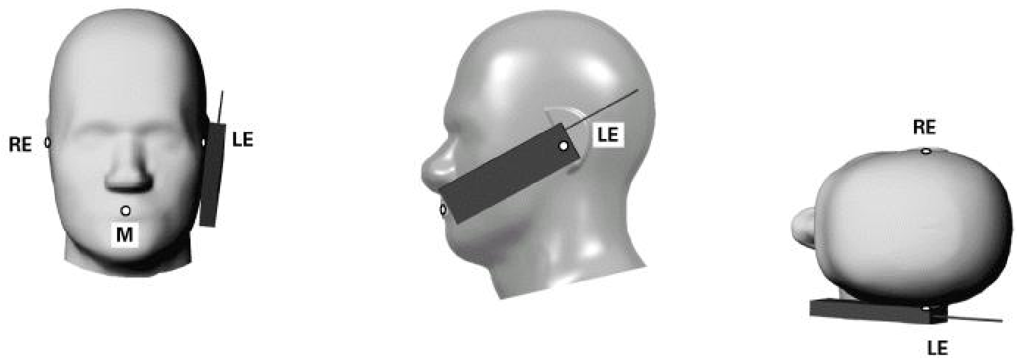


FIGURE 3.1b

4.2.1 TOUCH/CHEEK TEST POSITION

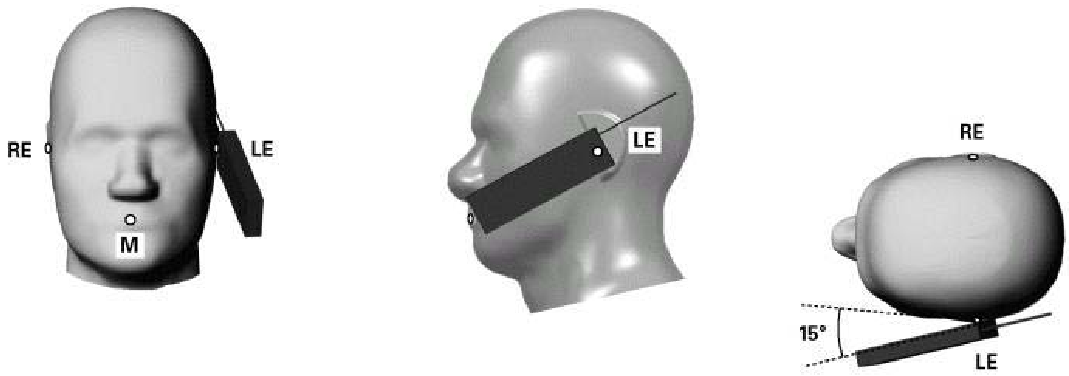
The head position in Figure 3.1, the ear reference points ERP are 15mm above entrance to ear canal along the B-M line. The line N-F (Neck-Front) is perpendicular to the B-M (Back Mouth) line. The handset device in Figure 3.1a and 3.1b,The vertical centerline pass through two points on the front side 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

4.2.2 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

4.2.3 BODY-WORN CONFIGURATION

The handset device attached the belt clip or the holster. The keypad face of the handset is against with the bottom of the flat phantom face and the bottom of the keypad face contact to the bottom of the flat phantom.

When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only accessory that dictates the closest spacing to the body must be tested.

4.2. DESCRIPTION OF TEST CONDITION

TEST DATE	TISSUE TYPE / FREQ.	TEST MODE	TEMPERATURE (°C)		HUMIDITY (%RH)	TESTED BY
			AIMBENT	LIQUID		
Dec. 22, 2009	HSL835	1-4	22.0	21.2	56	Sam Onn
Dec. 21, 2009	MSL835	5-6	22.1	21.3	52	Sam Onn
Dec. 18, 2009	HSL1900	7-10, 13	22.5	21.6	58	Sam Onn
Dec. 21, 2009	MSL1900	11-12	22.1	21.2	52	Sam Onn

4.3. DESCRIPTION OF TEST MODE

TEST MODE	COMMUNICATION MODE	MODULATION TYPE	ASSESSMENT POSTITION	TESTED CHANNEL	REMARK
1	CDMA 850 SO55	OQPSK	Right Head / Cheek	1013, 384, 777	HT ENERGY Battery
2	CDMA 850 SO55	OQPSK	Right Head / Tilt	384	HT ENERGY Battery
3	CDMA 850 SO55	OQPSK	Left Head / Cheek	384	HT ENERGY Battery
4	CDMA 850 SO55	OQPSK	Left Head / Tilt	384	HT ENERGY Battery
5	CDMA 850 SO32	OQPSK	Body / Back 15mm-separation	384	HT ENERGY Battery
6	CDMA 850 SO32	OQPSK	Body / Front 15mm-separation	384	HT ENERGY Battery
7	CDMA 1900 SO55	OQPSK	Right Head / Cheek	600	HT ENERGY Battery
8	CDMA 1900 SO55	OQPSK	Right Head / Tilt	600	HT ENERGY Battery
9	CDMA 1900 SO55	OQPSK	Left Head / Cheek	25, 600, 1175	HT ENERGY Battery
10	CDMA 1900 SO55	OQPSK	Left Head / Tilt	600	HT ENERGY Battery
11	CDMA 850 SO32	OQPSK	Body / Back 15mm-separation	600	HT ENERGY Battery
12	CDMA 850 SO32	OQPSK	Body / Front 15mm-separation	600	HT ENERGY Battery
13	CDMA 1900 SO55	OQPSK	Left Head / Cheek	1175	Formosa Battery

4.4. SUMMARY OF TEST RESULTS

PART OF ASSESSMENT	HEAD POSITION				BODY POSITION	
COMMUNICATION MODE	CDMA850 SO55				CDMA850 SO32	CDMA850 SO32
ITEM	1	2	3	4	5	6
	MEASURED VALUE OF 1g SAR (W/kg)					
	RIGHT		LEFT		BACK	FRONT
CHAN.	CHEEK	TILT	CHEEK	TILT	15mm	15mm
1013	0.713	-	-	-	-	-
384	0.890	0.495	0.789	0.395	0.494	0.376
777	0.778	-	-	-	-	-

PART OF ASSESSMENT	HEAD POSITION				BODY POSITION	
COMMUNICATION MODE	CDMA1900 SO55				CDMA1900 SO32	CDMA1900 SO32
ITEM	7	8	9	10	11	12
	MEASURED VALUE OF 1g SAR (W/kg)					
	RIGHT		LEFT		BACK	FRONT
CHAN.	CHEEK	TILT	CHEEK	TILT	15mm	15mm
25	-	-	1.290	-	-	-
600	0.660	0.402	1.290	0.626	**0.693**	0.481
1175	-	-	**1.390**	-	-	-

PART OF ASSESSMENT	HEAD POSITION
COMMUNICATION MODE	CDMA1900 SO55
ITEM	13
	MEASURED VALUE OF 1g SAR (W/kg)
	LEFT
CHAN.	CHEEK
1175	1.340

NOTE: The worst value has been marked by boldface.

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 DASY4 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
- Area scan
- Zoom scan
- Power reference measurement

The area scan was performed for the highest spatial SAR location. The zoom scan with 30mm x 30mm x 30mm volume was performed for SAR value averaged over 1g and 10g spatial volumes.

In the zoom scan, the distance between the measurement point at the probe sensor location (geometric center behind the probe tip) and the phantom surface is 3mm and maintained at a constant distance of ±0.5mm during a zoom scan to determine peak SAR locations. The distance is 3mm between the first measurement point and the bottom surface of the phantom. The secondary measurement point to the bottom surface of the phantom is with 8mm separation distance. The cube size is 7 x 7 x 7 points consists of 343 points and the grid space is 5mm.

The measurement time is 0.5s at each point of the zoom 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.

In the area scan, the separation distance is 3mm between the each measurement point and the phantom surface. The scan size shall be included the transmission portion of the EUT. The measurement time is the same as the zoom scan. At last the reference power drift shall be less than ±5%.

5.2 SAR LIMITS

HUMAN EXPOSURE	**SAR (W/kg)**	
	(GENERAL POPULATION / UNCONTROLLED EXPOSURE ENVIRONMENT)	**(OCCUPATIONAL / CONTROLLED EXPOSURE ENVIRONMENT)**
Spatial Peak (averaged over 1 g)	**1.6**	8.0

NOTE:

1. This limits accord to 47 CFR 2.1093 – Safety Limit.
2. The EUT property been complied with the partial body exposure limit under the general population environment.

5.3 MEASURED SAR RESULTS

TEST MODE	CHAN.	FREQ. (MHz)	MODULATION	TEST POSITION	CONDUCTED POWER (dBm) BEGIN TEST	POWER DRIFT (dB)	MEASURED 1g SAR (W/kg)
1	1013	824.7	OQPSK	Right Head / Cheek	24.17	-0.130	0.713
1	384	836.5	OQPSK	Right Head / Cheek	24.18	0.156	0.890
1	777	848.3	OQPSK	Right Head / Cheek	24.21	-0.099	0.778
2	384	836.5	OQPSK	Right Head / Tilt	24.18	-0.035	0.495
3	384	836.5	OQPSK	Left Head / Cheek	24.18	-0.080	0.789
4	384	836.5	OQPSK	Left Head / Tilt	24.18	-0.111	0.395
5	384	836.5	OQPSK	Body / Back	24.30	-0.127	0.494
6	384	836.5	OQPSK	Body / Front	24.30	-0.086	0.376
7	600	1880.0	OQPSK	Right Head / Cheek	23.87	-0.116	0.660
8	600	1880.0	OQPSK	Right Head / Tilt	23.87	-0.137	0.402
9	25	1851.25	OQPSK	Left Head / Cheek	23.53	-0.030	1.290
9	600	1880.0	OQPSK	Left Head / Cheek	23.87	0.058	1.290
9	1175	1908.75	OQPSK	Left Head / Cheek	23.57	0.106	**1.390**
10	600	1880.0	OQPSK	Left Head / Tilt	23.87	-0.137	0.626
11	600	1880.0	OQPSK	Body / Back	23.89	-0.105	**0.693**
12	600	1880.0	OQPSK	Body / Front	23.89	-0.030	0.481
13	1175	1908.75	OQPSK	Left Head / Cheek	23.57	-0.011	1.340

NOTE:

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

5.4 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)	MUSCLE 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 1900MHz SIMULATING LIQUID TABLE

INGREDIENT	HEAD SIMULATING LIQUID 1900MHz (HSL-1900)	MUSCLE SIMULATING LIQUID 1900MHz (MSL-1900)
Water	55.24%	70.16%
DGMBE	44.45%	29.44%
Salt	0.306%	00.39%
Dielectric Parameters at 22℃	f= 1900MHz ε= 40.0 ± 5% σ= 1.40 ± 5% S/m	f= 1900MHz ε= 53.3 ± 5% σ= 1.52 ± 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 DASY4 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		HSL-835			
SIMULATING LIQUID TEMP.		21.2			
TEST DATE		Dec. 22, 2009			
TESTED BY		Sam Onn			
FREQ. (MHz)	**LIQUID PARAMETER**	**STANDARD VALUE**	**MEASUREMENT VALUE**	**ERROR PERCENTAGE (%)**	**LIMIT(%)**
824.7	Permitivity (ε)	41.60	42.70	2.64	±5
835.0		41.50	42.60	2.65	
836.5		41.50	42.50	2.41	
848.3		41.50	42.40	2.17	
824.7	Conductivity (σ) S/m	0.90	0.91	1.11	
835.0		0.90	0.92	2.22	
836.5		0.90	0.92	2.22	
848.3		0.91	0.93	2.20	

LIQUID TYPE		MSL-835			
SIMULATING LIQUID TEMP.		21.3			
TEST DATE		Dec. 21, 2009			
TESTED BY		Sam Onn			
FREQ. (MHz)	**LIQUID PARAMETER**	**STANDARD VALUE**	**MEASUREMENT VALUE**	**ERROR PERCENTAGE (%)**	**LIMIT(%)**
835.0	Permitivity (ε)	55.20	53.60	-2.90	±5
836.5		55.20	53.60	-2.90	
835.0	Conductivity (σ) S/m	0.97	0.99	2.06	
836.5		0.97	0.99	2.06	

FOR CDMA1900 BAND SIMULATING LIQUID

LIQUID TYPE		HSL-1900			
SIMULATING LIQUID TEMP.		21.6			
TEST DATE		Dec. 18, 2009			
TESTED BY		Sam Onn			
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)	LIMIT(%)
1851.25	Permitivity (ε)	40.00	41.20	3.00	±5
1880.00		40.00	41.10	2.75	
1900.00		40.00	41.10	2.75	
1908.75		40.00	41.00	2.50	
1851.25	Conductivity (σ) S/m	1.40	1.36	-2.86	
1880.00		1.40	1.38	-1.43	
1900.00		1.40	1.41	0.71	
1908.75		1.40	1.42	1.43	

LIQUID TYPE		MSL-1900			
SIMULATING LIQUID TEMP.		21.2			
TEST DATE		Dec. 21, 2009			
TESTED BY		Sam Onn			
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)	LIMIT(%)
1880.00	Permitivity (ε)	53.30	54.50	2.25	±5
1900.00		53.30	54.40	2.06	
1880.00	Conductivity (σ) S/m	1.52	1.52	0.00	
1900.00		1.52	1.54	1.32	

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 DASY4 system is less than ±0.1mm.

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

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**
HSL835	2.37 (1g)	2.28	-3.80	15mm	Dec. 22, 2009
MSL835	2.54 (1g)	2.38	-6.30	15mm	Dec. 21, 2009
HSL1900	10.20 (1g)	9.82	-3.73	10mm	Dec. 18, 2009
MSL1900	10.20 (1g)	9.56	-6.27	10mm	Dec. 21, 2009
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)		Standard Uncertainty (±%)		(v_i)
				(1g)	(10g)	(1g)	(10g)	
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)	3.50	Normal	1	0.64	0.43	2.24	1.51	∞
Liquid Permittivity (target)	5.00	Rectangular	$\sqrt{3}$	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	3.62	Normal	1	0.6	0.49	2.17	1.77	∞
Combined Standard Uncertainty						**9.99**	**9.62**	
Coverage Factor for 95%						**Kp=2**		
Expanded Uncertainty (K=2)						**19.98**	**19.25**	

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

7. MEASUREMENT SAR PROCEDURE UNCERTAINTIES

The assessment of spatial peak SAR of the hand handheld devices is according to IEEE 1528 / EN 62209-1. All testing situation shall be met below these requirements.

- The system is used by an experienced engineer who follows the manual and the guidelines taught during the training provided by SPEAG.
- The probe has been calibrated within the requested period and the stated uncertainty for the relevant frequency bands does not exceed 4.8% (k=1).
- The validation dipole has been calibrated within the requested period and the system performance check has been successful.
- The DAE unit has been calibrated within the within the requested period.
- The minimum distance between the probe sensor and inner phantom shell is selected to be between 4 and 5mm.
- The operational mode of the DUT is CW, CDMA, FDMA or TDMA (GSM, DCS, PCS, IS136 and PDC) and the measurement/integration time per point is >500 ms.
- The dielectric parameters of the liquid have been assessed using Agilent 85070D dielectric probe kit or a more accurate method.
- The dielectric parameters are within 5% of the target values.
- The DUT has been positioned as described in section 3.

7.1. PROBE CALIBRATION UNCERTAINTY

SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528, EN 62209-1, IEC 62209, etc.) under ISO17025. The uncertainties are stated on the calibration certificate. For the most relevant frequency bands, these values do not exceed 4.8% (k=1). If evaluations of other bands are performed for which the uncertainty exceeds these values, the uncertainty tables given in the summary have to be revised accordingly.

7.2. ISOTROPY UNCERTAINTY

The axial isotropy tolerance accounts for probe rotation around its axis while the hemispherical isotropy error includes all probe orientations and field polarizations. These parameters are assessed by SPEAG during initial calibration. In 2001, SPEAG further tightened its quality controls and warrants that the maximal deviation from axial isotropy is ±0.20dB, while the maximum deviation of hemispherical isotropy is ±0.40dB, corresponding to ±4.7% and ±9.6%, respectively. A weighting factor of cp equal to 0.5 can be applied, since the axis of the probe deviates less than 30 degrees from the normal surface orientation.

7.3. BOUNDARY EFFECT UNCERTAINTY

The effect can be estimated according to the following error approximation formula

$$SAR_{tolerance}[\%] = SAR_{be}[\%] \times \frac{(d_{be} + d_{step})^2}{2d_{step}} \frac{e^{-\frac{d_{be}}{\delta/2}}}{\delta/2}$$

$$d_{be} + d_{step} < 10mm$$

The parameter d_{be} is the distance in mm between the surface and the closest measurement point used in the averaging process; d_{step} is the separation distance in mm between the first and second measurement points; δ is the minimum penetration depth in mm within the head tissue equivalent liquids (i.e., δ= 13.95mm at 3GHz); SAR_{be} is the deviation between the measured SAR value at the distance d_{be} from the boundary and the wave-guide analytical value SAR_{ref}.DASY4 applies a boundary effect compensation algorithm according to IEEE 1528, which is possible since the axis of the probe never deviates more than 30 degrees from the normal surface orientation. SAR_{be}[%] is assessed during the calibration process and SPEAG warrants that the uncertainty at distances larger than 4mm is always less than 1%.In summary, the worst case boundary effect SAR tolerance[%] for scanning distances larger than 4mm is < ± 0.8%.

7.4. PROBE LINEARITY UNCERTAINTY

Field probe linearity uncertainty includes errors from the assessment and compensation of the diode compression effects for CW and pulsed signals with known duty cycles. This error is assessed using the procedure described in IEEE 1528 / EN 62209-1. For SPEAG field probes, the measured difference between CW and pulsed signals, with pulse frequencies between 10Hz and 1kHz and duty cycles between 1 and 100, is < ±0.20dB (< ±4.7%).

7.5. READOUT ELECTRONICS UNCERTAINTY

All uncertainties related to the probe readout electronics (DAE unit), including the gain and linearity of the instrumentation amplifier, its loading effect on the probe, and accuracy of the signal conversion algorithm, have been assessed accordingly to IEEE 1528 / EN 62209-1.The combination (root-sum-square RSS method) of these components results in an overall maximum error of ±1.0%.

7.6. RESPONSE TIME UNCERTAINTY

The time response of the field probes is assessed by exposing the probe to a well-controlled electric field producing SAR larger than 2.0W/kg at the tissue medium surface. The signal response time is evaluated as the time required by the system to reach 90% of the expected final value after an on/of switch of the power source. Analytically, it can be expressed as:

$$SAR_{tolerance}[\%] = 100 \times \left(\frac{T_m}{T_m + \tau e^{-T_m/\tau} - \tau} - 1\right)$$

where Tm is 500 ms, i.e., the time between measurement samples, and τ the time constant. The response time τ of SPEAG's probes is <5ms. In the current implementation, DASY4 waits longer than 100 ms after having reached the grid point before starting a measurement, i.e., the response time uncertainty is negligible.

7.7. INTEGRATION TIME UNCERTAINTY

If the device under test does not emit a CW signal, the integration time applied to measure the electric field at a specific point may introduce additional uncertainties due to the discretization and can be assessed as follows

$$SAR_{tolerance}[\%] = 100 \times \sum_{allsub-frames} \frac{t_{frame}}{t_{integration}} \frac{slot_{idle}}{slot_{total}}$$

The tolerances for the different systems are given in Table 7.1, whereby the worst-case $SAR_{tolerance}$ is 2.6%.

System	$SAR_{tolerance}$ %
CW	0
CDMA*	0
WCDMA*	0
FDMA	0
IS-136	2.6
PDC	2.6
GSM/DCS/PCS	1.7
DECT	1.9
Worst-Case	2.6

TABLE 7.1

7.8. PROBE POSITIONER MECHANICAL TOLERANCE

The mechanical tolerance of the field probe positioner can introduce probe positioning uncertainties. The resulting SAR uncertainty is assessed by comparing the SAR obtained according to the specifications of the probe positioner with respect to the actual position defined by the geometric enter of the probe sensors. The tolerance is determined as:

$$SAR_{tolerance}[\%] = 100 \times \frac{d_{ph}}{\delta/2}$$

The specified repeatability of the RX robot family used in DASY4 systems is ±25μm. The absolute accuracy for short distance movements is better than ±0.1mm, i.e., the $SAR_{tolerance}$[%] is better than 1.5% (rectangular).

7.9. PROBE POSITIONING

The probe positioning procedures affect the tolerance of the separation distance between the probe tip and the phantom surface as:

$$SAR_{tolerance}[\%] = 100 \times \frac{d_{ph}}{\delta/2}$$

where d_{ph} is the maximum deviation of the distance between the probe tip and the phantom surface. The optical surface detection has a precision of better than 0.2mm, resulting in an $SAR_{tolerance}$[%] of <2.9% (rectangular distribution). Since the mechanical detection provides better accuracy, 2.9% is a worst-case figure for DASY4 system.

7.10. PHANTOM UNCERTAINTY

The SAR measurement uncertainty due to SPEAG phantom shell production tolerances has been evaluated using

$$SAR_{tolerance}[\%] \cong 100 \times \frac{2d}{a}, \qquad d << a$$

For a maximum deviation d of the inner and outer shell of the phantom from that specified in the CAD file of ±0.2mm, and a 10mm spacing a between source and tissue liquid, the calculated phantom uncertainty is ±4.0%.

7.11. DASY4 UNCERTAINTY BUDGET

Error Description	Tolerance (±%)	Probability Distribution	Divisor	(C_i) (1g)	(C_i) (10g)	Standard Uncertainty (±%) (1g)	Standard Uncertainty (±%) (10g)	(v_i)
Measurement Equipment								
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	∞
Test Sample Related								
Device Positioning	0.69	Normal	1	1	1	0.69	0.69	10
Device Holder	3.60	Normal	1	1	1	3.60	3.60	5
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)	3.50	Normal	1	0.64	0.43	2.24	1.51	∞
Liquid Permittivity (target)	5.00	Rectangular	$\sqrt{3}$	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	3.62	Normal	1	0.6	0.49	2.17	1.77	∞
Combined Standard Uncertainty						**10.58**	**10.23**	
Coverage Factor for 95%						**Kp=2**		
Expanded Uncertainty (K=2)						**21.16**	**20.47**	

TABLE 7.2

The table 7.2: Worst-Case uncertainty budget for DASY4 assessed according to IEEE 1528. The budget is valid for the frequency range 300MHz ~ 3GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

8. 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.

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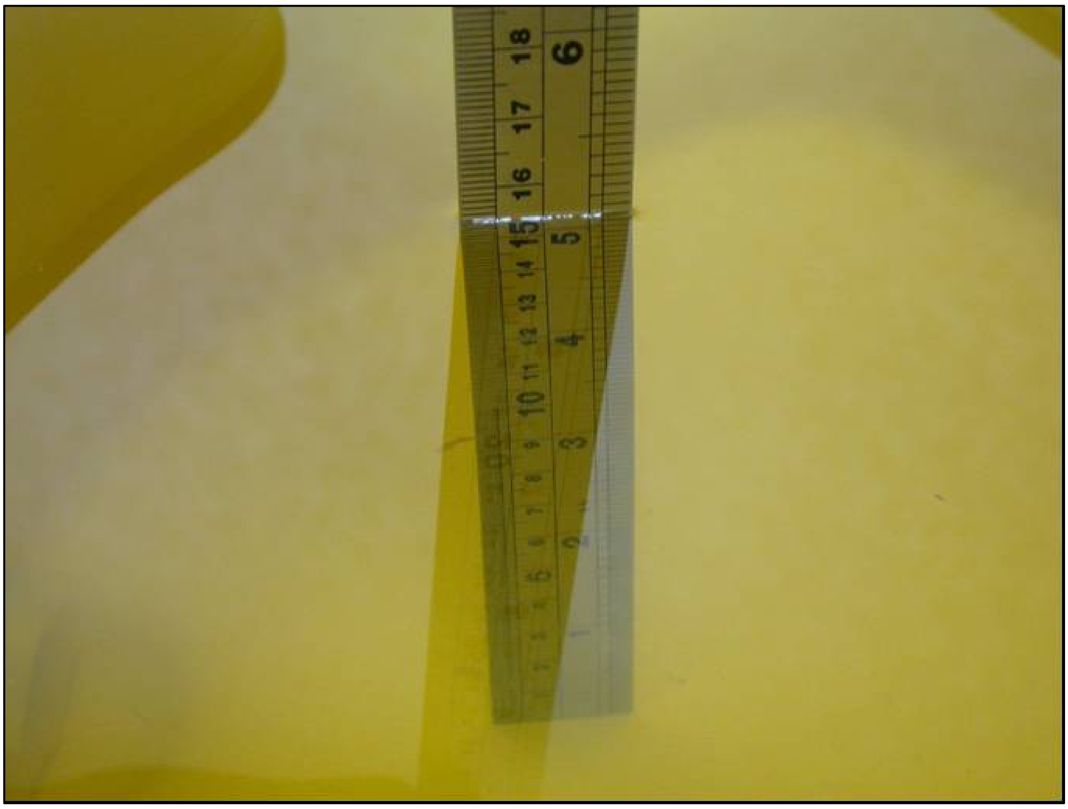
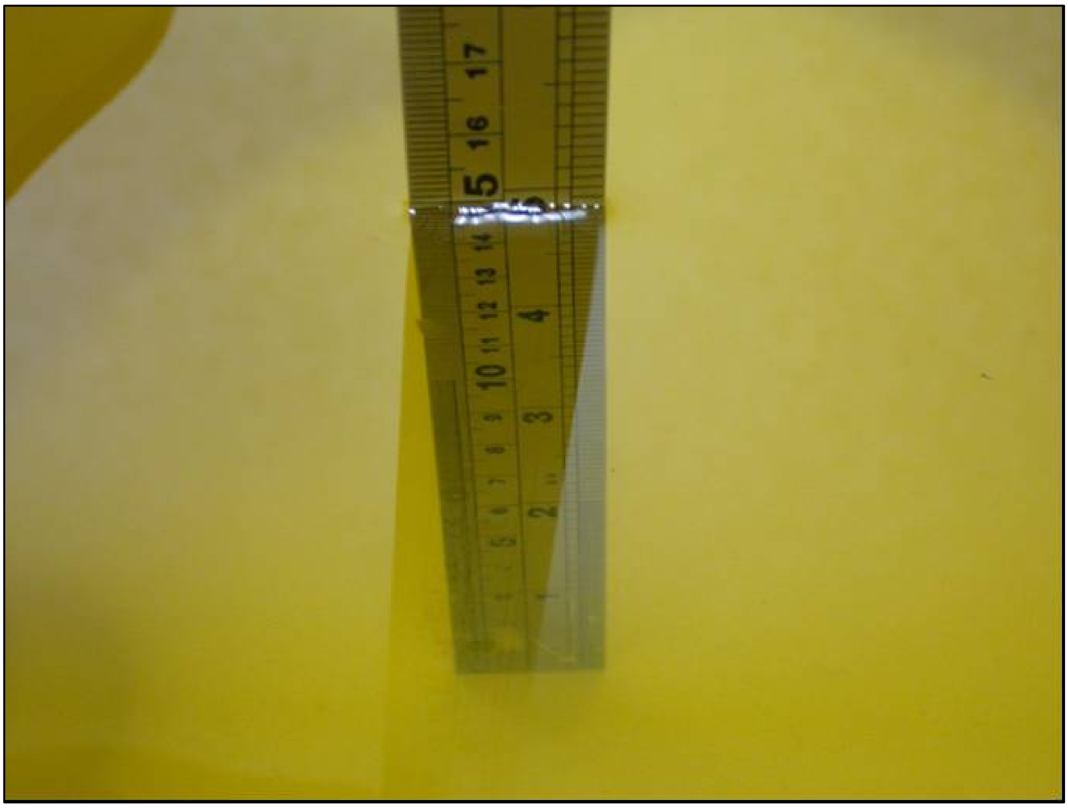
APPENDIX A: TEST DATA

Liquid Level Photo

Tissue HSL835MHz D=155mm



Tissue MSL835MHz D=150mm



Tissue HSL1900MHz D=152mm

Tissue MSL1900MHz D=150mm

Date/Time: 2009/12/22 11:44:16

Test Laboratory: Bureau Veritas ADT

M01-Right Head-Cheek-CDMA850-Ch1013

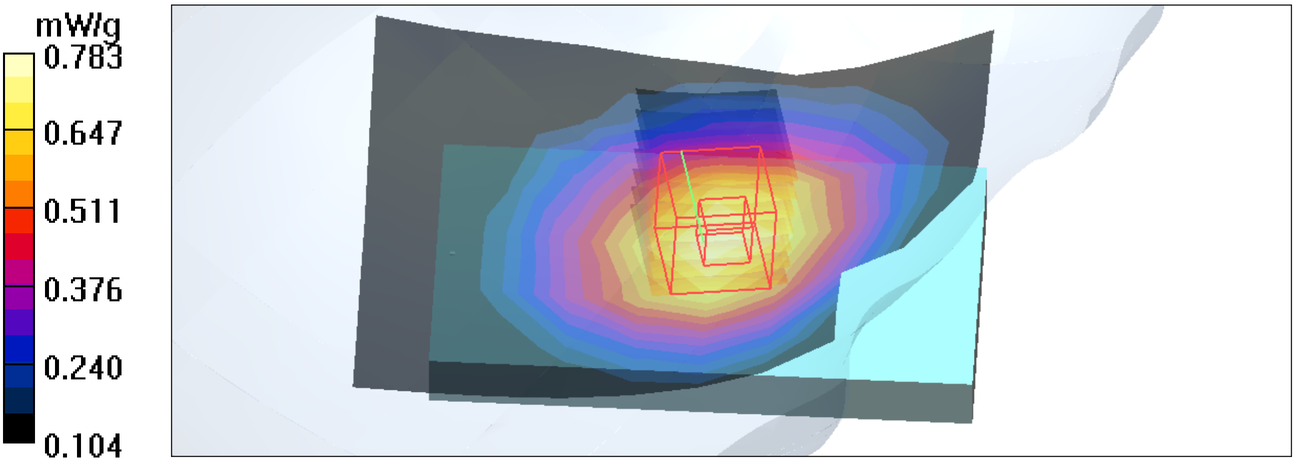
DUT: Smartphone ; Type: PB31200

Communication System: CDMA850 ; Frequency: 824.7 MHz ; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 824.7 MHz; σ = 0.91 mho/m; ε_r = 42.7; ρ = 1000 kg/m^3
Phantom section: Right Section ; DUT test position : Cheek ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.57, 9.57, 9.57) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - Low Channel 1013/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.785 mW/g

Touch position - Low Channel 1013/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.1 V/m; Power Drift = -0.130 dB
Peak SAR (extrapolated) = 0.922 W/kg
SAR(1 g) = 0.713 mW/g; SAR(10 g) = 0.540 mW/g
Maximum value of SAR (measured) = 0.783 mW/g



Date/Time: 2009/12/22 13:09:46

Test Laboratory: Bureau Veritas ADT

M01-Right Head-Cheek-CDMA850-Ch384

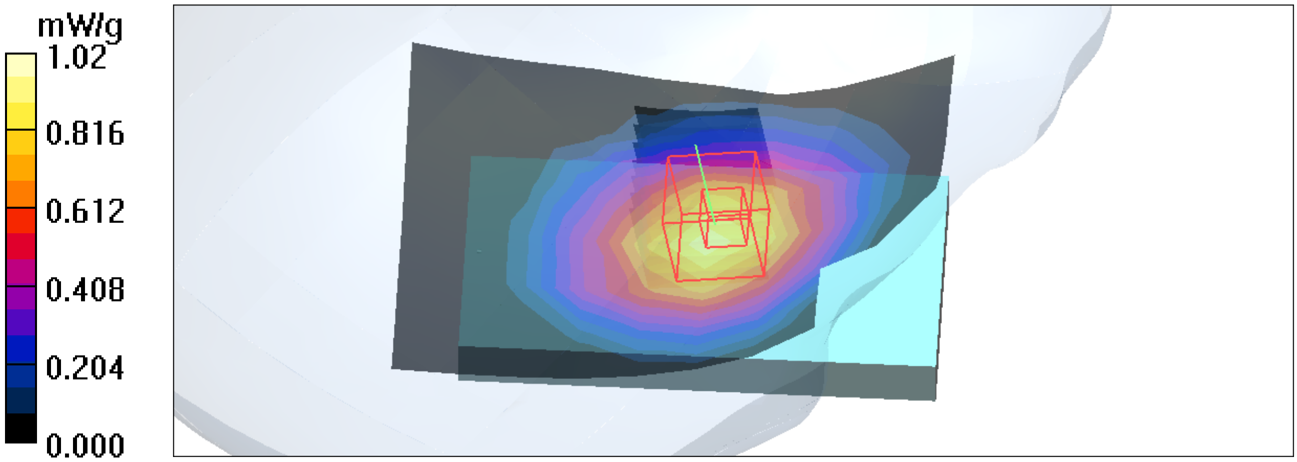
DUT: Smartphone ; Type: PB31200

Communication System: CDMA850 ; Frequency: 836.5 MHz ; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 836.5 MHz; σ = 0.92 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3
Phantom section: Right Section ; DUT test position : Cheek ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.57, 9.57, 9.57) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - Mid Channel 384/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.926 mW/g

Touch position - Mid Channel 384/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 31.6 V/m; Power Drift = 0.156 dB
Peak SAR (extrapolated) = 1.21 W/kg
SAR(1 g) = 0.890 mW/g; SAR(10 g) = 0.652 mW/g
Maximum value of SAR (measured) = 1.02 mW/g



Date/Time: 2009/12/22 13:28:00

Test Laboratory: Bureau Veritas ADT

M01-Right Head-Cheek-CDMA850-Ch777

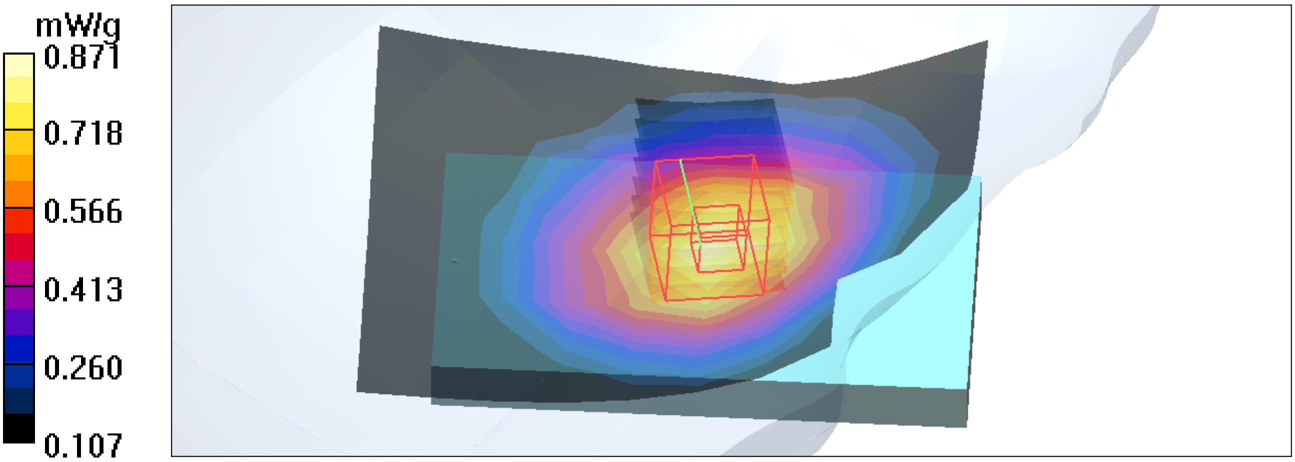
DUT: Smartphone ; Type: PB31200

Communication System: CDMA850 ; Frequency: 848.3 MHz ; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 848.3 MHz; σ = 0.93 mho/m; ε_r = 42.4; ρ = 1000 kg/m^3
Phantom section: Right Section ; DUT test position : Cheek ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.57, 9.57, 9.57) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - High Channel 777/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.850 mW/g

Touch position - High Channel 777/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.4 V/m; Power Drift = -0.099 dB
Peak SAR (extrapolated) = 0.961 W/kg
SAR(1 g) = 0.778 mW/g; SAR(10 g) = 0.582 mW/g
Maximum value of SAR (measured) = 0.871 mW/g



Date/Time: 2009/12/22 13:48:02

Test Laboratory: Bureau Veritas ADT

M02-Right Head-Tilt-CDMA850-Ch384

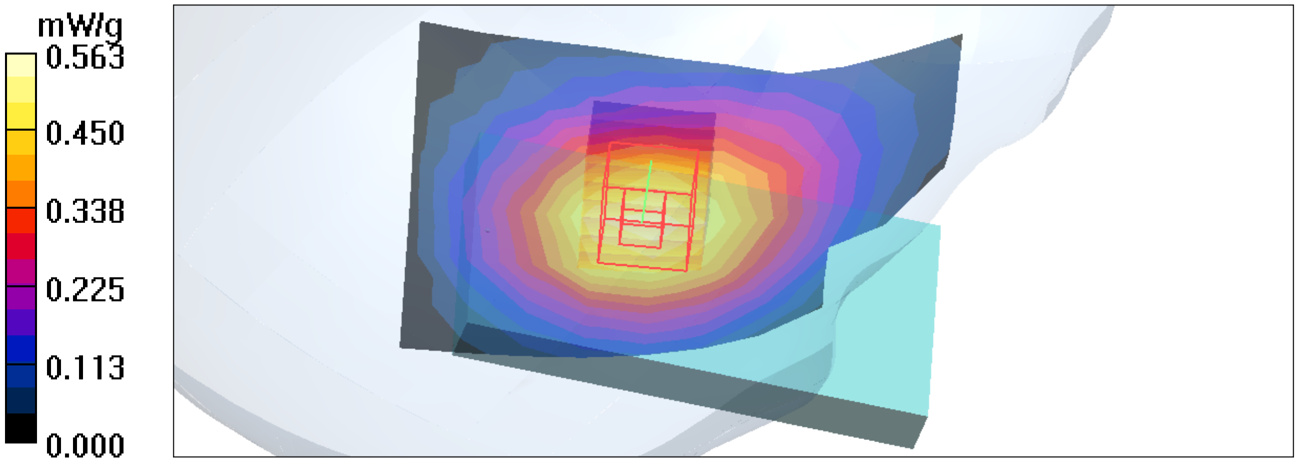
DUT: Smartphone ; Type: PB31200

Communication System: CDMA850 ; Frequency: 836.5 MHz ; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 836.5 MHz; σ = 0.92 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3
Phantom section: Right Section ; DUT test position : Tilt ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.57, 9.57, 9.57) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Tilt position - Mid Channel 384/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.563 mW/g

Tilt position - Mid Channel 384/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.2 V/m; Power Drift = -0.035 dB
Peak SAR (extrapolated) = 0.621 W/kg
SAR(1 g) = 0.495 mW/g; SAR(10 g) = 0.371 mW/g
Maximum value of SAR (measured) = 0.548 mW/g



Date/Time: 2009/12/22 15:22:25

Test Laboratory: Bureau Veritas ADT

M03-Left Head-Cheek-CDMA850-Ch384

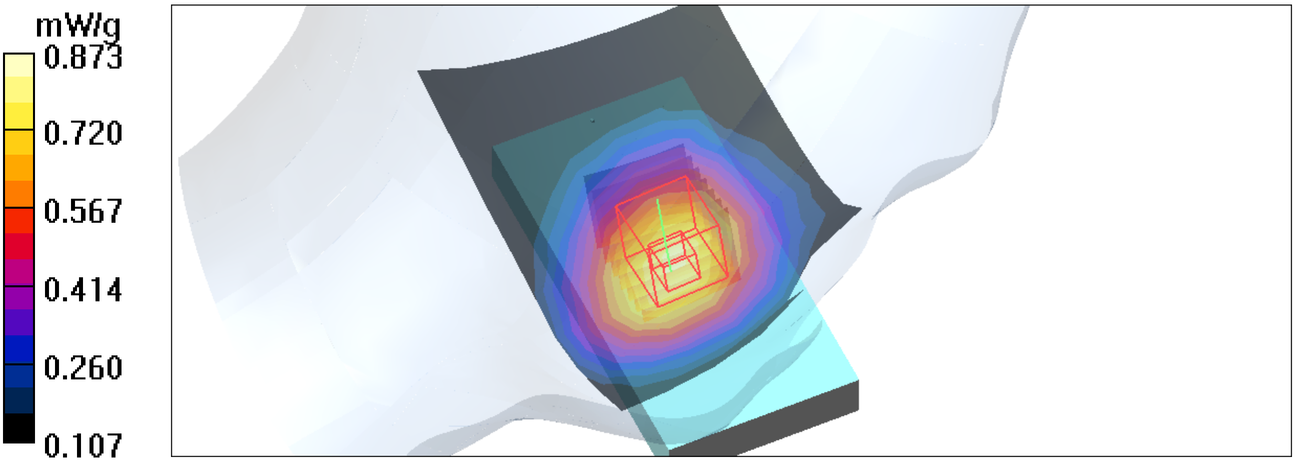
DUT: Smartphone ; Type: PB31200

Communication System: CDMA850 ; Frequency: 836.5 MHz ; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 836.5 MHz; σ = 0.92 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Cheek ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.57, 9.57, 9.57) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - Mid Channel 384/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.860 mW/g

Touch position - Mid Channel 384/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.7 V/m; Power Drift = -0.080 dB
Peak SAR (extrapolated) = 0.997 W/kg
SAR(1 g) = 0.789 mW/g; SAR(10 g) = 0.590 mW/g
Maximum value of SAR (measured) = 0.873 mW/g



Date/Time: 2009/12/22 15:49:09

Test Laboratory: Bureau Veritas ADT

M04-Left Head-Tilt-CDMA850-Ch384

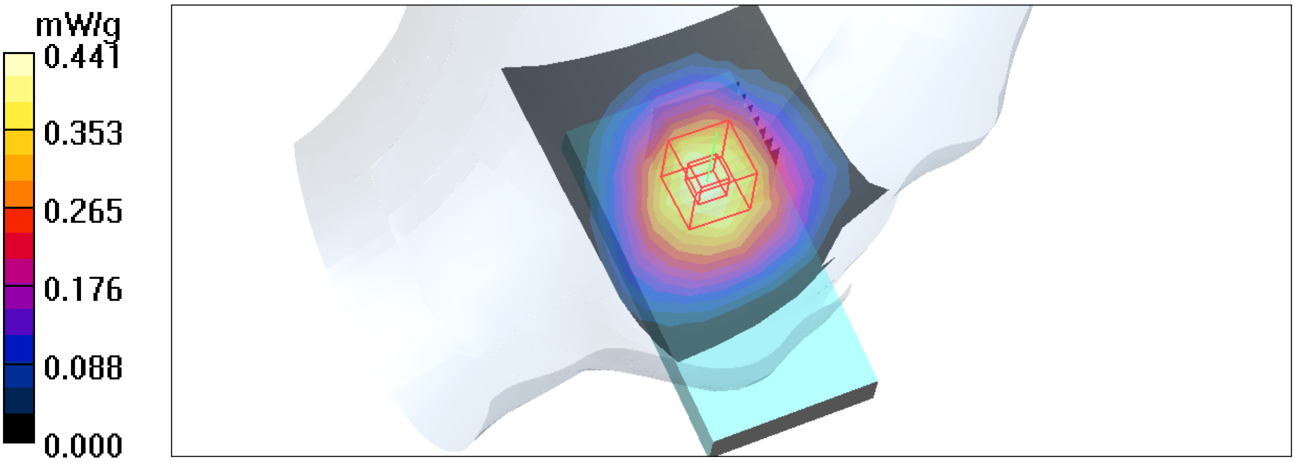
DUT: Smartphone ; Type: PB31200

Communication System: CDMA850 ; Frequency: 836.5 MHz ; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 836.5 MHz; σ = 0.92 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Tilt ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.57, 9.57, 9.57) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Tilt position - Mid Channel 384/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.441 mW/g

Tilt position - Mid Channel 384/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.3 V/m; Power Drift = -0.111 dB
Peak SAR (extrapolated) = 0.504 W/kg
SAR(1 g) = 0.395 mW/g; SAR(10 g) = 0.296 mW/g



Date/Time: 2009/12/21 17:05:29

Test Laboratory: Bureau Veritas ADT

M05-Body-CDMA850-Ch384

DUT: Smartphone ; Type: PB31200

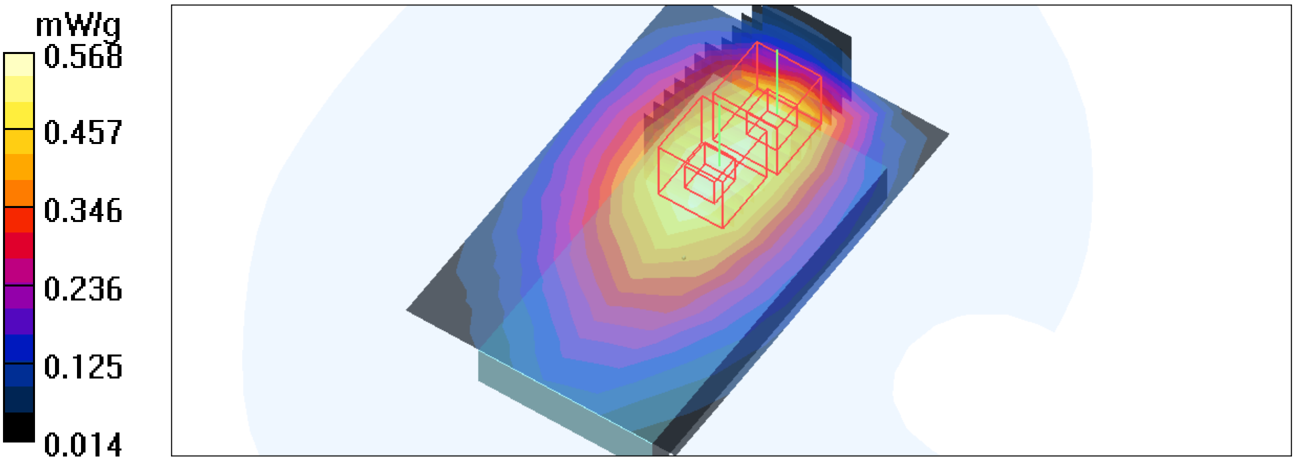
Communication System: CDMA850 ; Frequency: 836.5 MHz ; Duty Cycle: 1:1
Medium: MSL835 Medium parameters used: f = 836.5 MHz; σ = 0.99 mho/m; εr = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section ; DUT test position : Body ; Modulation Type: OQPSK
Separation Distance : 15 mm (The back side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.71, 9.71, 9.71) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12 ; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 384/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.568 mW/g

Mid Channel 384/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.3 V/m; Power Drift = -0.127 dB
Peak SAR (extrapolated) = 0.709 W/kg
SAR(1 g) = 0.475 mW/g; SAR(10 g) = 0.323 mW/g
Maximum value of SAR (measured) = 0.548 mW/g

Mid Channel 384/Zoom Scan (7x7x7) (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.3 V/m; Power Drift = -0.127 dB
Peak SAR (extrapolated) = 0.651 W/kg
SAR(1 g) = 0.494 mW/g; SAR(10 g) = 0.361 mW/g
Maximum value of SAR (measured) = 0.552 mW/g



Date/Time: 2009/12/21 18:10:24

Test Laboratory: Bureau Veritas ADT

M06-Body-CDMA850-Ch384 / Lcd Up

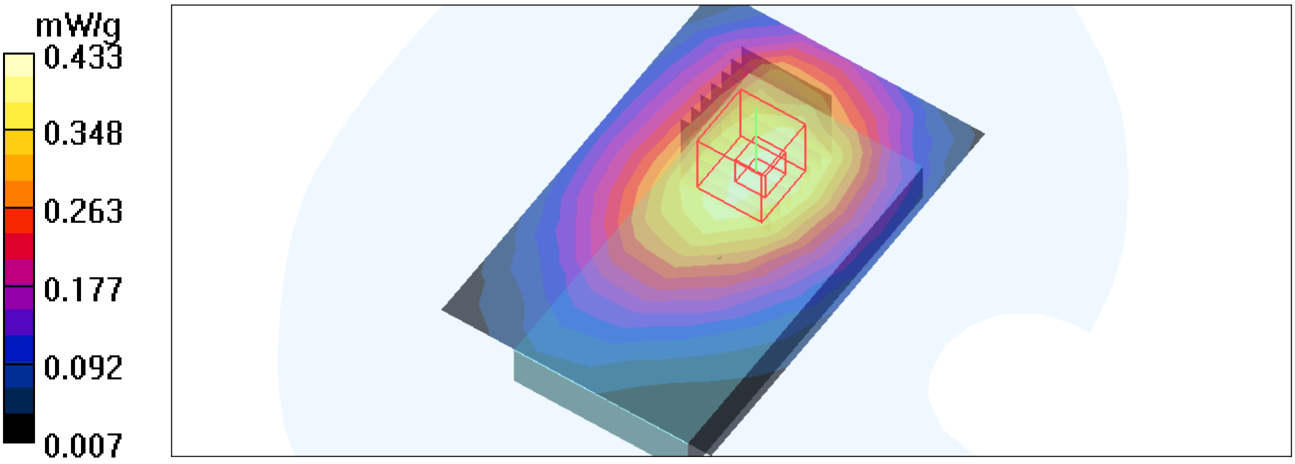
DUT: Smartphone ; Type: PB31200

Communication System: CDMA850 ; Frequency: 836.5 MHz ; Duty Cycle: 1:1
Medium: MSL835 Medium parameters used: f = 836.5 MHz; σ = 0.99 mho/m; εr = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section ; DUT test position : Body ; Modulation Type: OQPSK
Separation Distance : 15 mm (The front side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.71, 9.71, 9.71) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12 ; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 384/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.433 mW/g

Mid Channel 384/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.8 V/m; Power Drift = -0.086 dB
Peak SAR (extrapolated) = 0.494 W/kg
SAR(1 g) = 0.376 mW/g; SAR(10 g) = 0.279 mW/g
Maximum value of SAR (measured) = 0.417 mW/g



Date/Time: 2009/12/18 15:46:28

Test Laboratory: Bureau Veritas ADT

M07-Right Head-Cheek-CDMA1900-Ch600

DUT: Smartphone ; Type: PB31200

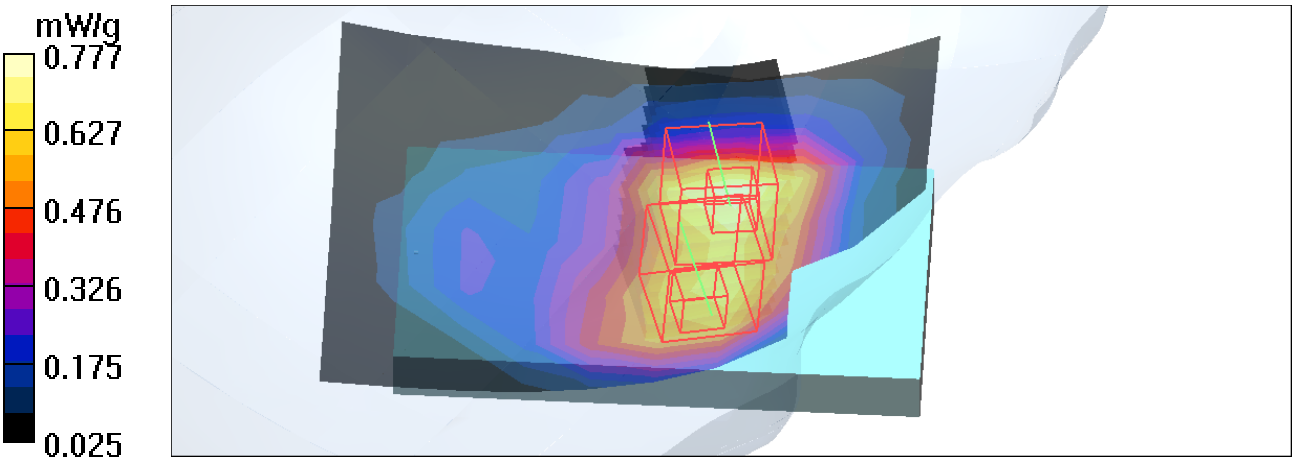
Communication System: CDMA1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Right Section ; DUT test position : Cheek ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.08, 8.08, 8.08) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - Mid Channel 600/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.769 mW/g

Touch position - Mid Channel 600/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 23.4 V/m; Power Drift = -0.116 dB
Peak SAR (extrapolated) = 1.01 W/kg
SAR(1 g) = 0.660 mW/g; SAR(10 g) = 0.415 mW/g
Maximum value of SAR (measured) = 0.777 mW/g

Touch position - Mid Channel 600/Zoom Scan (7x7x7) (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 23.4 V/m; Power Drift = -0.116 dB
Peak SAR (extrapolated) = 0.872 W/kg
SAR(1 g) = 0.592 mW/g; SAR(10 g) = 0.375 mW/g
Maximum value of SAR (measured) = 0.700 mW/g



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Test Laboratory: Bureau Veritas ADT

M08-Right Head-Tilt-CDMA1900-Ch600

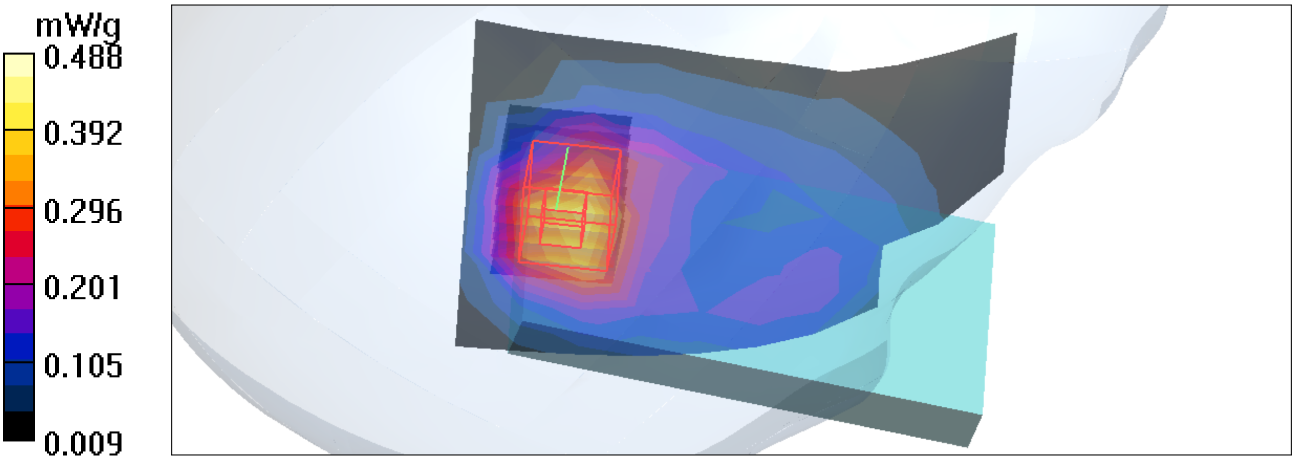
DUT: Smartphone ; Type: PB31200

Communication System: CDMA1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Right Section ; DUT test position : Tilt ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.08, 8.08, 8.08) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Tilt position - Mid Channel 600/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.417 mW/g

Tilt position - Mid Channel 600/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.4 V/m; Power Drift = -0.137 dB
Peak SAR (extrapolated) = 0.664 W/kg
SAR(1 g) = 0.402 mW/g; SAR(10 g) = 0.232 mW/g
Maximum value of SAR (measured) = 0.488 mW/g



Date/Time: 2009/12/18 17:26:14

Test Laboratory: Bureau Veritas ADT

M09-Left Head-Cheek-CDMA1900-Ch25

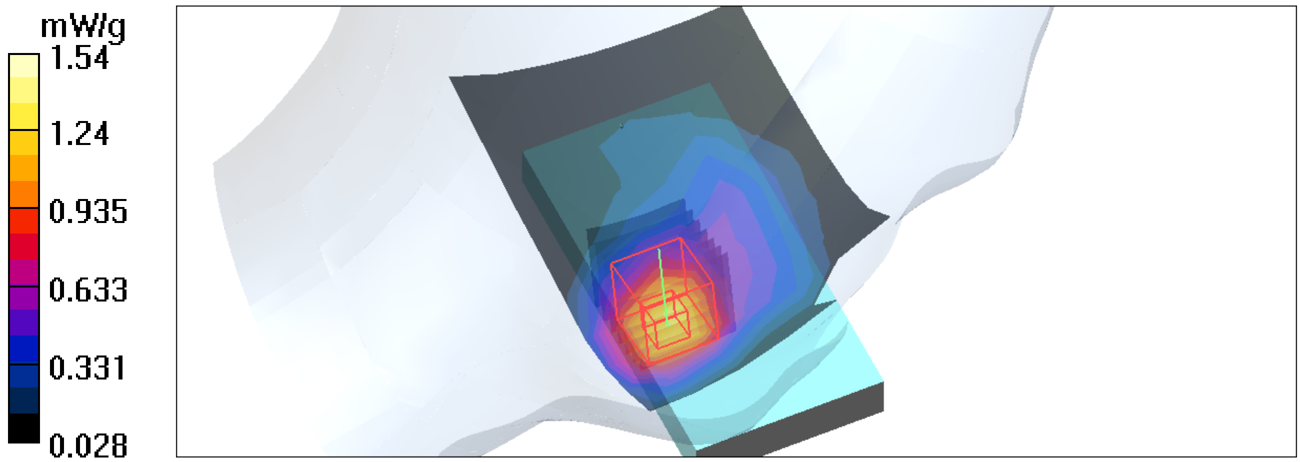
DUT: Smartphone ; Type: PB31200

Communication System: CDMA1900 ; Frequency: 1851.25 MHz ; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1851.25 MHz; σ = 1.36 mho/m; ε_r = 41.2; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Cheek ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.08, 8.08, 8.08) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - Low Channel 25/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.31 mW/g

Touch position - Low Channel 25/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 31.2 V/m; Power Drift = -0.030 dB
Peak SAR (extrapolated) = 2.01 W/kg
SAR(1 g) = 1.29 mW/g; SAR(10 g) = 0.759 mW/g
Maximum value of SAR (measured) = 1.54 mW/g



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Test Laboratory: Bureau Veritas ADT

M09-Left Head-Cheek-CDMA1900-Ch600

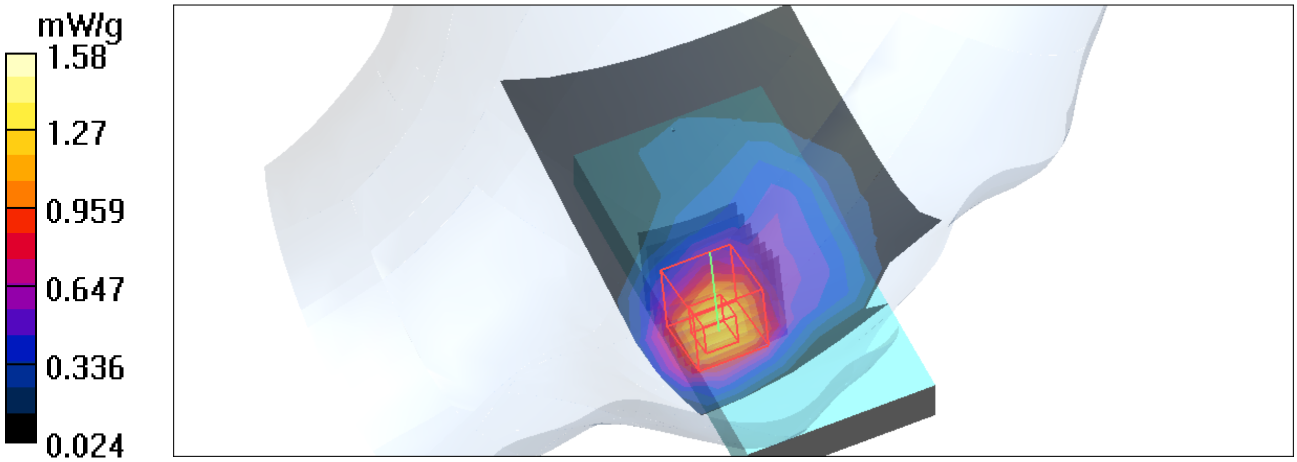
DUT: Smartphone ; Type: PB31200

Communication System: CDMA1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Cheek ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.08, 8.08, 8.08) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - Mid Channel 600/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.33 mW/g

Touch position - Mid Channel 600/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.7 V/m; Power Drift = 0.058 dB
Peak SAR (extrapolated) = 2.11 W/kg
SAR(1 g) = 1.29 mW/g; SAR(10 g) = 0.753 mW/g
Maximum value of SAR (measured) = 1.58 mW/g



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Test Laboratory: Bureau Veritas ADT

M09-Left Head-Cheek-CDMA1900-Ch1175

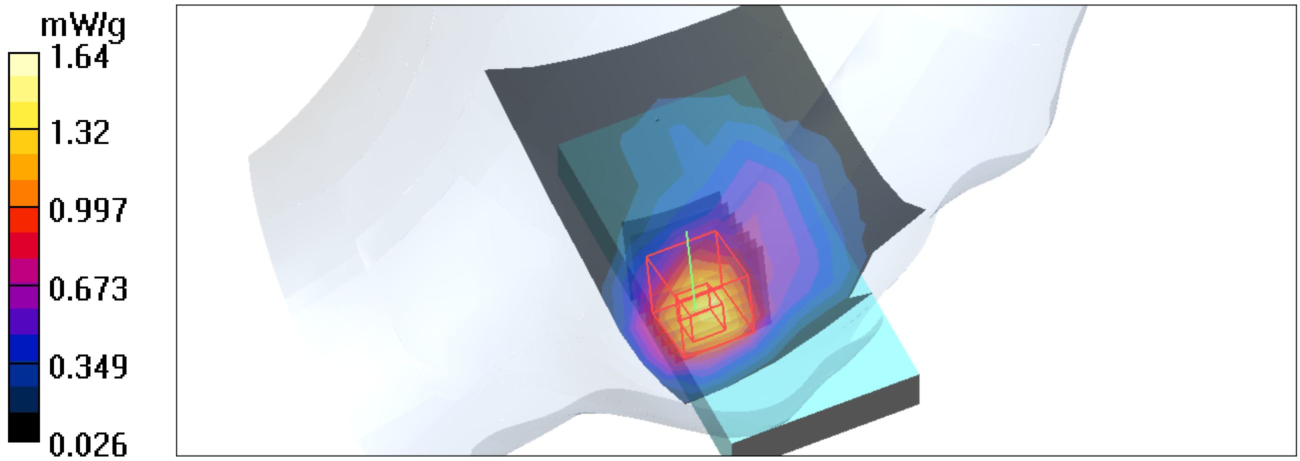
DUT: Smartphone ; Type: PB31200

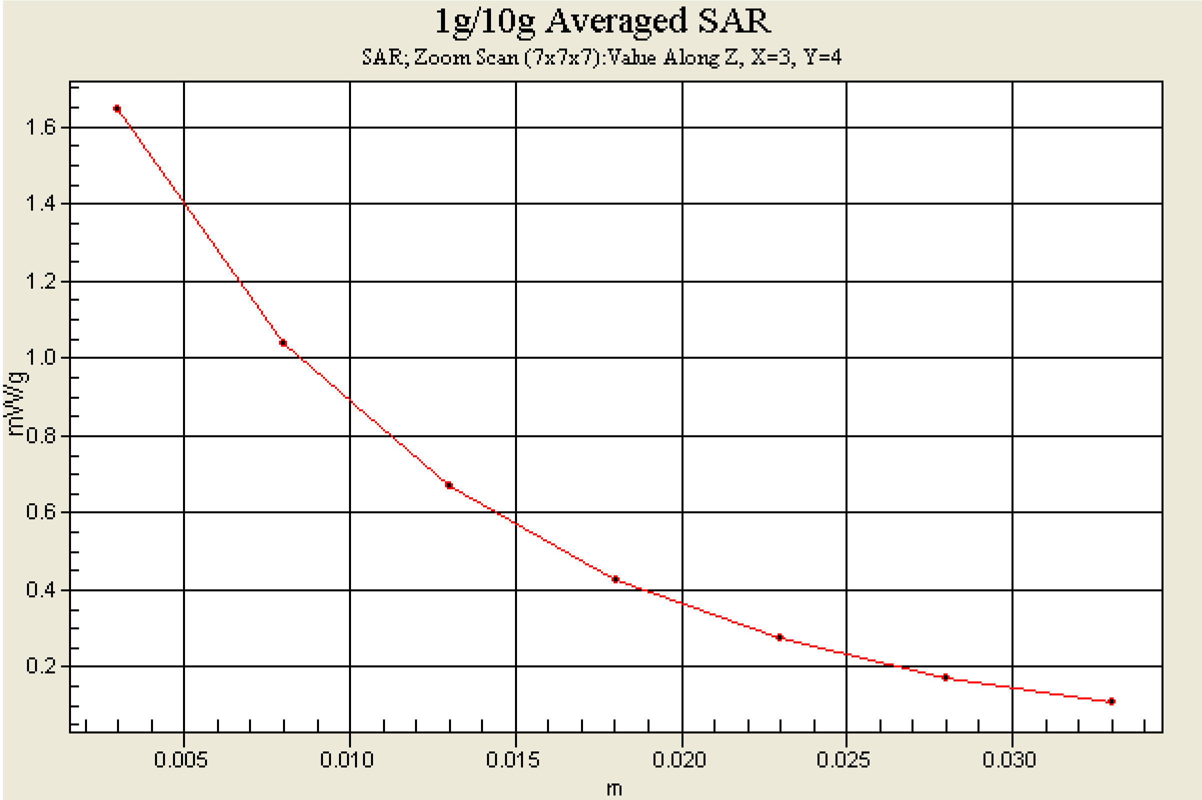
Communication System: CDMA1900 ; Frequency: 1908.75 MHz ; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1908.75 MHz; σ = 1.42 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Cheek ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.08, 8.08, 8.08) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - High Channel 1175/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.46 mW/g

Touch position - High Channel 1175/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 31.2 V/m; Power Drift = 0.106 dB
Peak SAR (extrapolated) = 2.16 W/kg
SAR(1 g) = 1.39 mW/g; SAR(10 g) = 0.811 mW/g
Maximum value of SAR (measured) = 1.64 mW/g




1g/10g Averaged SAR
SAR; Zoom Scan (7x7x7):Value Along Z, X=3, Y=4
mW/g
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.005
0.010
0.015
0.020
0.025
0.030
m

Date/Time: 2009/12/18 18:45:29

Test Laboratory: Bureau Veritas ADT

M10-Left Head-Tilt-CDMA1900-Ch600

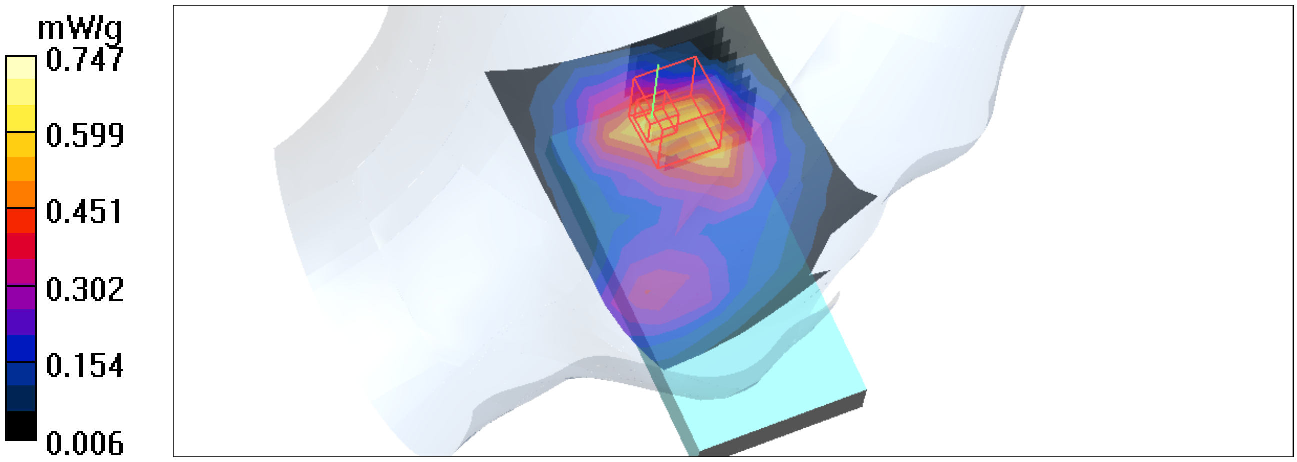
DUT: Smartphone ; Type: PB31200

Communication System: CDMA1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Tilt ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.08, 8.08, 8.08) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Tilt position - Mid Channel 600/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.718 mW/g

Tilt position - Mid Channel 600/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.7 V/m; Power Drift = -0.137 dB
Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.626 mW/g; SAR(10 g) = 0.393 mW/g
Maximum value of SAR (measured) = 0.747 mW/g



Date/Time: 2009/12/21 14:24:54

Test Laboratory: Bureau Veritas ADT

M11-Body-CDMA1900-Ch600

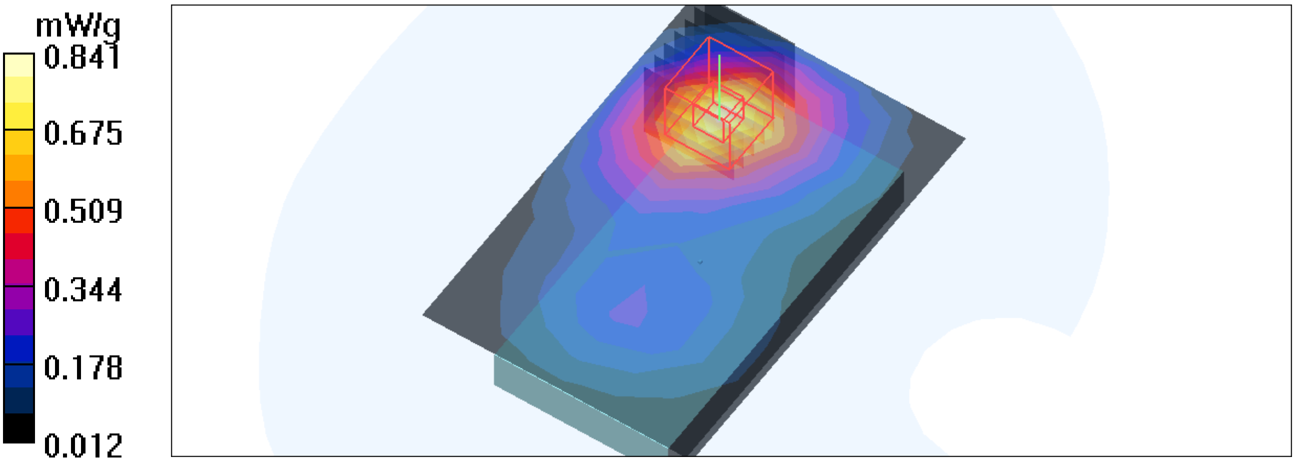
DUT: Smartphone ; Type: PB31200

Communication System: CDMA1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:1
Medium: MSL1900 Medium parameters used: f = 1880 MHz; σ = 1.52 mho/m; ε_r = 54.5; ρ = 1000 kg/m^3
Phantom section: Flat Section ; DUT test position : Body ; Modulation Type: OQPSK
Separation Distance : 15 mm (The back side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.21, 8.21, 8.21) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12 ; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 600/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.841 mW/g

Mid Channel 600/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 23.7 V/m; Power Drift = -0.105 dB
Peak SAR (extrapolated) = 1.13 W/kg
SAR(1 g) = 0.693 mW/g; SAR(10 g) = 0.411 mW/g
Maximum value of SAR (measured) = 0.830 mW/g



Date/Time: 2009/12/21 15:05:56

Test Laboratory: Bureau Veritas ADT

M12-Body-CDMA1900-Ch600 / Lcd Up

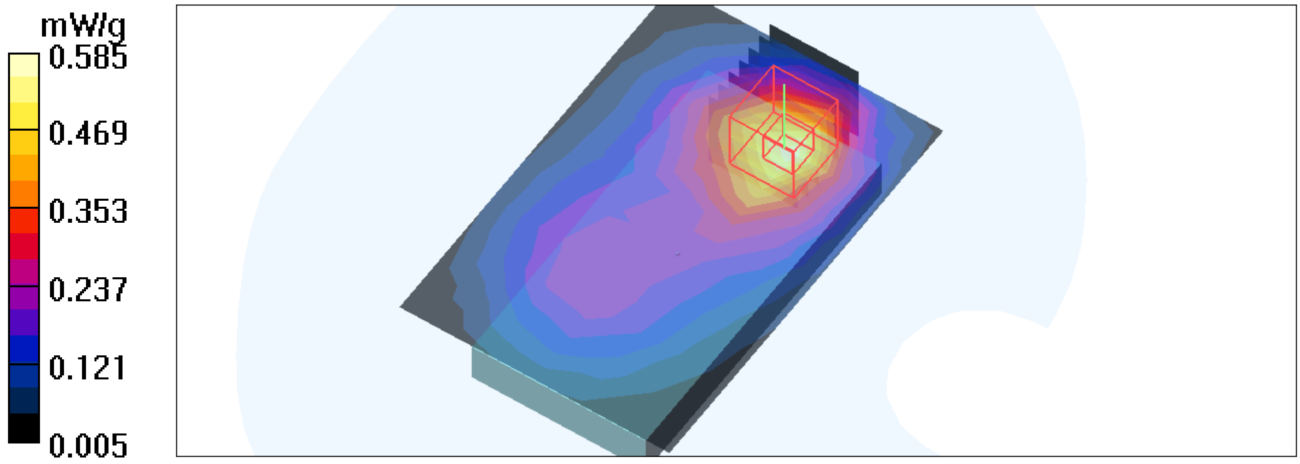
DUT: Smartphone ; Type: PB31200

Communication System: CDMA1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:1
Medium: MSL1900 Medium parameters used: f = 1880 MHz; $\sigma = 1.52$ mho/m; $\varepsilon_r = 54.5$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section ; DUT test position : Body ; Modulation Type: OQPSK
Separation Distance : 15 mm (The front side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.21, 8.21, 8.21) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12 ; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 600/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.585 mW/g

Mid Channel 600/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.4 V/m; Power Drift = -0.030 dB
Peak SAR (extrapolated) = 0.780 W/kg
SAR(1 g) = 0.481 mW/g; SAR(10 g) = 0.286 mW/g
Maximum value of SAR (measured) = 0.571 mW/g



Date/Time: 2009/12/18 15:24:55

Test Laboratory: Bureau Veritas ADT

M13-Left Head-Cheek-CDMA1900-Ch1175 (Formosa)

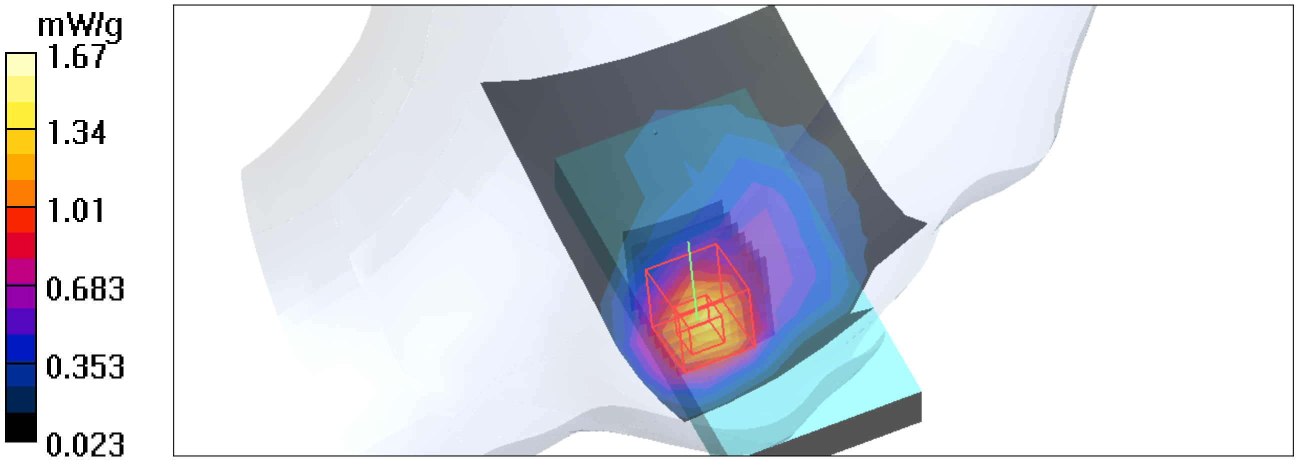
DUT: Smartphone ; Type: PB31200

Communication System: CDMA1900 ; Frequency: 1908.75 MHz ; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1908.75 MHz; σ = 1.42 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Cheek ; Modulation type: OQPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.08, 8.08, 8.08) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - High Channel 1175/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.46 mW/g

Touch position - High Channel 1175/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 31.9 V/m; Power Drift = -0.011 dB
Peak SAR (extrapolated) = 2.25 W/kg
SAR(1 g) = 1.34 mW/g; SAR(10 g) = 0.768 mW/g
Maximum value of SAR (measured) = 1.67 mW/g



Date/Time: 2009/12/22 11:01:26

Test Laboratory: Bureau Veritas ADT

System Validation Check-HSL 835MHz

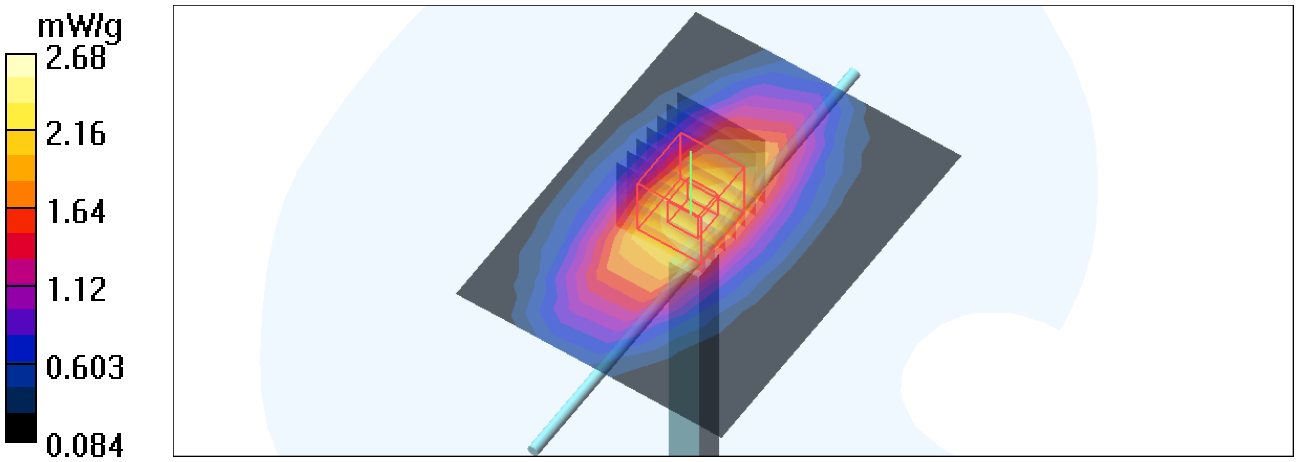
DUT: Dipole 850 MHz ; Type: D835V2 ; Serial: 4d021 ; Test Frequency: 835 MHz

Communication System: CW ; Frequency: 835 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: HSL835;Medium parameters used: f = 835 MHz; σ = 0.92 mho/m; ε_r = 42.6; ρ = 1000 kg/m^3 ;
Liquid level : 155 mm
Phantom section: Flat Section ; Separation distance : 15 mm (The feetpoint of the dipole to the Phantom)Air temp. : 22.0 degrees ; Liquid temp. : 21.2 degrees

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.57, 9.57, 9.57) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.41 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.4 V/m; Power Drift = -0.090 dB
Peak SAR (extrapolated) = 3.44 W/kg
SAR(1 g) = 2.28 mW/g; SAR(10 g) = 1.49 mW/g
Maximum value of SAR (measured) = 2.68 mW/g



Date/Time: 2009/12/21 16:35:30

Test Laboratory: Bureau Veritas ADT

System Validation Check-MSL 835MHz

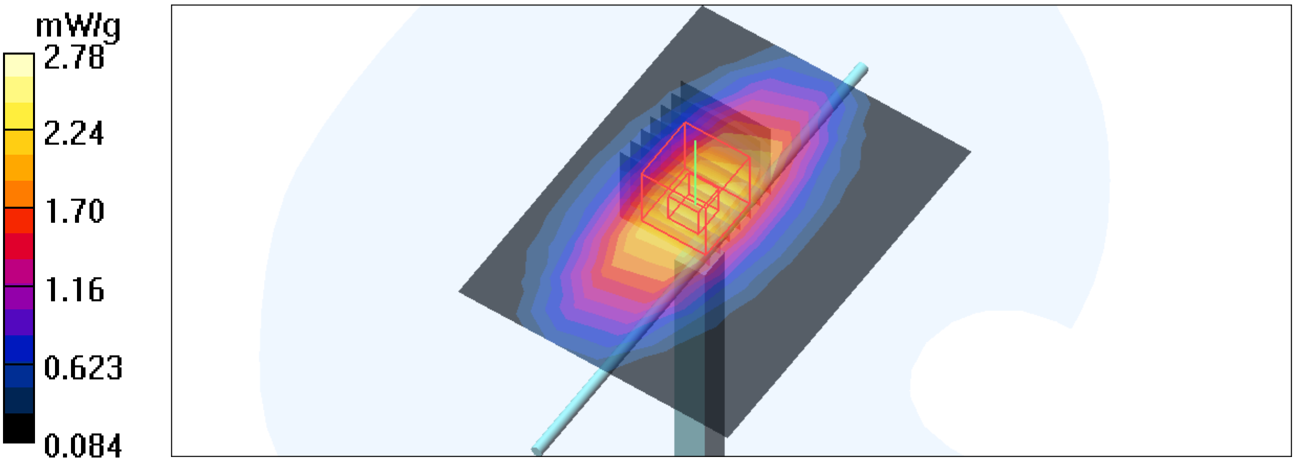
DUT: Dipole 850 MHz ; Type: D835V2 ; Serial: 4d021 ; Test Frequency: 835 MHz

Communication System: CW ; Frequency: 835 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: MSL835;Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 53.6; 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. : 22.1 degrees ; Liquid temp. : 21.3 degrees

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.71, 9.71, 9.71) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=15mm, Pin=250mW/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.39 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.1 V/m; Power Drift = 0.012 dB
Peak SAR (extrapolated) = 3.60 W/kg
SAR(1 g) = 2.38 mW/g; SAR(10 g) = 1.56 mW/g
Maximum value of SAR (measured) = 2.78 mW/g



Date/Time: 2009/12/18 13:08:02

Test Laboratory: Bureau Veritas ADT

System Validation Check-HSL 1900MHz

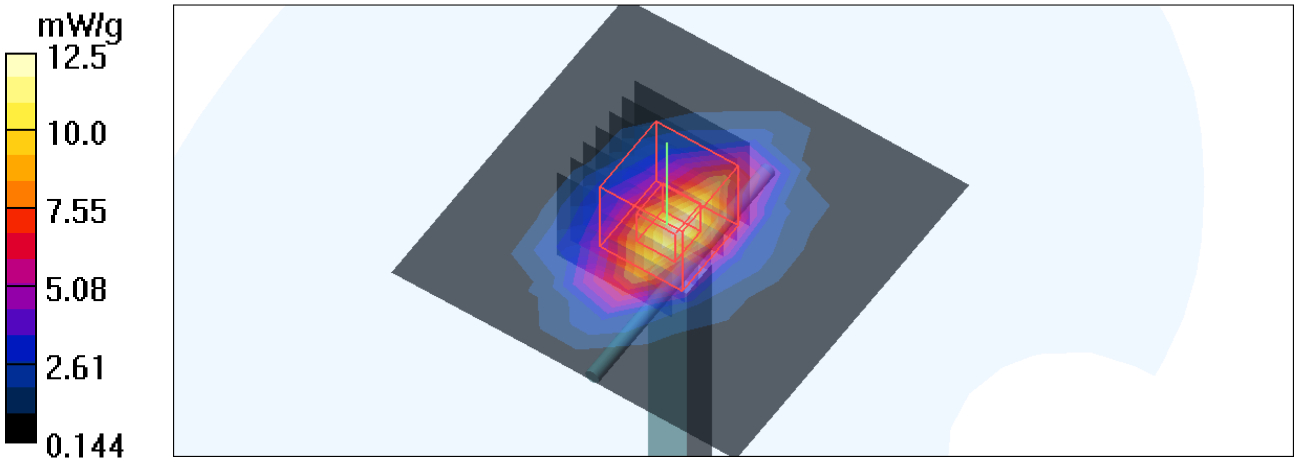
DUT: Dipole 1900 MHz ; Type: D1900V2 ; Serial: 5d022 ; Test Frequency: 1900 MHz

Communication System: CW ; Frequency: 1900 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: HSL1900;Medium parameters used: f = 1900 MHz; σ = 1.41 mho/m; ε_r = 41.1; 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. : 22.5 degrees ; Liquid temp. : 21.6 degrees

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.08, 8.08, 8.08) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 12.5 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.4 V/m; Power Drift = -0.020 dB
Peak SAR (extrapolated) = 19.2 W/kg
SAR(1 g) = 9.82 mW/g; SAR(10 g) = 5.06 mW/g



Date/Time: 2009/12/21 13:31:29

Test Laboratory: Bureau Veritas ADT

System Validation Check-MSL 1900MHz

DUT: Dipole 1900 MHz ; Type: D1900V2 ; Serial: 5d022 ; Test Frequency: 1900 MHz

Communication System: CW ; Frequency: 1900 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: MSL1900;Medium parameters used: f = 1900 MHz; σ = 1.54 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3 ; Liquid level : 150 mm
Phantom section: Flat Section ; Separation distance : 10 mm (The feetpoint of the dipole to the Phantom)Air temp. : 22.1 degrees ; Liquid temp. : 21.2 degrees

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.21, 8.21, 8.21) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2009/7/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 12.3 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.7 V/m; Power Drift = -0.063 dB
Peak SAR (extrapolated) = 18.3 W/kg
SAR(1 g) = 9.56 mW/g; SAR(10 g) = 5.02 mW/g