SAR TEST REPORT
(FOR MOBILE)

REPORT NO.:	SA980810L01
MODEL NO.:	F-03B
RECEIVED:	Aug. 10, 2009
TESTED:	Aug. 10 ~ Aug. 13, 2009
ISSUED:	Aug. 27, 2009

APPLICANT:	FUJITSU LIMITED
ADDRESS:	1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki 211-8588, Japan
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.
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Testing Laboratory
2021

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1. CERTIFICATION

PRODUCT: Mobile phone
MODEL: F-03B
BRAND: FOMA
APPLICANT: FUJITSU LIMITED
TESTED: Aug. 10 ~ Aug. 13, 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: F-03B) 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 : Joanna Wang / Senior Specialist , **DATE :** Aug. 27, 2009

TECHNICAL ACCEPTANCE : James Fan / Engineer , **DATE :** Aug. 27, 2009
Responsible for RF

APPROVED BY : Gary Chang / Assistant Manager , **DATE :** Aug. 27, 2009

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>EUT</td><td colspan="3">Mobile phone</td></tr>
<tr><td>MODEL NO.</td><td colspan="3">F-03B</td></tr>
<tr><td>FCC ID</td><td colspan="3">VQK-F03B</td></tr>
<tr><td>POWER SUPPLY</td><td colspan="3">3.7Vdc from rechargeable lithium battery
5.4Vdc from power adapter
5.0Vdc from host equipment</td></tr>
<tr><td>CLASSIFICATION</td><td colspan="3">Portable device, production unit</td></tr>
<tr><td>MODULATION TYPE</td><td colspan="3">GMSK / BPSK</td></tr>
<tr><td>FREQUENCY RANGE</td><td colspan="3">Tx Frequency:
824.2MHz ~ 848.8MHz (850MHz band)
1850.2MHz ~ 1909.8MHz (1900MHz band)
Rx Frequency:
869.2MHz ~ 893.8MHz (850MHz band)
1930.2MHz ~ 1989.8MHz (1900MHz band)</td></tr>
<tr><td>CHANNEL FREQUENCIES UNDER TEST AND ITS CONDUCTED OUTPUT POWER</td><td colspan="3">Refer to NOTE 6 as below</td></tr>
<tr><td rowspan="2">MAXIMUM SAR (1g)</td><td colspan="3">Head: 0.764W/kg</td></tr>
<tr><td colspan="3">Body: 0.406W/kg</td></tr>
<tr><td>ANTENNA TYPE</td><td colspan="3">Integral antenna</td></tr>
<tr><td rowspan="3">MAX. ANTENNA GAIN</td><td></td><td>EUT OPEN</td><td>EUT CLOSE</td></tr>
<tr><td>850MHz band</td><td>0dBi</td><td>4dBi</td></tr>
<tr><td>1900MHz band</td><td>0dBi</td><td>2dBi</td></tr>
<tr><td>DATA CABLE</td><td colspan="3">NA</td></tr>
<tr><td>I/O PORTS</td><td colspan="3">Refer to user’s manual</td></tr>
<tr><td>ACCESSORY DEVICES</td><td colspan="3">Battery</td></tr>
</table>

NOTE:

1. The EUT is powered by the following adapter and battery.

ADAPTER (NOT FOR SALE)	
BRAND	SMK
INPUT POWER	100-240 Vac, 0.12A, 50-60Hz
OUTPUT POWER	5.4Vdc, 700mA
POWER CABLE	DC 1.5m non-shielded cable without core

BATTERY	
BRAND	Fujitsu Limited
MODEL	CA54310-0005
RATING	3.7Vdc, 770mAh

2. Refer to following table for IMEI no.:

IMEI NO.
35677502******

3. Hardware version: R14.2
4. Software version: V2.1
5. The communicated functions of EUT listed as below:

		850MHz	1900MHz	
2G	GSM		√	With Bluetooth
	GPRS		√	
3G	WCDMA	√		
	Release 5 HSDPA	√		

6. Channel frequencies under test and its conducted output power listed as below:

<850MHz BNAD>

OUTPUT POWER (dBm)			
CHANNEL	WCDMA		HSDPA
	RMC	AMR	RMC
CH 4132	23.93	23.91	23.68
CH 4182	23.71	23.80	23.52
CH 4233	23.66	23.64	23.55

<1900MHz BNAD>

OUTPUT POWER (dBm)		
CHANNEL	GSM	GPRS TIME SLOT 1
CH 512	29.6	29.5
CH 661	29.6	29.5
CH 810	30.0	29.8

7. 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 WCDMA

The following procedures were followed according to FCC "SAR Measurement Procedure for 3G Devices", October 2007.

Ø WCDMA Handsets

The following procedures are applicable to WCDMA handsets operating under 3GPP Release 99, Release 5 and Release 6.19 The default test configuration is to measure SAR with an established radio link between the DUT and a communication test set using a 12.2 kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations (DPCCH & DPDCHn), HSDPA and HSPA (HSUPA/HSDPA) modes according to output power, exposure conditions and device operating capabilities. Both uplink and downlink should be configured with the same RMC or AMR, when required. SAR for Release 5 HSDPA and Release 6 HSPA are measured using the applicable FRC (fixed reference channel) and E-DCH reference channel configurations. Maximum output power is verified according to applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. When Maximum Power Reduction (MPR) is not implemented according to Cubic Metric (CM) requirements for Release 6 HSPA, the following procedures do not apply.

Ø Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the procedures described in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all "1's" for WCDMA/HSDPA or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) should be tabulated in the SAR report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations should be clearly identified.

Ø Head SAR Measurements

SAR for head exposure configurations in voice mode is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than ¼ dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 kbps AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that results in the highest SAR in 12.2 kbps RMC for that RF channel.

Ø Body SAR Measurements

SAR for body exposure configurations in voice and data modes is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". SAR for other spreading codes and multiple DPDCHn, when supported by the DUT, are not required when the maximum average output of each RF channel, for each spreading code and DPDCHn configuration, are less than ¼ dB higher than those measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel with an applicable RMC configuration for the corresponding spreading code or DPDCHn using the exposure configuration that results in the highest SAR with 12.2 kbps RMC. When more than 2 DPDCHn are supported by the DUT, it may be necessary to configure additional DPDCHn for a DUT using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

Ø Release 5 HSDPA Data Devices

The following procedures are applicable to HSDPA data devices operating under 3GPP Release 5. Body exposure conditions are typically required for these devices, including handsets and data modems operating in various electronic devices. HSDPA operates in conjunction with WCDMA and requires an active DPCCH. The default test configuration is to measure SAR in WCDMA without HSDPA, with an established radio link between the DUT and a communication test set using a 12.2 kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR for HSDPA is selectively measured using the highest SAR configuration in WCDMA with an FRC (fixed reference channel) in H-set 1 and a 12.2 kbps RMC. SAR is selectively confirmed for other physical channel configurations (DPCCH & DPDCHn) according to output power, exposure conditions and device operating capabilities. Maximum output power is verified according to the applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. The DUT must be tested according to its UE Category and explained in the SAR report.

Ø Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the Release 5 procedures described in section 5.2 of 3GPP TS 34.121, using an FRC with H-set 1 and a 12.2 kbps RMC with TPC (transmit power control) set to all "1's". When HSDPA is active output power is measured according requirements for HS-DPCCH Sub-test 1 - 4. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc.), with and without HSDPA active, should be tabulated in the SAR report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations should be clearly identified in the SAR report.

Ø SAR Measurements

When voice transmission and head exposure conditions are applicable to a WCDMA/HSDPA data device, head exposure is measured according to the 'Head SAR Measurements' procedures in the 'WCDMA Handsets' section of this document. SAR for body exposure configurations is measured according to the 'Body SAR Measurements' procedures of that section. In *addition*, body SAR is also measured for HSDPA when the maximum average output of each RF channel with HSDPA active is at least ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA.

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 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.

2.4 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.

EX3DV3 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, CENELEC 50361 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 ± 0.2 mm
FILLING VOLUME	Approx. 25 liters
DIMENSIONS	Height: 810 mm; Length: 1000 mm; Width: 500 mm

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, 1900
RETURN LOSS	> 20 dB at specified validation position
POWER CAPABILITY	> 100 W (f < 1GHz); > 40 W (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 GSM900/DCS1800/PCS1900 GSM/GPRS/CDMA 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 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.

$$SAR = E_{tot}^2 \cdot \frac{s}{r \cdot 1'000}$$

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.

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

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.	CAL. DATE
1	Universal Radio Communication Tester	R&S	CMU200	104958	Sep. 04, 2008

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 POSITION

4.1 DESCRIPTION OF TEST POSITION

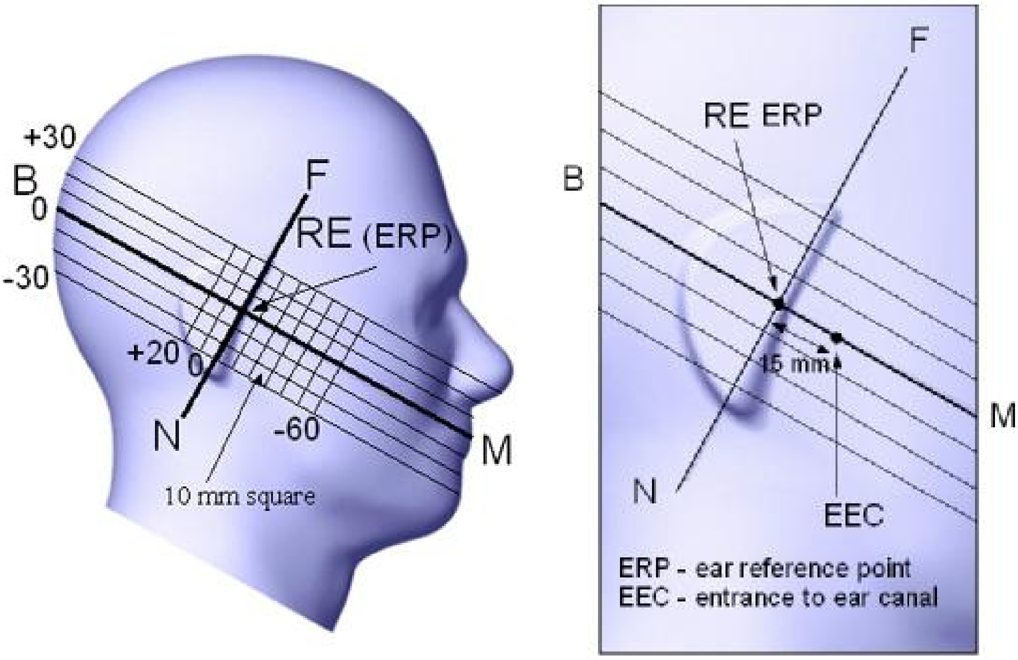


FIGURE 3.1

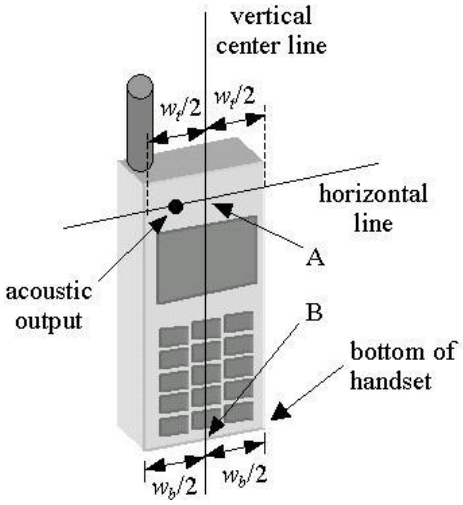


FIGURE 3.1a

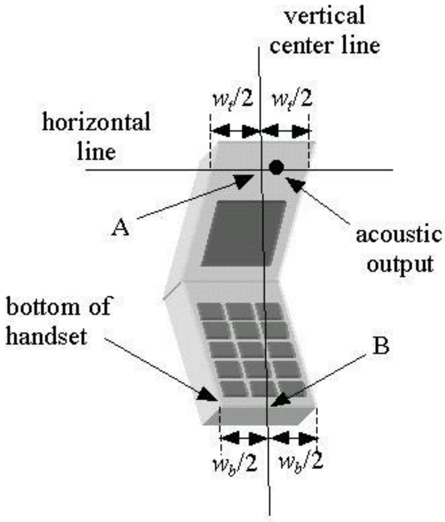
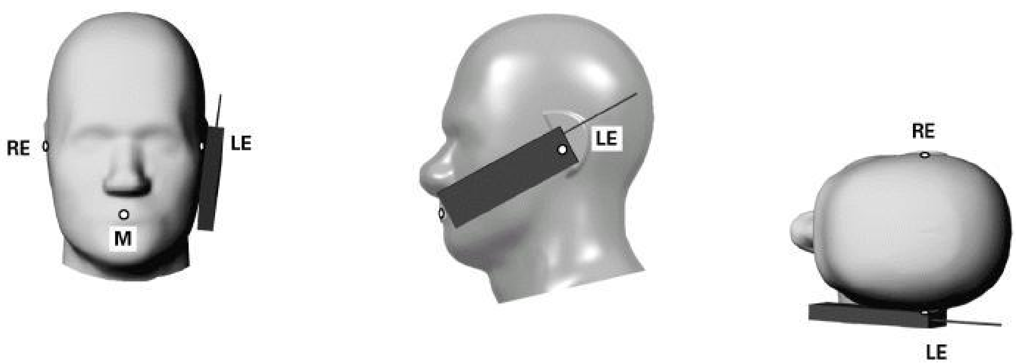


FIGURE 3.1b

4.1.1 TOUCH/CHEEK TEST POSITION

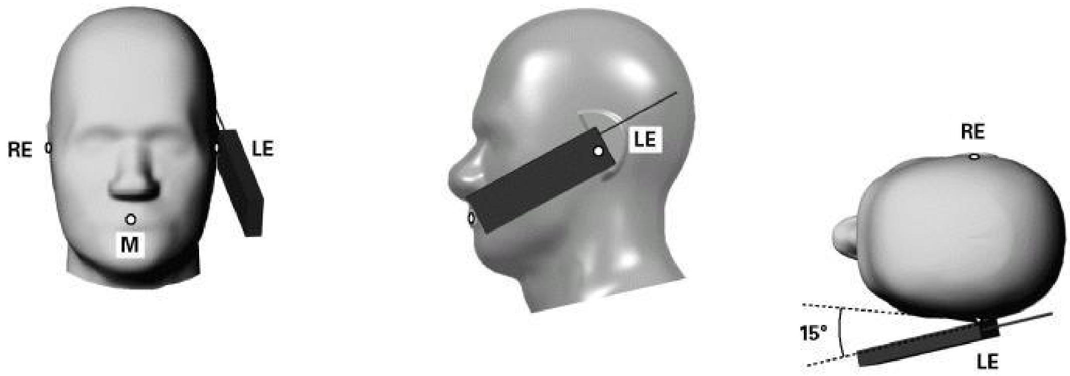
The head position in Figure 3.1, the ear reference points ERP are 15mm above entrance to ear canal along the B-M line. The line N-F (Neck-Front) is perpendicular to the B-M (Back Mouth) line. The handset device in Figure 3.1a and 3.1b,The vertical centerline pass through two points on the front side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

TEST MODE	COMMUNICATION MODE	MODULATION TYPE	ASSESSMENT POSTITION	TESTED CHANNEL
1	WCDMA850	BPSK	Right Head / Cheek	4182
2		BPSK	Right Head / Tilt	4182
3		BPSK	Left Head / Cheek	4182
4		BPSK	Left Head / Tilt	4182
5		BPSK	Body / Back	4182
6		BPSK	Body / Front	4182
7	PCS1900	GMSK	Right Head / Cheek	661
8		GMSK	Right Head / Tilt	661
9		GMSK	Left Head / Cheek	661
10		GMSK	Left Head / Tilt	661
11		GMSK	Body / Back	661
12	GPRS1900 TS1	GMSK	Body / Back	661
13		GMSK	Body / Front	661

NOTE: The Body position to the phantom with 15mm-separation distance.

4.3 SUMMARY OF TEST RESULTS

ITEM		1	2	3	4
PART OF ASSESSMENT		HEAD POSITION			
COMMUNICATION MODE		WCDMA850			
CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)			
4182	836.4 (Mid.)	0.631	0.255	**0.764**	0.330

ITEM		5	6
PART OF ASSESSMENT		BODY POSITION	
COMMUNICATION MODE		WCDMA850	
CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)	
4182	836.4 (Mid.)	**0.406**	0.161

ITEM		7	8	9	10
PART OF ASSESSMENT		HEAD POSITION			
COMMUNICATION MODE		PCS1900			
CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)			
661	1880.0 (Mid.)	0.363	0.245	0.481	0.281

ITEM		11	12	13
PART OF ASSESSMENT		BODY POSITION		
COMMUNICATION MODE		PCS1900	GPRS1900 TS1	
CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)		
661	1880.0 (Mid.)	0.200	0.209	0.097

NOTE: The worst value of each communication has been marked by boldface.

5. TEST RESULTS

5.1 TEST PROCEDURES

The EUT (Mobile phone) 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 50361, 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 with 15mm x 15mm grid was performed for the highest spatial SAR location. Consist of 11 x 13 points while the scan size is the 150mm x 180mm. 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 4.0 mm and maintained at a constant distance of ±1.0 mm during a zoom scan to determine peak SAR locations. The distance is 4mm 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 9mm separation distance. The cube size is 7 x 7 x 7 points consist of 343 points and the grid space is 5mm.

The measurement time is 0.5 s 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 4mm 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 MEASURED SAR RESULTS

850MHz BAND HEAD POSITION

ENVIRONMENTAL CONDITION	Air Temperature：23.1°C, Liquid Temperature：22.0°C Humidity：62%RH					
TESTED BY	Sam Onn			**DATE**	Aug. 10, 2009	
CHAN.	**FREQ. (MHz)**	**MODULATION TYPE**	**TX POWER (dBm)**	**POWER DRIFT (%)**	**DEVICE TEST POSITION MODE**	**MEASURED 1g SAR (W/kg)**
4182	**836.4 (Mid.)**	**BPSK**	23.71	-0.021	1	0.631
4182	**836.4 (Mid.)**	**BPSK**	23.71	0.059	2	0.255
4182	**836.4 (Mid.)**	**BPSK**	23.71	0.044	3	**0.764**
4182	**836.4 (Mid.)**	**BPSK**	23.71	-0.029	4	0.330

NOTE:

1. Test configuration of each mode is described in section 4.2.
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%.

850MHz BAND BODY POSITION

ENVIRONMENTAL CONDITION	Air Temperature：23.0°C, Liquid Temperature：22.2°C Humidity：61%RH		
TESTED BY	Sam Onn	DATE	Aug. 10, 2009

CHAN.	FREQ. (MHz)	MODULATION TYPE	TX POWER (dBm)	POWER DRIFT (%)	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
4182	**836.4 (Mid.)**	**BPSK**	23.71	-0.044	5	**0.406**
4182	**836.4 (Mid.)**	**BPSK**	23.71	-0.104	6	0.161

NOTE:

1. Test configuration of each mode is described in section 4.2.
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%.

1900MHz BAND HEAD POSITION

ENVIRONMENTAL CONDITION	Air Temperature：22.9°C, Liquid Temperature：21.7°C Humidity：60%RH		
TESTED BY	Sam Onn	DATE	Aug. 12, 2009

CHAN.	FREQ. (MHz)	MODULATION TYPE	TX POWER (dBm)	POWER DRIFT (%)	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
661	1880.0 (Mid.)	GMSK	29.60	-0.151	7	0.363
661	1880.0 (Mid.)	GMSK	29.60	0.034	8	0.245
661	1880.0 (Mid.)	GMSK	29.60	0.105	9	0.481
661	1880.0 (Mid.)	GMSK	29.60	-0.085	10	0.281

NOTE:

1. Test configuration of each mode is described in section 4.2.
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%.

1900MHz BAND BODY POSITION

ENVIRONMENTAL CONDITION	Air Temperature：23.4°C, Liquid Temperature：22.5°C Humidity：61%RH		
TESTED BY	Sam Onn	DATE	Aug. 13, 2009

CHAN.	FREQ. (MHz)	MODULATION TYPE	TX POWER (dBm)	POWER DRIFT (%)	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
661	**1880.0 (Mid.)**	**GMSK**	29.60	0.078	11	0.200
661	**1880.0 (Mid.)**	**GMSK**	29.50	0.065	12	0.209
661	**1880.0 (Mid.)**	**GMSK**	29.50	-0.035	13	0.097

NOTE:

1. Test configuration of each mode is described in section 4.2.
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 SAR LIMITS

HUMAN EXPOSURE	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	**(Occupational / controlled Exposure Environment)**
Spatial Average (whole body)	0.08	0.4
Spatial Peak (averaged over 1 g)	**1.6**	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

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.

5.4 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 ingredients are used：

- **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 (75-125 mPa.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 30 min. 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 $\varepsilon'=10.0$, $\varepsilon''=0.0$). 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 900 MHz) and press ‘Option’-button.

Select the current medium for the frequency of the validation (e.g. Setup Medium Brain 900 MHz).

850MHz BAND SIMULATING LIQUID

LIQUID TYPE		HSL-835		
SIMULATING LIQUID TEMP.		22.0		
TEST DATE		Aug. 10, 2009		
TESTED BY		Sam Onn		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
835.0	Permitivity (ε)	41.50	42.10	1.45
836.4		41.50	42.10	1.45
835.0	Conductivity (σ) S/m	0.90	0.93	3.33
836.4		0.90	0.93	3.33
Dielectric Parameters Required at 22℃		**f= 835MHz** **ε= 41.5 ± 5%** **σ= 0.97 ± 5% S/m**		

LIQUID TYPE		MSL-835		
SIMULATING LIQUID TEMP.		22.2		
TEST DATE		Aug. 10, 2009		
TESTED BY		Sam Onn		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
835.0	Permitivity (ε)	55.20	54.60	-1.09
836.4		55.20	54.60	-1.09
835.0	Conductivity (σ) S/m	0.97	0.95	-2.06
836.4		0.97	0.95	-2.06
Dielectric Parameters Required at 22℃		**f= 835MHz** **ε= 55.0 ± 5%** **σ= 1.05 ± 5% S/m**		

1900MHz BAND SIMULATING LIQUID

LIQUID TYPE		HSL-1900		
SIMULATING LIQUID TEMP.		21.7		
TEST DATE		Aug. 12, 2009		
TESTED BY		Sam Onn		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
1880	Permitivity (ε)	40.00	41.10	2.75
1900		40.00	41.00	2.50
1880	Conductivity (σ) S/m	1.40	1.39	-0.71
1900		1.40	1.41	0.71
Dielectric Parameters Required at 22℃		f= 1900MHz ε= 40.0 ± 5% σ= 1.40 ± 5% S/m		

LIQUID TYPE		MSL-1900		
SIMULATING LIQUID TEMP.		22.5		
TEST DATE		Aug. 13, 2009		
TESTED BY		Sam Onn		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
1880	Permitivity (ε)	53.30	54.20	1.69
1900		53.30	54.10	1.50
1880	Conductivity (σ) S/m	1.52	1.49	-1.97
1900		1.52	1.50	-1.32
Dielectric Parameters Required at 22℃		f= 1900MHz ε= 53.3 ± 5% σ= 1.52 ± 5% S/m		

5.5 TEST EQUIPMENT FOR TISSUE PROPERTY

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	Network Analyzer	Agilent	E8358A	US41480538	Nov. 27, 2008	Nov. 26, 2009
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.

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 EQUIPMENT

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	DAE	510	Jan. 21, 2009	Jan. 20, 2010
5	Robot Positioner	Staubli Unimation	NA	NA	NA	NA
6	Validation Dipole	S & P	D835V2	4d021	May 25, 2009	May 24, 2010
			D1900V2	5d022	Mar. 17, 2009	Mar. 16, 2010

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

6.2 TEST PROCEDURE

Before you start the system performance check, need only to tell the system with which components (probe, medium, and device) are performing the system performance check; the system will take care of all parameters. The dipole must be placed beneath the flat phantom 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 the EUT 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 ±0.02 dB.

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%.

6.3 VALIDATION RESULTS

SYSTEM VALIDATION TEST OF SIMULATING LIQUID					
FREQUENCY (MHz)	**REQUIRED SAR (mW/g)**	**MEASURED SAR (mW/g)**	**DEVIATION (%)**	**SEPARATION DISTANCE**	**TESTED DATE**
HSL 835	2.37 (1g)	2.33	-1.69	15mm	Aug. 10, 2009
MSL 835	2.54 (1g)	2.34	-7.87	15mm	Aug. 10, 2009
HSL 1900	10.20 (1g)	9.56	-6.27	10mm	Aug. 12, 2009
MSL 1900	10.20 (1g)	9.68	-5.10	10mm	Aug. 13, 2009
TESTED BY	Sam Onn				

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

6.4 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)	3.90	Normal	1	0.64	0.43	2.50	1.68	∞
Liquid Permittivity (target)	5.00	Rectangular	$\sqrt{3}$	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	3.41	Normal	1	0.6	0.49	2.05	1.67	∞
Combined Standard Uncertainty						**10.03**	**9.64**	
Coverage Factor for 95%						**Kp=2**		
Expanded Uncertainty (K=2)						**20.05**	**19.27**	

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. 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 50361, 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 ±0.20 dB, while the maximum deviation of hemispherical isotropy is ±0.40 dB, 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

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

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

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= 13.95 mm 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. For SPEAG field probes, the measured difference between CW and pulsed signals, with pulse frequencies between 10 Hz and 1 kHz and duty cycles between 1 and 100, is < ±0.20 dB (< ±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.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 2.0 W/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:

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

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 <5 ms. 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:

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

The specified repeatability of the RX robot family used in DASY4 systems is ±25 µm. 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:

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

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 0.2 mm, 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 ±0.2 mm, 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)		Standard Uncertainty (±%)		(v_i)
				(1g)	(10g)	(1g)	(10g)	
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)	3.90	Normal	1	0.64	0.43	2.50	1.68	∞
Liquid Permittivity (target)	5.00	Rectangular	$\sqrt{3}$	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	3.41	Normal	1	0.6	0.49	2.05	1.67	∞
Combined Standard Uncertainty						**10.61**	**10.24**	
Coverage Factor for 95%						**Kp=2**		
Expanded Uncertainty (K=2)						**21.22**	**20.49**	

TABLE 7.2

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 by the following approval agencies according to ISO/IEC 17025.

USA	FCC, NVLAP
GERMANY	TUV Rheinland
JAPAN	VCCI
NORWAY	NEMKO
CANADA	INDUSTRY CANADA , CSA
R.O.C.	TAF, BSMI, NCC
NETHERLANDS	Telefication
SINGAPORE	GOST-ASIA (MOU)
RUSSIA	CERTIS (MOU)

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

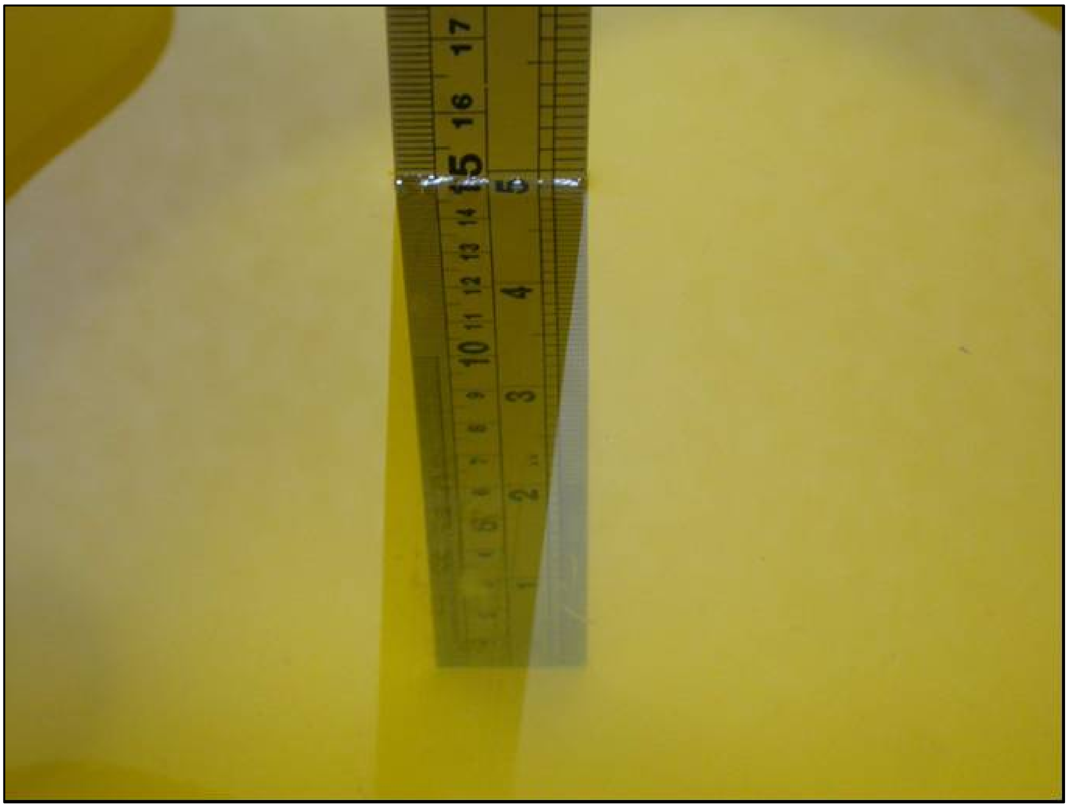
Web Site: www.adt.com.tw

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

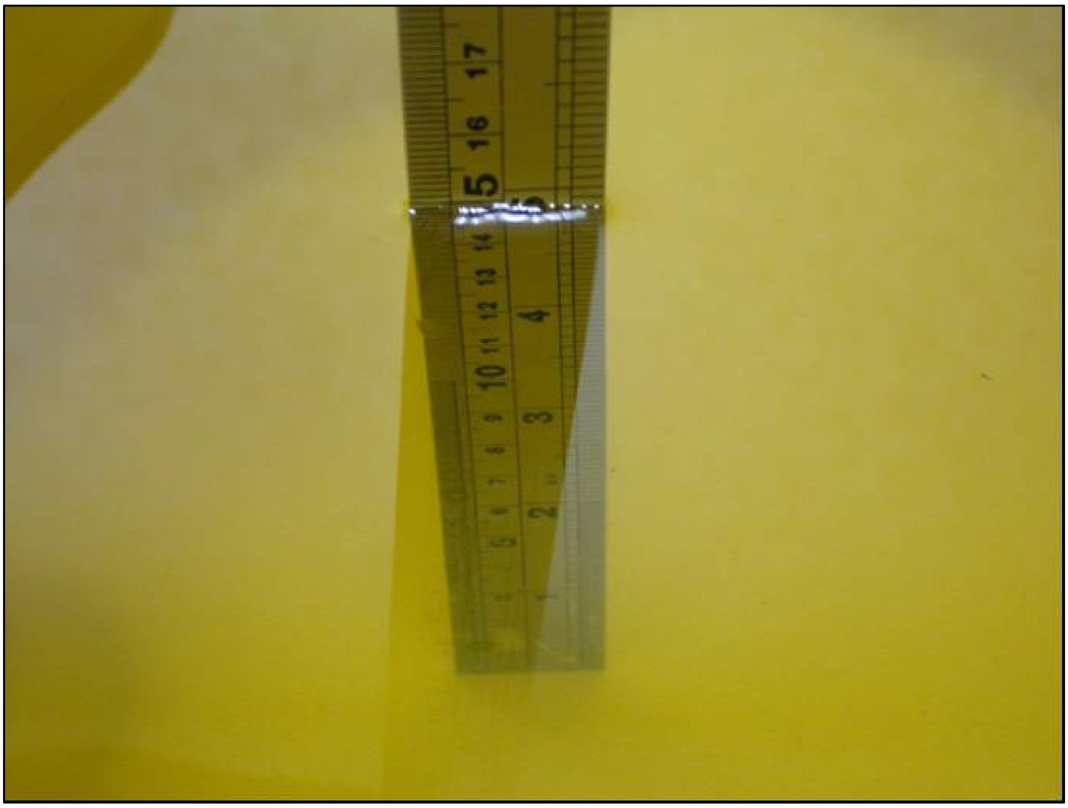
APPENDIX A: TEST DATA

Liquid Level Photo

Tissue HSL835MHz D=151mm



Tissue MSL835MHz D=150mm



Tissue HSL1900MHz D=151mm

Tissue MSL1900MHz D=155mm

Date/Time: 2009/8/10 16:54:57

Test Laboratory: Bureau Veritas ADT

M01-Right Head-Cheek-WCDMA850-Ch4182

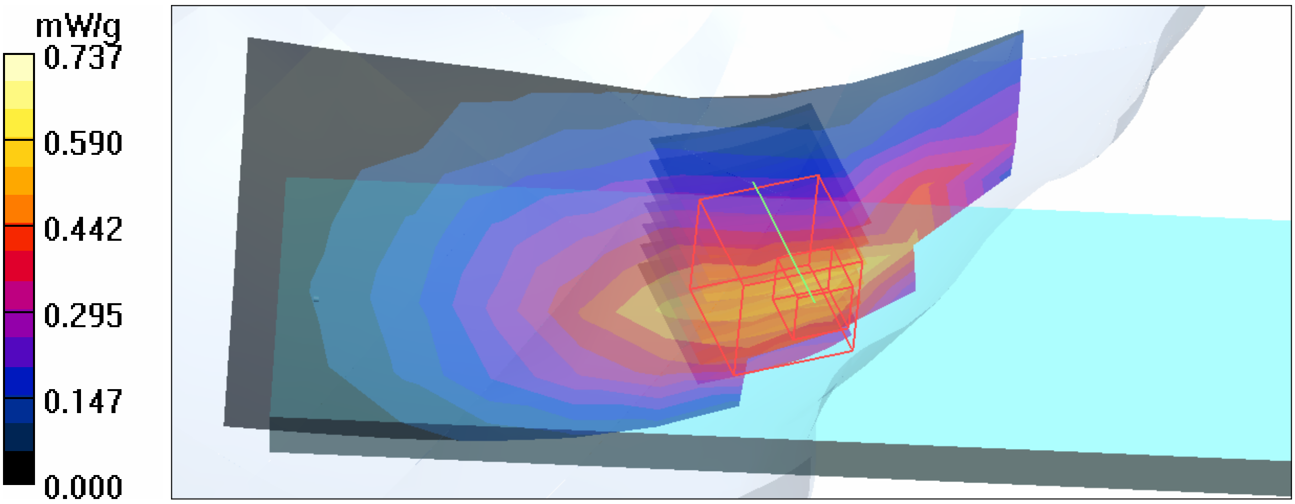
DUT: Mobile phone ; Type: F-03B

Communication System: WCDMA ; Frequency: 836.4 MHz ; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 836.4 MHz; σ = 0.93 mho/m; ε_r = 42.1; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Cheek ; Modulation type: BPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.57, 9.57, 9.57) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- 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 4182/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.737 mW/g

Touch position - Mid Channel 4182/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.21 V/m; Power Drift = -0.021 dB
Peak SAR (extrapolated) = 0.901 W/kg
SAR(1 g) = 0.631 mW/g; SAR(10 g) = 0.441 mW/g
Maximum value of SAR (measured) = 0.723 mW/g



Date/Time: 2009/8/10 17:14:24

Test Laboratory: Bureau Veritas ADT

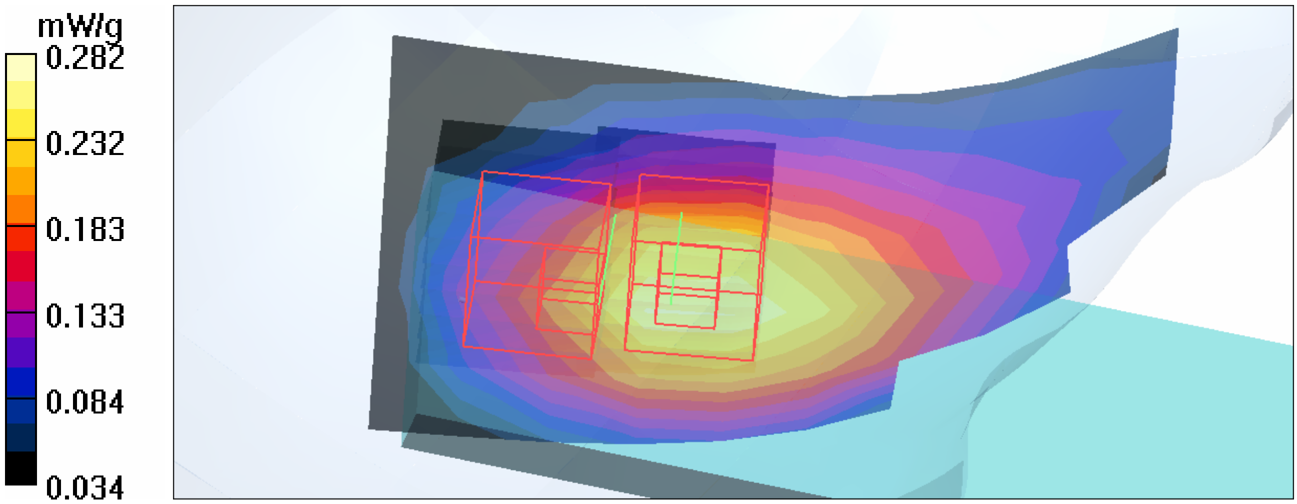
M02-Right Head-Tilt-WCDMA850-Ch4182

DUT: Mobile phone ; Type: F-03B

Communication System: WCDMA ; Frequency: 836.4 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 836.4 MHz; σ = 0.93 mho/m; ε_r = 42.1; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Tilt ; Modulation type: BPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.57, 9.57, 9.57) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- 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 4182/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.267 mW/g
Tilt position - Mid Channel 4182/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.8 V/m; Power Drift = 0.059 dB
Peak SAR (extrapolated) = 0.325 W/kg
SAR(1 g) = 0.255 mW/g; SAR(10 g) = 0.190 mW/g
Maximum value of SAR (measured) = 0.282 mW/g
Tilt position - Mid Channel 4182/Zoom Scan (7x7x7) (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.8 V/m; Power Drift = 0.059 dB
Peak SAR (extrapolated) = 0.282 W/kg
SAR(1 g) = 0.195 mW/g; SAR(10 g) = 0.121 mW/g
Maximum value of SAR (measured) = 0.243 mW/g



Date/Time: 2009/8/10 17:45:07

Test Laboratory: Bureau Veritas ADT

M03-Left Head-Cheek-WCDMA850-Ch4182

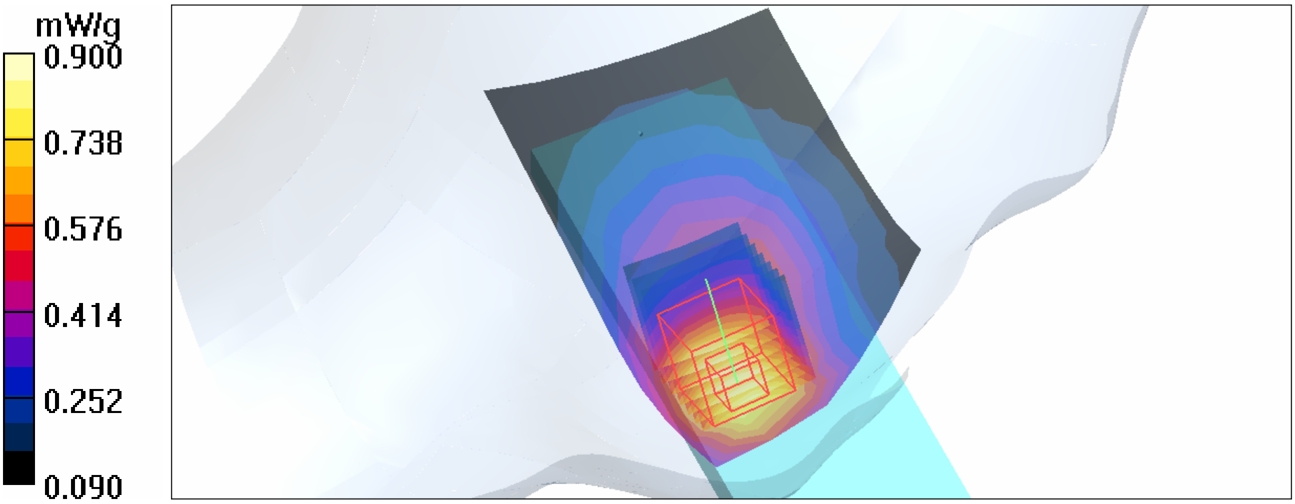
DUT: Mobile phone ; Type: F-03B

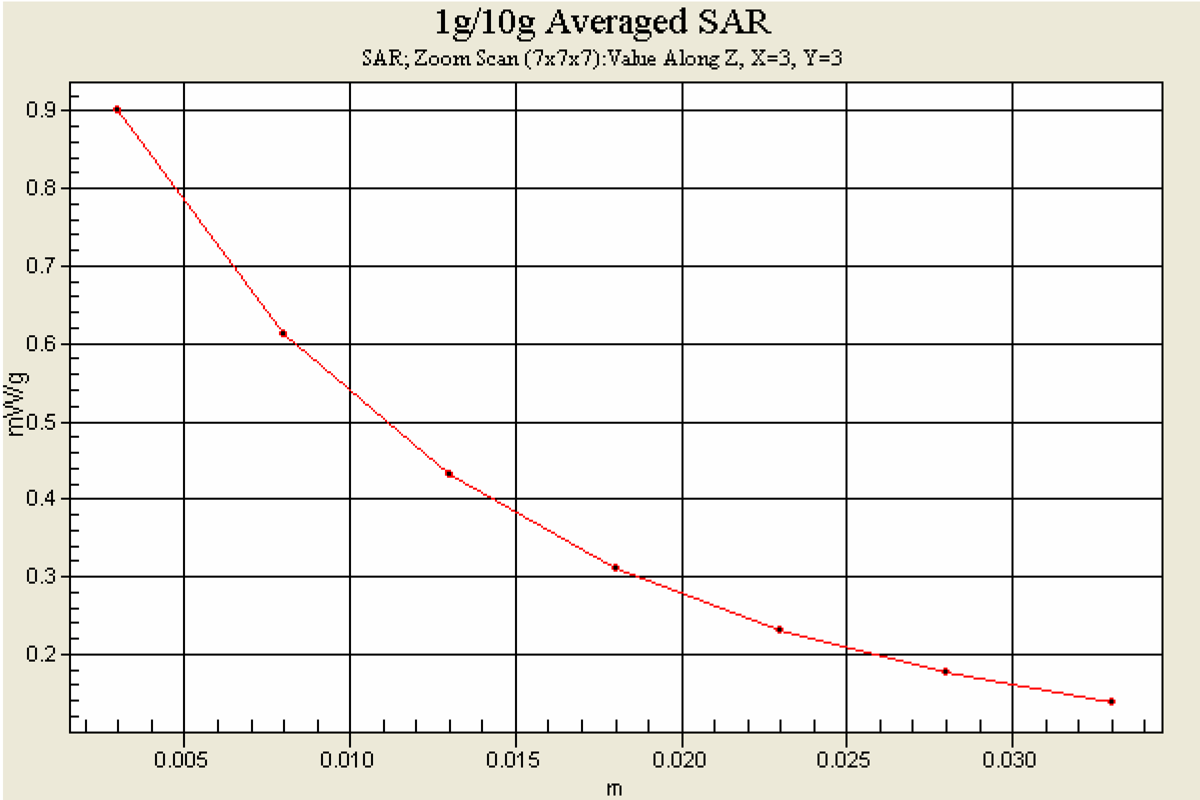
Communication System: WCDMA ; Frequency: 836.4 MHz ; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 836.4 MHz; σ = 0.93 mho/m; ε_r = 42.1; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Cheek ; Modulation type: BPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.57, 9.57, 9.57) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/1/21
- 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 4182/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.827 mW/g

Touch position - Mid Channel 4182/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.90 V/m; Power Drift = 0.044 dB
Peak SAR (extrapolated) = 1.15 W/kg
SAR(1 g) = 0.764 mW/g; SAR(10 g) = 0.511 mW/g
Maximum value of SAR (measured) = 0.900 mW/g




1g/10g Averaged SAR
SAR; Zoom Scan (7x7x7):Value Along Z, X=3, Y=3
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
mW/g
0.005
0.010
0.015
0.020
0.025
0.030
m

Date/Time: 2009/8/10 18:23:59

Test Laboratory: Bureau Veritas ADT

M04-Left Head-Tilt-WCDMA850-Ch4182

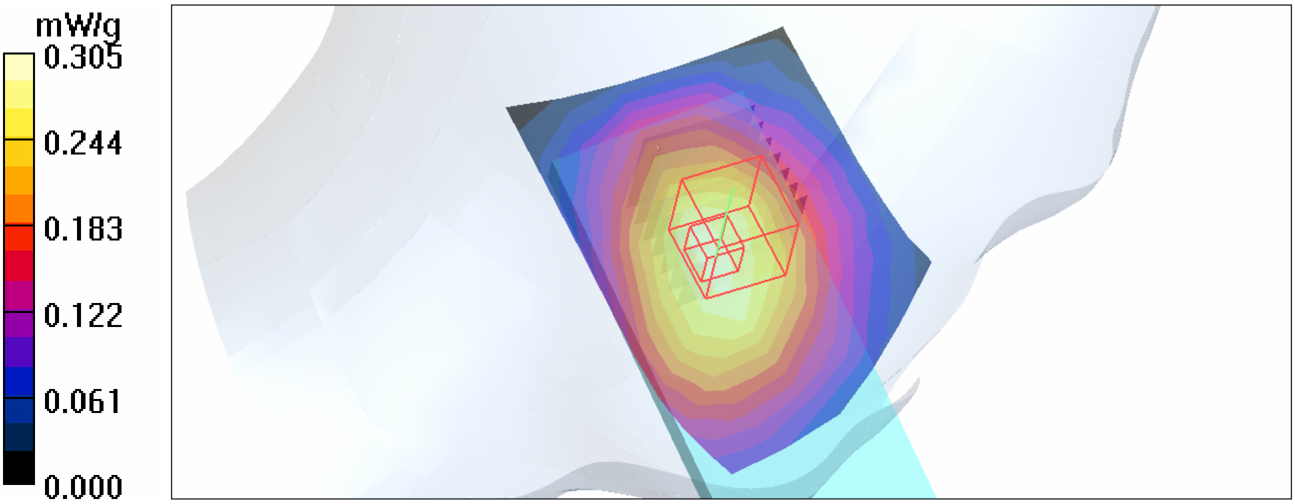
DUT: Mobile phone ; Type: F-03B

Communication System: WCDMA ; Frequency: 836.4 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 836.4 MHz; σ = 0.93 mho/m; ε_r = 42.1; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Tilt ; Modulation type: BPSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(9.57, 9.57, 9.57) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/1/21
- 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 4182/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.297 mW/g

Tilt position - Mid Channel 4182/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.1 V/m; Power Drift = -0.029 dB
Peak SAR (extrapolated) = 0.635 W/kg
SAR(1 g) = 0.330 mW/g; SAR(10 g) = 0.216 mW/g
Maximum value of SAR (measured) = 0.305 mW/g



Date/Time: 2009/8/10 19:49:00

Test Laboratory: Bureau Veritas ADT

M05-Body-WCDMA850-Ch4182

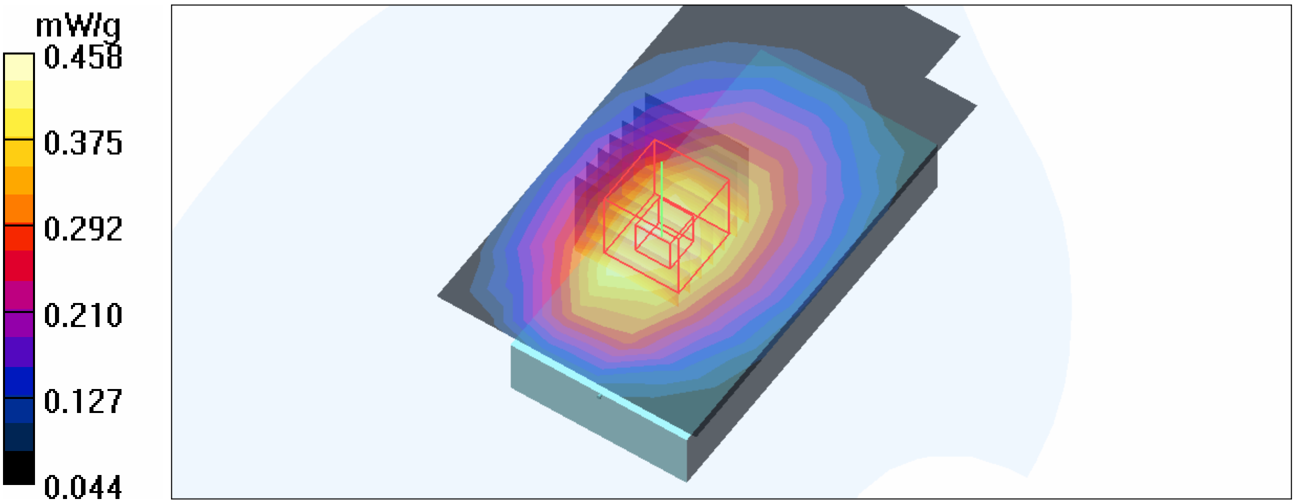
DUT: Mobile Phone ; Type: F-03B

Communication System: WCDMA ; Frequency: 836.4 MHz ; Duty Cycle: 1:1
Medium: MSL835 Medium parameters used: f = 836.4 MHz; $\sigma = 0.95$ mho/m; $\varepsilon_r = 54.6$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section ; DUT test position : Body ; Modulation Type: BPSK
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 Sn510 ; Calibrated: 2009/1/21
- 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 4182/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.441 mW/g

Mid Channel 4182/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.9 V/m; Power Drift = -0.044 dB
Peak SAR (extrapolated) = 0.549 W/kg
SAR(1 g) = 0.406 mW/g; SAR(10 g) = 0.288 mW/g
Maximum value of SAR (measured) = 0.458 mW/g



Date/Time: 2009/8/10 20:30:40

Test Laboratory: Bureau Veritas ADT

M06-Body-WCDMA850-Ch4182

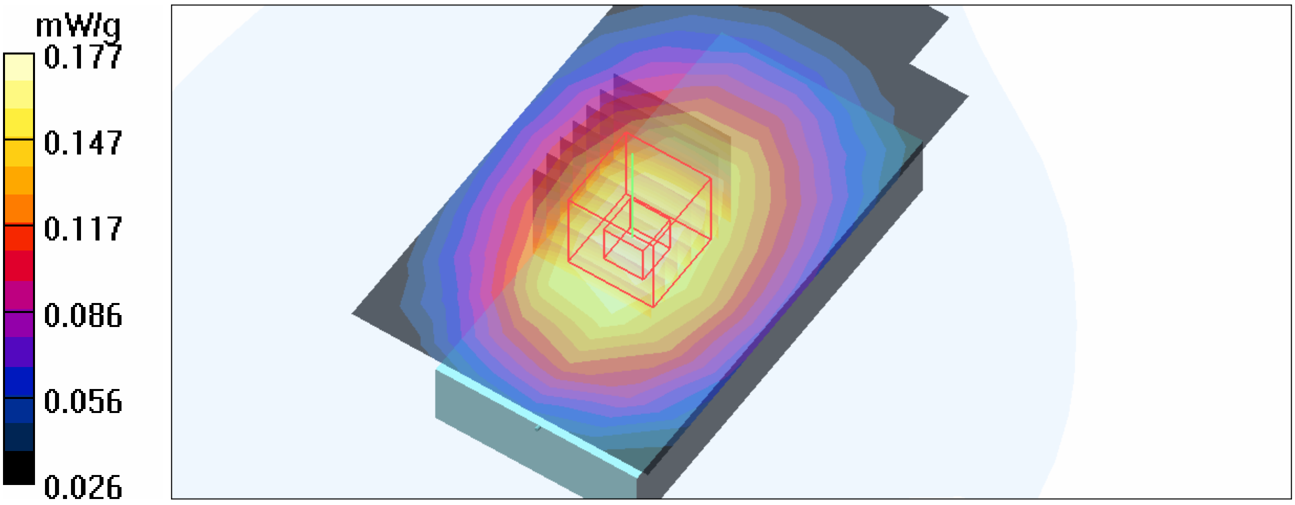
DUT: Mobile Phone ; Type: F-03B

Communication System: WCDMA ; Frequency: 836.4 MHz ; Duty Cycle: 1:1
Medium: MSL835 Medium parameters used: f = 836.4 MHz; σ = 0.95 mho/m; ε_r = 54.6; ρ = 1000 kg/m^3
Phantom section: Flat Section ; DUT test position : Body ; Modulation Type: BPSK
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 Sn510 ; Calibrated: 2009/1/21
- 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 4182/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.173 mW/g

Mid Channel 4182/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.98 V/m; Power Drift = -0.104 dB
Peak SAR (extrapolated) = 0.204 W/kg
SAR(1 g) = 0.161 mW/g; SAR(10 g) = 0.121 mW/g
Maximum value of SAR (measured) = 0.177 mW/g



Date/Time: 2009/8/12 15:37:45

Test Laboratory: Bureau Veritas ADT

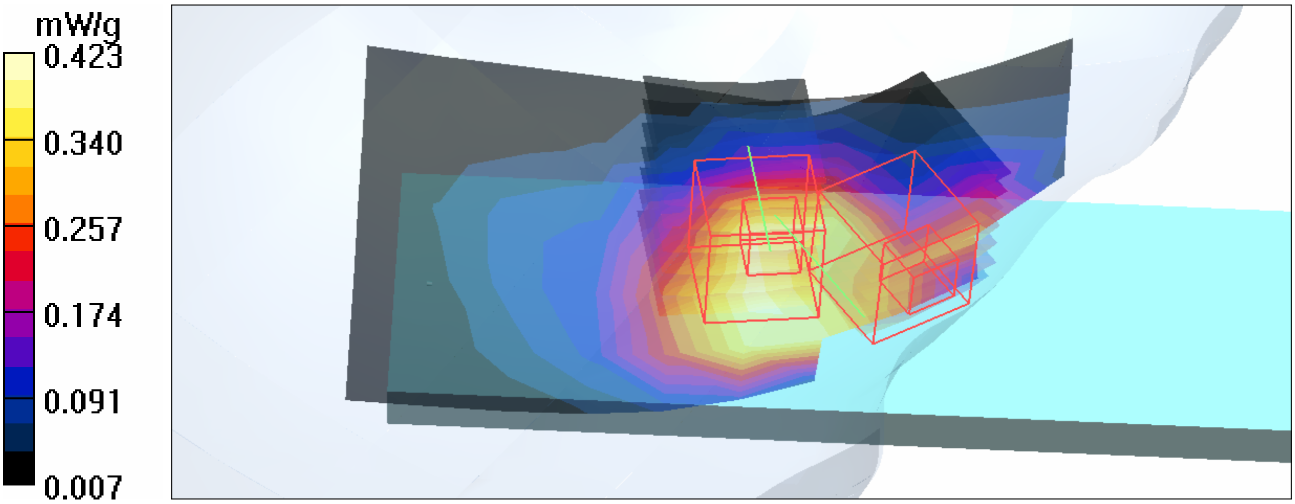
M07-Right Head-Cheek-PCS1900-Ch661

DUT: Mobile phone ; Type: F-03B

Communication System: PCS 1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:8.3
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.39 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Right Section ; DUT test position : Cheek ; Modulation type: GMSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.08, 8.08, 8.08) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- 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 661/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.411 mW/g
Touch position - Mid Channel 661/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.82 V/m; Power Drift = -0.151 dB
Peak SAR (extrapolated) = 0.555 W/kg
SAR(1 g) = 0.363 mW/g; SAR(10 g) = 0.237 mW/g
Maximum value of SAR (measured) = 0.423 mW/g
Touch position - Mid Channel 661/Zoom Scan (7x7x7) (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.82 V/m; Power Drift = -0.151 dB
Peak SAR (extrapolated) = 0.477 W/kg
SAR(1 g) = 0.287 mW/g; SAR(10 g) = 0.169 mW/g
Maximum value of SAR (measured) = 0.353 mW/g



Date/Time: 2009/8/12 16:10:33

Test Laboratory: Bureau Veritas ADT

M08-Right Head-Tilt-PCS1900-Ch661

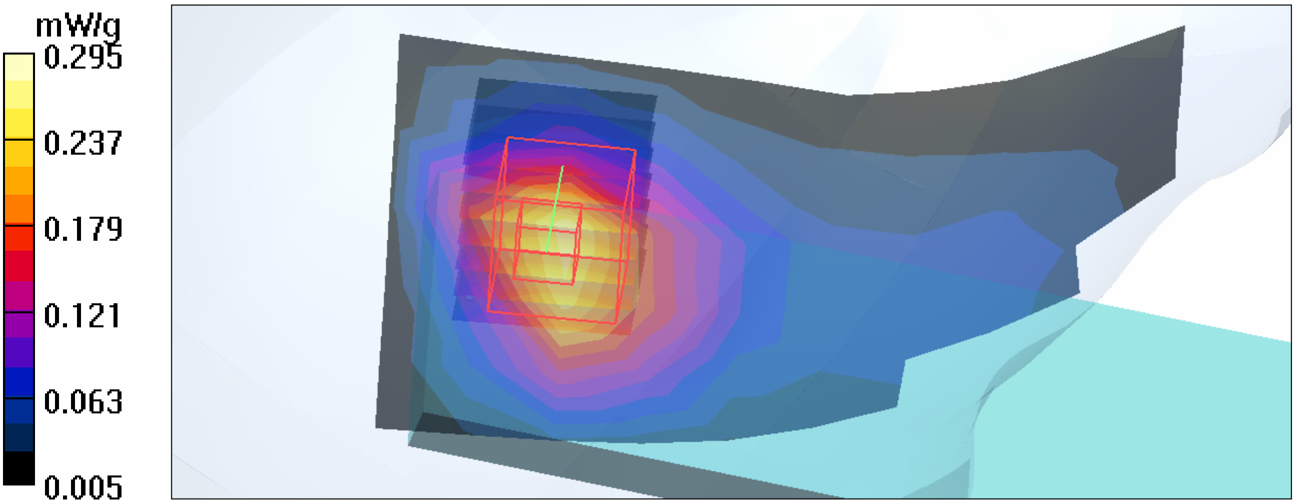
DUT: Mobile phone ; Type: F-03B

Communication System: PCS 1900 ; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.39 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Right Section ; DUT test position : Tilt ; Modulation type: GMSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.08, 8.08, 8.08) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/1/21
- 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 661/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.272 mW/g

Tilt position - Mid Channel 661/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.72 V/m; Power Drift = 0.034 dB
Peak SAR (extrapolated) = 0.398 W/kg
SAR(1 g) = 0.245 mW/g; SAR(10 g) = 0.142 mW/g
Maximum value of SAR (measured) = 0.295 mW/g



Date/Time: 2009/8/12 17:07:44

Test Laboratory: Bureau Veritas ADT

M09-Left Head-Cheek-PCS1900-Ch661

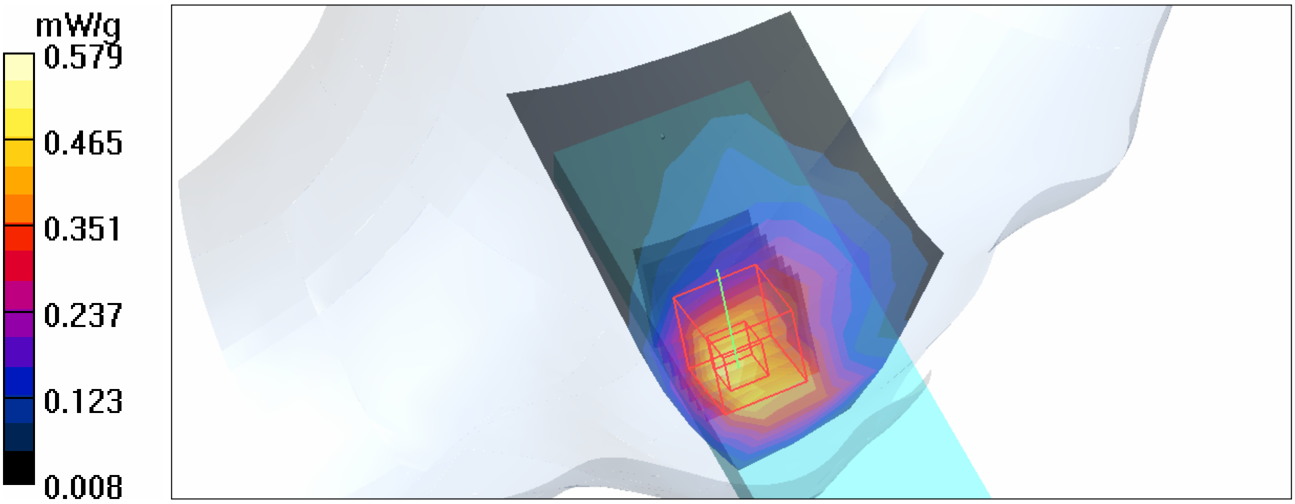
DUT: Mobile phone ; Type: F-03B

Communication System: PCS 1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:8.3
Medium: HSL1900 Medium parameters used: f = 1880 MHz; $\sigma = 1.39$ mho/m; $\varepsilon_r = 41.1$; $\rho = 1000$ kg/m^3
Phantom section: Left Section ; DUT test position : Cheek ; Modulation type: GMSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.08, 8.08, 8.08) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/1/21
- 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 661/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.520 mW/g

Touch position - Mid Channel 661/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.33 V/m; Power Drift = 0.105 dB
Peak SAR (extrapolated) = 0.746 W/kg
SAR(1 g) = 0.481 mW/g; SAR(10 g) = 0.277 mW/g
Maximum value of SAR (measured) = 0.579 mW/g



Date/Time: 2009/8/12 17:27:38

Test Laboratory: Bureau Veritas ADT

M10-Left Head-Tilt-PCS1900-Ch661

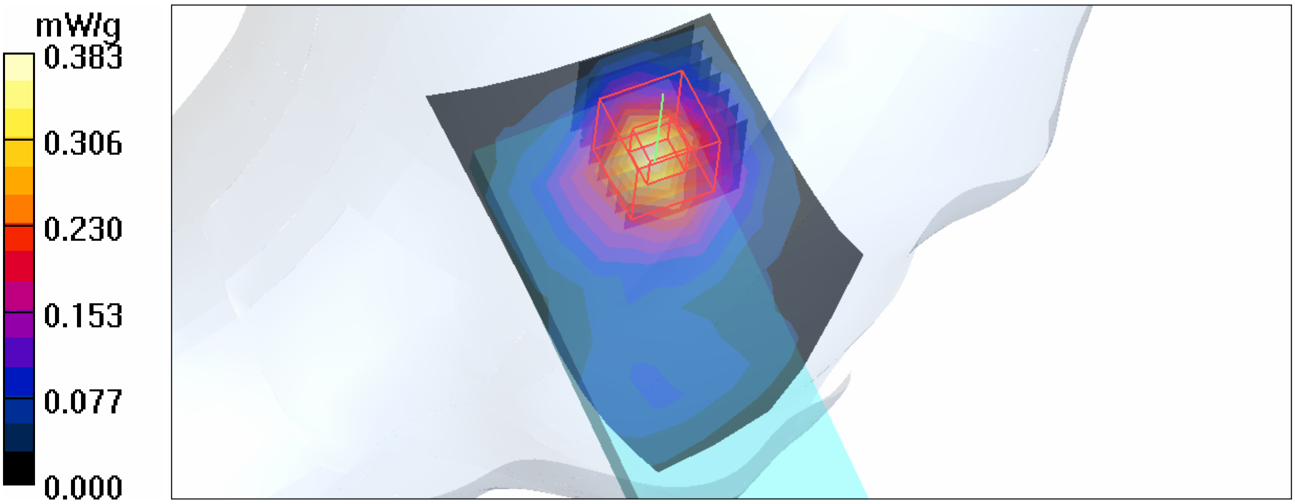
DUT: Mobile phone ; Type: F-03B

Communication System: PCS 1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:8.3
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.39 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Cheek ; Modulation type: GMSK

DASY4 Configuration:
- Probe: EX3DV3 - SN3504 ; ConvF(8.08, 8.08, 8.08) ; Calibrated: 2009/1/21
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/1/21
- 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 661/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.383 mW/g

Tilt position - Mid Channel 661/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.11 V/m; Power Drift = -0.085 dB
Peak SAR (extrapolated) = 0.463 W/kg
SAR(1 g) = 0.281 mW/g; SAR(10 g) = 0.161 mW/g
Maximum value of SAR (measured) = 0.337 mW/g



Date/Time: 2009/8/13 09:44:24

Test Laboratory: Bureau Veritas ADT

M11-Body-PCS1900-Ch661

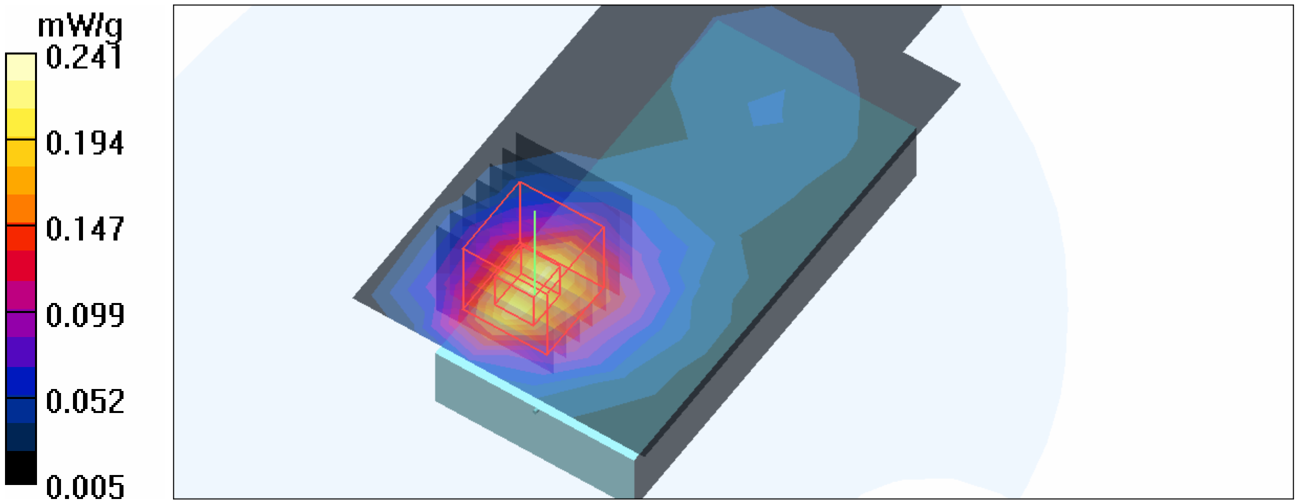
DUT: Mobile Phone ; Type: F-03B

Communication System: PCS 1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:8.3
Medium: MSL1900 Medium parameters used: f = 1880 MHz; σ = 1.49 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section ; DUT test position : Body ; Modulation Type: GMSK
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 Sn510 ; Calibrated: 2009/1/21
- 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 661/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.221 mW/g

Mid Channel 661/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.66 V/m; Power Drift = 0.078 dB
Peak SAR (extrapolated) = 0.334 W/kg
SAR(1 g) = 0.200 mW/g; SAR(10 g) = 0.113 mW/g
Maximum value of SAR (measured) = 0.241 mW/g



Date/Time: 2009/8/13 10:21:26

Test Laboratory: Bureau Veritas ADT

M12-Body-GPRS1900 TS1-Ch661

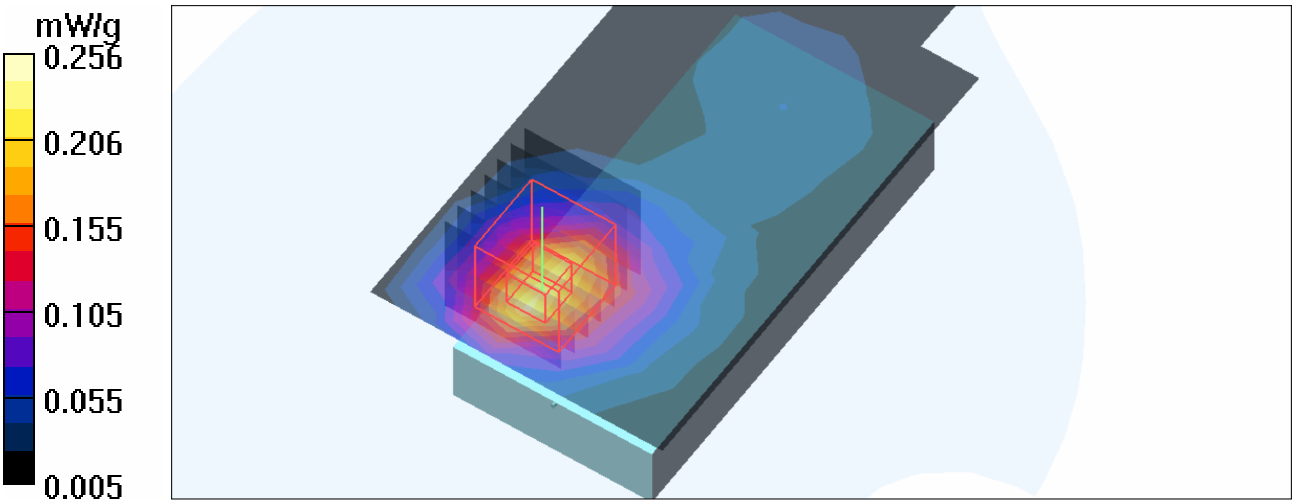
DUT: Mobile Phone ; Type: F-03B

Communication System: PCS 1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:8.3
Medium: MSL1900 Medium parameters used: f = 1880 MHz; $\sigma = 1.49$ mho/m; $\varepsilon_r = 54.2$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section ; DUT test position : Body ; Modulation Type: GMSK / UL 1 time slot
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 Sn510 ; Calibrated: 2009/1/21
- 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 661/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.226 mW/g

Mid Channel 661/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.18 V/m; Power Drift = 0.065 dB
Peak SAR (extrapolated) = 0.348 W/kg
SAR(1 g) = 0.209 mW/g; SAR(10 g) = 0.118 mW/g
Maximum value of SAR (measured) = 0.256 mW/g



Date/Time: 2009/8/13 10:56:50

Test Laboratory: Bureau Veritas ADT

M13-Body-GPRS1900 TS1-Ch661

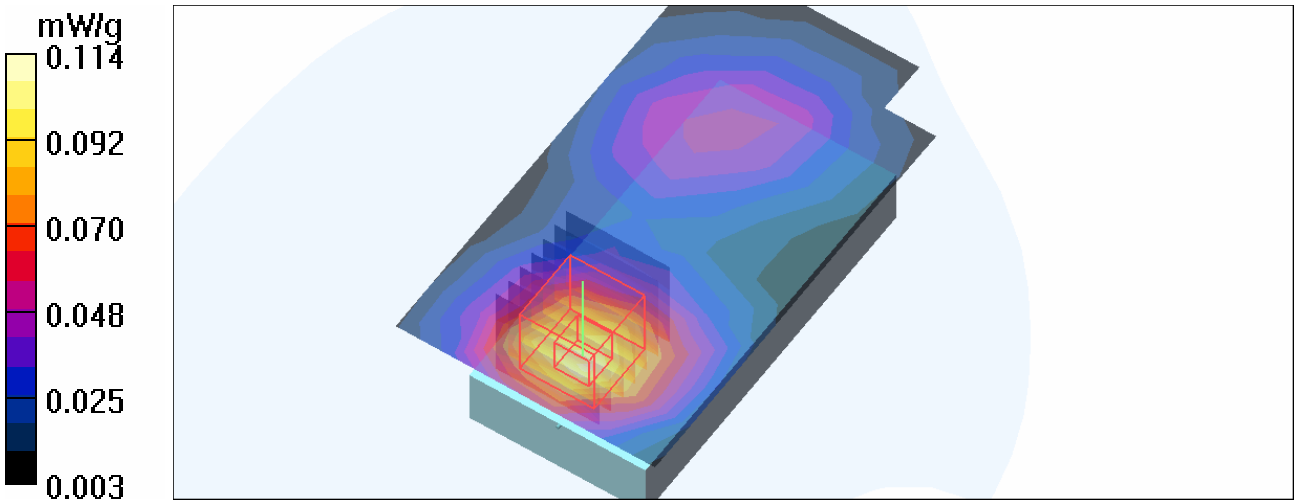
DUT: Mobile Phone ; Type: F-03B

Communication System: PCS 1900 ; Frequency: 1880 MHz ; Duty Cycle: 1:8.3
Medium: MSL1900 Medium parameters used: f = 1880 MHz; $\sigma = 1.49$ mho/m; $\varepsilon_r = 54.2$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section ; DUT test position : Body ; Modulation Type: GMSK / UL 1 time slot
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 Sn510 ; Calibrated: 2009/1/21
- 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 661/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.113 mW/g

Mid Channel 661/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.16 V/m; Power Drift = -0.035 dB
Peak SAR (extrapolated) = 0.153 W/kg
SAR(1 g) = 0.097 mW/g; SAR(10 g) = 0.059 mW/g
Maximum value of SAR (measured) = 0.114 mW/g



Date/Time: 2009/8/10 13:52:48

Test Laboratory: Bureau Veritas ADT

System Validation Check-HSL 835MHz

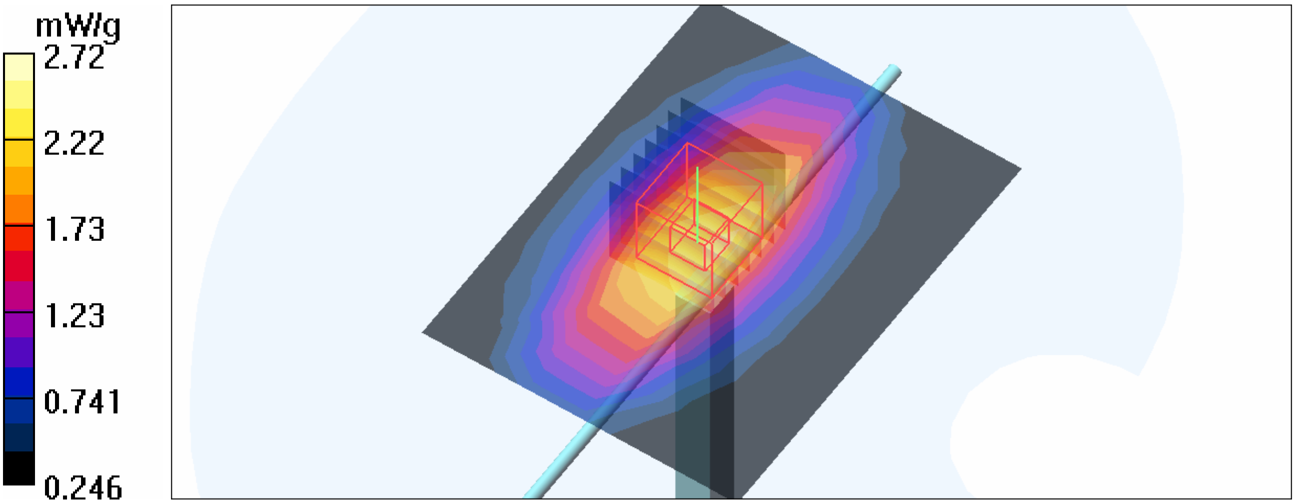
DUT: Dipole 850 MHz ; Type: D835V2 ; Serial: 4d021 ; Test Frequency: 835 MHz

Communication System: CW ; Frequency: 835 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: HSL835;Medium parameters used: f = 835 MHz; $\sigma = 0.93$ mho/m; $\varepsilon_r = 42.1$; $\rho = 1000$ kg/m^3 ;
Liquid level : 151 mm
Phantom section: Flat Section ; Separation distance : 15 mm (The feetpoint of the dipole to the Phantom)Air temp. : 23.1 degrees ; Liquid temp. : 22.0 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 Sn510; Calibrated: 2009/1/21
- 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) = 2.48 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.4 V/m; Power Drift = -0.026 dB
Peak SAR (extrapolated) = 3.46 W/kg
SAR(1 g) = 2.33 mW/g; SAR(10 g) = 1.53 mW/g
Maximum value of SAR (measured) = 2.72 mW/g



Date/Time: 2009/8/10 09:02:57

Test Laboratory: Bureau Veritas ADT

System Validation Check-MSL 835MHz

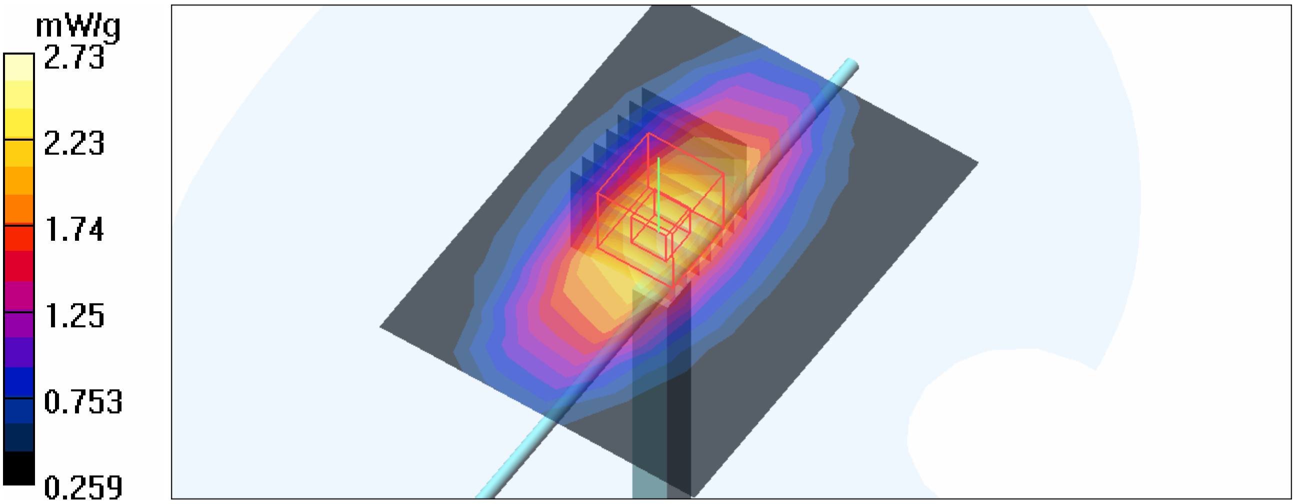
DUT: Dipole 850 MHz ; Type: D835V2 ; Serial: 4d021 ; Test Frequency: 835 MHz

Communication System: CW ; Frequency: 835 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: MSL835;Medium parameters used: f = 835 MHz; σ = 0.95 mho/m; ε_r = 54.6; 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. : 23.0 degrees ; Liquid temp. : 22.2 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 Sn510; Calibrated: 2009/1/21
- 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) = 2.51 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 = -0.115 dB
Peak SAR (extrapolated) = 3.44 W/kg
SAR(1 g) = 2.34 mW/g; SAR(10 g) = 1.54 mW/g
Maximum value of SAR (measured) = 2.73 mW/g



Date/Time: 2009/8/12 11:39:09

Test Laboratory: Bureau Veritas ADT

System Validation Check-HSL 1900MHz

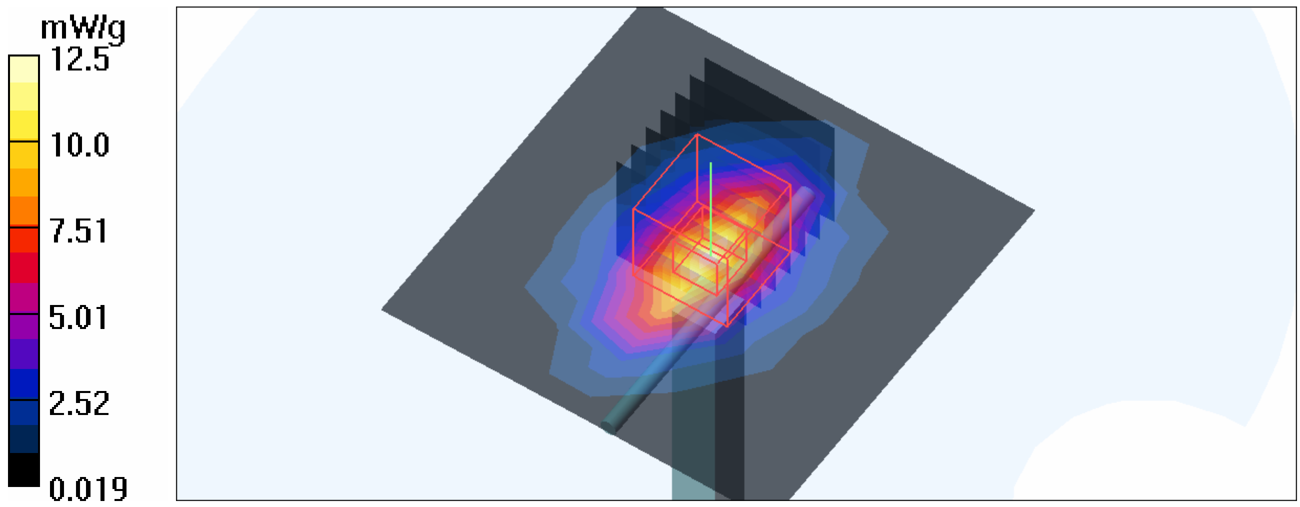
DUT: Dipole 1900 MHz ; Type: D1900V2 ; Serial: 5d022 ; Test Frequency: 1900 MHz

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; ρ = 1000 kg/m^3 ;
Liquid level : 151 mm
Phantom section: Flat Section ; Separation distance : 10 mm (The feetpoint of the dipole to the Phantom)Air temp. : 22.9 degrees ; Liquid temp. : 21.7 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 Sn510; Calibrated: 2009/1/21
- 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 = 93.2 V/m; Power Drift = -0.025 dB
Peak SAR (extrapolated) = 18.3 W/kg
SAR(1 g) = 9.56 mW/g; SAR(10 g) = 4.85 mW/g
Maximum value of SAR (measured) = 12.4 mW/g



Date/Time: 2009/8/13 09:03:59

Test Laboratory: Bureau Veritas ADT

System Validation Check-MSL 1900MHz

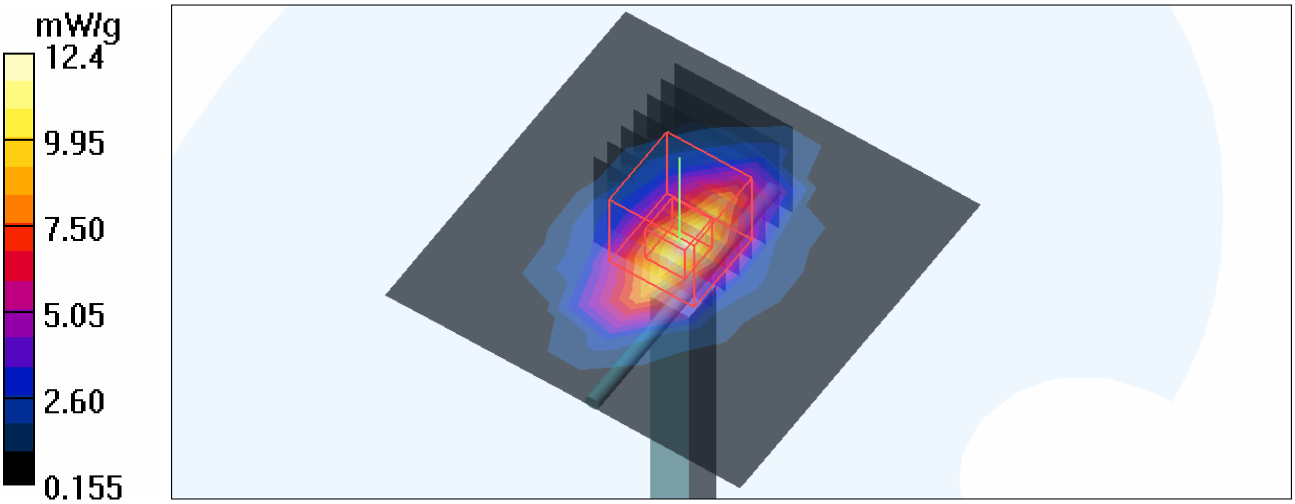
DUT: Dipole 1900 MHz ; Type: D1900V2 ; Serial: 5d022 ; Test Frequency: 1900 MHz

Communication System: CW ; Frequency: 1900 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: MSL1900;Medium parameters used: f = 1900 MHz; σ = 1.5 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3 ;
Liquid level : 155 mm
Phantom section: Flat Section ; Separation distance : 10 mm (The feetpoint of the dipole to the Phantom)Air temp. : 23.4 degrees ; Liquid temp. : 22.5 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 Sn510; Calibrated: 2009/1/21
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

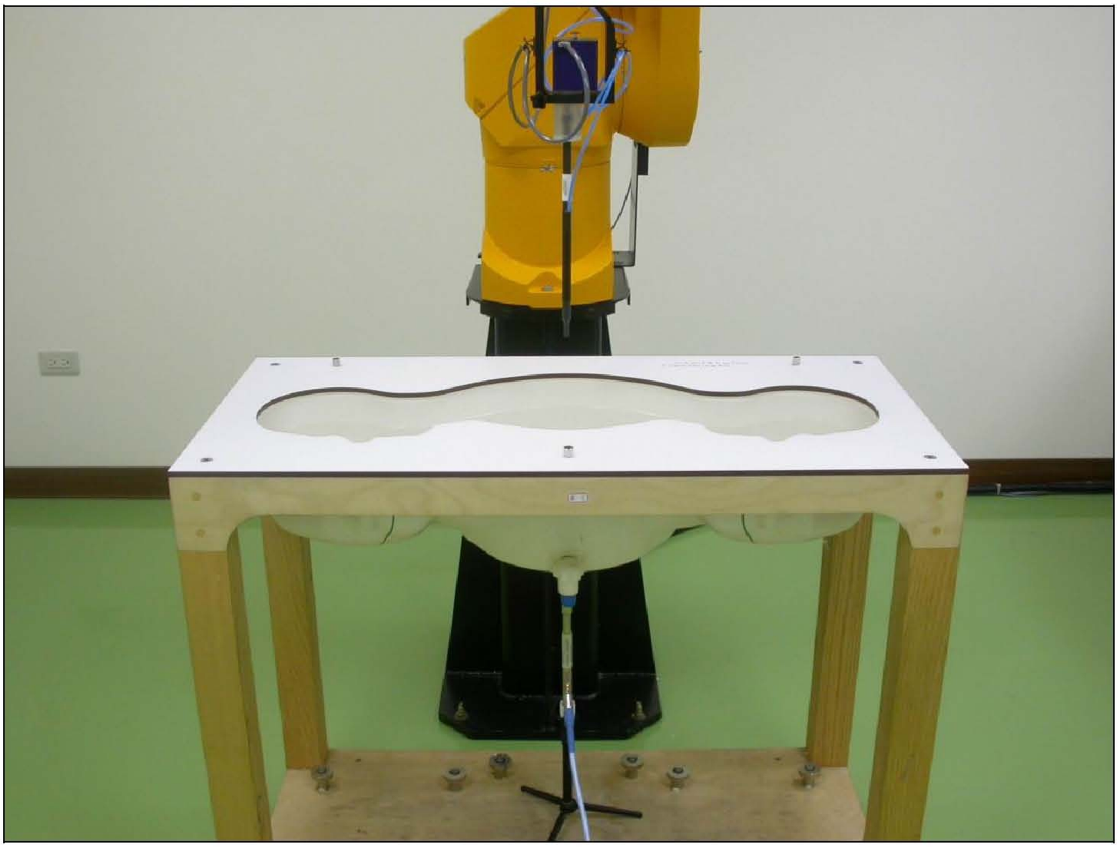
d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 12.2 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.8 V/m; Power Drift = -0.107 dB
Peak SAR (extrapolated) = 17.8 W/kg
SAR(1 g) = 9.68 mW/g; SAR(10 g) = 5.07 mW/g
Maximum value of SAR (measured) = 12.4 mW/g



APPENDIX B: ADT SAR MEASUREMENT SYSTEM

APPENDIX C: PHOTOGRAPHS OF SYSTEM VALIDATION



APPENDIX D: SYSTEM CERTIFICATE & CALIBRATION

D1: SAM PHANTOM

Schmid & Partner
Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 CA
Series No	TP-1150 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

[1] CENELEC EN 50361
[2] IEEE P1528-200x draft 6.5
[3] IEC PT 62209 draft 0.9
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 28.02.2002

Signature / Stamp

F. Bomholt

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