Shenzhen GTI Technology Co., Ltd.

1F,2 Block, Jiaquan Building, Guanlan High-tech Park Baoan District,
Shenzhen, Guangdong, China.
Tel: +86-755-27559792
Fax: +86-755-86116468

TEST REPORT

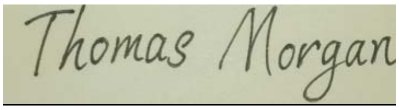
Product Name ....:	WCDMA Mobile Phone
Trademark ....:	NUU
Model/Type reference...............:	NU-3S
Listed Model(s) ....:	NU-3S series
Model difference ....:	NU-3S other series model No. are all the same with main model NU-3S, except for body color, RAM and LOGO to meet different customer requirements
FCC ID.......................................:	**2ADINNUUNU3S**
Test Standards ....:	**ANSI C95.1–1999** **47CFR §2.1093** **KDB 447498**
Applicant ....:	Sun Cupid Technology (HK) Ltd.
Address of Applicant................:	16/F, CEO Tower, 77 Wing Hong St, Cheung Sha Wan, Kowloon, Hong Kong
Date of Receipt ....:	Oct.20, 2014
Date of Test Date.......................:	Oct.20, 2014 - Nov.13, 2014
Data of Issue. ....:	Nov.14, 2014

Test result	**Pass ***

∗ In the configuration tested, the EUT complied with the standards specified above

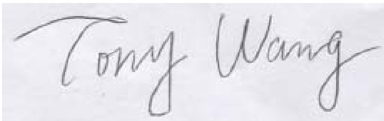
GENERAL DESCRIPTION OF EUT	
Equipment:	WCDMA Mobile Phone
Model Name:	NU-3S
Manufacturer:	Sun Cupid Technology (Shenzhen) Ltd.
Manufacturer Address:	10A, No.3 Bldg, China Academy of Sci & Tech Development, No.1 High-Tech South St. Nanshan district, Shenzhen, China.
Power Source:	DC 3.7V from 2050mAh Li-ion battery
Power Rating:	Input: 100-240VAC, 50/60Hz 0.2A MAX Output: 5V⎓1.0A

Compiled By:



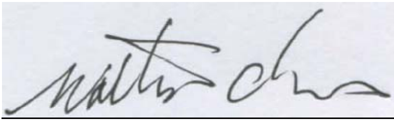
(Thomas Morgan)

Reviewed By:



(Tony Wang)

Approved By:



(Walter Chen)

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1. SUMMARY

1.1. Test Standards

IEEE Std C95.1, 1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 KHz to 300 GHz. It specifies the maximum exposure limit of 1.6 W/kg as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

IEEE Std 1528™-2003: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

KDB 447498 D01 Mobile Portable RF Exposure v05r02: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

KDB 616217 D04 SAR for laptop and tablets v01: SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers

KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01: SAR Measurement Requirements for 100 MHz to 6 GHz

KDB865664 D02 SAR Reporting v01: RF Exposure Compliance Reporting and Documentation Considerations

KDB248227: SAR measurement procedures for 802.112abg transmitters

FCC Part 2.1093 Radiofrequency Radiation Exposure Evaluation: Portable Devices

KDB648474 D04 SAR Handsets Multi Xmiter and Ant v01: SAR Evaluation Considerations for Wireless Handsets.

KDB941225 D06 Hot Spot SAR v01: SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

KDB941225 D03 Test Reduction GSM_GPRS_EDGE V01: Recommended SAR Test Reduction Procedures for GSM/GPRS/EDGE

1.2. Summary of Maximum SAR Value

The maximum results of Specific Absorption Rate (SAR) found during testing for EUT are as follows:

Highest tested and scaled SAR Summary

Exposure Position	Frequency Band	Highest Tested 1g-SAR(W/Kg)	Highest Scaled Maximum SAR(W/Kg)
Head	GSM 850	0.212	0.233
	PCS 1900	0.132	0.147
	WCDMA Band II	0.351	0.379
	WCDMA Band V	0.207	0.217
	WLAN2450	0.285	0.373
Body- worn	GSM 850	0.302	0.335
	PCS 1900	0.300	0.309
	WCDMA Band II	0.638	0.689
	WCDMA Band V	0.544	0.571
	WLAN2450	0.436	0.571

Highest Simultaneous transmission SAR Summary

Exposure Position	Transmission Combination	Highest Simultaneous Maximum SAR(W/Kg)
Head	GSM 850+WLAN	0.606
	PCS 1900+WLAN	0.520
	WCDMA Band II+WLAN	0.752
	WCDMA Band V+WLAN	0.590
Body- worn	GSM 850+WLAN	0.906
	PCS 1900+WLAN	0.880
	WCDMA Band II+WLAN	1.260
	WCDMA Band V+WLAN	1.142

Note:

1. This device is compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/Kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1, and had been tested in accordance with measurement methods and procedures specified in IEEE 1528-2003 and the relevant KDB files like KDB 941225 D01 , KDB 941225 D03 ,KDB 865664 D02 etc.
2. This EUT owns two SIM cards, after we perform the pretest for these two SIM cards; we found the SIM 1 is the worst case, so its result is recorded in this report

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen General Testing & Inspection Technology Co., Ltd.

Add: 1F, 2 Block, Jiaquan Building, Guanlan High-tech Park Baoan District, Shenzhen, Guangdong, China.

1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

IC Registration No.: 9783A

The 3m alternate test site of Shenzhen GTI Technology Co., Ltd.EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Aug, 2011.

FCC-Registration No.: 214666

Shenzhen GTI Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 214666, Sep 19, 2011

1.4. Measurement Uncertainty (300MHz-3GHz)

No.	Error Description	Type	Uncertainty Value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10 g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement System										
1	Probe calibration	B	5.50%	N	1	1	1	5.50%	5.50%	∞
2	Axial isotropy	B	4.70%	R	$\sqrt{3}$	0.7	0.7	1.90%	1.90%	∞

3	Hemispherical isotropy	B	9.60%	R	$\sqrt{3}$	0.7	0.7	3.90%	3.90%	∞
4	Boundary Effects	B	1.00%	R	$\sqrt{3}$	1	1	0.60%	0.60%	∞
5	Probe Linearity	B	4.70%	R	$\sqrt{3}$	1	1	2.70%	2.70%	∞
6	Detection limit	B	1.00%	R	$\sqrt{3}$	1	1	0.60%	0.60%	∞
7	RF ambient conditions-noise	B	0.00%	R	$\sqrt{3}$	1	1	0.00%	0.00%	∞
8	RF ambient conditions-reflec tion	B	0.00%	R	$\sqrt{3}$	1	1	0.00%	0.00%	∞
9	Response time	B	0.80%	R	$\sqrt{3}$	1	1	0.50%	0.50%	∞
10	Integration time	B	5.00%	R	$\sqrt{3}$	1	1	2.90%	2.90%	∞
11	RF ambient	B	3.00%	R	$\sqrt{3}$	1	1	1.70%	1.70%	∞
12	Probe positioned mech. restrictions	B	0.40%	R	$\sqrt{3}$	1	1	0.20%	0.20%	∞
13	Probe positioning with respect to phantom shell	B	2.90%	R	$\sqrt{3}$	1	1	1.70%	1.70%	∞
14	Max.SAR evaluation	B	3.90%	R	$\sqrt{3}$	1	1	2.30%	2.30%	∞
Test Sample Related										
15	Test sample positioning	A	1.86%	N	1	1	1	1.86%	1.86%	∞
16	Device holder uncertainty	A	1.70%	N	1	1	1	1.70%	1.70%	∞
17	Drift of output power	B	5.00%	R	$\sqrt{3}$	1	1	2.90%	2.90%	∞
Phantom and Set-up										
18	Phantom uncertainty	B	4.00%	R	$\sqrt{3}$	1	1	2.30%	2.30%	∞
19	Liquid conductivity (target)	B	5.00%	R	$\sqrt{3}$	0.64	0.43	1.80%	1.20%	∞
20	Liquid conductivity (meas.)	A	0.50%	N	1	0.64	0.43	0.32%	0.26%	∞
21	Liquid permittivity (target)	B	5.00%	R	$\sqrt{3}$	0.64	0.43	1.80%	1.20%	∞
22	Liquid permittivity (meas.)	A	0.16%	N	1	0.64	0.43	0.10%	0.07%	∞
Combined standard uncertainty	$u_c=\sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$		/	/	/	/	/	10.20%	10.00 %	∞
Expanded uncertainty (confidence interval of 95 %)	$u_e = 2u_c$		/	R	K=2	/	/	20.40%	20.00 %	∞

2. GENERAL INFORMATION

2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	15°C -35°C
Relative Humidity:	35%-55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	WCDMA Mobile Phone
Model/Type reference:	NU-3S
Test Device	Prototype
Power supply:	DC 3.7V from 2050mAh Li-ion battery
Adapter information:	Model: HNFG050100UU Input: 100-240VAC, 50/60Hz 0.2A MAX Output: 5V⎓1.0A
Hardware version:	UA1209 VER.A
Software version:	3S-US-01
2G	
Operation Band:	GSM850, PCS1900
Supported Type:	GSM/GPRS/EGPRS
Power Class:	GSM900:Power Class 4 DCS1800:Power Class 1
Modulation Type:	GMSK for GSM/GPRS GMSK/8PSK(only downlink) for EGPRS
GSM Release Version	R99
GPRS Multislot Class	12
EGPRS Multislot Class	12
WCDMA	
Operation Band:	FDD Band II & Band V
Power Class:	Power Class 3
Modulation Type:	QPSK for WCDMA/HSUPA/HSDPA
WCDMA Release Version:	R8
HSDPA Release Version:	Category 14
HSUPA Release Version:	Category 6
DC-HSUPA Release Version:	Not Supported
WIFI	

Supported type:	802.11b/802.11g/802.11n(H20)/802.11n(H40)
Modulation:	802.11b: DSSS 802.11g/802.11n(H20)/802.11n(H40): OFDM
Operation frequency:	802.11b/802.11g/802.11n(H20): 2412MHz~2462MHz 802.11n(H40): 2422MHz~2452MHz
Channel number:	802.11b/802.11g/802.11n(H20): 11 802.11n(H40): 7
Channel separation:	5MHz
Antenna type:	PIFA Antenna
Antenna gain:	1.60dBi
Bluetooth 3.0	
Version:	Supported BT3.0
Modulation:	GFSK, π/4DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	PIFA Antenna
Antenna gain:	1.60dBi
Bluetooth 4.0	
Supported type:	Version 4.0 for low Energy
Modulation:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2 MHz
Antenna type:	PIFA Antenna
Antenna gain:	1.60dBi

2.3. Description of Test Modes

The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power the EUT has been tested under typical operating condition and The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

2.4. Measurement Instruments List

Test Equipment	Manufacturer	Type/Model	Serial Number	Calibrated until
Data Acquisition Electronics DAEx	SPEAG	DAE4	1315	Nov 24,2014
E-field Probe	SPEAG	EX3DV4	3842	Jun 05,2015
System Validation Dipole 835V2	SPEAG	D835V2	4d134	Dec 12,2014
System Validation Dipole D900V2	SPEAG	D900V2	1d129	Dec 12,2014
System Validation Dipole D1750V2	SPEAG	D1750V2	1062	Dec 11,2014
System Validation Dipole 1900V2	SPEAG	D1900V2	5d150	Dec 11,2014
System Validation Dipole 2450V2	SPEAG	D2450V2	884	Dec 10,2014
Dielectric Probe Kit	Agilent	85070E	US44020288	/
Power meter	Agilent	E4417A	GB41292254	Nov 25,2014
Power sensor	Agilent	8481H	MY41095360	Nov 25,2014
Network analyzer	Agilent	8753E	US37390562	Nov 24,2014
Universal Radio Communication Tester	ROHDE & SCHWARZ	CMU200	112012	Oct 22,2015

Note: 1. The Cal. Interval was one year.

3. SAR MEASUREMENTS SYSTEM CONFIGURATION

3.1. SAR MEASUREMENT SET-UP

The DASY5 system for performing compliance tests consists of the following items:

A standard high precision 6-axis robot (Stäubli RX family) with controller and software.

An arm extension for accommodating the data acquisition electronics (DAE).

A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

A unit to operate the optical surface detector which is connected to the EOC.

The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.

The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003. DASY5 software and SEMCAD data evaluation software.

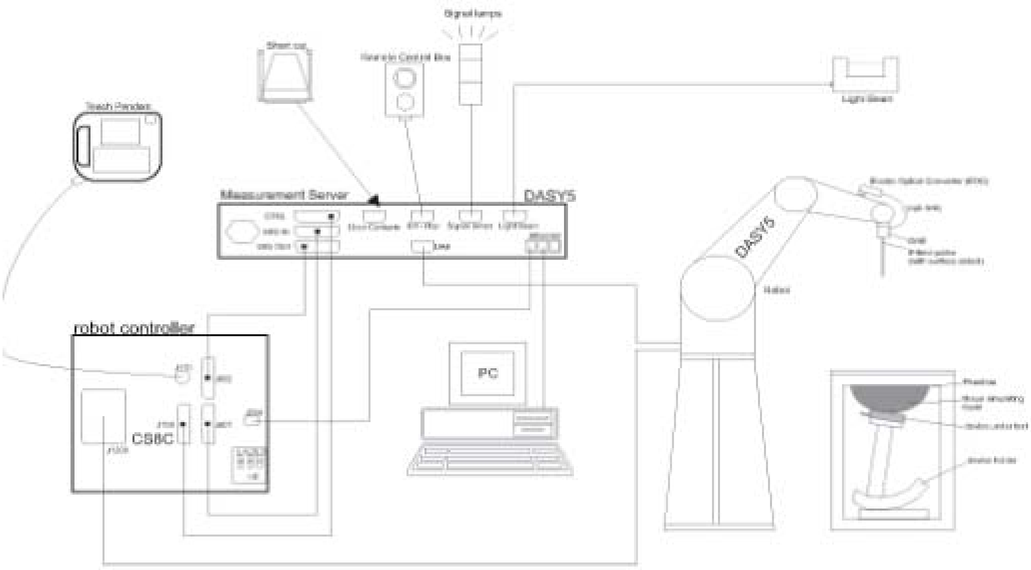
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

The generic twin phantom enabling the testing of left-hand and right-hand usage.

The device holder for handheld Mobile Phones.

Tissue simulating liquid mixed according to the given recipes.

System validation dipoles allowing to validate the proper functioning of the system.



3.2. DASY5 E-FIELD PROBE SYSTEM

The SAR measurements were conducted with the dosimetric probe ES3DV3 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

Probe Specification:

Construction: Symmetrical design with triangular core
Interleaved sensors
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

Calibration: ISO/IEC 17025 calibration service available.

Frequency: 10 MHz to 4 GHz;
Linearity: ± 0.2 dB (30 MHz to 4 GHz)

Directivity: ± 0.2 dB in HSL (rotation around probe axis)
± 0.3 dB in tissue material (rotation normal to probe axis)

Dynamic Range: 5 μW/g to > 100 mW/g;
Linearity: ± 0.2 dB

Dimensions: Overall length: 337 mm (Tip: 20 mm)
Tip diameter: 3.9 mm (Body: 12 mm)
Distance from probe tip to dipole centers: 2.0 mm

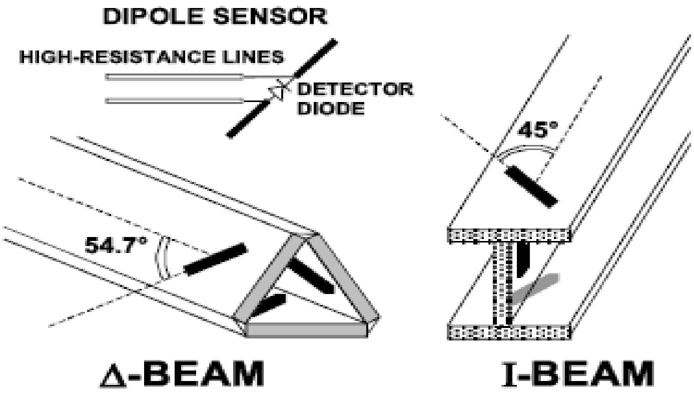
Application: General dosimetry up to 4 GHz
Dosimetry in strong gradient fields
Compliance tests of Mobile Phones

Compatibility: DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

Isotropic E-Field Probe:

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



3.3. PHANTOMS

The phantom used for all tests i.e. for both system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SPEAG. The SAM twin phantom is a fibreglass shell phantom with 2mm shell thickness (except the ear region, where shell thickness increases to 6mm).

System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.

SAM Twin Phantom

3.4. DEVICE HOLDER

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the DASY system.

The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

Device holder supplied by SPEAG

3.5. SCANNING PROCEDURE

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The “reference” and “drift” measurements 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 DUT’s output power and should vary max. ± 5 %.

The “surface check” measurement tests the optical surface detection system of the DASY5 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). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot. Before starting the area scan a grid spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged. After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

Zoom Scan

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centred around the maxima found in the preceding area scan.

Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY5 system allows evaluations that combine measured data and robot positions, such as: • maximum search • extrapolation • boundary correction • peak search for averaged SAR During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Sheppard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Sheppard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

3.6. DATA STORAGE AND EVALUATION

Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

Data Evaluation

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	Normi, ai0, ai1, ai2
	- Conversion factor	ConvFi
	- Diode compression point	Dcpi
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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:

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

With Vi = compensated signal of channel i (i = x, y, z)
Ui = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcpi = diode compression point (DASY parameter)

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

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

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

With Vi = compensated signal of channel i (i = x, y, z)
Normi = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)2] for E-field Probes
ConvF = sensitivity enhancement in solution
aij = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strength of channel i in V/m
Hi = 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.

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

with SAR = local specific absorption rate in mW/g
Etot = 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 normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

4. TISSUE SIMULATING LIQUID

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15cm. For head SAR testing the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15cm For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15cm.The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in 4.2

4.1. The composition of the tissue simulating liquid

Ingredient	835MHz		1900MHz		2450MHz	
(% Weight)	Head	Body	Head	Body	Head	Body
Water	40.45	52.4	54.90	40.5	46.7	73.2
Salt	1.42	1.40	0.18	0.50	0.00	0.04
Sugar	57.6	45.0	0.00	0.00	0.00	0.00
HEC	0.40	1.00	0.00	0.50	0.00	0.00
Preventol	0.10	0.20	0.00	0.50	0.00	0.00
DGBE	0.00	0.00	44.92	0.00	53.3	26.7
TWEEN	0.00	0.00	0.00	0.00	0.00	0.00

4.2. Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using COMOSAR Dielectric Probe Kit and R&S Network Analyzer ZVL6.

Fr. (MHz)	Dielectric Parameters (±5%)				Tissue Temp [°C]	Test time
	head		body			
	εr 39.425-43.575	δ[s/m] 0.855-0.945	εr 52.44-57-96	δ[s/m] 0.9215-1.0185		
835	41.94	0.90	54.73	0.99	21	Nov.,11,2014

Fr. (MHz)	Dielectric Parameters (±5%)				Tissue Temp [°C]	Test time
	head		body			
	εr 38.00-42.00	δ[s/m] 1.33-1.47	εr 50.635-55.965	δ[s/m] 1.444-1.596		
1900	39.84	1.46	55.32	1.50	21	Nov.,11,2014

Fr. (MHz)	Dielectric Parameters (±5%)				Tissue Temp [°C]	Test time
	head		body			
	εr 37.24-41.16	δ[s/m] 1.71-1.89	εr 50.065-55.335	δ[s/m] 1.8525-2.0475		
2450	39.30	1.84	54.33	1.94	21	Nov.,11,2014

4.3. Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

Target Frequency (MHz)	head		body	
	εr	σ (S/m)	εr	σ (S/m)
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	**41.5**	**0.90**	**55.2**	**0.97**
900	41.5	0.97	55.0	1.05
915	41.5	1.01	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	**40.0**	**1.40**	**53.3**	**1.52**
2450	**39.2**	**1.80**	**52.7**	**1.95**
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

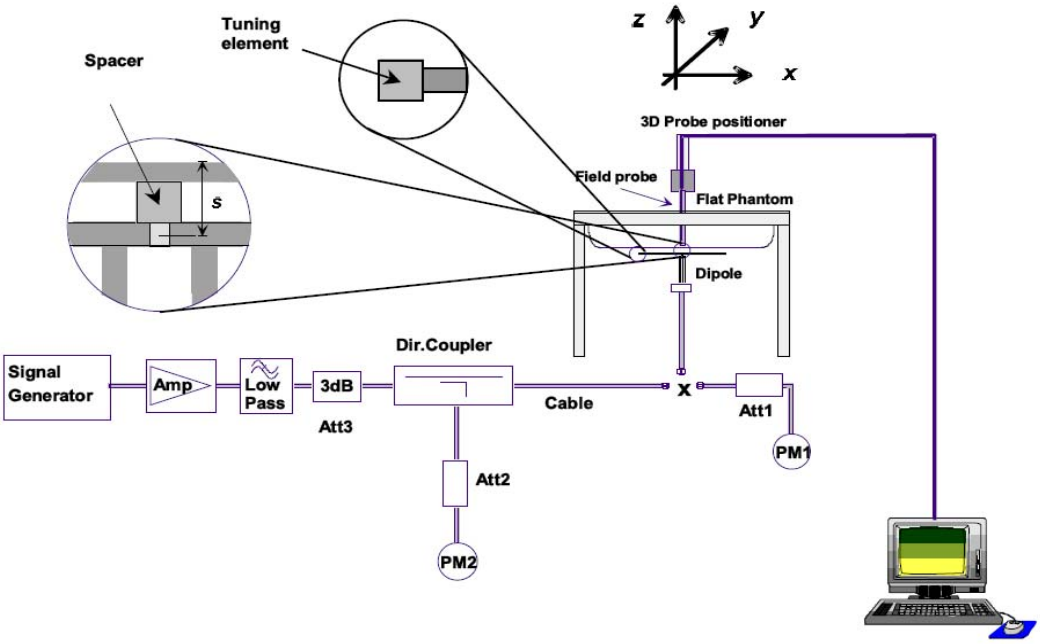
(εr = relative permittivity, σ = conductivity and ρ = 1000 kg/m3)

5. System Check

The purpose of the system check is to verify that the system operates within its specifications at the device test frequency. The system check is simple check of repeatability to make sure that the system works correctly at the time of the compliance test;

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.



The output power on dipole port must be calibrated to 24 dBm (250mW) before dipole is connected.

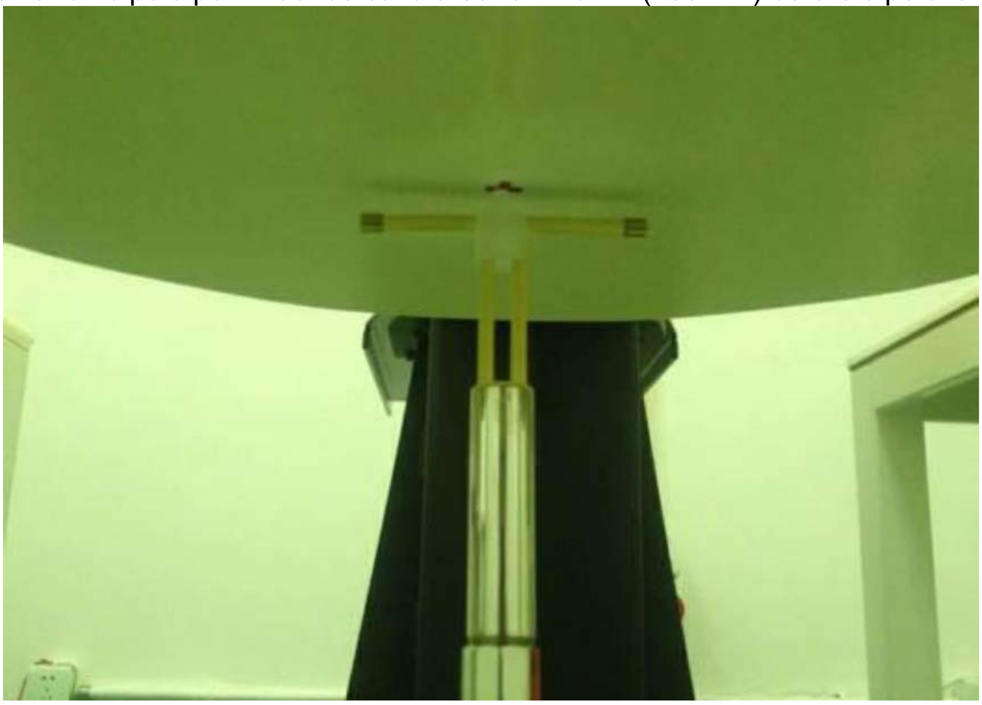


Photo of Dipole Setup

System Validation of Head 1g Average

Measurement is made at temperature 22.0 ℃ and relative humidity 55%.						Measurement Date
Verification results	Frequency (MHz)	Target value (W/kg)	Measured 250mW value (W/kg)	Normalized 1W value (W/kg)	Deviation	
	835	9.66	2.32	9.28	-3.93%	Nov.,11th,2014
	1900	38.30	9.60	38.40	0.26%	Nov.,11th,2014
	2450	51.70	12.47	49.88	-3.52%	Nov.,11th,2014

System Validation of Body 1g Average

Measurement is made at temperature 22.0 ℃ and relative humidity 55%.						Measurement Date
Verification results	Frequency (MHz)	Target value (W/kg)	Measured 250mW value (W/kg)	Normalized 1W value (W/kg)	Deviation	
	835	9.36	2.27	9.08	-2.99%	Nov.,11th,2014
	1900	39.90	9.51	38.04	-4.66%	Nov.,11th,2014
	2450	51.80	12.53	50.12	-3.24%	Nov.,11th,2014

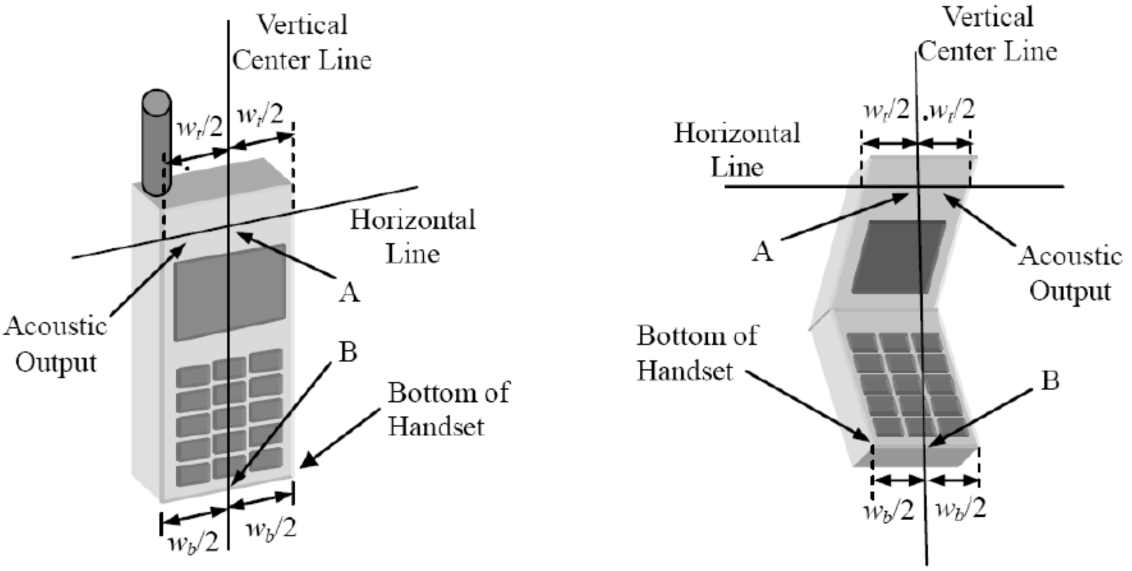
6. EUT TEST POSITION

6.1. Define Two Imaginary Lines on the Handset

(1) The vertical centerline passes through two points on the front side of the handset the midpoint of the width wt of the handset at the level of the acoustic output, and the midpoint of the width wb of the handset.

(2) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.

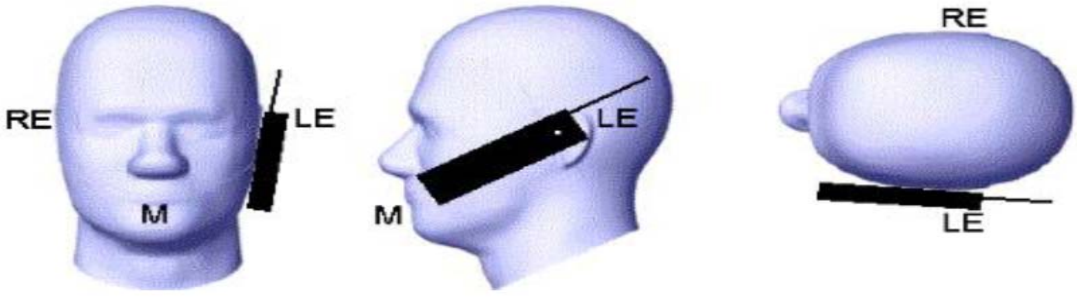
(3) The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.



6.2. Cheek Position

(1) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center picec in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.

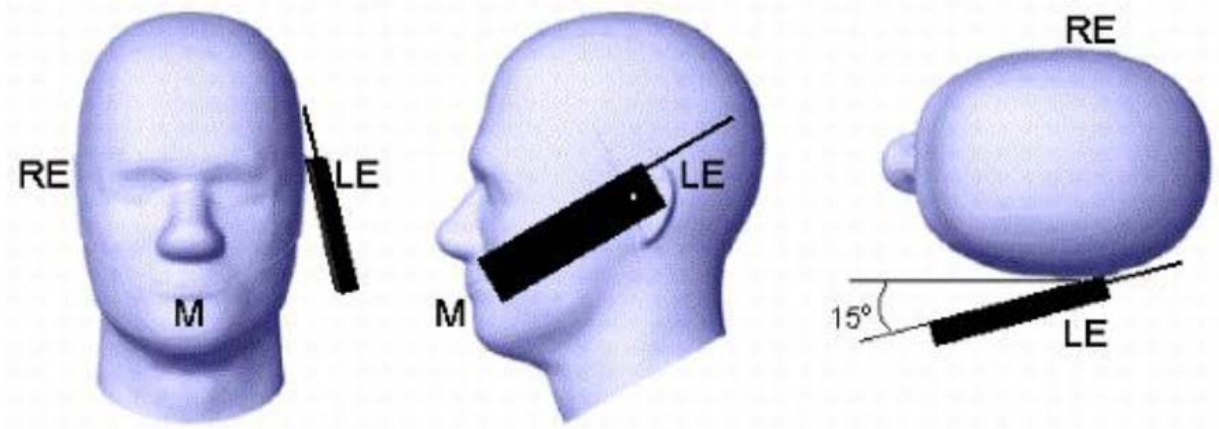
(2) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost



6.3. Title Position

(1) To position the device in the —cheek position described above.

(2) While maintaining the device in the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until with the ear is lost.

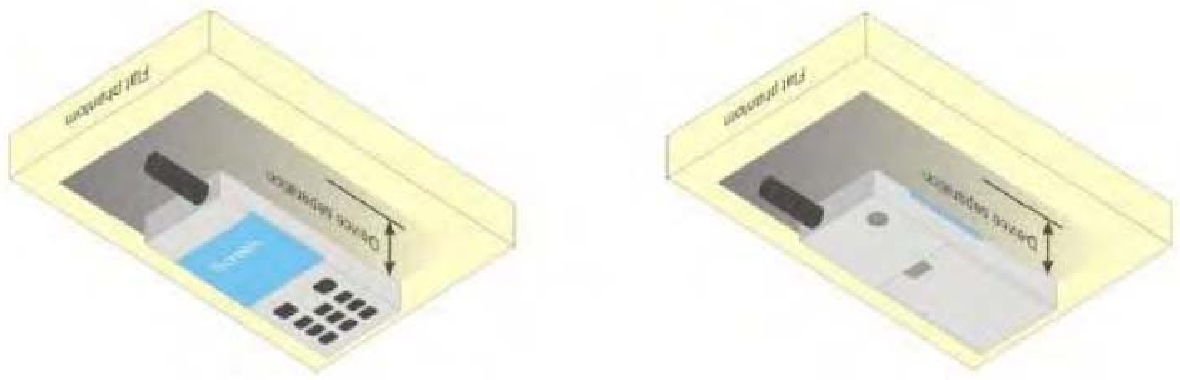


6.4. Body Worn Position

(1) To position the EUT parallel to the phantom surface.

(2) To adjust the EUT parallel to the flat phantom.

(3) To adjust the distance between the EUT surface and the flat phantom to 5mm. (Hotspot mode the distance of 10mm).



6.5. SAR Testing for Tablet

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D01v02r02 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is requires for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

7. Measurement Procedures

The measurement procedures are as follows:

7.1 Conducted power measurement

a) For WWAN power measurement, use base station simulator connection with RF cable, at maximum power in each supported wireless interface and frequency band.

b) Read the WWAN RF power level from the base station simulator.

c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously Transmission, at maximum RF power in each supported wireless interface and frequency band.

d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power.

7.2 SAR measurement

a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.

b) Place the EUT in the positions as clause 12 demonstrates.

c) Set scan area, grid size and other setting on the DASY software.

d) Measure SAR results for the highest power channel on each testing position.

e) Find out the largest SAR result on these testing positions of each band

f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

a) Power reference measurement

b) Area scan

c) Zoom scan

d) Power drift measurement

7.3 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value. The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan. 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:

(a) Extraction of the measured data (grid and values) from the Zoom Scan

(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)

(c) Generation of a high-resolution mesh within the measured volume

(d) Interpolation of all measured values form the measurement grid to the high-resolution grid

(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface

(f) Calculation of the averaged SAR within masses of 1g and 10g.

7.4 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

7.5 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

7.6 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ $1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

7.7 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

7.8 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

7.9 Area Scan Based 1-g SAR

7.9.1 Requirement of KDB

According to the KDB447498 D01 v05, when the implementation is based the specific polynomial fit algorithm as presented at the 29th Bioelectromagnetics Society meeting (2007) and the estimated 1-g SAR is ≤ 1.2 W/kg, a zoom scan measurement is not required provided it is also not needed for any other purpose; for example, if the peak SAR location required for simultaneous transmission SAR test exclusion can be determined accurately by the SAR system or manually to discriminate between distinctive peaks and scattered noisy SAR distributions from area scans.

There must not be any warning or alert messages due to various measurement concerns identified by the SAR system; for example, noise in measurements, peaks too close to scan boundary, peaks are too sharp, spatial resolution and uncertainty issues etc. The SAR system verification must also demonstrate that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR (See Annex B). When all the SAR results for each exposure condition in a frequency band and wireless mode are based on estimated 1-g SAR, the 1-g SAR for the highest SAR configuration must be determined by a zoom scan.

7.9.2 Fast SAR Algorithms

The approach is based on the area scan measurement applying a frequency dependent attenuation parameter. This attenuation parameter was empirically determined by analyzing a large number of phones. The MOTOROLA FAST SAR was developed and validated by the MOTOROLA Research Group in Ft. Lauderdale.

In the initial study, an approximation algorithm based on Linear fit was developed. The accuracy of the algorithm has been demonstrated across a broad frequency range (136-2450 MHz) and for both 1- and 10-g averaged SAR using a sample of 264 SAR measurements from 55 wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithm are 1.2% and 5.8% for 1- and 10-g averaged SAR, respectively

In the second step, the same research group optimized the fitting algorithm to a Polynomial fit whereby the frequency validity was extended to cover the range 30-6000MHz. Details of this study can be found in the BEMS 2007 Proceedings.

Both algorithms are implemented in DASY software.

8. TEST CONDITIONS AND RESULTS

8.1. Conducted Power Results

Max Conducted power measurement results and power drift from tune-up tolerance provide by manufacturer:

The conducted power measurement results for GSM850/1900

Test Mode	Conducted Power (dBm)		
GSM850	Channel 251 (848.8MHz)	Channel 190 (836.6MHz)	Channel 128 (824.2MHz)
	32.39	32.57	32.41
GSM1900	Channel 810 (1909.8MHz)	Channel 661 (1880MHz)	Channel 512 (1850.2MHz)
	30.47	30.55	30.23

The conducted power measurement results for GPRS/EGPRS

Test Mode	Measured Power (dBm)			Calculation (dB)	Frame-Averaged Power (dBm)		
GSM850 GPRS (GMSK)	Test Channel				Test Channel		
	251	190	128		251	190	128
1 Txslot	32.25	32.54	32.29	-9.03	23.22	23.51	23.26
2 Txslot	30.45	30.56	30.48	-6.02	24.43	24.54	24.46
3 Txslot	28.23	28.33	28.02	-4.26	23.97	24.07	23.76
4 Txslot	25.54	25.24	25.45	-3.01	22.53	22.23	22.44
Test Mode	Measured Power (dBm)			Calculation (dB)	Frame-Averaged Power (dBm)		
GSM850 EGPRS (GMSK)	Test Channel				Test Channel		
	251	190	128		251	190	128
1 Txslot	32.47	32.57	32.36	-9.03	22.74	22.81	22.62
2 Txslot	30.36	30.44	30.33	-6.02	24.34	24.42	24.31
3 Txslot	28.23	28.47	28.43	-4.26	23.97	24.21	24.17
4 Txslot	26.32	26.23	26.47	-3.01	23.31	23.22	23.46
Test Mode	Measured Power (dBm)			Calculation (dB)	Frame-Averaged Power (dBm)		
GSM1900 GPRS (GMSK)	Test Channel				Test Channel		
	810	661	512		810	661	512
1 Txslot	30.31	30.65	30.24	-9.03	20.63	20.51	20.66
2 Txslot	28.53	28.87	28.69	-6.02	22.51	22.85	22.67
3 Txslot	26.56	26.11	26.32	-4.26	22.30	21.85	22.06
4 Txslot	25.46	25.25	25.14	-3.01	22.45	22.24	22.13
Test Mode	Measured Power (dBm)			Calculation (dB)	Frame-Averaged Power (dBm)		
GSM1900 EGPRS (GMSK)	Test Channel				Test Channel		
	810	661	512		810	661	512
1 Txslot	30.25	30.78	30.14	-9.03	21.22	21.75	21.11
2 Txslot	28.49	28.64	28.37	-6.02	22.47	22.62	22.35
3 Txslot	26.36	26.54	26.22	-4.26	22.10	22.28	21.96
4 Txslot	25.23	25.11	25.33	-3.01	22.22	22.10	22.32

NOTES:

1) Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB

2) According to the conducted power as above, the body measurements are performed with 2Txslots for GPRS850 and GPRS1900.

3) Note: According to the KDB941225 D03, “when SAR tests for EDGE or EGPRS mode is necessary, GMSK modulation should be used”.

The conducted power measurement results for WCDMA

Item	band	FDD Band II result (dBm)			FDD Band V result (dBm)		
		Test Channel			Test Channel		
	ARFCN	9262	9400	9538	4132	4183	4233
5.2(WCDMA)	\	23.54	23.66	23.24	23.23	23.78	23.47
5.2AA (HSDPA)	1	22.33	22.43	22.38	22.44	22.55	22.36
	2	22.29	22.36	22.14	22.17	22.45	22.42
	3	21.49	21.78	21.30	21.22	21.66	21.21
	4	21.42	21.33	21.22	21.33	21.33	21.25
5.2B (HSUPA)	1	22.22	22.56	22.32	22.36	22.87	22.50
	2	22.14	22.63	22.65	22.25	22.54	22.43
	3	21.15	21.45	21.20	21.45	21.36	21.30
	4	21.26	21.47	21.15	21.22	21.47	21.35
	5	22.36	22.23	22.56	22.31	22.55	22.32

Note:

1) Per KDB 941225 D02v02r02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/HSUPA output power is < 0.25dB higher than RMC, or reported SAR with RMC 12.2kbps setting is≤1.2W/kg, HSDPA/HSUPA SAR evaluation can be excluded.

WLAN

Mode	Channel	Frequency (MHz)	Worst case Data rate of worst case	Conducted Output Power (dBm)	
				Peak	Average
802.11b	1	2412	1Mbps	16.97	14.32
	6	2437	1Mbps	17.56	14.83
	11	2462	1Mbps	17.15	14.80
802.11g	1	2412	6Mbps	18.86	13.25
	6	2437	6Mbps	18.95	13.33
	11	2462	6Mbps	18.47	13.29
802.11n(20MHz)	1	2412	6.5 Mbps	18.43	12.63
	6	2437	6.5 Mbps	18.55	12.47
	11	2462	6.5 Mbps	18.36	12.66
802.11n(40MHz)	3	2422	13.5 Mbps	17.26	11.87
	6	2437	13.5 Mbps	17.65	11.94
	9	2452	13.5 Mbps	17.35	11.91

Note:

1) Per KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR exclusion.
2) For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate.
3) Following KDB 248227 D01 v01r02, 802.11g, 802.11n-HT20 and 802.11n-HT40 output power is less than

1/4dB higher than 11b mode, thus the SAR can be excluded.

Bluetooth

Mode	Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)
LBE	00	2402	-2.47
	19	2440	-2.10
	39	2480	-2.26
GFSK	00	2402	1.91
	39	2441	1.89
	78	2480	2.23
π/4DQPSK	00	2402	1.25
	39	2441	1.31
	78	2480	1.68
8DPSK	00	2402	1.35
	39	2441	1.31
	78	2480	1.16

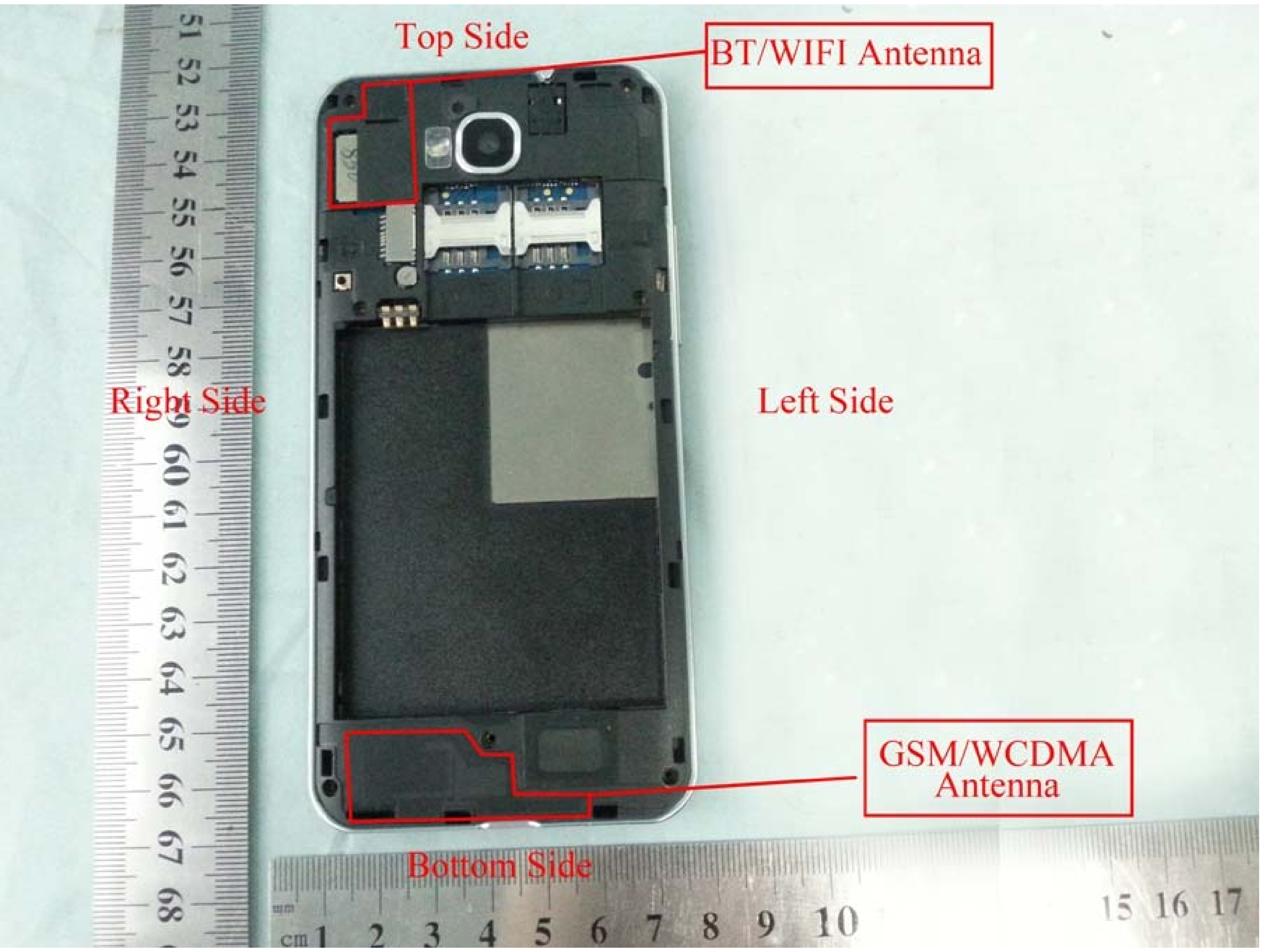
Note:
Per KDB 447498 D01v05r02, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances≤50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] . [√f(GHz)] ≤ 3 for 1-g SAR and] ≤ 7.5 for 10-g extremity SAR

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Bluetooth Max Power Allowed (dBm)	Bluetooth Max Power Allowed (mW)	Calculated Value	Separation Distance (mm)	Frequency (GHz)	Exclusion thresholds
2.5	**2**	**0.6**	**0**	**2.48**	**3**

Note:
Per KDB 447498 D01v05r02, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold is 0.6 which is≤ 3, SAR testing is not required.

8.2. Antenna Location



SAR Measurement Positions

According to the KDB941225 D06 Hot Spot SAR v01, the edges with less than 2.5 cm distance to the antennas need to be tested for SAR.

SAR measurement positions						
Mode	Front	Rear	Left edge	Right edge	Top edge	Bottom edge
Main antenna(GSM/WCDMA)	Yes	Yes	Yes	Yes	No	Yes
WLAN	Yes	Yes	No	Yes	Yes	No

8.3. TEST RESULTS

8.3.1 SAR Test Results Summary

Test position and configuration

Head SAR was performed with the device configured in the positions according to IEEE1528, and Body SAR was performed with the device 0mm from the phantom; Body SAR was also performed with the headset attached and without.

Operation Mode ·

- According to KDB 447498 D01 v05r02 ,for each exposure position, if the highest 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional.
- Per KDB 865664 D01 v01r01,for each frequency band, if the measured SAR is ≥0.8W/Kg, testing for repeated SAR measurement is required , that the highest measured SAR is only to be tested. When the SAR results are near the limit, the following procedures are required for each device to verify these types of SAR measurement related variation concerns by repeating the highest measured SAR configuration in each frequency band.

1) When the original highest measured SAR is ≥0.8W/Kg, repeat that measurement once.
2) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is ＞1.20 or when the original or repeated measurement is ≥1.45 W/Kg.
3) Perform a third repeated measurement only if the original, first and second repeated measurement is ≥1.5 W/Kg and ratio of largest to smallest SAR for the original, first and second measurement is ≥1.20. ·

- Body-worn exposure conditions are intended to voice call operations, therefore GSM voice call mode is selected to be test.
- According to KDB 648474 D04 v01r01,when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤1.2W/Kg, SAR testing with a headset connected is not required. ·
- According to 941225 D06, when the overall device length and width are＞9cm×5cm, Hotspot mode with a test separation distance of 10mm. For device with form factors smaller than 9cm×5cm, Hotspot mode with a test separation distance of 5mm. Body SAR was also performed with the headset attached and without.
- According to 248227 D01, SAR is not required for 802.11g channels when the maximum average output power is less than 1/4dB higher than measured on the corresponding 802.11b channels. ·
- Maximum Scaling SAR in order to calculate the Maximum SAR values to test under the standard Peak Power, Calculation method is as follows:
  Maximum Scaling SAR =tested SAR (Max.) × [maximum turn-up power (mw)/ maximum measurement output power(mw)]

8.3.2 Standalone SAR

SAR Values (GSM850-Head)

Test Frequency		Side	Test Position	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Measurement SAR over 1g(W/kg)	Power drift	Scaling Factor	Reported SAR over 1g(W/kg)	SAR limit 1g (W/kg)	Ref. Plot #
Ch	MHz										
190	836.60	Left	Touch	33.00	32.57	0.158	-0.10	1.10	0.174	1.60	--
190	836.60	Left	Tilt	33.00	32.57	0.082	-0.08	1.10	0.090	1.60	--
190	836.60	Right	Touch	33.00	32.57	0.212	-0.09	1.10	0.233	1.60	1
190	836.60	Right	Tilt	33.00	32.57	0.105	-0.11	1.10	0.116	1.60	--

SAR Values (GSM850-Body)

Test Frequency		Mode (number of timeslots)	Test Position	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Measurement SAR over 1g(W/kg)	Power drift	Scaling Factor	Reported SAR over 1g(W/kg)	SAR limit 1g (W/kg)	Ref. Plot #
Ch	MHz										
190	836.60	GPRS (2)	Front	31.00	30.56	0.146	-0.11	1.11	0.162	1.60	--
190	836.60	GPRS (2)	Rear	31.00	30.56	0.302	0.16	1.11	0.335	1.60	2
190	836.60	GPRS (2)	Left	31.00	30.56	0.247	-0.07	1.11	0.274	1.60	--
190	836.60	GPRS (2)	Right	31.00	30.56	0.205	0.09	1.11	0.228	1.60	--
190	836.60	GPRS (2)	Bottom	31.00	30.56	0.214	-0.05	1.11	0.238	1.60	--
190	836.60	EGPRS(2)	Rear	31.00	30.44	0.262	0.04	1.14	0.299	1.60	--

Note:
1) The distance between the EUT and the phantom bottom is 0mm.
2) According to KDB447498, when the 1-g SAR for the mid-band channel or the channel with highest output power satisfies the following conditions, testing of the other channels in the band is not required.
≤0.8W/Kg and transmission band ≤100MHz;
≤0.6W/Kg and 100MHz ≤transmission band ≤200MHz;
≤ 0.4W/Kg and transmission band >200MHz

SAR Values (GSM1900-Head)

Test Frequency		Side	Test Position	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Measurement SAR over 1g(W/kg)	Power drift	Scaling Factor	Reported SAR over 1g(W/kg)	SAR limit 1g (W/kg)	Ref. Plot #
Ch	MHz										
661	1880.0	Left	Touch	31.00	30.55	0.118	-0.11	1.11	0.131	1.60	--
661	1880.0	Left	Tilt	31.00	30.55	0.065	-0.06	1.11	0.072	1.60	--
661	1880.0	Right	Touch	31.00	30.55	0.132	0.11	1.11	0.147	1.60	3
661	1880.0	Right	Tilt	31.00	30.55	0.086	-0.09	1.11	0.095	1.60	--

SAR Values (GSM1900-Body)

Test Frequency		Mode (number of timeslots)	Test Position	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Measurement SAR over 1g(W/kg)	Power drift	Scaling Factor	Reported SAR over 1g(W/kg)	SAR limit 1g (W/kg)	Ref. Plot #
Ch	MHz										
661	1880.0	GPRS (2)	Front	29.00	28.87	0.187	-0.09	1.03	0.193	1.60	--
661	1880.0	GPRS (2)	Rear	29.00	28.87	0.300	0.13	1.03	0.309	1.60	4
661	1880.0	GPRS (2)	Left	29.00	28.87	0.193	0.05	1.03	0.199	1.60	--
661	1880.0	GPRS (2)	Right	29.00	28.87	0.206	-0.04	1.03	0.212	1.60	--
661	1880.0	GPRS (2)	Bottom	29.00	28.87	0.293	-0.03	1.03	0.302	1.60	--
661	1880.0	EGPRS (2)	Rear	29.00	28.64	0.280	0.07	1.09	0.305	1.60	

Note:
1) The distance between the EUT and the phantom bottom is 0mm.
2) According to KDB447498, when the 1-g SAR for the mid-band channel or the channel with highest output power satisfies the following conditions, testing of the other channels in the band is not required.
≤0.8W/Kg and transmission band ≤100MHz;
≤0.6W/Kg and 100MHz ≤transmission band ≤200MHz;
≤ 0.4W/Kg and transmission band >200MHz

SAR Values (WCDMA Band II-Head)

Test Frequency		Side	Test Position	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Measurement SAR over 1g(W/kg)	Power drift	Scaling Factor	Reported SAR over 1g(W/kg)	SAR limit 1g (W/kg)	Ref. Plot #
Ch	MHz										
9400	1880	Left	Touch	24.00	23.66	0.338	-0.05	1.08	0.365	1.60	--
9400	1880	Left	Tilt	24.00	23.66	0.236	-0.06	1.08	0.255	1.60	--
9400	1880	Right	Touch	24.00	23.66	0.351	-0.05	1.08	0.379	1.60	5
9400	1880	Right	Tilt	24.00	23.66	0.263	0.11	1.08	0.284	1.60	--

SAR Values (WCDMA Band II-Body)

Test Frequency		Mode (number of timeslots)	Test Position	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Measurement SAR over 1g(W/kg)	Power drift	Scaling Factor	Reported SAR over 1g(W/kg)	SAR limit 1g (W/kg)	Ref. Plot #
Ch	MHz										
9400	1880	RMC	Front	24.00	23.66	0.325	-0.11	1.08	0.351	1.60	--
9400	1880	RMC	Rear	24.00	23.66	0.638	-0.06	1.08	0.689	1.60	6
9400	1880	RMC	Left	24.00	23.66	0.424	-0.08	1.08	0.458	1.60	--
9400	1880	RMC	Right	24.00	23.66	0.236	-0.08	1.08	0.255	1.60	--
9400	1880	RMC	Bottom	24.00	23.66	0.565	-0.09	1.08	0.61	1.60	--

Note:

1) *The distance between the EUT and the phantom bottom is 0mm.*
2) *According to KDB447498, when the 1-g SAR for the mid-band channel or the channel with highest output power satisfies the following conditions, testing of the other channels in the band is not required.*
   ≤0.8W/Kg and transmission band ≤100MHz;
   ≤0.6W/Kg and 100MHz ≤transmission band ≤200MHz;
   ≤ 0.4W/Kg and transmission band >200MHz

SAR Values (WCDMA Band V-Head)

Test Frequency		Side	Test Position	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Measurement SAR over 1g(W/kg)	Power drift	Scaling Factor	Reported SAR over 1g(W/kg)	SAR limit 1g (W/kg)	Ref. Plot #
Ch	MHz										
4183	836.60	Left	Touch	24.00	23.78	0.178	-0.05	1.05	0.187	1.60	--
4183	836.60	Left	Tilt	24.00	23.78	0.116	-0.06	1.05	0.122	1.60	--
4183	836.60	Right	Touch	24.00	23.78	0.207	0.09	1.05	0.217	1.60	7
4183	836.60	Right	Tilt	24.00	23.78	0.143	0.11	1.05	0.150	1.60	--

SAR Values (WCDMA Band V-Body)

Test Frequency		Mode (number of timeslots)	Test Position	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Measurement SAR over 1g(W/kg)	Power drift	Scaling Factor	Reported SAR over 1g(W/kg)	SAR limit 1g (W/kg)	Ref. Plot #
Ch	MHz										
4183	836.60	RMC	Front	24.00	23.78	0.248	-0.11	1.05	0.26	1.60	--
4183	836.60	RMC	Rear	24.00	23.78	0.544	-0.03	1.05	0.571	1.60	8
4183	836.60	RMC	Left	24.00	23.78	0.145	-0.08	1.05	0.152	1.60	--
4183	836.60	RMC	Right	24.00	23.78	0.215	-0.08	1.05	0.226	1.60	--
4183	836.60	RMC	Bottom	24.00	23.78	0.166	-0.09	1.05	0.179	1.60	--

Note:

3) *The distance between the EUT and the phantom bottom is 0mm.*
4) *According to KDB447498, when the 1-g SAR for the mid-band channel or the channel with highest output power satisfies the following conditions, testing of the other channels in the band is not required.*
   ≤0.8W/Kg and transmission band ≤100MHz;
   ≤0.6W/Kg and 100MHz ≤transmission band ≤200MHz;
   ≤ 0.4W/Kg and transmission band >200MHz

SAR Values (WLAN2450-Head)

Test Frequency		Side	Test Position	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Measurement SAR over 1g(W/kg)	Power drift	Scaling Factor	Reported SAR over1g (W/kg)	SAR limit 1g (W/kg)	Ref. Plot #
Ch	MHz										
6	2437	Left	Touch	16.00	14.83	0.274	-0.08	1.31	0.359	1.60	--
6	2437	Left	Tilt	16.00	14.83	0.122	-0.11	1.31	0.160	1.60	--
6	2437	Right	Touch	16.00	14.83	0.285	-0.08	1.31	0.373	1.60	9
6	2437	Right	Tilt	16.00	14.83	0.135	-0.15	1.31	0.177	1.60	--

SAR Values (WLAN2450-Body)

Test Frequency		Test Position	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Measurement SAR over 1g(W/kg)	Power drift	Scaling Factor	Reported SAR over1g (W/kg)	SAR limit 1g (W/kg)	Ref. Plot #
Ch	MHz									
6	2437	Front	16.00	14.83	0.293	-0.06	1.31	0.384	1.60	--
6	2437	Rear	16.00	14.83	0.436	-0.06	1.31	0.571	1.60	10
6	2437	Right	16.00	14.83	0.378	-0.09	1.31	0.495	1.60	--
6	2437	Top	16.00	14.83	0.269	0.07	1.31	0.352	1.60	--

Note:

1) The distance between the EUT and the phantom bottom is 0mm.

2) According to KDB447498, when the 1-g SAR for the mid-band channel or the channel with highest output power satisfies the following conditions, testing of the other channels in the band is not required.

≤0.8W/Kg and transmission band ≤100MHz;

≤0.6W/Kg and 100MHz ≤transmission band ≤200MHz;

≤ 0.4W/Kg and transmission band >200MHz

8.3.2 Simultaneous SAR Evaluation

Application Simultaneous Transmission information:

NO.	Simultaneous Transmission Configurations	Phone		Note
		Head	Body	
1	GSM(Voice) + WLAN2.4GHz(data)	Yes	-	-
2	WCDMA(Voice) + WLAN2.4GHz(data)	Yes	-	-
3	GSM(Voice) + Bluetooth(data)	Yes	-	-
4	WCDMA((Voice) + Bluetooth(data)	Yes	-	-
5	GPRS/EDGE(Data) + WLAN2.4GHz(data)	-	Yes	2.4GHz Hotspot
6	WCDMA(Data) + WLAN2.4GHz(data)	-	Yes	2.4GHz Hotspot
7	GPRS/EDGE(Data) + Bluetooth(data)	-	Yes	Bluetooth Tethering
8	WCDMA(Data) + Bluetooth(data)	-	Yes	Bluetooth Tethering

NOTE:

1) WLAN2.4GHz and Bluetooth share the same antenna, and cannot transmit simultaneously.
2) The Reported SAR summation is calculated based on the same configuration and test position.
3) Per KDB 447498 D01v05r02, simultaneous transmission SAR is compliant if,
   a) Scalar SAR summation < 1.6W/kg.
   b) SPLSR = $(SAR1 + SAR2)^{1.5}$ / (min. separation distance, mm), and the peak separation distance is determined from the square root of \[$(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2$], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan
   c) If SPLSR≦ 0.04, simultaneously transmission SAR measurement is not necessary
   d) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg
4) For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r02 based on the formula below.
   a) (max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] .[√f(GHz)/ x] W/kg for test separation distances≦50 mm; where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
   b) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   c) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.
   d) Bluetooth estimated SAR is conservatively determined by 5mm separation, for all applicable exposure positions.

Bluetooth Max Power Allowed (dBm)	Bluetooth Max Power Allowed(mW)	Exposure Position	Estimated SAR (W/kg)
2.5	2	All Positions	0.084

GSM/WCDMA & WLAN Mode

Position	Max.WWAN SAR (W/Kg)	Max. WLAN SAR W/Kg)	SAR Summation	Limit (W/kg)	SPLSR≦0.04 (Yes/No)
GSM850+WLAN 2.4G-DTS					
Left Cheek	0.174	0.359	0.533	1.60	N/A
Left Tilt	0.09	0.160	0.250		N/A
Right Cheek	0.233	0.373	0.606		N/A
Right Tilt	0.116	0.177	0.293		N/A
Body front	0.162	0.384	0.546		N/A
Body Rear	0.335	0.571	0.906		N/A
Body Left	0.274				N/A
Body Right	0.228	0.495	0.723		N/A
Body top		0.352			N/A
Body Bottom	0.238				N/A
PCS1900+WLAN 2.4G-DTS					
Left Cheek	0.131	0.359	0.490	1.60	N/A
Left Tilt	0.072	0.160	0.232		N/A
Right Cheek	0.147	0.373	0.520		N/A
Right Tilt	0.095	0.177	0.272		N/A
Body front	0.193	0.384	0.577		N/A
Body Rear	0.309	0.571	0.880		N/A
Body Left	0.199				N/A
Body Right	0.212	0.495	0.707		N/A
Body top		0.352			N/A
Body Bottom	0.302				N/A
WCDMA Band II+WLAN 2.4G-DTS					
Left Cheek	0.365	0.359	0.724	1.60	N/A
Left Tilt	0.255	0.160	0.415		N/A
Right Cheek	0.379	0.373	0.752		N/A
Right Tilt	0.284	0.177	0.461		N/A
Body front	0.351	0.384	0.735		N/A
Body Rear	0.689	0.571	1.260		N/A
Body Left	0.458				N/A
Body Right	0.255	0.495	0.750		N/A
Body top		0.352			N/A
Body Bottom	0.610				N/A
WCDMA Band V+WLAN 2.4G-DTS					
Left Cheek	0.187	0.359	0.546	1.60	N/A
Left Tilt	0.122	0.160	0.282		N/A
Right Cheek	0.217	0.373	0.590		N/A
Right Tilt	0.150	0.177	0.327		N/A
Body front	0.260	0.384	0.644		N/A
Body Rear	0.571	0.571	1.142		N/A
Body Left	0.152				N/A
Body Right	0.226	0.495	0.721		N/A
Body top		0.352			N/A
Body Bottom	0.179				N/A

Note:

1) According to KDB 447498 D01 General RF Exposure Guidance v05, when the simultaneous transmission SAR is less than1.6 W/Kg, SPLSR assessment is not required.
2) SPLSR mean is “The SAR to Peak Location Separation Ratio”.

GSM/WCDMA & BT Mode

Position	Max.WWAN SAR (W/Kg)	Max. BT SAR W/Kg)	SAR Summation	Limit (W/kg)	SPLSR≦0.04 (Yes/No)
GSM850+BT 2.4G-DSS					
Left Cheek	0.174	0.084	0.258	1.60	N/A
Left Tilt	0.09	0.084	0.174		N/A
Right Cheek	0.233	0.084	0.317		N/A
Right Tilt	0.116	0.084	0.200		N/A
Body front	0.162	0.084	0.246		N/A
Body Rear	0.335	0.084	0.419		N/A
Body Left	0.274	0.084	0.358		N/A
Body Right	0.228	0.084	0.312		N/A
Body top		0.084			N/A
Body Bottom	0.238	0.084	0.322		N/A
PCS1900+BT 2.4G-DSS					
Left Cheek	0.131	0.084	0.215	1.60	N/A
Left Tilt	0.072	0.084	0.156		N/A
Right Cheek	0.147	0.084	0.231		N/A
Right Tilt	0.095	0.084	0.179		N/A
Body front	0.193	0.084	0.277		N/A
Body Rear	0.309	0.084	0.393		N/A
Body Left	0.199	0.084	0.283		N/A
Body Right	0.212	0.084	0.296		N/A
Body top		0.084			N/A
Body Bottom	0.302	0.084	0.386		N/A
WCDMA Band II+BT 2.4G-DSS					
Left Cheek	0.365	0.084	0.449	1.60	N/A
Left Tilt	0.255	0.084	0.339		N/A
Right Cheek	0.379	0.084	0.463		N/A
Right Tilt	0.284	0.084	0.368		N/A
Body front	0.351	0.084	0.435		N/A
Body Rear	0.689	0.084	0.773		N/A
Body Left	0.458	0.084	0.542		N/A
Body Right	0.255	0.084	0.339		N/A
Body top		0.084			N/A
Body Bottom	0.610	0.084	0.694		N/A
WCDMA Band V+BT 2.4G-DSS					
Left Cheek	0.187	0.084	0.271	1.60	N/A
Left Tilt	0.122	0.084	0.206		N/A
Right Cheek	0.217	0.084	0.301		N/A
Right Tilt	0.150	0.084	0.234		N/A
Body front	0.260	0.084	0.344		N/A
Body Rear	0.571	0.084	0.655		N/A
Body Left	0.152	0.084	0.236		N/A
Body Right	0.226	0.084	0.310		N/A
Body top		0.084			N/A
Body Bottom	0.179	0.084	0.263		N/A

Note:

1) According to KDB 447498 D01 General RF Exposure Guidance v05, when the simultaneous transmission SAR is less than1.6 W/Kg, SPLSR assessment is not required.

2) SPLSR mean is “The SAR to Peak Location Separation Ratio”.

9. System Check Results

System Performance Check at 835 MHz Head

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d134

Date/Time: 11/11/2014

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 835 MHz; σ = 0.90 S/m; εr = 41.94; ρ = 1000 kg/m3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (8.83, 8.83, and 8.83); Calibrated: 06/06/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x91x1): Measurement grid: dx=15.00 mm, dy=15.00 mm

Maximum value of SAR (interpolated) = 2.58 mW/g

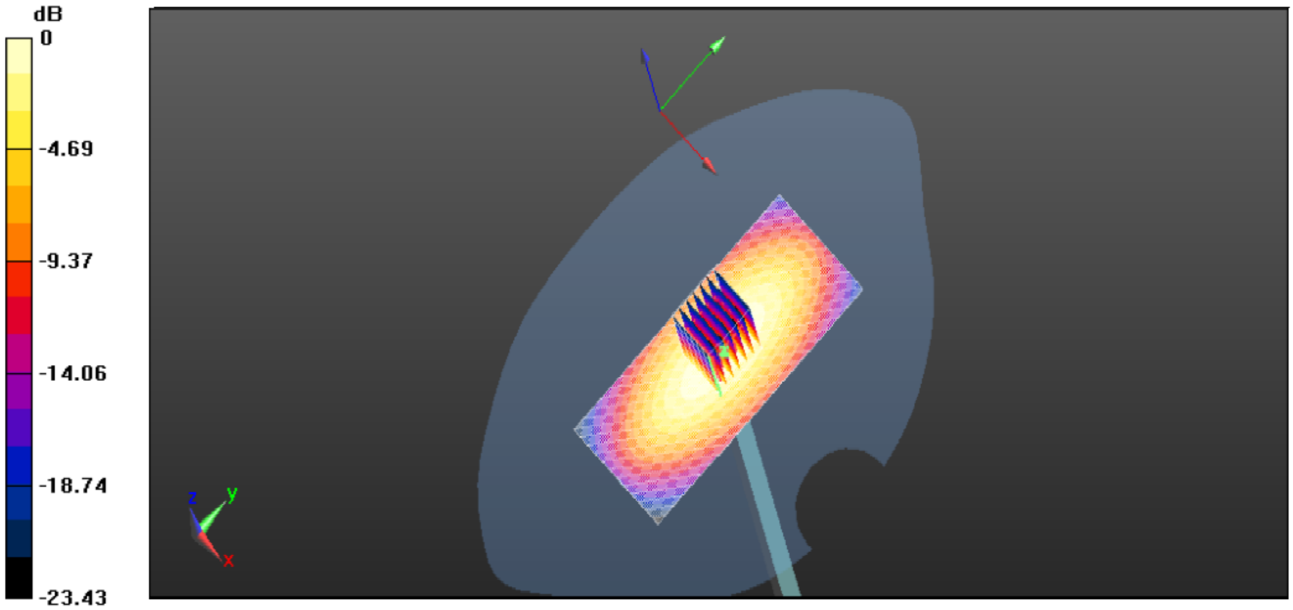
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 52.994 V/m; Power Drift = 0.082 dB

Peak SAR (extrapolated) = 3.542 W/kg

SAR(1 g) = 2.32 mW/g; SAR(10 g) = 1.49 mW/g

Maximum value of SAR (measured) = 2.59 mW/g



0 dB = 2.58mW/g=8.23dB mW/g

System Performance Check 835MHz Head 250mW

System Performance Check at 835 MHz Body

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d134

Date/Time: 11/11/2014

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 835 MHz; σ = 0.99 S/m; ε_r = 54.73; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (9.09, 9.09, and 9.09); Calibrated: 06/06/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x91x1): Measurement grid: dx=15.00 mm, dy=15.00 mm

Maximum value of SAR (interpolated) = 2.15 mW/g

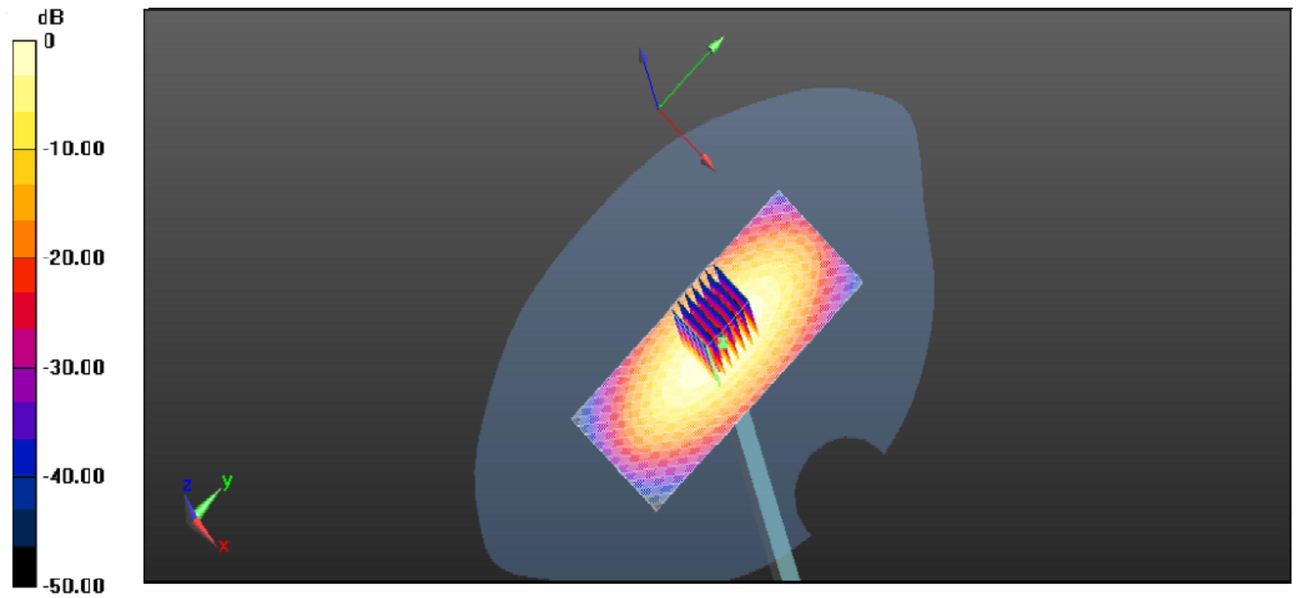
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 46.528 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.262 W/kg

SAR(1 g) = 2.27 mW/g; SAR(10 g) = 1.50 mW/g

Maximum value of SAR (measured) = 3.24 mW/g



0 dB = 3.24 mW/g = 11.24 dB mW/g

System Performance Check 835MHz Body 250mW

System Performance Check at 1900 MHz Head

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d150

Date/Time: 11/11/2014

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1900 MHz; σ = 1.46 S/m; εr = 39.84; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF(7.55, 7.55, 7.55); Calibrated: 06/06/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x91x1): Measurement grid: dx=15.00 mm, dy=15.00 mm

Maximum value of SAR (interpolated) = 10.65 W/kg

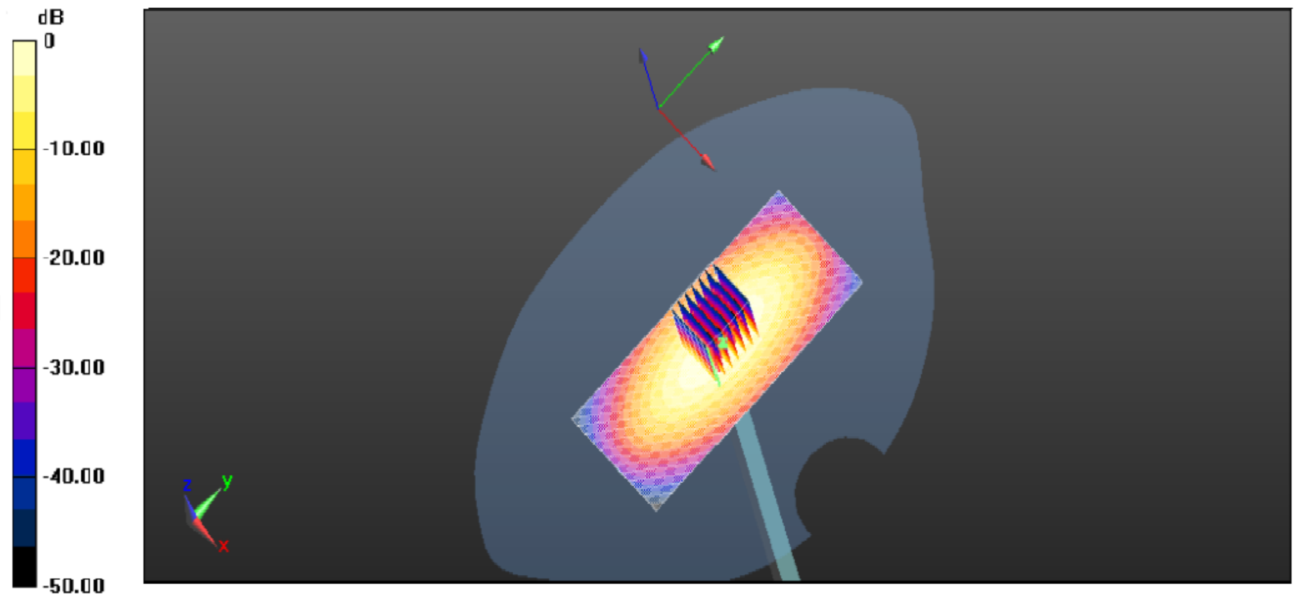
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.818 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 12.352 W/kg

SAR(1 g) = 9.60 W/kg; SAR(10 g) = 4.99 W/kg

Maximum value of SAR (measured) = 12.43 W/kg



0 dB = 12.43 W/kg = 20.55 dB W/kg

System Performance Check 1900MHz Head 250mW

System Performance Check at 1900 MHz Body

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d150

Date/Time: 11/11/2014

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1900 MHz; σ = 1.50 S/m; εr =55.32; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF(7.43, 7.43, 7.43); Calibrated: 06/06/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x91x1): Measurement grid: dx=15.00 mm, dy=15.00 mm

Maximum value of SAR (interpolated) = 11.46 mW/g

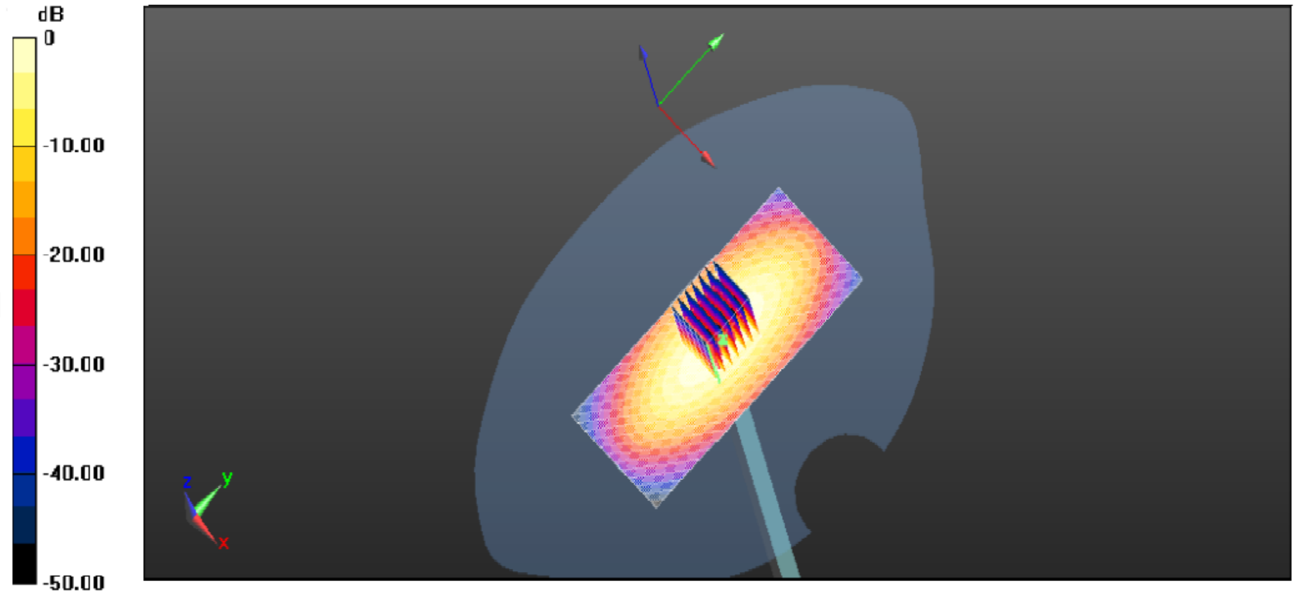
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 83.816 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 16.826 W/kg

SAR(1 g) = 9.51 mW/g; SAR(10 g) = 5.15 mW/g

Maximum value of SAR (measured) = 16.34 mW/g



0 dB = 16.34 mW/g = 24.35 dB mW/g

System Performance Check 1900MHz Body 250mW

System Performance Check at 2450 MHz Head

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 884

Date/Time: 11/11/2014

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2450 MHz; σ = 1.84 S/m; ε_r = 39.30; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (7.26, 7.26, and 7.26); Calibrated: 06/06/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x91x1): Measurement grid: dx=15.00 mm, dy=15.00 mm

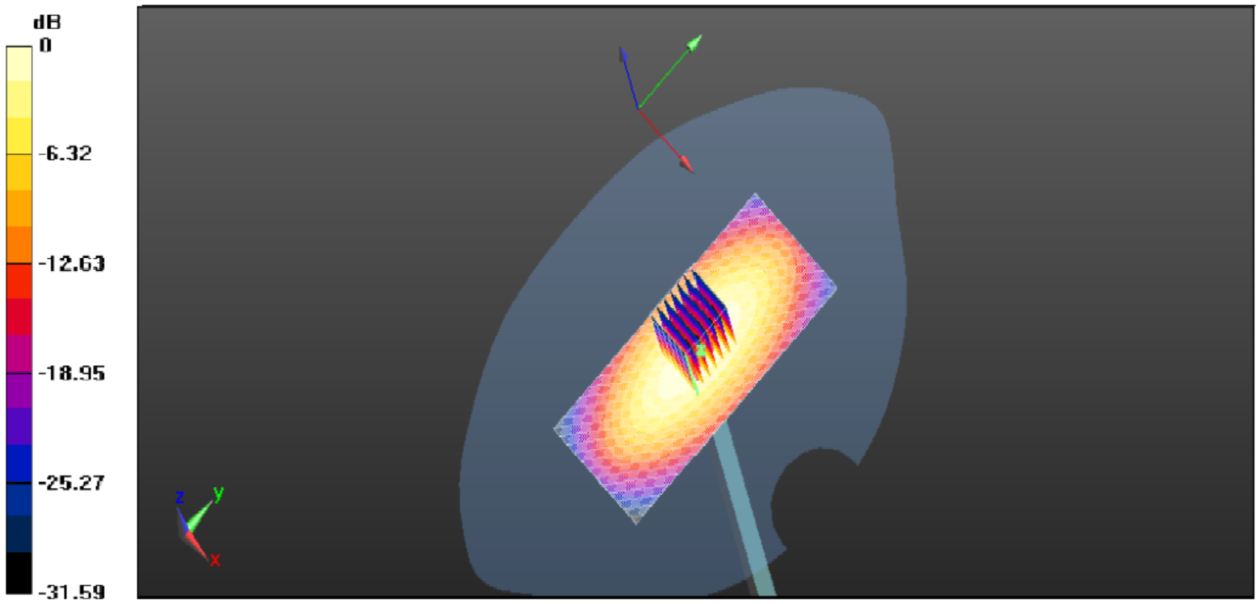
Maximum value of SAR (interpolated) = 14.9 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.714 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 26.08 mW/g

SAR (1 g) = 12.47 mW/g; SAR (10 g) = 5.75 mW/g

Maximum value of SAR (measured) = 14.8 mW/g



0 dB = 14.9 mW/g = 23.46 dB mW/g

System Performance Check 2450MHz Head 250mW

System Performance Check at 2450 MHz Body

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 884

Date/Time: 11/11/2014

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2450 MHz; σ = 1.94 S/m; ε_r = 54.33; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (6.93, 6.93, and 6.93); Calibrated: 06/06/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Area Scan (61x91x1): Measurement grid: dx=15.00 mm, dy=15.00 mm

Maximum value of SAR (interpolated) = 13.15 mW/g

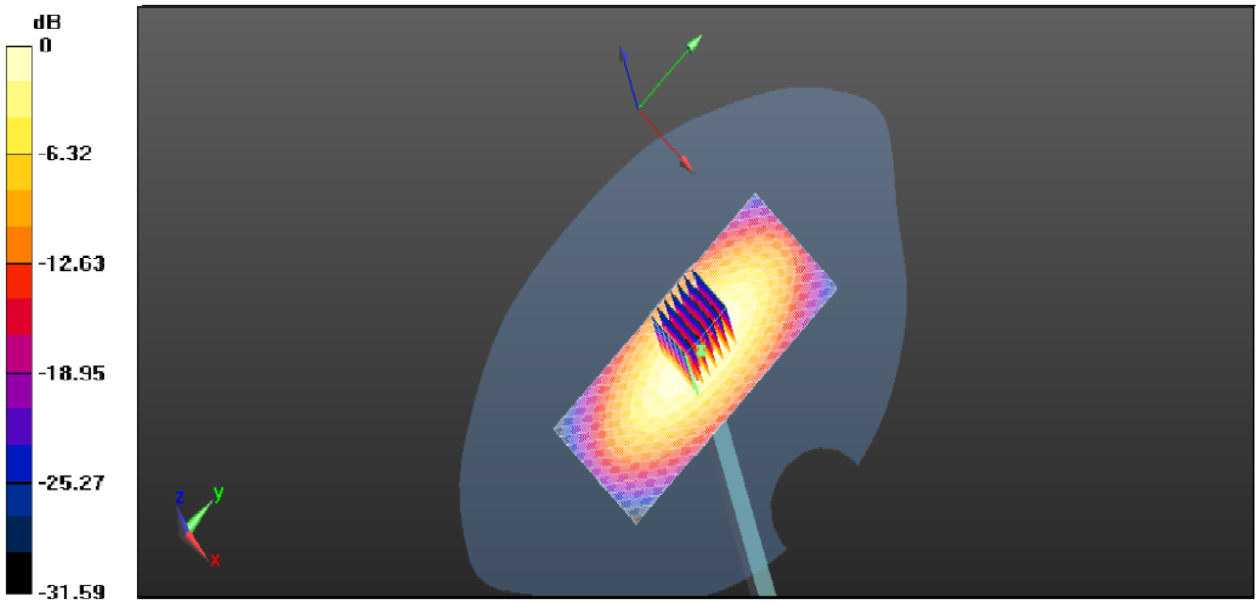
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.986 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 16.08 mW/g

SAR(1 g) = 12.53 mW/g; SAR(10 g) = 5.64 mW/g

Maximum value of SAR (measured) = 16.08 mW/g



0 dB = 16.08 mW/g = 24.67 dB mW/g

System Performance Check 2450MHz Body 250mW

10. SAR Test Graph Results

GSM850 Right Head Touch Middle Channel

Date/Time: 11/11/2014

Communication System: Customer System; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.89 S/m; ε_r = 41.48; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (8.83, 8.83, and 8.83); Calibrated: 06/06/2014;

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (51x101x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.216 W/kg

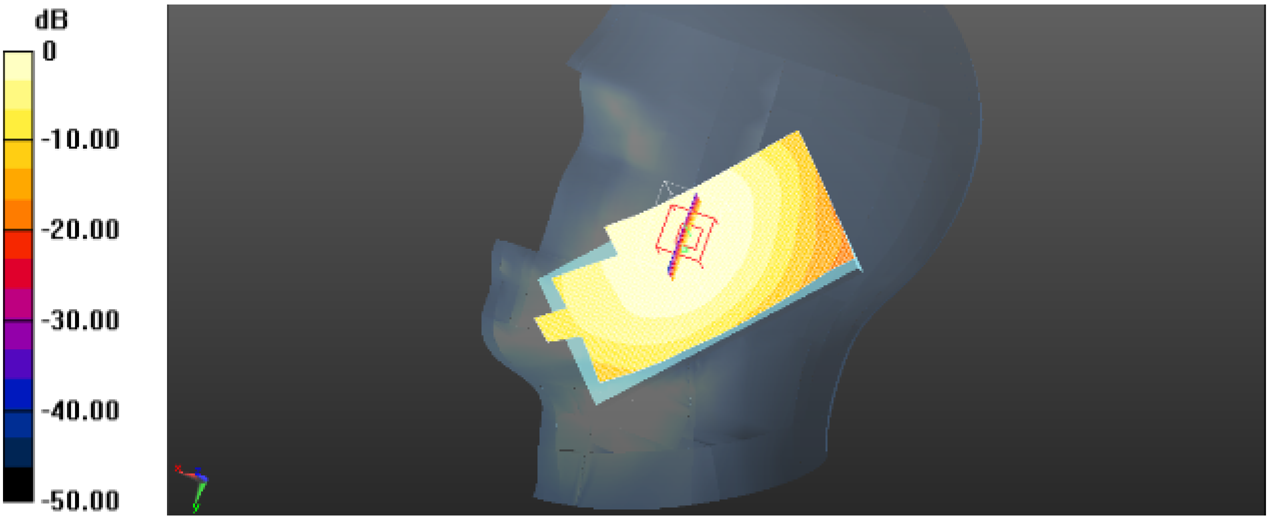
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.903V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.258 W/kg

SAR (1 g) = 0.212 W/kg; SAR (10 g) = 0.164 W/kg

Maximum value of SAR (measured) = 0.223 W/kg



0 dB = 0.216 W/kg = -13.31 dB W/kg

Plot 1: Right Head Touch (GSM850 Middle Channel)

GSM850 GPRS 2TS Body Rear Side Middle Channel

Date/Time: 11/11/2014

Communication System: Customer System; Frequency: 836.6 MHz; Duty Cycle: 1:4.1

Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.96 S/m; ε_r = 55.86; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (9.09, 9.09, and 9.09); Calibrated: 06/06/2014;

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (51x101x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.313 W/kg

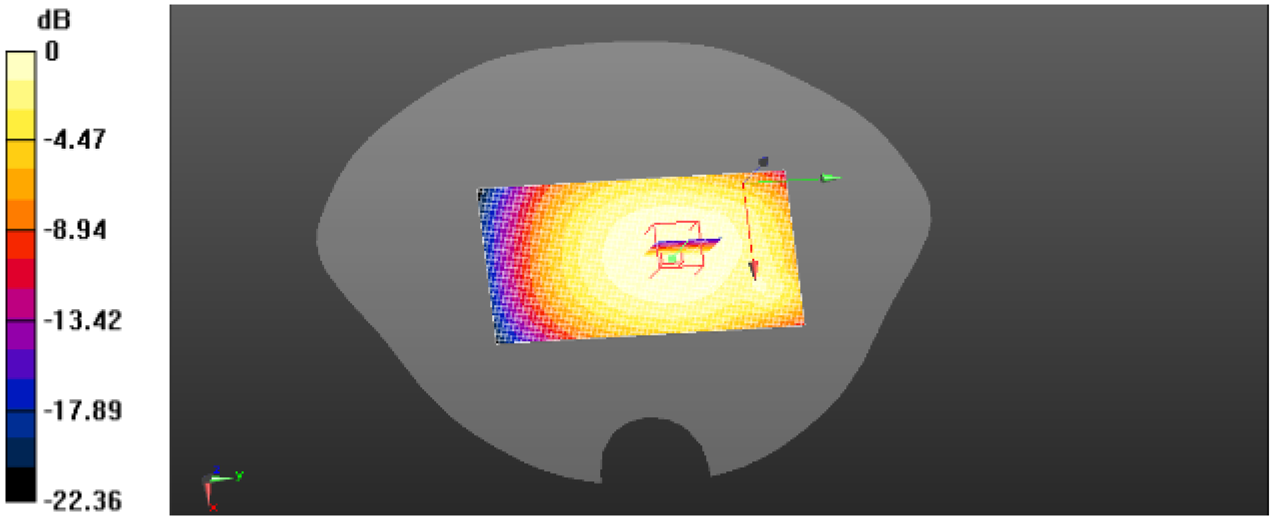
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.032 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 0.361 W/kg

SAR (1 g) = 0.302 W/kg; SAR (10 g) = 0.234 W/kg

Maximum value of SAR (measured) = 0.314 W/kg



0 dB = 0.313 W/kg = -10.09 dB W/kg

Plot 2: Body Rear Side (GSM850 GPRS 2TS Middle Channel)

GSM1900 Right Head Touch Middle Channel

Date/Time: 11/11/2014

Communication System: Customer System; Frequency: 1880.0 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): f = 1880.0 MHz; σ = 1.45 S/m; ε_r = 39.74; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (7.55, 7.55, 7.55); Calibrated: 06/06/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (51x101x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.146 W/kg

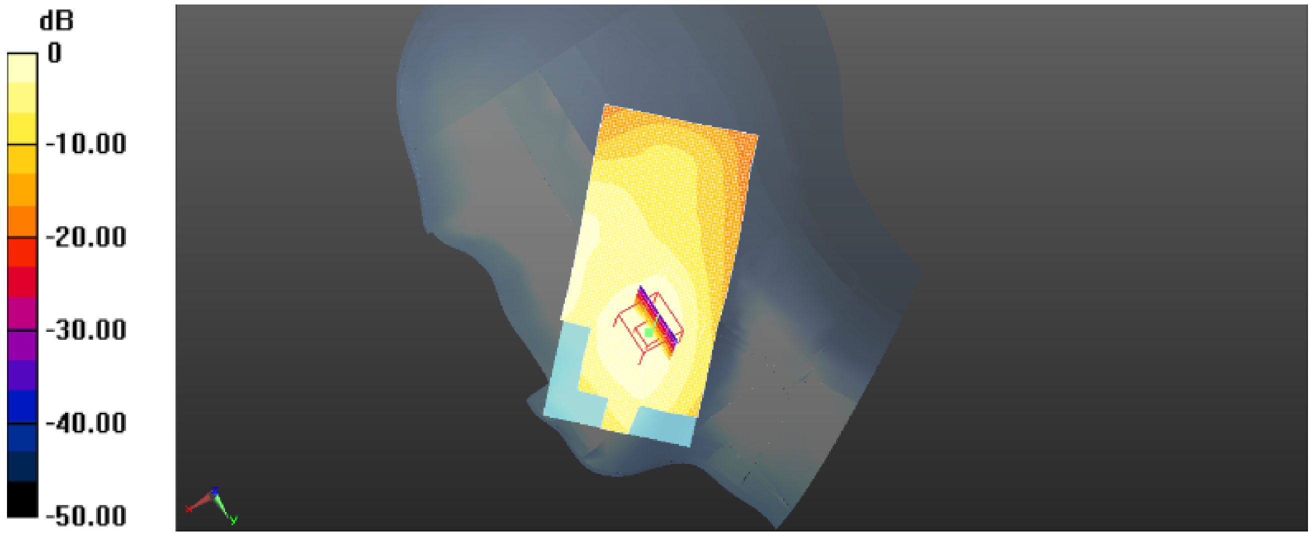
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.248 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.202 W/kg

SAR(1 g) = 0.132 W/kg; SAR(10 g) = 0.082 W/kg

Maximum value of SAR (measured) = 0.145 W/kg



0 dB = 0.146 W/kg = -16.71 dB W/kg

Plot 3: Right Head Touch (GSM1900 Middle Channel)

GSM1900 GPRS 2TS Body Rear Side Middle Channel

Date/Time: 11/11/2014

Communication System: Customer System; Frequency: 1880.0 MHz; Duty Cycle: 1:4.1

Medium parameters used (interpolated): f = 1880.0 MHz; σ = 1.57 S/m; ε_r = 51.14; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (7.43, 7.43, 7.43); Calibrated: 06/06/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (51x101x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.290 W/kg

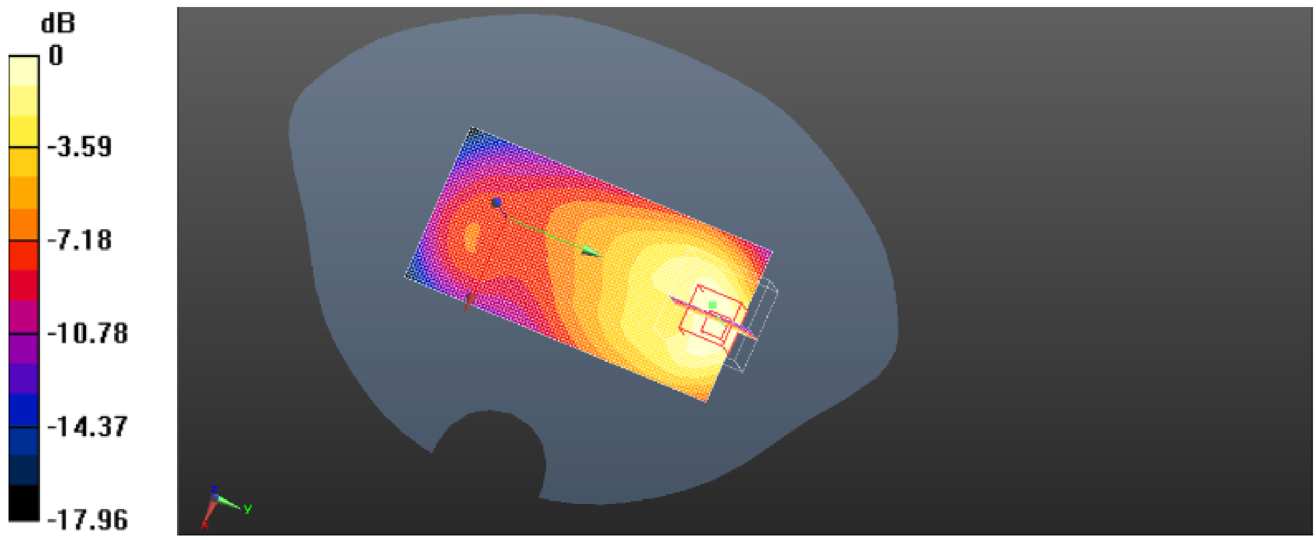
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.310 V/m; Power Drift =0.13 dB

Peak SAR (extrapolated) = 0.507 W/kg

SAR(1 g) = 0.300 W/kg; SAR(10 g) = 0.169 W/kg

Maximum value of SAR (measured) = 0.314 W/kg



0 dB = 0.290 W/kg = -10.75 dB W/kg

Plot 4: Body Rear Side (GSM1900 GPRS 2TS Middle Channel)

WCDMA Band II RMC Right Head Touch Middle Channel

Date/Time: 11/11/2014

Communication System: Customer System; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1880 MHz; σ = 1.45 S/m; ε_r = 39.74; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (7.55, 7.55, and 7.55); Calibrated: 06/06/2014;

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (51x101x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.380 W/kg

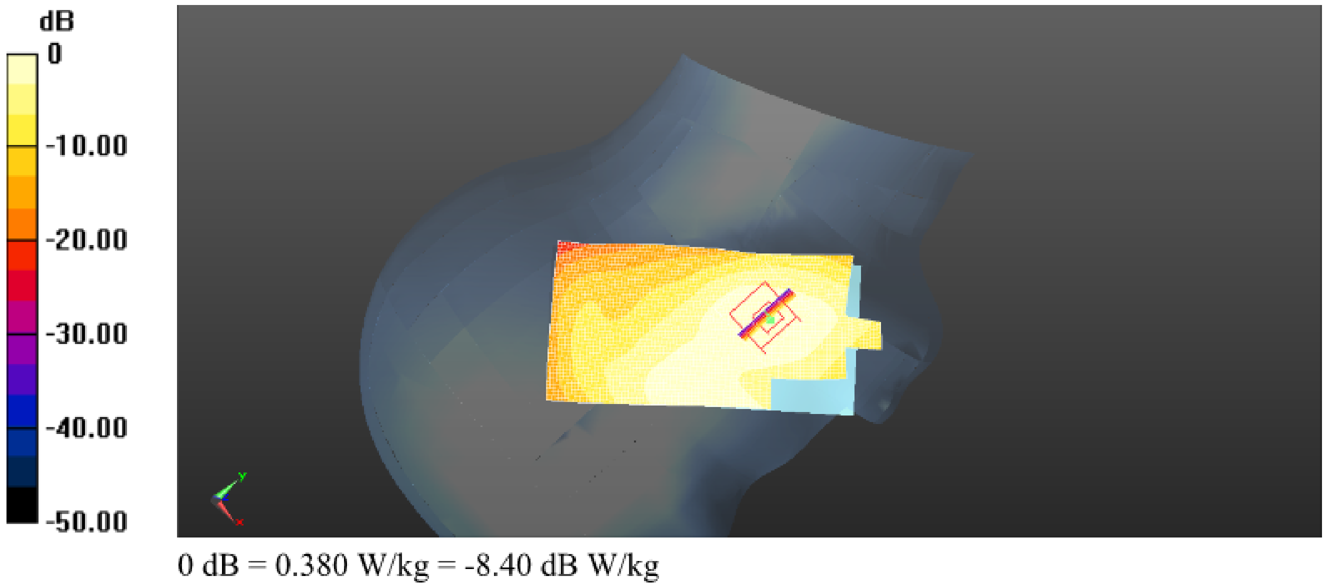
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.795 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.535 W/kg

SAR(1 g) = 0.351 W/kg; SAR(10 g) = 0.216 W/kg

Maximum value of SAR (measured) = 0.381 W/kg



Plot 5: Right Head Touch (WCDMA Band II RMC Middle Channel)

WCDMA Band II RMC Body Rear Side Middle Channel

Date/Time: 11/11/2014

Communication System: Customer System; Frequency: 1880.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1880.0 MHz; σ = 1.57 S/m; ε_r = 51.14; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (7.43, 7.43, and 7.43); Calibrated: 06/06/2014;

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (51x101x1): Measurement grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.669 W/kg

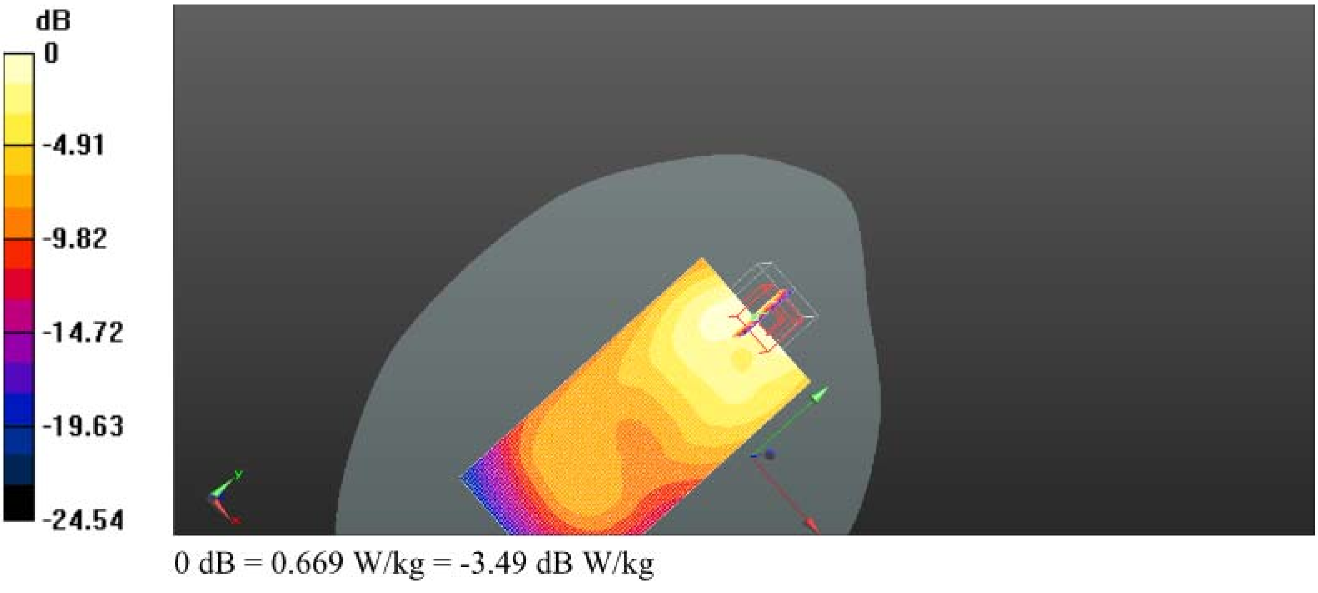
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.131 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.064 W/kg

SAR(1 g) = 0.638 W/kg; SAR(10 g) = 0. 363 W/kg

Maximum value of SAR (measured) = 0.681 W/kg



Plot 6: Body Rear Side (WCDMA Band II RMC Middle Channel)

WCDMA Band V RMC Right Head Touch Middle Channel

Date/Time: 11/11/2014

Communication System: Customer System; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.89 S/m; ε_r = 41.48; ρ = 1000 kg/m^3

Phantom section: Right Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (8.83, 8.83, and 8.83); Calibrated: 06/06/2014;

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (51x101x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.212 W/kg

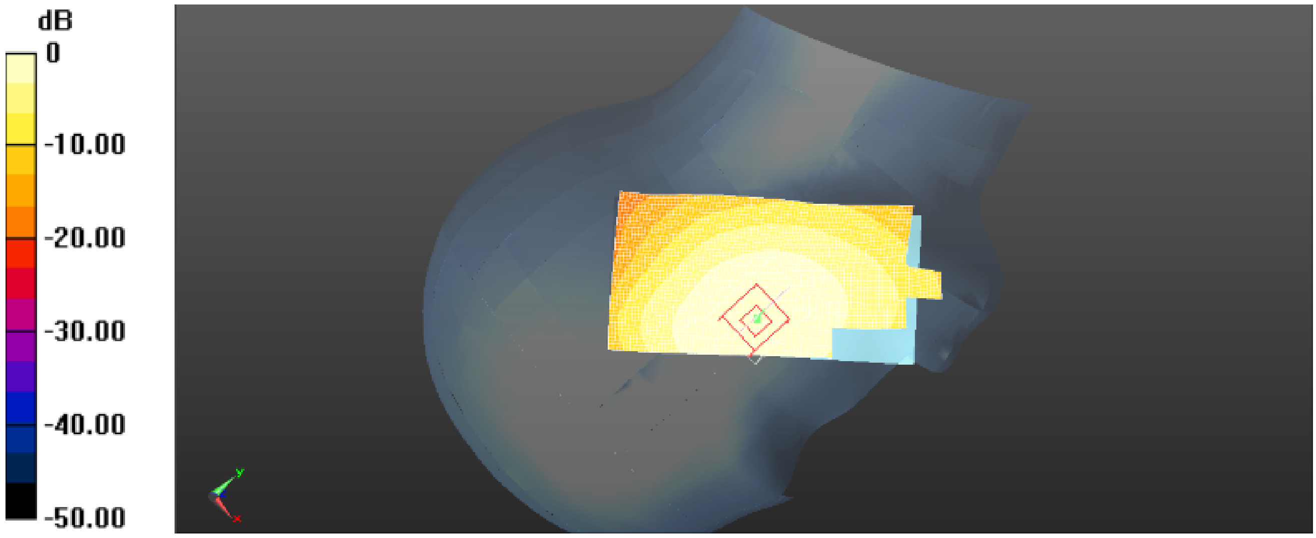
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.952 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.247 W/kg

SAR(1 g) = 0.207 W/kg; SAR(10 g) = 0.159 W/kg

Maximum value of SAR (measured) = 0.217 W/kg



0 dB = 0.212 W/kg = -13.47 dB W/kg

Plot 7: Right Head Touch (WCDMA Band V RMC Middle Channel)

WCDMA Band V RMC Body Rear Side Middle Channel

Date/Time: 11/11/2014

Communication System: Customer System; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.96 S/m; ε_r = 55.86; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (9.09, 9.09, and 9.09); Calibrated: 06/06/2014;

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (51x101x1): Interpolated grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.576 W/kg

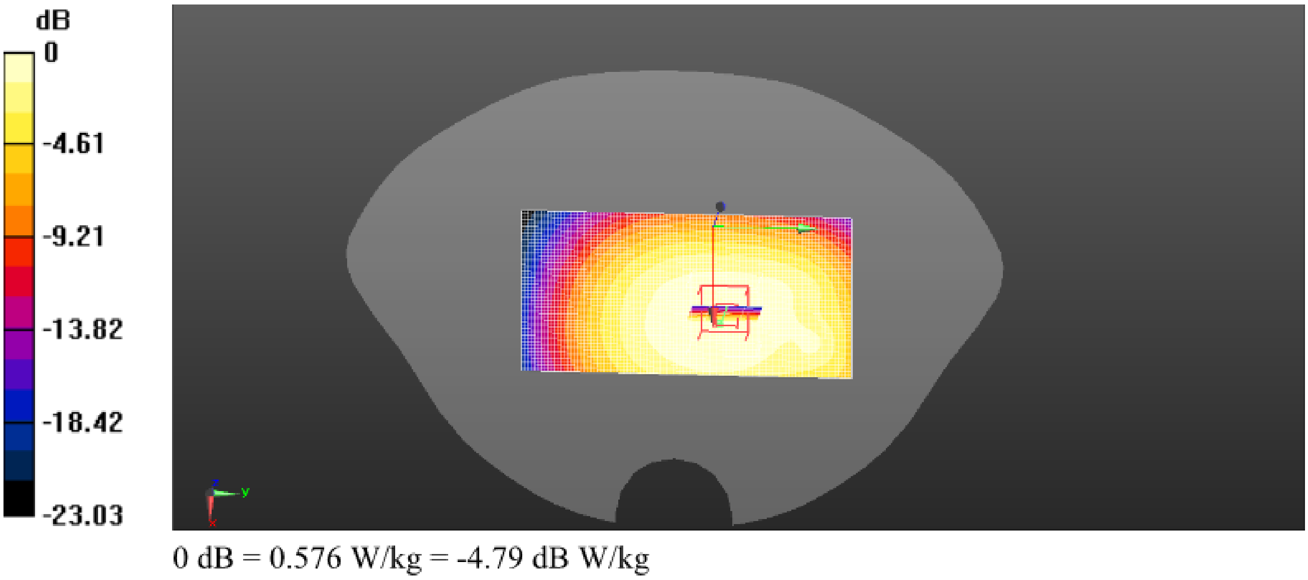
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.585 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0. 662 W/kg

SAR(1 g) = 0. 544 W/kg; SAR(10 g) = 0. 419 W/kg

Maximum value of SAR (measured) = 0.572 W/kg



Plot 8: Body Rear Side (WCDMA Band V RMC Middle Channel)

Right Head Touch (WLAN2450 Middle Channel-Channel 6-2437MHz (1Mbps))

Date/Time: 11/11/2014

Communication System: Customer System; Frequency: 2437.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437.0 MHz; σ = 1.79 S/m; ε_r = 39.12; ρ = 1000 kg/m^3

Phantom section: Right Section:

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (7.26, 7.26, and 7.26); Calibrated: 06/06/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (51x101x1): Measurement grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.356W/kg

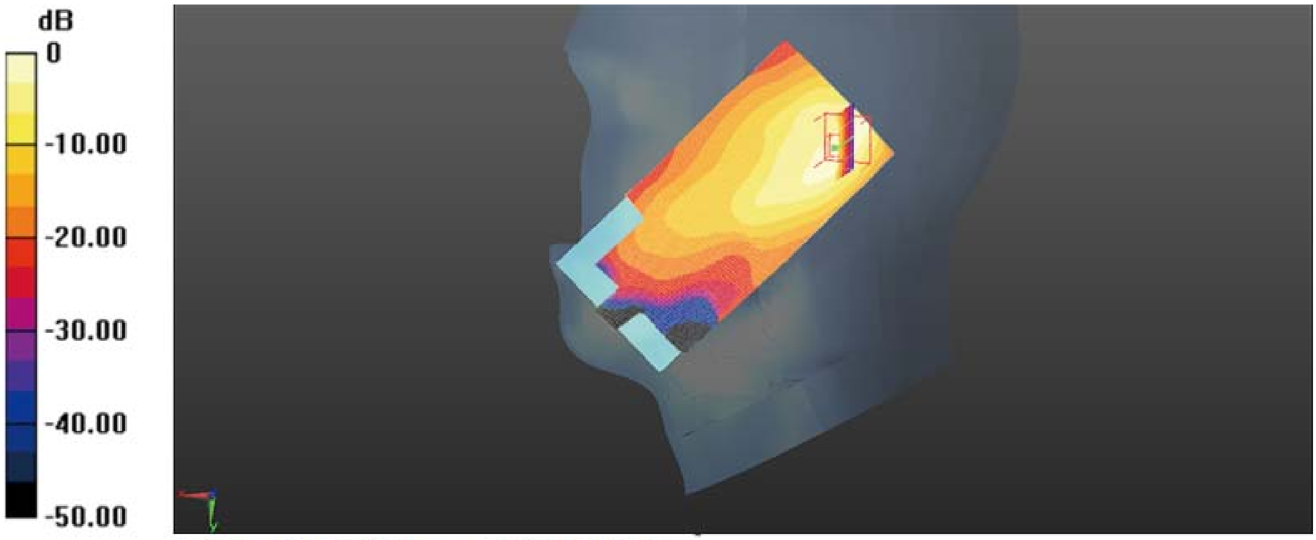
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.559 V/m; Power Drift =- 0.08 dB

Peak SAR (extrapolated) = 0.325 W/kg

SAR(1 g) = 0.285 W/kg; SAR(10 g) = 0.132 W/kg

Maximum value of SAR (measured) = 0.354 W/kg



0 dB = 0.356 W/kg = -8.97 dB W/kg

Plot 9: Right Head Touch (WLAN2450 Middle Channel-Channel 6-2437MHz (1Mbps))

Body- worn Rear Side (WLAN2450 Middle Channel-Channel 6-2437MHz (1Mbps))

Date/Time: 11/11/2014

Communication System: Customer System; Frequency: 2437.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437.0 MHz; σ = 1.96 S/m; ε_r = 52.65; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Probe: ES3DV3 - SN3842; ConvF (6.93, 6.93, and 6.93); Calibrated: 06/06/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1315; Calibrated: 25/11/2013

Phantom: SAM 1; Type: SAM;

Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (51x101x1): Measurement grid: dx=1.50 mm, dy=1.50 mm

Maximum value of SAR (interpolated) = 0.528 W/kg

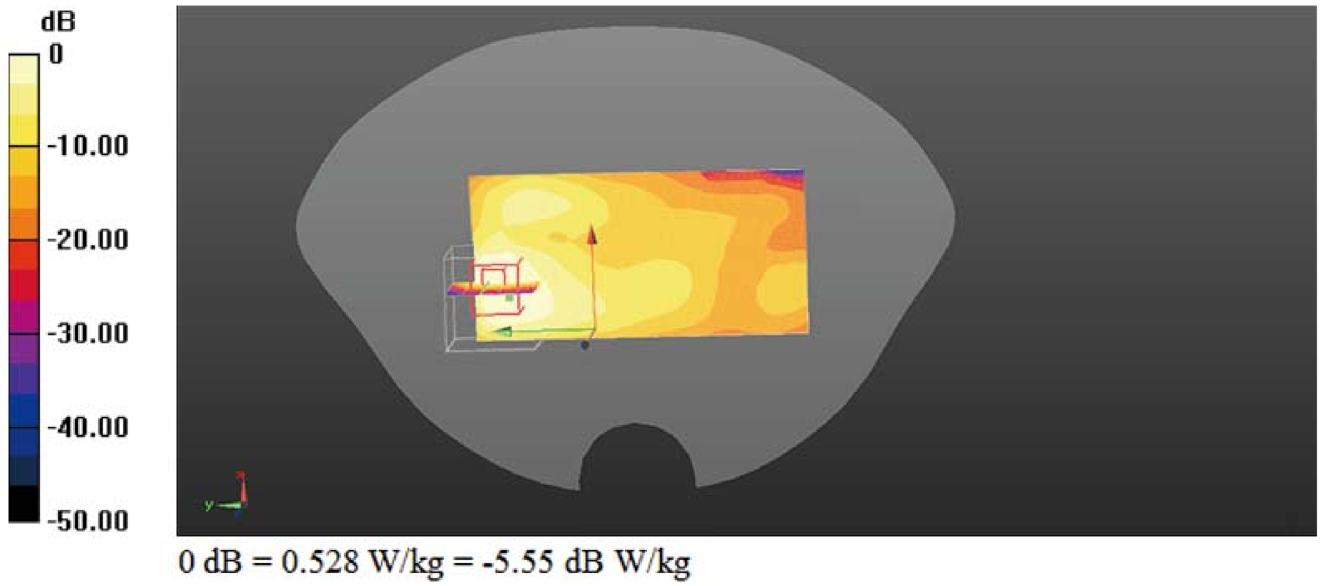
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.947 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.559 W/kg

SAR(1 g) = 0.436 W/kg; SAR(10 g) = 0.325 W/kg

Maximum value of SAR (measured) = 0.524 W/kg



Plot 10: Body- worn Rear Side (WLAN2450 Middle Channel-Channel 6-2437MHz (1Mbps))

11. CALIBRATION CERTIFICATE

11.1 PROBE CALIBRATION CERTICATE

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

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

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

Accreditation No.: **SCS 108**

Client **CIQ-SZ (Auden)**

Certificate No: **EX3-3831_Jun14**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3842

Calibration procedure(s): QA CAL-01.v8, QA CAL-12.v7, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: June 6, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-14 (No. 217-01733)	Apr-15
Power sensor E4412A	MY41498087	04-Apr-14 (No. 217-01733)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-14 (No. 217-01737)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-14 (No. 217-01735)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-14 (No. 217-01738)	Apr-15
Reference Probe ES3DV2	SN: 3013	28-Dec-13 (No. ES3-3013_Dec13)	Dec-15
DAE4	SN: 660	31-Jan-14 (No. DAE4-660_Jan13)	Jan-15
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: June 6, 2014

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

Certificate No: EX3-3831_Jun14 Page 1 of 11

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

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

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

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3842

Manufactured: October 25, 2011
Repaired: June 3, 2014
Calibrated: June 6, 2014

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

EX3DV4– SN:3842 June 6, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3842

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.35	0.52	0.42	± 10.1 %
DCP (mV)[B]	104.7	100.4	100.5	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	132.3	±3.5 %
		Y	0.0	0.0	1.0		162.7	
		Z	0.0	0.0	1.0		147.6	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3842

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	43.5	0.87	10.00	10.00	10.00	0.15	1.10	± 13.4 %
835	41.5	0.91	8.83	8.83	8.83	0.28	1.07	± 12.0 %
900	41.5	0.97	8.78	8.78	8.78	0.32	1.00	± 12.0 %
1810	40.0	1.40	7.68	7.68	7.68	0.38	0.88	± 12.0 %
1900	40.0	1.40	7.55	7.55	7.55	0.50	0.77	± 12.0 %
2450	39.2	1.80	7.26	7.26	7.26	0.71	0.63	± 12.0 %

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3842

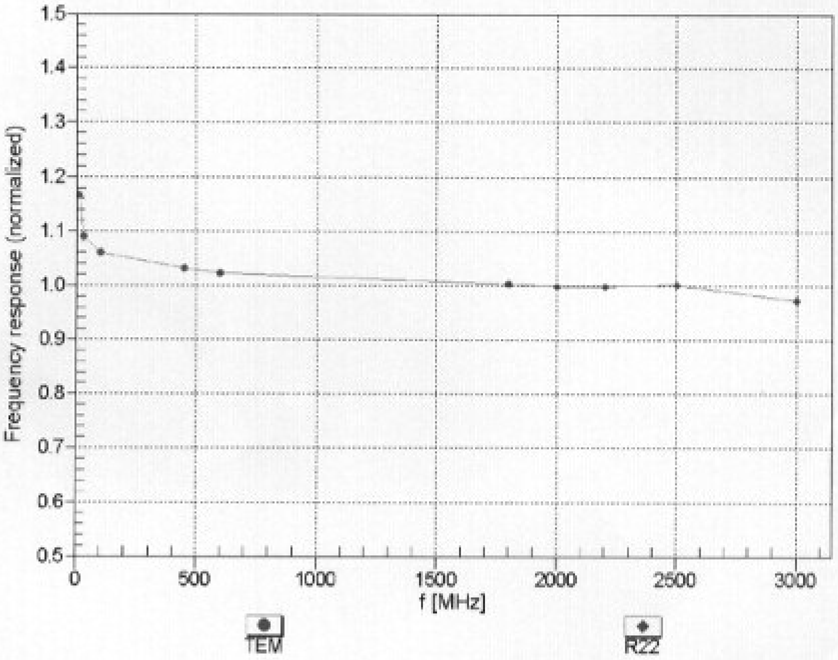
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	10.34	10.34	10.34	0.09	1.00	± 13.4 %
835	55.2	0.98	9.09	9.09	9.09	0.42	0.84	± 12.0 %
900	55.0	1.05	9.16	9.16	9.16	0.47	0.79	± 12.0 %
1810	53.3	1.52	7.78	7.78	7.78	0.50	0.81	± 12.0 %
1900	53.3	1.52	7.43	7.43	7.43	0.29	1.07	± 12.0 %
2450	52.7	1.95	6.93	6.93	6.93	0.80	0.59	± 12.0 %

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

EX3DV4– SN:3842 June 6, 2014

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

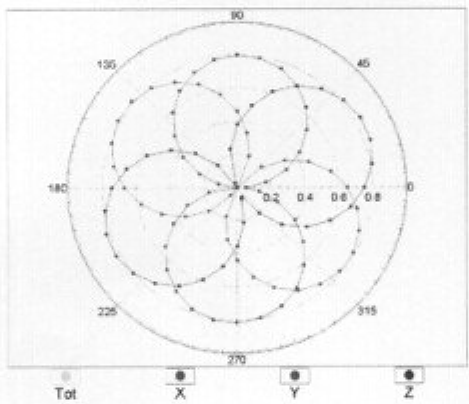


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

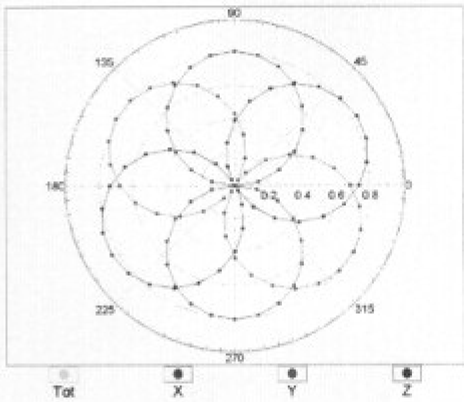
Certificate No: EX3-3831_Jun13 Page 7 of 11

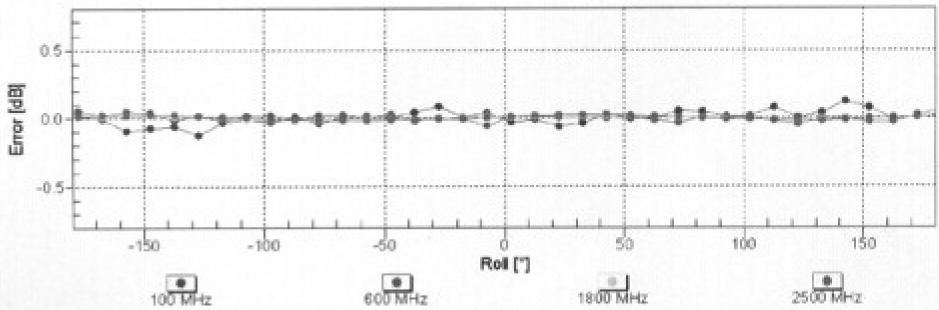
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

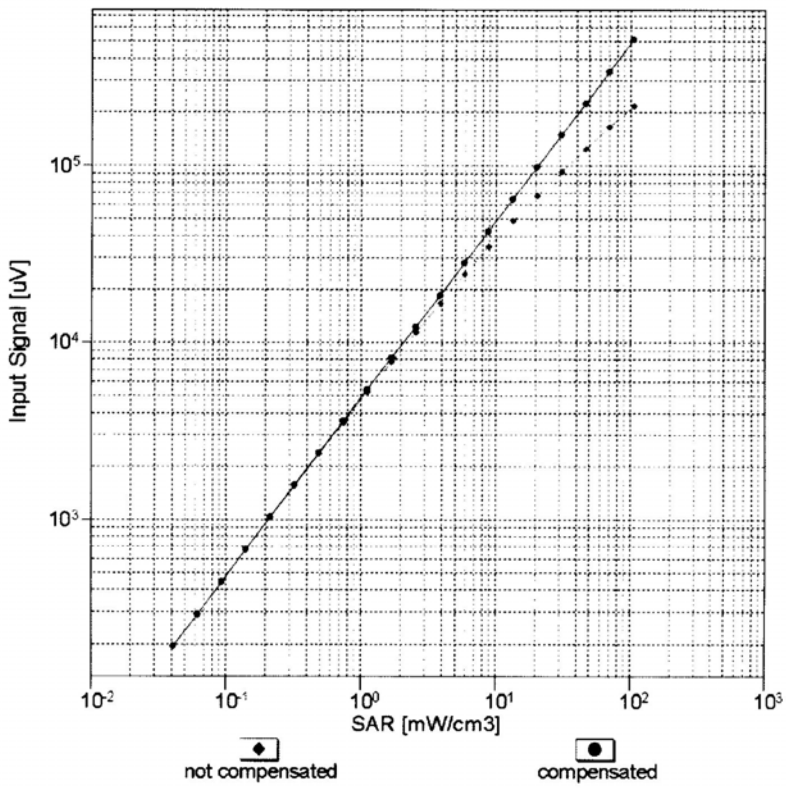


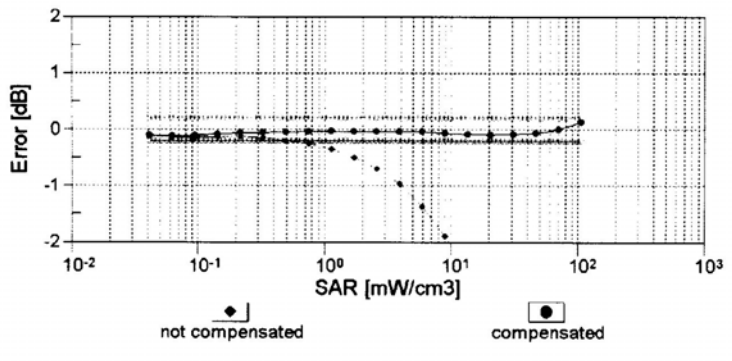


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV4– SN:3842 June 6, 2014

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



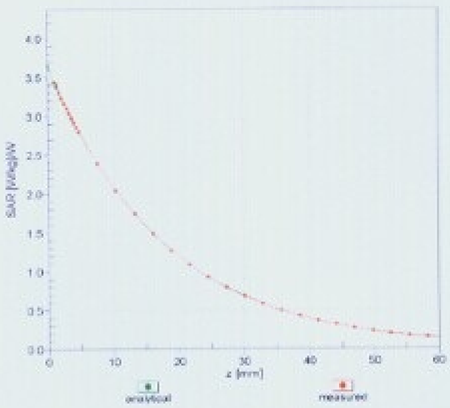


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

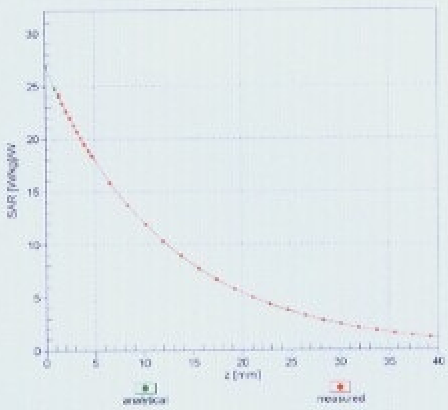
EX3DV4– SN:3842 June 6, 2014

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

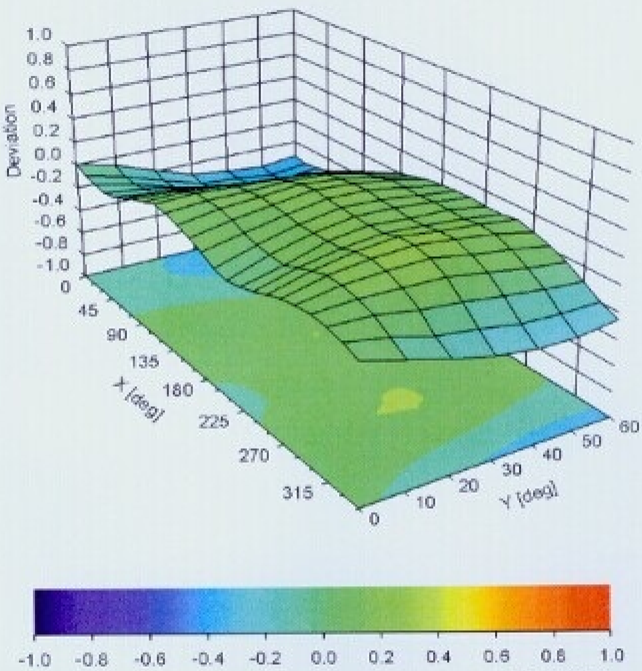


f = 1810 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3842

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-117.4
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

Shenzhen General Testing & Inspection Technology Co., Ltd.
1F, 2 Block, Jiaquan Building, Guanlan High-tech Park Baoan District, Shenzhen, Guangdong, China
Tel.: (86)755-27588991 Fax: (86)755-86116468 Http://www.sz-ctc.com.cn

11.2 D835V2 Dipole Calibration Certificate

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Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191, China
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CNAS L0442

Client CIQ SZ (Auden) Certificate No: J13-2-3049

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d134

Calibration Procedure(s) TMC-OS-E-02-194
Calibration procedure for dipole validation kits

Calibration date: December 13, 2013

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	11-Sep-13 (TMC, No.JZ13-443)	Sep-14
Power sensor NRV-Z5	100595	11-Sep-13 (TMC, No. JZ13-443)	Sep -14
Reference Probe ES3DV3	SN 3149	5- Sep-13 (SPEAG, No.ES3-3149_Sep13)	Sep-14
DAE4	SN 777	22-Feb-13 (SPEAG, DAE4-777_Feb13)	Feb -14
Signal Generator E4438C	MY49070393	13-Nov-13 (TMC, No.JZ13-394)	Nov-14
Network Analyzer E8362B	MY43021135	19-Oct-13 (TMC, No.JZ13-278)	Oct-14

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: December 17, 2013

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Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.8.7.1137
Extrapolation	Advanced Extrapolation	
Phantom	Twin Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.7 ± 6 %	0.88 mho/m ± 6 %
Head TSL temperature change during test	<0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.38 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.66 mW /g ± 20.8 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.55 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.27 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.3 ± 6 %	0.97 mho/m ± 6 %
Body TSL temperature change during test	<0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.32 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.36 mW /g ± 20.8 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.54 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.20 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.5Ω + 3.14jΩ
Return Loss	- 28.1dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.2Ω + 2.90jΩ
Return Loss	- 30.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.241 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
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DASY5 Validation Report for Head TSL Date: 12.11.2013

Test Laboratory: TMC, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d134

Communication System: CW; Frequency: 835 MHz

Medium parameters used: f = 835 MHz; σ = 0.884 mho/m; εr = 41.65; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(6.21,6.21,6.21); Calibrated: 2013/9/5
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: SAM 1186;Type: QD000P40CC;
- Measurement SW: DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

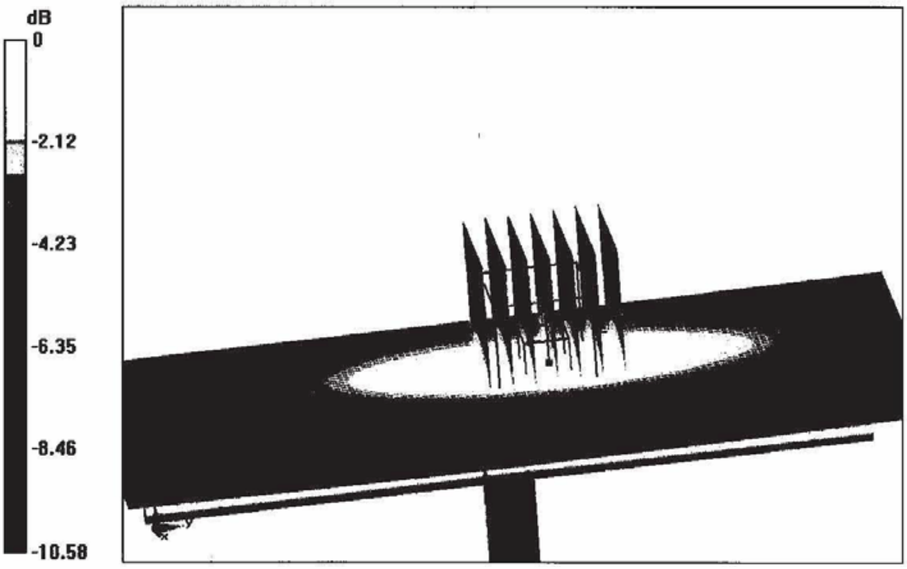
Dipole Calibration for Head Tissue/Pin=250mW, d=15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 48.581 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.57 W/kg

SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.55 W/kg

Maximum value of SAR (measured) = 2.80 W/kg



0 dB = 2.80 W/kg = 4.47 dBW/kg

Certificate No: J13-2-3049 Page 5 of 8

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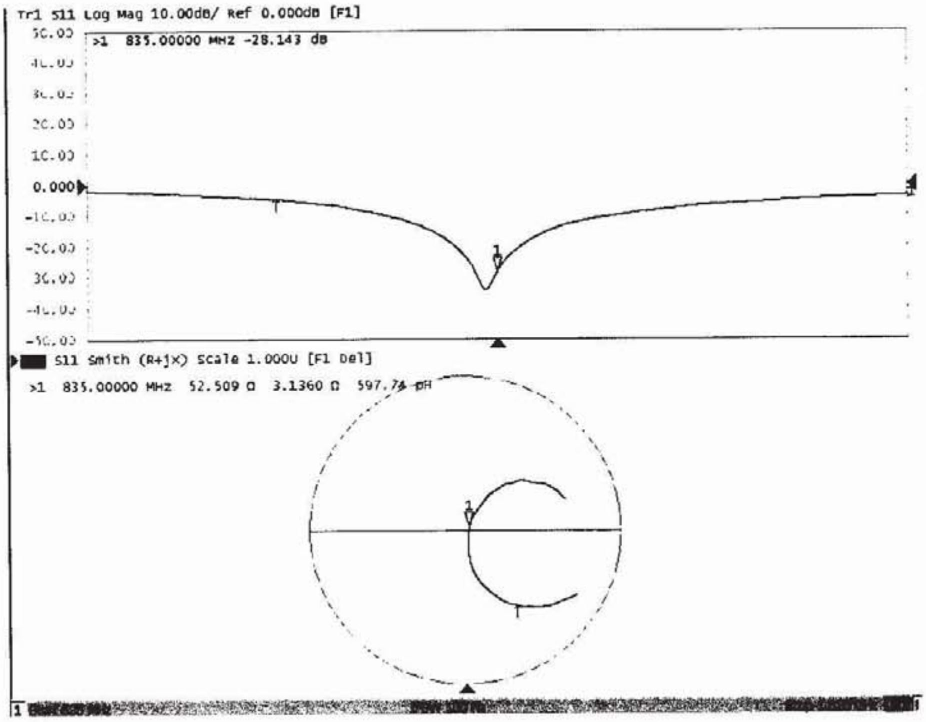
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 12.13.2013

Test Laboratory: TMC, Beijing, China

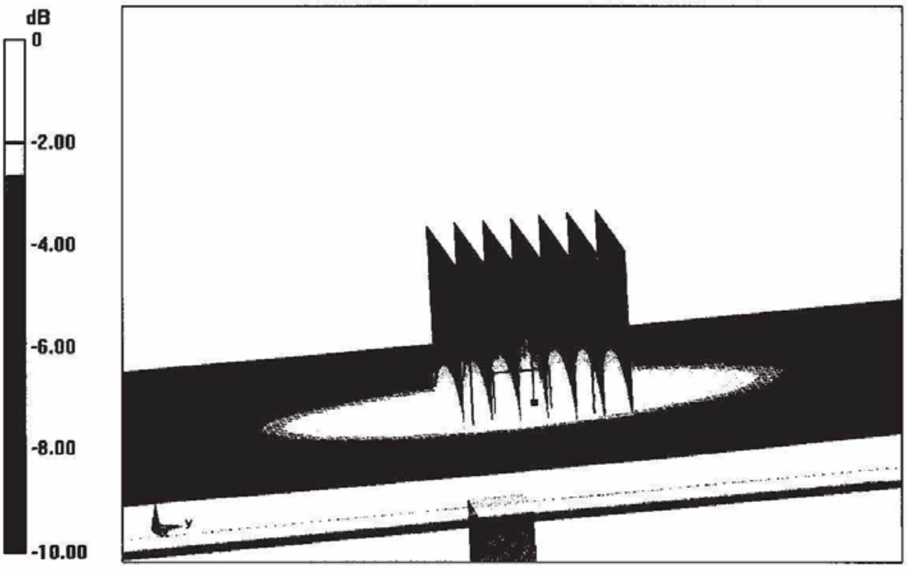
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d134

Communication System: CW; Frequency: 835 MHz;
Medium parameters used: f = 835 MHz; σ = 0.965 mho/m; εr = 56.32; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(5.98,5.98,5.98) ; Calibrated: 2013/9/5
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: SAM 1186;Type: QD000P40CC;
- Measurement SW: DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

Dipole Calibration for Body Tissue/Pin=250mW, d=15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.271 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.38 W/kg
SAR(1 g) = 2.32 W/kg; SAR(10 g) = 1.54 W/kg
Maximum value of SAR (measured) = 2.69 W/kg



0 dB = 2.69 W/kg = 4.30 dBW/kg

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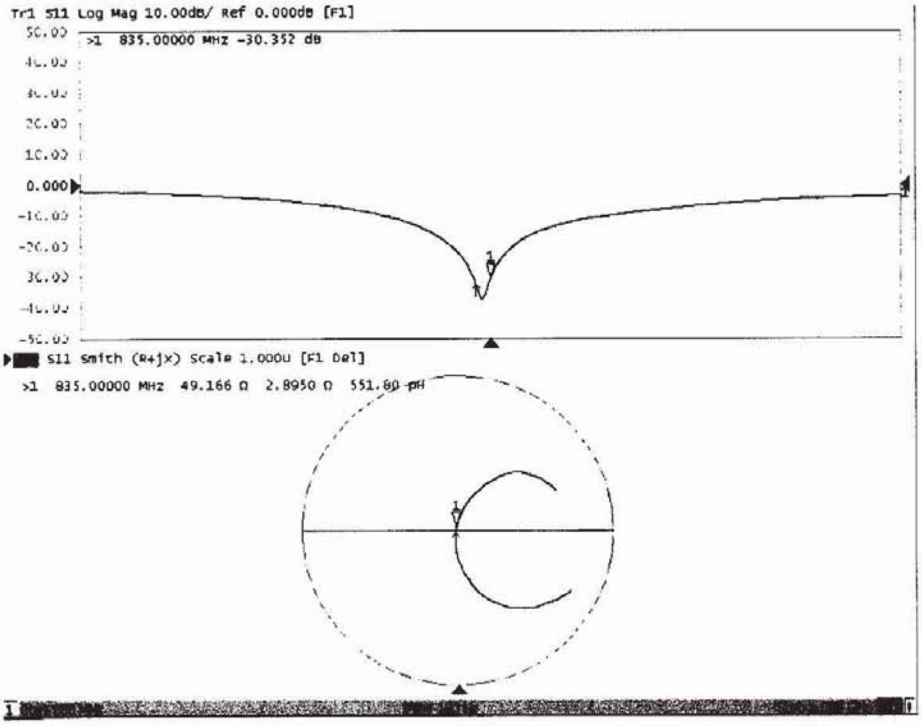
Impedance Measurement Plot for Body TSL



11.3 D1900V2 DIPOLE CALIBRATION CERTICATE

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ilac-MRA CNAS 校准 CNAS L0442

Client CIQ SZ (Auden) Certificate No: J13-2-3052

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d150
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits
Calibration date:	December 12, 2013

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	11-Sep-13 (TMC, No.JZ13-443)	Sep-14
Power sensor NRV-Z5	100595	11-Sep-13 (TMC, No. JZ13-443)	Sep -14
Reference Probe ES3DV3	SN 3149	5- Sep-13 (SPEAG, No.ES3-3149_Sep13)	Sep-14
DAE4	SN 777	22-Feb-13 (SPEAG, DAE4-777_Feb13)	Feb -14
Signal Generator E4438C	MY49070393	13-Nov-13 (TMC, No.JZ13-394)	Nov-14
Network Analyzer E8362B	MY43021135	19-Oct-13 (TMC, No.JZ13-278)	Oct-14

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	[signature]
Reviewed by:	Qi Dianyuan	SAR Project Leader	[signature]
Approved by:	Lu Bingsong	Deputy Director of the laboratory	[signature]

Issued: December 17, 2013

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Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005

c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.8.7.1137
Extrapolation	Advanced Extrapolation	
Phantom	Twin Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.9 ± 6 %	1.42 mho/m ± 6 %
Head TSL temperature change during test	<0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.71 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**38.3 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.08 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.2 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.7 ± 6 %	1.53 mho/m ± 6 %
Body TSL temperature change during test	<0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.96 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**39.9 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.26 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.0 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.3Ω+ 3.17jΩ
Return Loss	- 30.0dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.8Ω+ 3.92jΩ
Return Loss	- 27.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.048 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 12.12.2013

Test Laboratory: TMC, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d150

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz; σ = 1.416 mho/m; εr = 38.91; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(5.06,5.06,5.06); Calibrated: 2013/9/5
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: SAM 1186; Type: QD000P40CC;
- DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

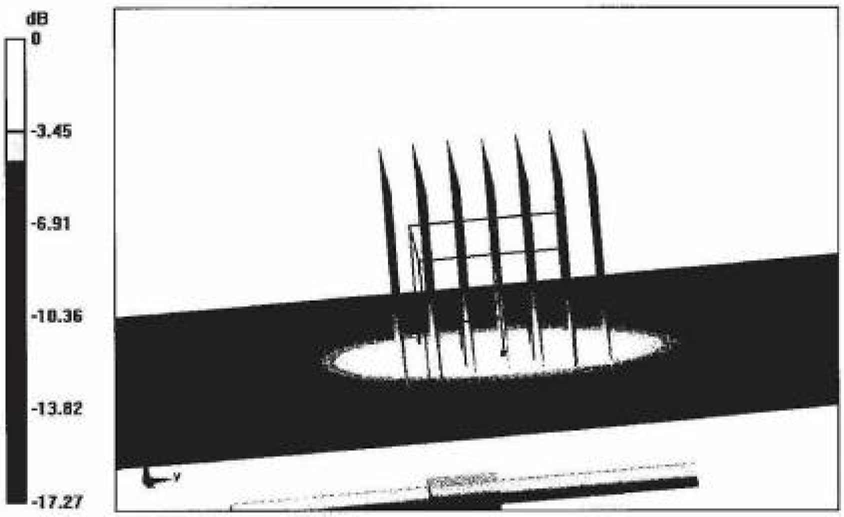
Dipole Calibration for Head Tissue/Pin=250mW, d=10mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 90.054 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 17.9 W/kg

SAR(1 g) = 9.71 W/kg; SAR(10 g) = 5.08 W/kg

Maximum value of SAR (measured) = 11.8 W/kg



0 dB = 11.8 W/kg = 10.72 dBW/kg

Certificate No: J13-2-3052 Page 5 of 8

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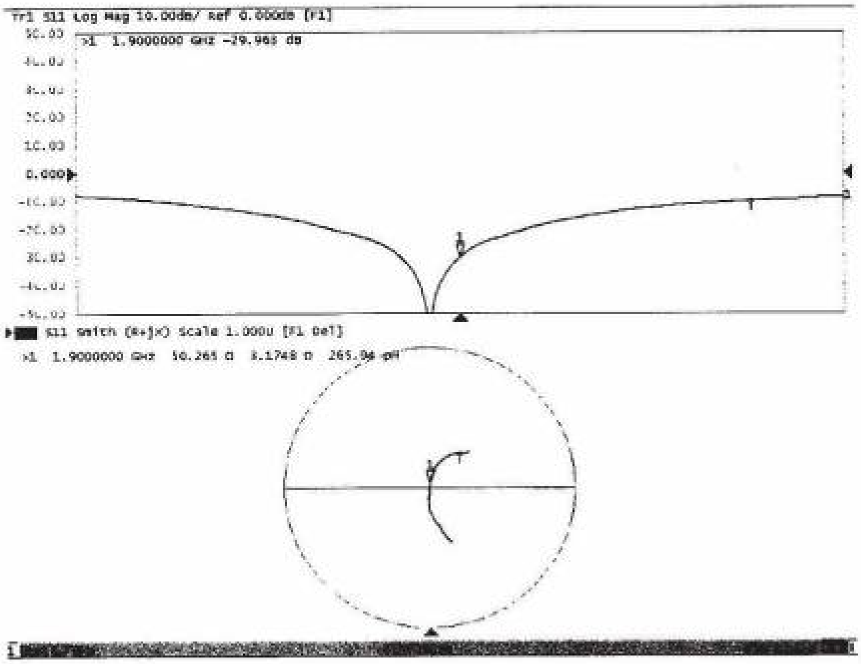
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 12.10.2013

Test Laboratory: TMC, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d150

Communication System: CW; Frequency: 1900 MHz;

Medium parameters used: f = 1900 MHz; σ = 1.528 mho/m; εr = 53.74; ρ = 1000 kg/m^3

Phantom section: Flat Phantom

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(4.72,4.72,4.72) ; Calibrated: 2013/9/5
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: SAM1186; Type: QD000P40CC;
- DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

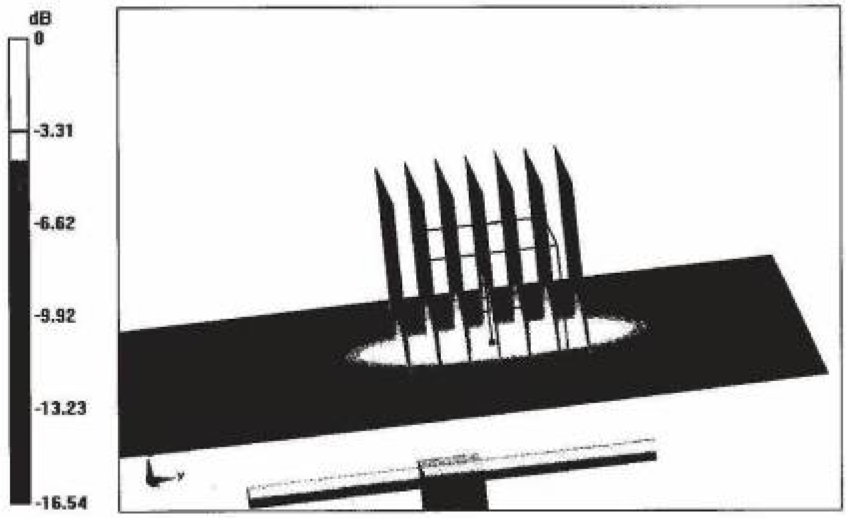
Dipole Calibration for Body Tissue/Pin=250mW, d=10mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 83.606 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 17.7 W/kg

SAR(1 g) = 9.98 W/kg; SAR(10 g) = 5.26 W/kg

Maximum value of SAR (measured) = 12.1 W/kg



0 dB = 12.1 W/kg = 10.83 dBW/kg

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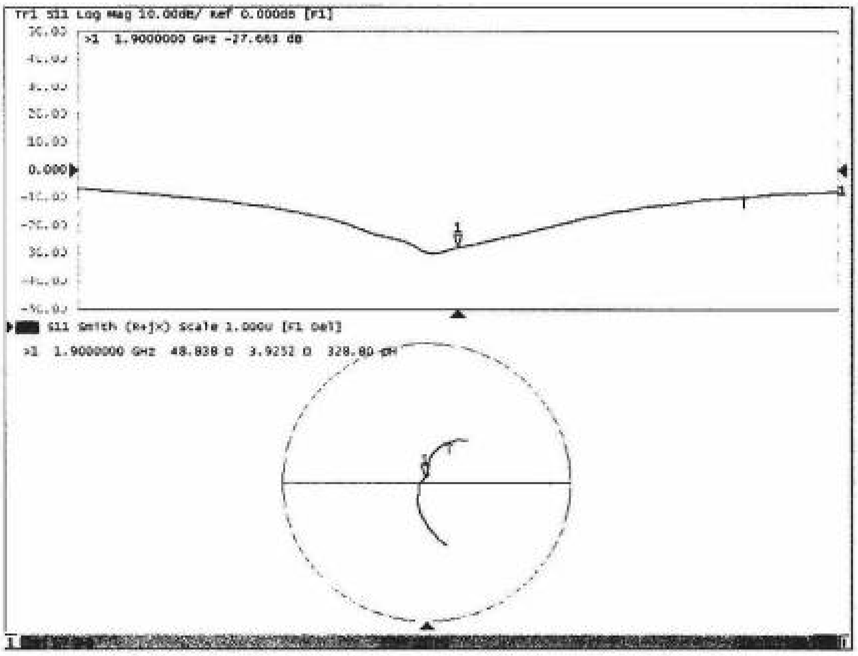
Impedance Measurement Plot for Body TSL



11.4 D2450V2 Dipole Calibration Ceriticate

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Client CIQ SZ (Auden) **Certificate No: J13-2-3053**

CALIBRATION CERTIFICATE

Object D2450V2 - SN: 884

Calibration Procedure(s) TMC-OS-E-02-194
Calibration procedure for dipole validation kits

Calibration date: December 11, 2013

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	11-Sep-13 (TMC, No.JZ13-443)	Sep-14
Power sensor NRV-Z5	100595	11-Sep-13 (TMC, No. JZ13-443)	Sep -14
Reference Probe ES3DV3	SN 3149	5- Sep-13 (SPEAG, No.ES3-3149_Sep13)	Sep-14
DAE4	SN 777	22-Feb-13 (SPEAG, DAE4-777_Feb13)	Feb -14
Signal Generator E4438C	MY49070393	13-Nov-13 (TMC, No.JZ13-394)	Nov-14
Network Analyzer E8362B	MY43021135	19-Oct-13 (TMC, No.JZ13-278)	Oct-14

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: December 17, 2013

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.8.7.1137
Extrapolation	Advanced Extrapolation	
Phantom	Twin Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.82 mho/m ± 6 %
Head TSL temperature change during test	<0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**51.7 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.05 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.8 ± 6 %	1.94 mho/m ± 6 %
Body TSL temperature change during test	<0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.9 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**51.8 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.98 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.0 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	46.8Ω+ 3.76jΩ
Return Loss	- 25.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	55.2Ω+ 2.38jΩ
Return Loss	- 25.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL Date: 12.10.2013

Test Laboratory: TMC, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 884

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz; σ = 1.817 mho/m; εr = 38.96; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(4.48,4.48,4.48); Calibrated: 2013/9/5
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: SAM 1593; Type: QD000P40CC;
- DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

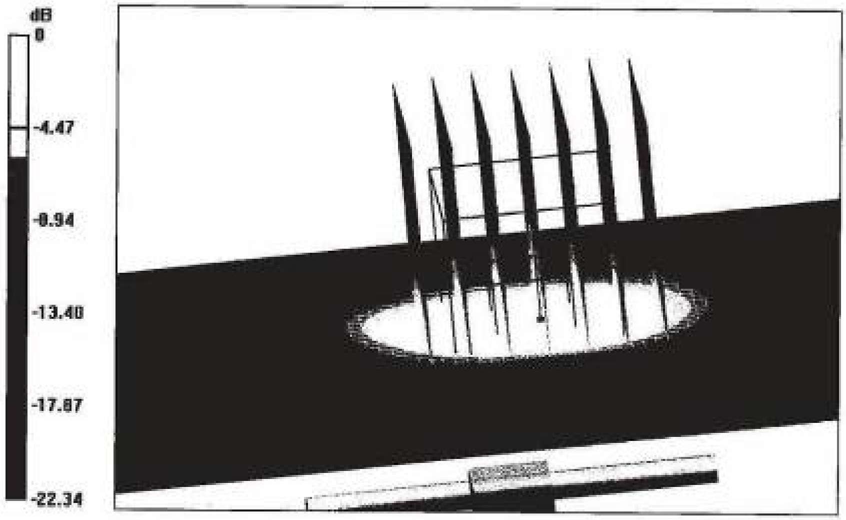
Dipole Calibration for Head Tissue/Pin=250mW, d=10mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 86.529 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 27.0 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 6.05 W/kg

Maximum value of SAR (measured) = 16.2 W/kg



0 dB = 16.2 W/kg = 12.10 dBW/kg

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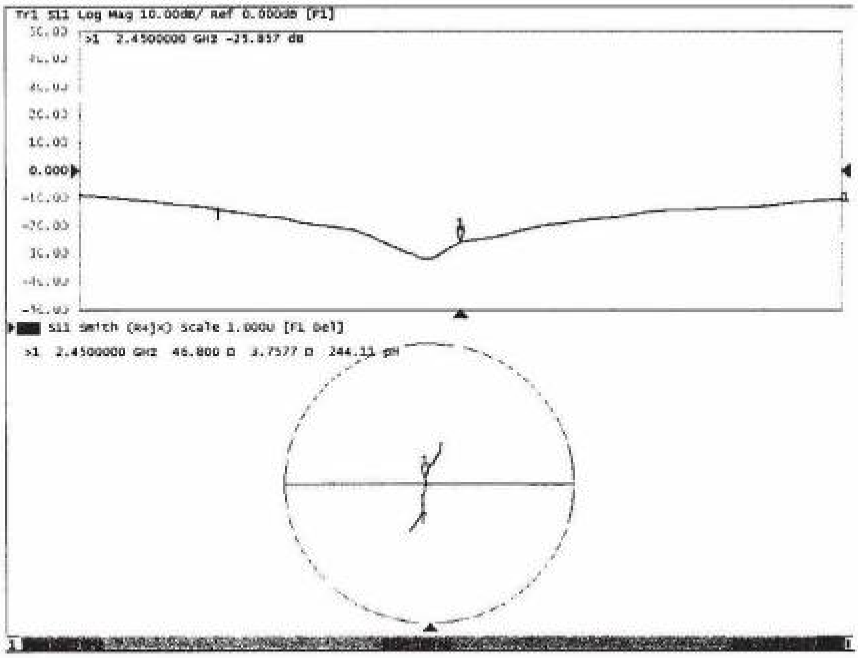
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 12.11.2013

Test Laboratory: TMC, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 884

Communication System: CW; Frequency: 2450 MHz;

Medium parameters used: f = 2450 MHz; σ = 1.939 mho/m; εr = 52.97; ρ = 1000 kg/m^3

Phantom section: Flat Phantom

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DVS - SN3149; ConvF(4.21,4.21,4.21) ; Calibrated: 2013/9/5
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 22/2/2013
- Phantom: SAM1186; Type: QD000P40CC;
- DASY52 52.8.7(1137); SEMCAD X Version 14.6.10 (7164)

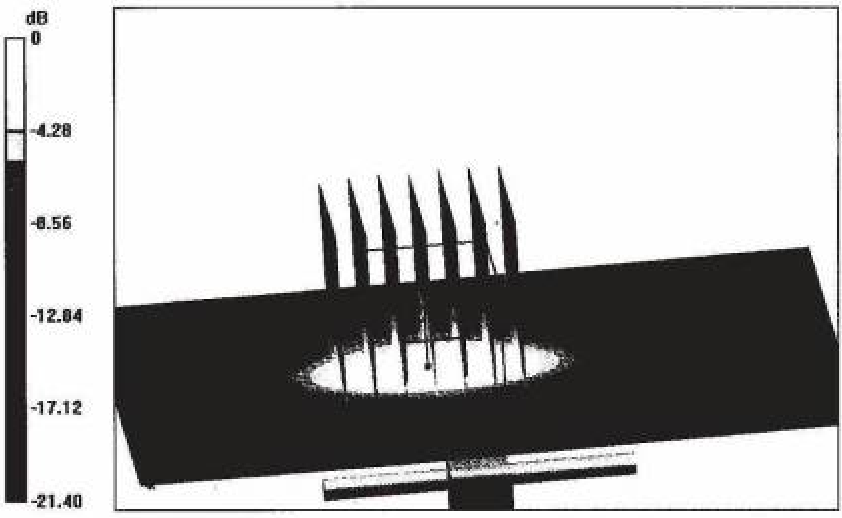
Dipole Calibration for Body Tissue/Pin=250mW, d=10mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 84.687 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.1 W/kg

SAR(1 g) = 12.9 W/kg; SAR(10 g) = 5.98 W/kg

Maximum value of SAR (measured) = 16.0 W/kg



0 dB = 16.0 W/kg = 12.04 dBW/kg

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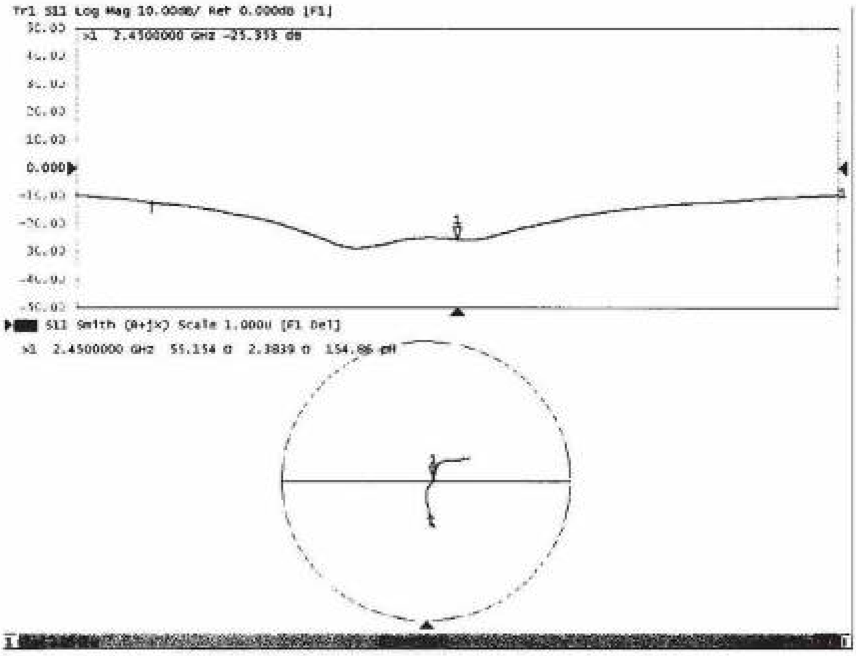
Impedance Measurement Plot for Body TSL



11.5 DAE4 CALIBRATION CERTICATE

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Client : CIQ SZ (Auden) Certificate No: J13-2-3048

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 1315
Calibration Procedure(s)	TMC-OS-E-01-198 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	November 25, 2013

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Documenting Process Calibrator 753	1971018	01-July-13 (TMC, No:JW13-049)	July-14

	Name	Function	Signature
Calibrated by:	Yu zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: November 25, 2013

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Glossary:

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- *DC Voltage Measurement*: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

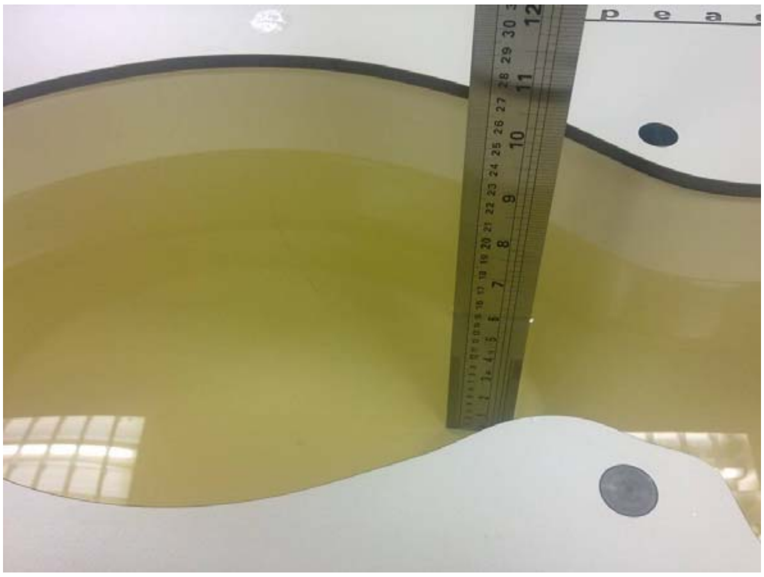
DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	403.915 ± 0.15% (k=2)	405.171 ± 0.15% (k=2)	404.667 ± 0.15% (k=2)
Low Range	3.98903 ± 0.7% (k=2)	3.94180 ± 0.7% (k=2)	3.93862 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	162.5° ± 1 °

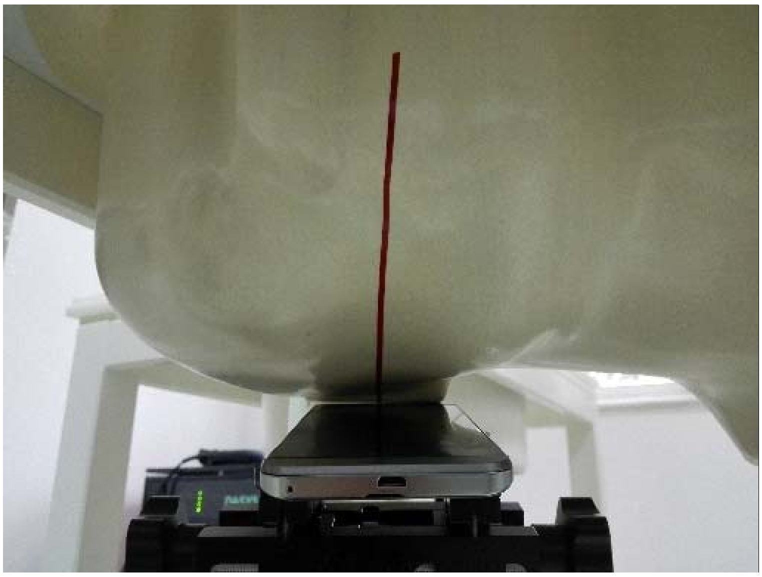
12. EUT TEST PHOTO

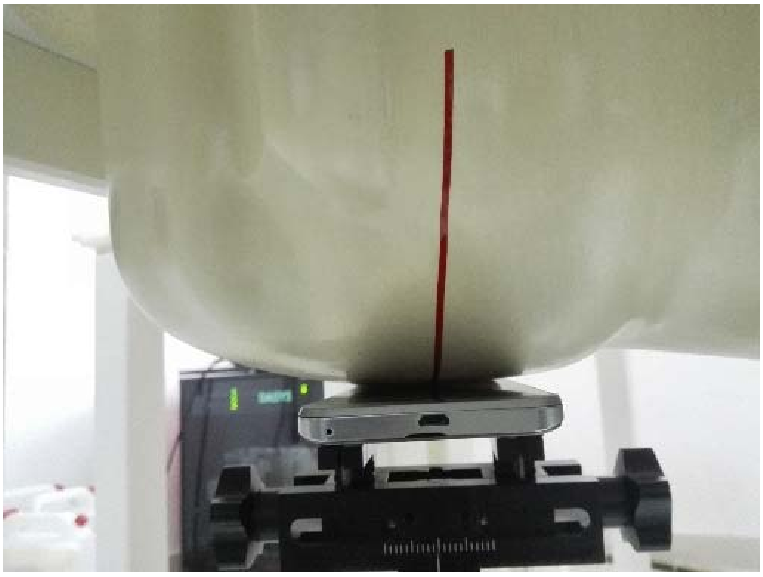


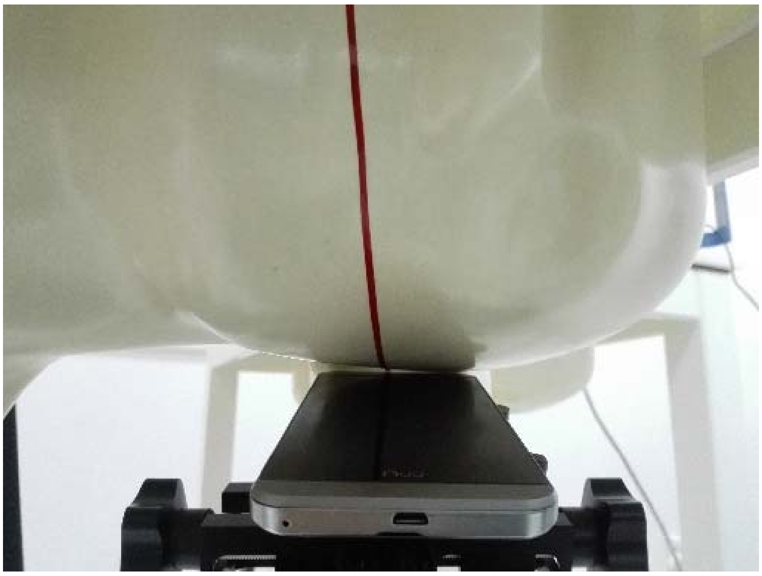
Photograph of the depth in the Phantom (835MHz)

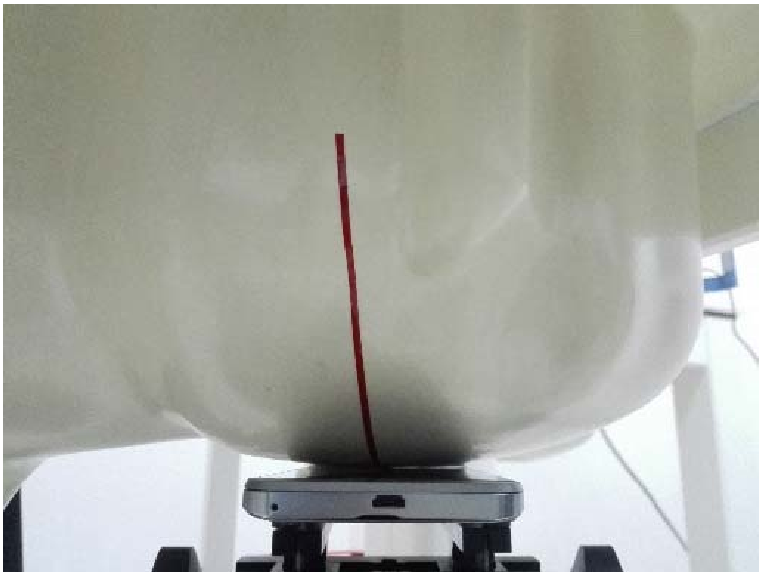
Photograph of the depth in the Head Phantom (1900MHz)

Photograph of the depth in the Phantom (2450MHz)


Right Head Tilt Setup Photo


Right Head Touch Setup Photo


Left Head Tilt Setup Photo



Left Head Touch Setup Photo

0mm Body-worn Rear Setup Photo

0mm Body-worn Front Side Setup Photo

0mm Body-worn Left SideSetup Photo

0mm Body-worn Right Side Setup Photo

0mm Body-worn Top Side Setup Photo

0mm Body-worn Bottom Side Setup Photo

13. PHOTOGRAPHS OF EUT CONSTRUCTIONAL

Reference to the test report No. GTI20140490F-1

**********************THE END***********************