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TEST REPORT

Report Reference No. ..... :	**TRE15100202**	R/C…….:	67318
FCC ID ..... :	**2AGEH-G1815**		
Applicant's name ..... :	**Rivercell International Corp**		
Address.....:	8202 NW 70th Street Suite 3 Miami FL 33166		
Manufacturer.....:	GPLUS TELECOM CO.,LTD.		
Address.....:	Room 505-507,East Science And Technology Building, Keyuan Road Science And Technology Park,Nanshan,Shenzhen,China		
Test item description ..... :	**GSM Mobile Phone**		
Trade Mark .....:	-		
Model/Type reference.....:	G1815		
Listed Model(s) .....:	--		
Standard ..... :	**FCC 47 CFR Part2.1093** **ANSI/IEEE C95.1: 1999** **IEEE 1528: 2013**		
Date of receipt of test sample……..:	Oct 30,2015		
Date of testing……:	Nov 02,2015- Nov 03,2015		
Date of issue……...:	Nov 11,2015		
Result..... ……..:	**PASS**		

Compiled by (position+printedname+signature)...:	File administrators:Candy Liu	Candy Liu
Supervised by (position+printedname+signature)...:	Test Engineer: Hans Hu	Hans Hu
Approved by (position+printedname+signature)...:	Manager: Hans Hu	Hans Hu

Testing Laboratory Name ..... :	**Shenzhen Huatongwei International Inspection Co., Ltd**
Address.....:	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

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The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1. Test Standards and Test Desciption 3
1.1. Test Standards 3
1.2. Test Description 3
2. Summary 4
2.1. Client Information 4
2.2. Product Description 4
2.3. EUT configuration 5
2.4. Modifications 5
3. Test Environment 6
3.1. Address of the test laboratory 6
3.2. Test Facility 6
3.3. Environmental conditions 7
4. Equipments Used during the Test 7
5. Measurement Uncertainty 8
6. SAR Measurements System Configuration 9
6.1. SAR Measurement Set-up 9
6.2. DASY5 E-field Probe System 10
6.3. Phantoms 11
6.4. Device Holder 11
7. SAR Test Procedure 12
7.1. Scanning Procedure 12
7.2. Data Storage and Evaluation 13
8. Position of the wireless device in relation to the phantom 15
8.1. Head Position 15
8.2. Body Position 16
9. System Check 17
9.1. Tissue Dielectric Parameters 17
9.2. SAR System Check 19
10. SAR Exposure Limits 25
11. Conducted Power Measurement Results 26
12. Maximum Tune-up Limit 28
13. Antenna Location 28
14. SAR Measurement Results 29
15. Simultaneous Transmission analysis 37
16. TestSetup Photos 39
17. External and Internal Photos of the EUT 41

1 . Test Standards and Test Desciption

1.1. Test Standards

The tests were performed according to following standards:

FCC 47 Part 2.1093 Radiofrequency Radiation Exposure Evaluation:Portable Devices
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.
IEEE Std 1528™-2013: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.
KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r03: SAR Measurement Requirements for 100 MHz to 6 GHz
KDB865664 D02 SAR Reporting v01r01: RF Exposure Compliance Reporting and Documentation Considerations
KDB 447498 D01 Mobile Portable RF Exposure v05r02: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
KDB 248227 D01 SAR meas for 802 11 a b g v01r02: SAR Measurement Proceduresfor802.11 a/b/g Transmitters
KDB 648474 D04 Handset SAR v01r02: SAR Evaluation Considerations for Wireless Handsets
KDB 941225 D01 SAR test for 3G devices v02: SAR Measurement Procedures for 3G Devices
KDB941225 D03 Test Reduction GSM_GPRS_EDGE V01 : Recommended SAR Test Reduction Procedures for GSM/GPRS/EDGE
KDB 941225 D04 v01: SAR for GSM EGPRS Dual Xfer Mode
KDB 941225 D05 SAR for LTE Devices v02r03: SAR Evaluation Considerations for LTE Devices
KDB 941225 D06 Hotspot Mode SAR v01r01: SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

1.2. Test Description

The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power

2. Summary

2.1. Client Information

Applicant:	Rivercell International Corp
Address:	8202 NW 70th Street Suite 3 Miami FL 33166
Manufacturer:	GPLUS TELECOM CO.,LTD.
Address:	Room 505-507,East Science And Technology Building, Keyuan Road Science And Technology Park,Nanshan,Shenzhen,China

2.2. Product Description

Name of EUT	GSM Mobile Phone
Trade Mark:	-
Model No.:	G1815
Listed Model(s):	--
Device Category:	Portable
RF Exposure Environment:	General Population / Uncontrolled
Power supply:	DC 3.7V From internal battery
Adapter information:	Model:G1815 Input:AC 100-240V 50/60Hz 0.15A Output:5Vd.c.,500mA
Hardware version:	WJT_X600A_012
Software version:	X600_WJT_012_V01
Maximum SAR Value	
Separation Distance:	Head: 0mm Body: 10mm
Max Report SAR Value (1g):	Head: **0.647 W/Kg** Body: **0.709 W/Kg**
2G	
Support Network:	GSM, GPRS
Support Band:	GSM850, DCS1900
Modulation:	GSM/GPRS: GMSK
Transmit Frequency:	GSM850: 824.20MHz-848.80MHz PCS1900: 1850.20MHz-1909.80MHz
Receive Frequency:	GSM850: 869.20MHz-893.80MHz PCS1900: 1930.20MHz-1989.80MHz
GPRS Class:	12
Antenna type:	Intergal Antenna
Bluetooth	
Version:	Supported BT4.0+EDR
Modulation:	GFSK, π/4DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	Integral Antenna

2.3. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- ● - supplied by the manufacturer
- ○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

2.4. Modifications

No modifications were implemented to meet testing criteria.

3. Test Environment

3.1. Address of the test laboratory

Laboratory:Shenzhen Huatongwei International Inspection Co., Ltd.
Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China
Phone: 86-755-26748019 Fax: 86-755-26748089

3.2. Test Facility

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

CNAS-Lab Code: L1225
Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: February 28, 2015. Valid time is until February 27, 2018.

A2LA-Lab Cert. No. 3902.01
Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until December 31, 2016.

FCC-Registration No.: 317478
Shenzhen Huatongwei International Inspection 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 317478, Renewal date Jul. 18, 2014, valid time is until Jul. 18, 2017.

IC-Registration No.: 5377A&5377B
The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377A on Dec. 31, 2013, valid time is until Dec. 31, 2016.
Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B on Dec.03, 2014, valid time is until Dec.03, 2017.

ACA
Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

VCCI
The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2484. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 29, 2015.
Radiated disturbance above 1GHz measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-292. Date of Registration: Dec. 24, 2013. Valid time is until Dec. 23, 2016.
Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 19, 2015.
Telecommunication Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-1837. Date of Registration: May 07, 2013. Valid time is until May 06, 2016.

DNV
Shenzhen Huatongwei International Inspection Co., Ltd. has been found to comply with the requirements of DNV towards subcontractor of EMC and safety testing services in conjunction with the EMC and Low voltage Directives and in the voluntary field. The acceptance is based on a formal quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025 (2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors. Valid time is until Aug. 24, 2016.

3.3. Environmental conditions

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

Temperature:	18-25 ° C
Humidity:	40-65 %
Atmospheric pressure:	950-1050mbar

4. Equipments Used during the Test

Test Equipment	Manufacturer	Type/Model	Serial Number	Calibration	
				Last Calibration	Calibration Interval
Data Acquisition Electronics DAEx	SPEAG	DAE4	1315	2015/07/22	1
E-field Probe	SPEAG	ES3DV3	3292	2015/08/15	1
System Validation Dipole 835V2	SPEAG	D835V2	4d134	2014/12/13	1
System Validation Dipole D900V2	SPEAG	D900V2	1d129	2015/09/01	1
System Validation Dipole D1750V2	SPEAG	D1750V2	1062	2015/07/25	1
System Validation Dipole D1900V2	SPEAG	D1900V2	5d150	2014/12/12	1
System Validation Dipole 2450V2	SPEAG	D2450V2	884	2015/09/01	1
Dielectric Probe Kit	Agilent	85070E	US44020288	/	/
Power meter	Agilent	E4417A	GB41292254	2015/10/26	1
Power sensor	Agilent	8481H	MY41095360	2015/10/26	1
Network analyzer	Agilent	8753E	US37390562	2015/10/25	1
Universal Radio Communication Tester	ROHDE & SCHWARZ	CMU200	112012	2015/10/23	1

Note:
The Probe,Dipole and DAE calibration reference to the Appendix A.

5. Measurement Uncertainty

No.	Error Description	Type	Uncertainty Value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	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-reflection	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 evalation	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 cpermittivity (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%	∞

6. SAR Measurements System Configuration

6.1. 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.

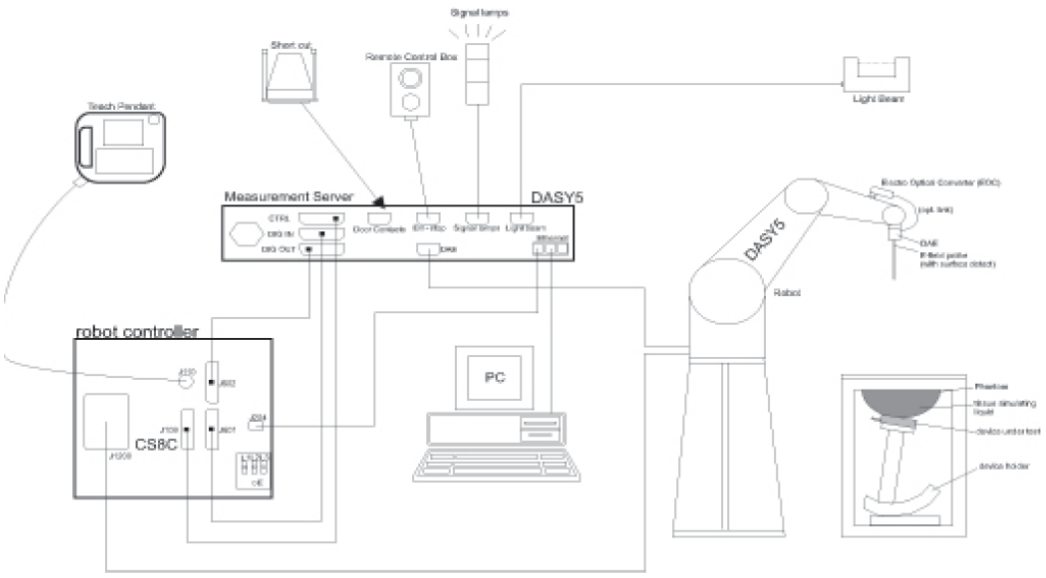
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

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.



6.2. 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)

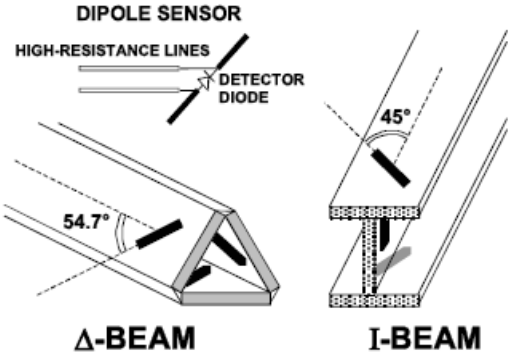
Calibration ISO/IEC 17025 calibration service available.

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:



6.3. 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 fiberglass 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

6.4. 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 centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

Device holder supplied by SPEAG

7. SAR Test Procedure

7.1. 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 7x7x5 points within a cube whose base is centered 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 Shepard’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 Shepard’s method for extrapolation. For a grid using 7x7x5 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 7x7x5 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

7.2. 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:

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

Vi: compensated signal of channel (i = x, y, z)
Ui: input signal of channel (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:

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

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

Vi: compensated signal of channel (i = x, y, z)
Normi: sensor sensitivity of channel (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.

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

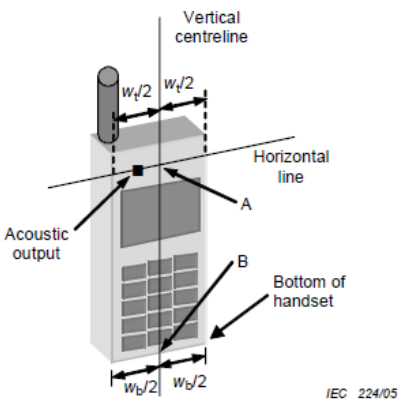
SAR: local specific absorption rate in mW/g
Etot: total field strength in V/m
σ: conductivity in [mho/m] or [Siemens/m]
ρ: equivalent tissue density in g/cm3

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.

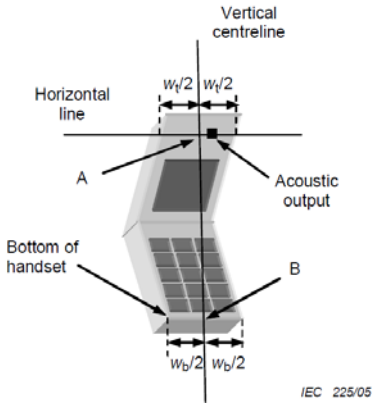
8. Position of the wireless device in relation to the phantom

8.1. Head Position

The wireless device define two imaginary lines on the handset, the vertical centreline and the horizontal line, for the handset in vertical orientation as shown in Figures 5a and 5b.
The vertical centreline passes through two points on the front side of the handset: the midpoint of the width W_t of the handset at the level of the acoustic output (point A in Figures 5a and 5b), and the midpoint of the width W_b of the bottom of the handset (point B).
The horizontal line is perpendicular to the vertical centreline and passes through the centre of the acoustic output (see Figures 5a and 5b). The two lines intersect at point A.
Note that for many handsets, point A coincides with the centre of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centreline is not necessarily parallel to the front face of the handset (see Figure 5b), especially for clam-shell handsets, handsets with flip cover pieces, and other irregularly shaped handsets.



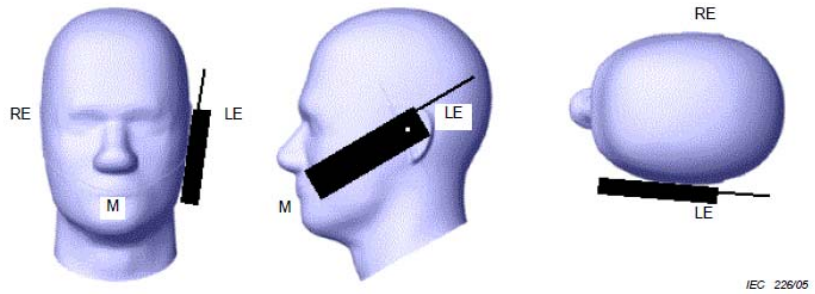
Figures 5a



Figures 5b

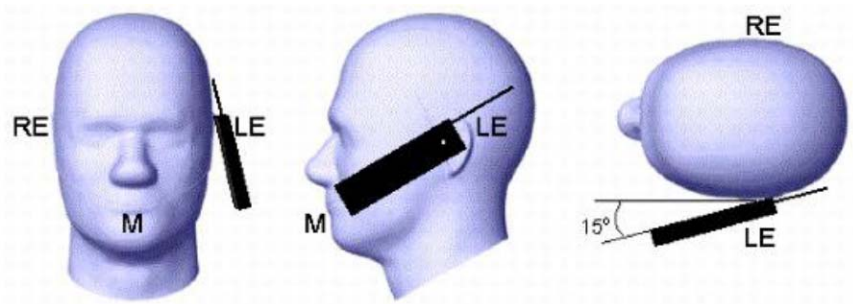
W_t	Width of the handset at the level of the acoustic
W_b	Width of the bottom of the handset
A	Midpoint of the widthwt of the handset at the level of the acoustic output
B	Midpoint of the width wb of the bottom of the handset

Cheek position



Picture 2 Cheek position of the wireless device on the left side of SAM

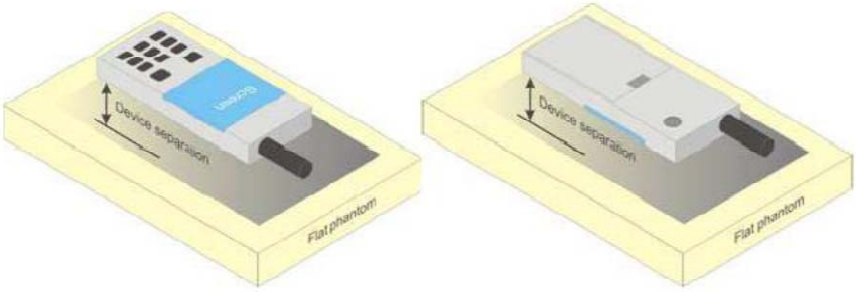
Tilt position



Picture 3 Tilt position of the wireless device on the left side of SAM

8.2. Body Position

A typical example of a body-worn device is a mobile phone, wireless enabled PDA or other battery operated wireless device with the ability to transmit while mounted on a person's body using a carry accessory approved by the wireless device manufacturer.



Picture 4 Test positions for body-worn devices

9. System Check

9.1. Tissue Dielectric Parameters

The liquid is consisted of water,salt,Glycol,Sugar,Preventol and Cellulose.The liquid has previously been proven to be suited for worst-case.The table 3 and table 4 show the detail solition.It's satisfying the latest tissue dielectric parameters requirements proposed by the KDB865664.

Tissue dielectric parameters for head and body phantoms				
Target Frequency	Head		Body	
(MHz)	εr	σ(s/m)	εr	σ(s/m)
150	52.3	0.76	61.9	0.80
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	0.98	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

Check Result:

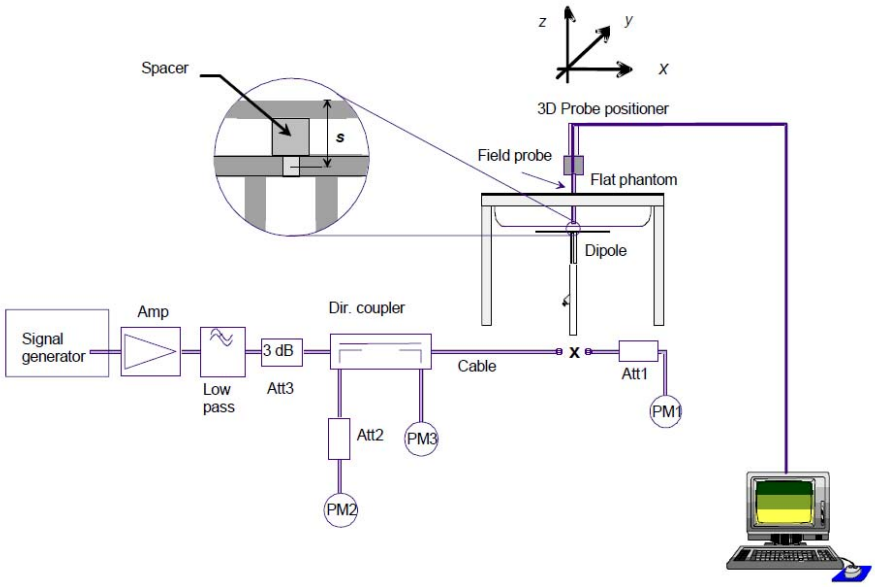
Dielectric performance of Head tissue simulating liquid				
Frequency (MHz)	Description	DielectricParameters		Temp
		εr	σ(s/m)	℃
835	Recommended result ±5% window	41.50 39.43 to 43.58	0.90 0.86 to 0.95	/
	Measurement value 2015-10-02	41.48	0.91	21
1900	Recommended result ±5% window	40.0 38.00 to 42.00	1.40 1.33 to 1.47	/
	Measurement value 2015-10-03	40.01	1.41	21

Dielectric performance of Body tissue simulating liquid				
Frequency (MHz)	Description	DielectricParameters		Temp
		εr	σ(s/m)	℃
835	Recommended result ±5% window	55.2 52.44 to 57.96	0.97 0.92 to 1.02	/
	Measurement value 2015-10-02	55.10	0.97	21
1900	Recommended result ±5% window	53.3 50.64 to 55.97	1.52 1.44 to 1.60	/
	Measurement value 2015-10-03	53.21	1.51	21

9.2. SAR System Check

The purpose of the system check is to verify that the system operates within its specifications at the decice 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

Check Result:

Head				
Frequency (MHz)	Description	SAR(W/kg)		Temp
		1g	10g	℃
835	Recommended result ±5% window	2.41 2.29 - 2.53	1.57 1.49 - 1.65	/
	Measurement value 2015-10-02	2.37	1.56	21
1900	Recommended result ±5% window	9.71 9.22 - 10.20	5.08 4.83 - 5.33	/
	Measurement value 2015-10-03	9.66	4.98	21

Body				
Frequency (MHz)	Description	SAR(W/kg)		Temp
		1g	10g	℃
835	Recommended result ±5% window	2.47 2.35 - 2.59	1.64 1.55 - 1.71	/
	Measurement value 2015-10-02	2.45	1.63	21
1900	Recommended result ±5% window	9.98 9.48 – 10.48	5.26 5.00 – 5.52	/
	Measurement value 2015-10-03	9.91	5.23	21

Note:

1. *the graph results see follow.*
2. *Recommended Values used derive from the calibration certificate and 250 mW is used asfeeding power to the calibrated dipole.*

System Performance Check at 835 MHz Head

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

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 835 MHz; σ = 0.91 S/m; εr = 41.48; ρ = 1000 kg/m3
Phantom section: Flat Section

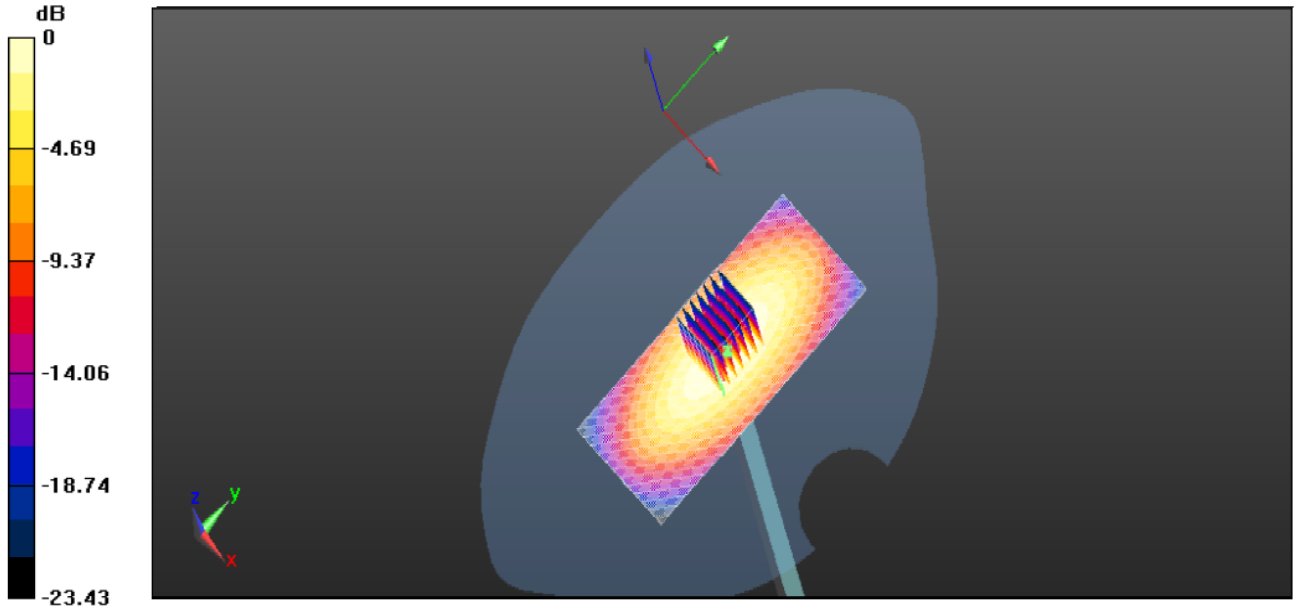
DASY5 Configuration:
•Probe: ES3DV3 - SN3292; ConvF(6.1, 6.1, 6.1); Calibrated: 15/08/2015;
•Sensor-Surface: 4mm (Mechanical Surface Detection)
•Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
•Phantom: SAM 1; Type: SAM;
•Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

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 = 0.08 dB
Peak SAR (extrapolated) = 3.542 W/kg

SAR(1 g) = 2.37 mW/g; SAR(10 g) = 1.56 mW/g

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



System Performance Check 835MHz Head 250mW

System Performance Check at 835 MHz Body

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

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 835 MHz; σ = 0.97 S/m; ε_r = 55.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

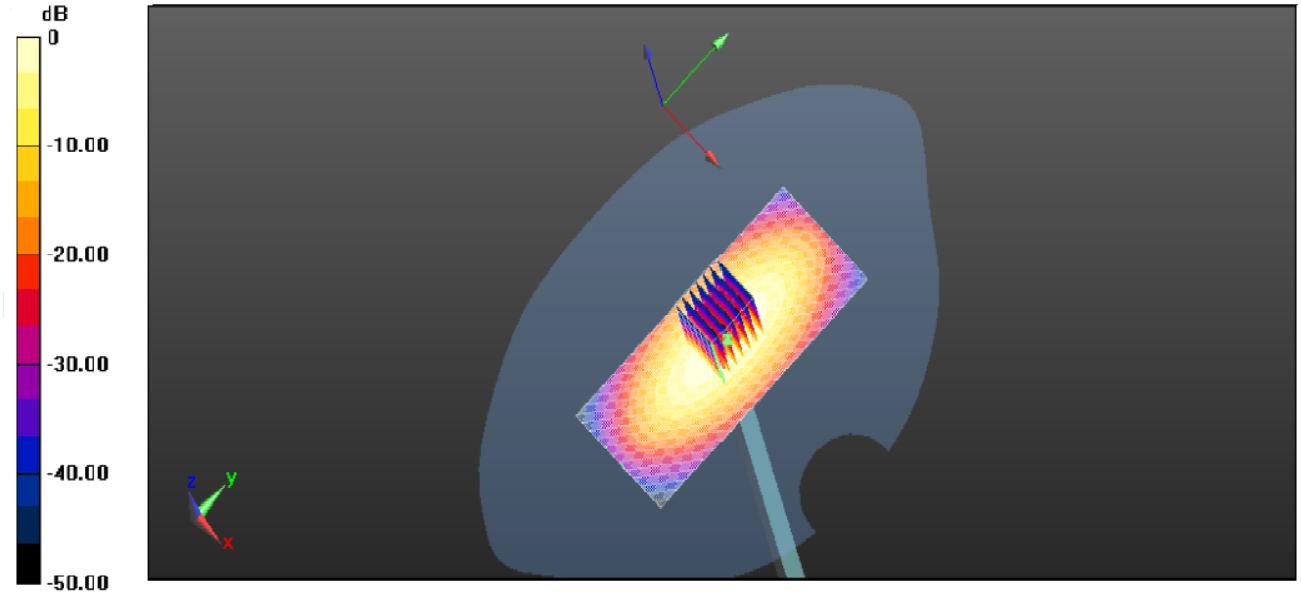
DASY5 Configuration:
•Probe: ES3DV3 - SN3292; ConvF(6.1, 6.1, 6.1); Calibrated: 15/08/2015;
•Sensor-Surface: 4mm (Mechanical Surface Detection)
•Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
•Phantom: SAM 1; Type: SAM;
•Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (61x91x1): Measurement grid: dx=15.00 mm, dy=15.00 mm
Maximum value of SAR (interpolated) = 2.45 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) = 2.562 W/kg

SAR(1 g) = 2.45 mW/g; SAR(10 g) = 1.63 mW/g

Maximum value of SAR (measured) = 2.46 mW/g



System Performance Check 835MHz Body 250mW

System Performance Check at 1900 MHz Head

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

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1900 MHz; σ = 1.41S/m; εr = 40.01; ρ = 1000 kg/m3
Phantom section: Flat Section

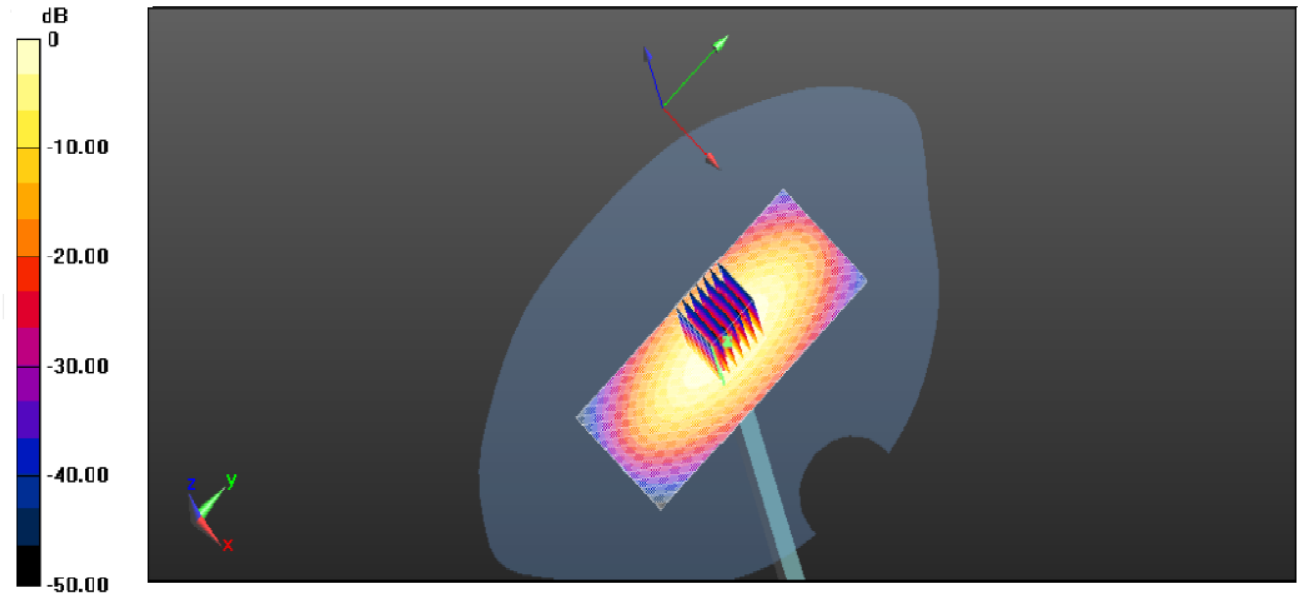
DASY5 Configuration:
Probe: ES3DV3 - SN3292; ConvF(5.07,5.07,5.07); Calibrated: 15/08/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
Phantom: SAM 1; Type: SAM;
Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

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) = 9.66 W/kg; SAR(10 g) = 4.98 W/kg

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



System Performance Check 1900MHz Head250mW

System Performance Check at 1900 MHz Body

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

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1900 MHz; σ = 1.51S/m; εr = 53.21; ρ = 1000 kg/m3
Phantom section: Flat Section

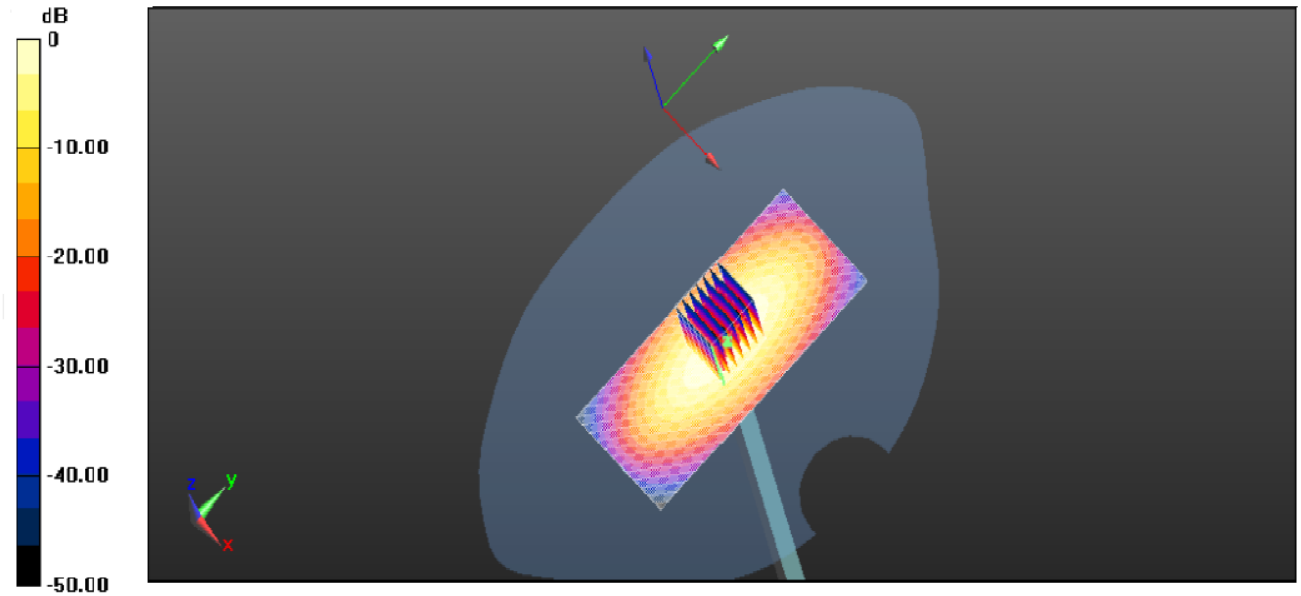
DASY5 Configuration:
Probe: ES3DV3 - SN3292; ConvF(5.07,5.07,5.07); Calibrated: 15/08/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
Phantom: SAM 1; Type: SAM;
Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

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) = 9.91 mW/g; SAR(10 g) = 5.23 mW/g

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



System Performance Check 1900MHz Body250mW

10. SAR Exposure Limits

SAR assessments have been made in line with the requirements of ANSI/IEEE C95.1-1992

Type Exposure	Limit (W/kg)	
	General Population / Uncontrolled Exposure Environment	Occupational / Controlled Exposure Environment
Spatial Average SAR (whole body)	0.08	0.4
Spatial Peak SAR (1g cube tissue for head and trunk)	1.60	8.0
Spatial Peak SAR (10g for limb)	4.0	20.0

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

Occupational/Controlled Environments: are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

11. Conducted Power Measurement Results

GSM Conducted Power

1. *Per KDB 447498 D01v0502, the maximum output power channel is used for SAR testing and further SAR test reduction*
2. *Per KDB 941225 D01v03, considering the possibility of e.g. 3rd party VoIP operation for Head and Body-worn SAR test reduction for GSM and GPRS modes is determined by the source-base time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the EUT was set in GPRS (4Tx slots) for GSM850 and GPRS (4Tx slots) for PCS1900.*
3. *Per KDB941225 D01v03, for hotspot SAR test reduction for GPRS modes is determined by the source-based time-averaged output power including tune-up tolerance, For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the EUT was set in GPRS (4Tx slots) for GSM850 and GPRS (4Tx slots) for PCS1900.*

Mode: GSM850		**Burst Average Power (dBm)**			Division Factors	**Frame-Averager Power (dBm)**		
		CH128	CH190	CH251		CH128	CH190	CH251
		824.2MHz	836.6MHz	848.8MHz		824.2MHz	836.6MHz	848.8MHz
GSM		33.52	33.45	33.41	-9.03	24.49	24.42	24.38
GPRS (GMSK)	1TXslot	33.49	33.43	33.40	-9.03	24.46	24.40	24.37
	2TXslots	31.78	31.61	31.54	-6.02	25.76	25.59	25.52
	3TXslots	30.77	30.69	30.60	-4.26	26.51	26.43	26.34
	4TXslots	29.70	29.50	29.47	-3.01	26.69	26.49	26.46
Mode: PCS1900		**Burst Average Power (dBm)**			Division Factors	**Frame-Averager Power (dBm)**		
		CH512	CH661	CH810		CH512	CH661	CH810
		1850.2MHz	1880.0MHz	1909.8MHz		1850.2MHz	1880.0MHz	1909.8MHz
GSM		30.55	30.84	30.65	-9.03	21.52	21.81	21.62
GPRS (GMSK)	1TXslot	30.52	30.82	30.64	-9.03	21.49	21.79	21.61
	2TXslots	28.75	28.99	28.75	-6.02	22.73	22.97	22.73
	3TXslots	27.22	27.49	27.32	-4.26	22.96	23.23	23.06
	4TXslots	26.52	26.75	26.57	-3.01	23.51	23.74	23.56

Note:

1) Division Factors

To Frame-Average 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

Bluetooth Conducted Power

General note:

Per KDB 447498 D01v05r02, the 1-g and 10-g SAR test exclusion thresholds for 100MHz to 6GHz at test separation distances ≦50mm are determined by:

[(max. Power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] * [√f(GHz)] ≦3.0 for 1-g SAR and ≦ 7.5 for 10-g extremity SAR

Bluetooth			
Mode	Channel	Frequency (MHz)	Conducted power (dBm)
GFSK	00	2402	5.07
	39	2441	5.70
	78	2480	5.67
π/4QPSK	00	2402	4.42
	39	2441	4.91
	78	2480	5.02
8DPSK	00	2402	4.33
	39	2441	4.85
	78	2480	4.92

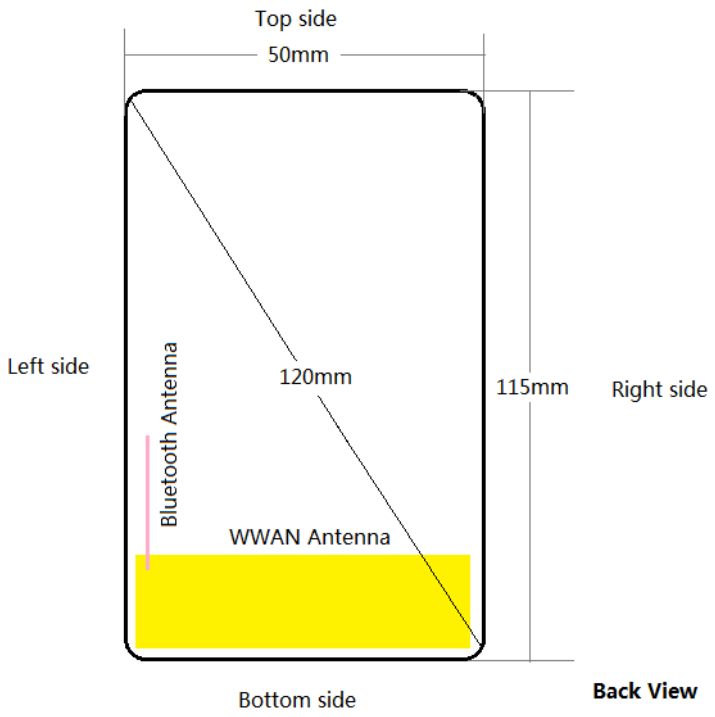
Per KDB 447498 D01v05r02, when the minimum test separation distance is <5mm, a distance of 5mm is applied to determine SAR test exclusion. The test exclusion thereshold is 0.6 which is ≦3, SAR testing is not required.

12. Maximum Tune-up Limit

Mode	Burst Average Power (dBm)	
	GSM850	PCS1900
GSM (GMSK, 1Tx Slot)	34.00	31.00
GPRS (GMSK, 1Tx Slot)	34.00	31.00
GPRS (GMSK, 2Tx Slot)	32.00	29.00
GPRS (GMSK, 3Tx Slot)	31.00	28.00
GPRS (GMSK, 4Tx Slot)	30.00	27.00

Mode	Burst Average Power (dBm)
Bluetooth V2.1+EDR	6.00

13. Antenna Location



Distance of the Antenna to the EUT surface/edge						
Antenna	Back	Front	Top side	Bottom side	Right side	Left side
WWAN	≦25mm	≦25mm	95mm	≦25mm	≦25mm	≦25mm
Bluetooth	≦25mm	≦25mm	≦25mm	70mm	40mm	≦25mm

Positions for SAR tests; Hotspot mode						
Antenna	Back	Front	Top side	Bottom side	Right side	Left side
WWAN	Yes	Yes	No	Yes	Yes	Yes
Bluetooth	Yes	Yes	Yes	No	No	Yes

General note:
Referring to KDB941225 D06 v02, when the overall device length and width are >9cm*5cm, the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

14. SAR Measurement Results

Head SAR

GSM850									
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)
		CH	MHz						
GPRS (4Tx slot)	Left-Cheek	128	824.2	29.70	30.00	1.07	-	-	-
		190	836.6	29.50	30.00	1.12	0.02	0.429	**0.481**
		251	848.8	29.47	30.00	1.13	-	-	-
	Left-Tilt	128	824.2	29.70	30.00	1.07	-	-	-
		190	836.6	29.50	30.00	1.12	-0.06	0.322	0.361
		251	848.8	29.47	30.00	1.13	-	-	-
	Right-Cheek	128	824.2	29.70	30.00	1.07	-	-	-
		190	836.6	29.50	30.00	1.12	0.07	0.378	0.423
		251	848.8	29.47	30.00	1.13	-	-	-
	Right-Tilt	128	824.2	29.70	30.00	1.07	-	-	-
		190	836.6	29.50	30.00	1.12	-0.02	0.291	0.327
		251	848.8	29.47	30.00	1.13	-	-	-
Worst case mode - GSM Mode									
GSM	Left-Cheek	190	836.6	33.45	34.00	1.14	-0.13	0.383	0.435

PCS1900									
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)
		CH	MHz						
GPRS (4Tx slot)	Left-Cheek	512	1850.2	26.52	27.00	1.12	-	-	-
		661	1880.0	26.75	27.00	1.06	0.17	0.397	**0.420**
		810	1909.8	26.57	27.00	1.10	-	-	-
	Left-Tilt	512	1850.2	26.52	27.00	1.12	-	-	-
		661	1880.0	26.75	27.00	1.06	0.19	0.284	0.301
		810	1909.8	26.57	27.00	1.10	-	-	-
	Right-Cheek	512	1850.2	26.52	27.00	1.12	-	-	-
		661	1880.0	26.75	27.00	1.06	-0.14	0.337	0.357
		810	1909.8	26.57	27.00	1.10	-	-	-
	Right-Tilt	512	1850.2	26.52	27.00	1.12	-	-	-
		661	1880.0	26.75	27.00	1.06	0.05	0.241	0.256
		810	1909.8	26.57	27.00	1.10	-	-	-
Worst case mode - GSM Mode									
GSM	Left-Cheek	661	1880.00	30.84	31.00	1.04	-0.07	0.356	0.369

Hotspot SAR

Distance of the Antenna to the EUT surface/edge						
Antenna	Back	Front	Top side	Bottom side	Right side	Left side
WWAN	≦25mm	≦25mm	95mm	≦25mm	≦25mm	≦25mm
Bluetooth	≦25mm	≦25mm	≦25mm	70mm	40mm	≦25mm

Positions for SAR tests; Hotspot mode						
Antenna	Back	Front	Top side	Bottom side	Right side	Left side
WWAN	Yes	Yes	No	Yes	Yes	Yes
Bluetooth	Yes	Yes	Yes	No	No	Yes

General note:
Referring to KDB941225 D06 v02, when the overall device length and width are >9cm*5cm, the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

GSM850									
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)
		CH	MHz						
GPRS (4Tx slot)	Front	128	824.2	29.70	30.00	1.07	-	-	-
		190	836.6	29.50	30.00	1.12	0.10	0.368	0.413
		251	848.8	29.47	30.00	1.13	-	-	-
	Back	128	824.2	29.70	30.00	1.07	-	-	-
		190	836.6	29.50	30.00	1.12	-0.01	0.558	**0.626**
		251	848.8	29.47	30.00	1.13	-	-	-
	Left	190	836.6	29.50	30.00	1.12	0.04	0.246	0.275
	Right	190	836.6	29.50	30.00	1.12	0.73	0.143	0.160
	Top	190	836.6	29.50	30.00	1.12	-	-	-
	Bottom	190	836.6	29.50	30.00	1.12	-0.11	0.318	0.357
Worst case mode - GSM Mode									
GSM	Back	190	836.6	33.45	34.00	1.14	-0.07	0.527	0.598

PCS1900									
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)
		CH	MHz						
GPRS (4Tx slot)	Front	512	1850.2	26.52	27.00	1.12	-	-	-
		661	1880.0	26.75	27.00	1.06	-0.10	0.24	0.25
		810	1909.8	26.57	27.00	1.10	-	-	-
	Back	512	1850.2	26.52	27.00	1.12	-	-	-
		661	1880.0	26.75	27.00	1.06	0.12	0.362	**0.383**
		810	1909.8	26.57	27.00	1.10	-	-	-
	Left	661	1880.0	26.75	27.00	1.06	-0.19	0.159	0.169
	Right	661	1880.0	26.75	27.00	1.06	-0.04	0.093	0.098
	Top	661	1880.0	26.75	27.00	1.06	-	-	-
	Bottom	661	1880.0	26.75	27.00	1.06	0.08	0.206	0.219
Worst case mode - GSM Mode									
GSM	Back	661	1880.00	30.84	31.00	1.04	0.03	0.319	0.331

Body SAR

GSM850									
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)
		CH	MHz						
GPRS (4Tx slot)	Front	128	824.2	29.70	30.00	1.07	-	-	-
		190	836.6	29.50	30.00	1.12	0.10	0.368	0.413
		251	848.8	29.47	30.00	1.13	-	-	-
	Back	128	824.2	29.70	30.00	1.07	-	-	-
		190	836.6	29.50	30.00	1.12	-0.01	**0.558**	**0.626**
		251	848.8	29.47	30.00	1.13	-	-	-
	Back with headset	128	824.2	29.70	30.00	1.07	-	-	-
		190	836.6	29.50	30.00	1.12	0.08	0.515	0.577
		251	848.8	29.47	30.00	1.13	-	-	-

PCS1900									
Mode	Test Position	Frequency		Conducted Power (dBm)	Tune up limit (dBm)	Tune up scaling factor	Power Drift(dB)	Measured SAR(1g) (W/kg)	Report SAR(1g) (W/kg)
		CH	MHz						
GPRS (4Tx slot)	Front	512	1850.2	26.52	27.00	1.12	-	-	-
		661	1880.0	26.75	27.00	1.06	-0.10	0.24	0.25
		810	1909.8	26.57	27.00	1.10	-	-	-
	Back	512	1850.2	26.52	27.00	1.12	-	-	-
		661	1880.0	26.75	27.00	1.06	0.12	**0.362**	**0.383**
		810	1909.8	26.57	27.00	1.10	-	-	-

SAR Test Data Plots

Left Head Cheek (GSM850 GPRS 4TSMiddle Channel)

Communication System: Customer System; Frequency:836.6 MHz;Duty Cycle:1:2
Medium parameters used (interpolated): f=836.6 MHz; σ=0.91S/m; εr=41.48; ρ=1000 kg/m3
Phantom section: Left Head Section:

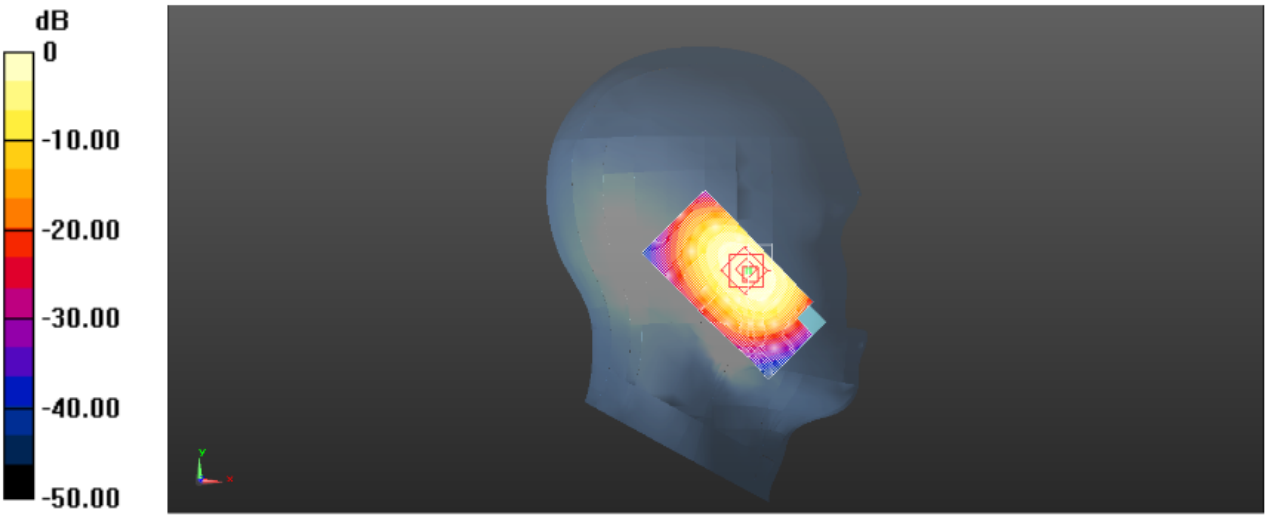
DASY 5 Configuration:
•Probe: ES3DV3 - SN3292; ConvF(6.1, 6.1, 6.1); Calibrated: 15/08/2015;
•Sensor-Surface: 4mm (Mechanical Surface Detection)
•Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
•Phantom: SAM 1; Type: SAM;
•Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) =0.460 W/kg

Zoom Scan (5x5x6)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=5mm
Reference Value =10.680 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.574 mW/g

SAR(1 g) = 0.429 mW/g; SAR(10 g) = 0.301 mW/g

Maximum value of SAR (measured) = 0.450 W/kg



Left Head Cheek (GSM850 GPRS 4TS Middle Channel)

Left Head Tilt (PCS1900 GPRS 4TS Middle Channel)

Communication System: Customer System; Frequency: 1880.0 MHz;Duty Cycle: 1:2
Medium parameters used: f = 1880.0 MHz; σ = 1.41 mho/m; ε = 40.01; ρ = 1000 kg/m 3
Phantom section: Left Head Section

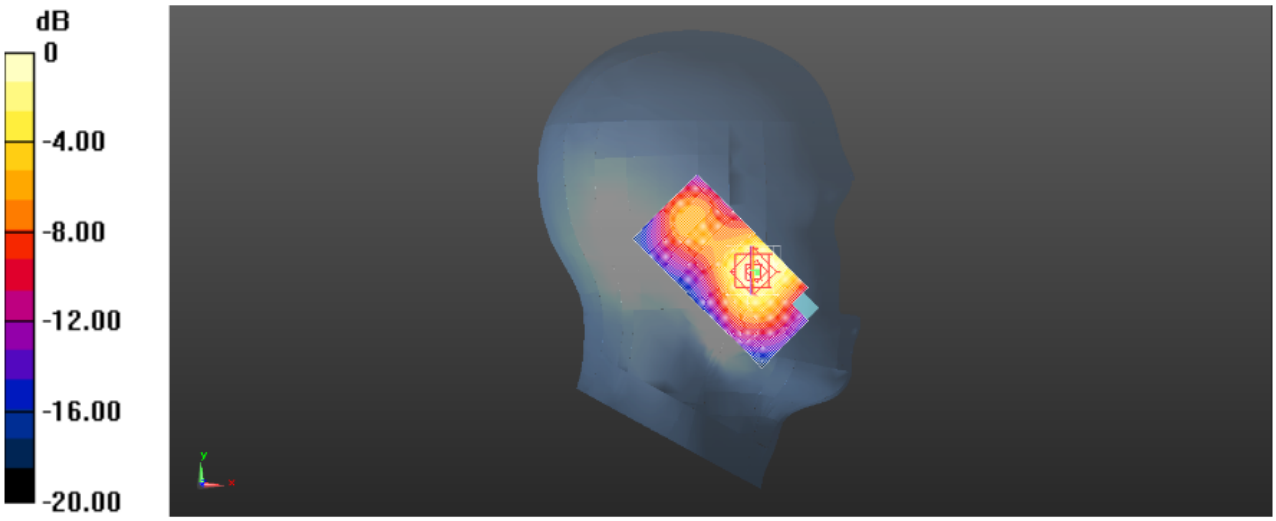
DASY5 Configuration:
•Probe: ES3DV3 - SN3292; ConvF(6.1, 6.1, 6.1); Calibrated: 15/08/2015;
•Sensor-Surface: 4mm (Mechanical Surface Detection)
•Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
•Phantom: SAM 1; Type: SAM;
•Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) =0.428 W/kg

Zoom Scan (5x5x6)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=5mm
Reference Value =8.045 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.578 mW/g

SAR(1 g) = 0.397 mW/g; SAR(10 g) = 0.243 mW/g

Maximum value of SAR (measured) = 0.434 W/kg



Left Head Tilt (DCS1800 Middle Channel)

Body- worn Rear Side (GSM850 GPRS 4TSMiddle Channel)

Communication System: Customer System; Frequency:836.6 MHz;Duty Cycle:1:2
Medium parameters used (interpolated): f=836.6 MHz; σ=0.97S/m; εr=55.10; ρ=1000 kg/m3
Phantom section: Flat Section:

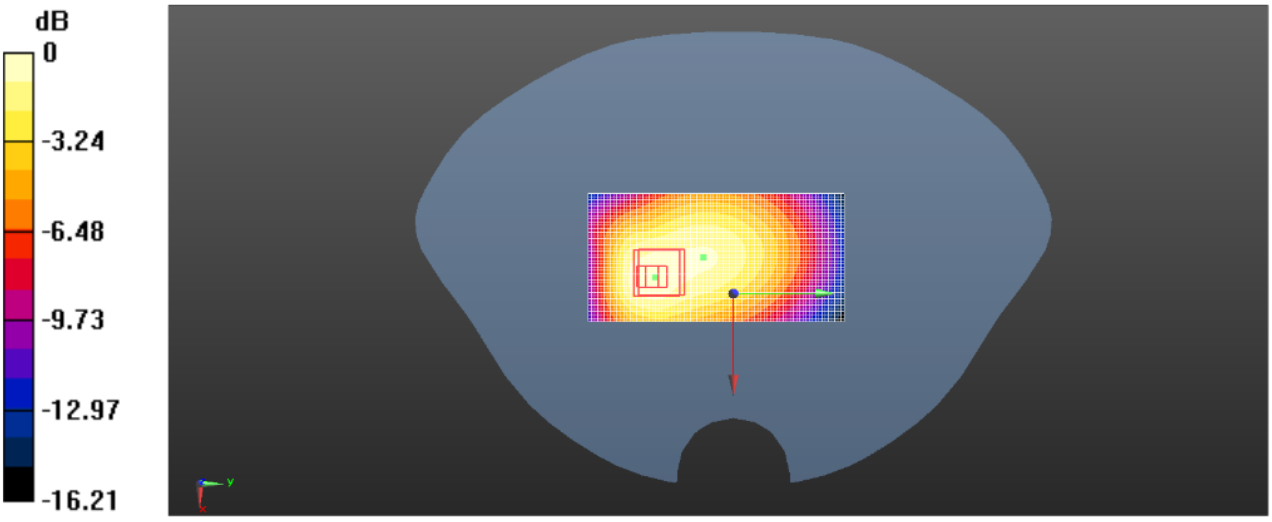
DASY 5 Configuration:
•Probe: ES3DV3 - SN3292; ConvF(6.1, 6.1, 6.1); Calibrated: 15/08/2015;
•Sensor-Surface: 4mm (Mechanical Surface Detection)
•Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
•Phantom: SAM 1; Type: SAM;
•Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) =0.620 W/kg

Zoom Scan (5x5x6)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=5mm
Reference Value =22.269 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.870 mW/g

SAR(1 g) = 0.558 mW/g; SAR(10 g) = 0.367 mW/g

Maximum value of SAR (measured) = 0.600 W/kg



Body- worn Rear Side (GSM850 GPRS 4TS Middle Channel)

Body- worn Rear Side (DCS1900 GPRS 4TS Middle Channel)

Communication System: Customer System; Frequency: 1880.0 MHz;Duty Cycle: 1:2
Medium parameters used: f = 1880.0 MHz; σ = 1.51 mho/m; ε = 53.21; ρ = 1000 kg/m 3
Phantom section: Flat Section

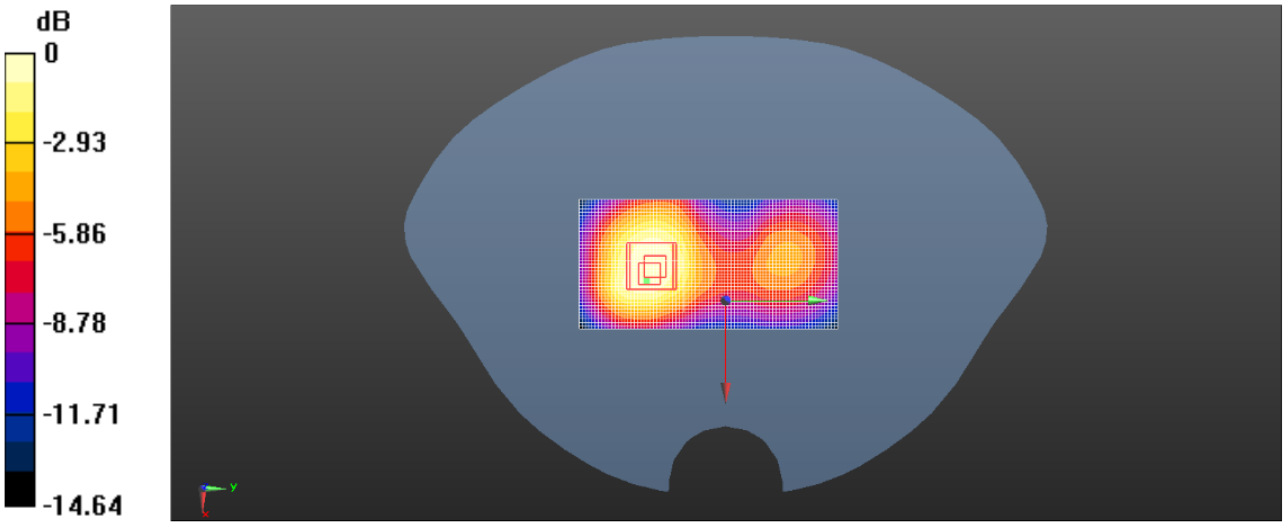
DASY5 Configuration:
•Probe: ES3DV3 - SN3292; ConvF(6.1, 6.1, 6.1); Calibrated: 15/08/2015;
•Sensor-Surface: 4mm (Mechanical Surface Detection)
•Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
•Phantom: SAM 1; Type: SAM;
•Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) =0.401 W/kg

Zoom Scan (5x5x6)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=5mm
Reference Value =7.678 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.618 mW/g

SAR(1 g) = 0.362 mW/g; SAR(10 g) = 0.214 mW/g

Maximum value of SAR (measured) =0.386 W/kg



Body- worn Rear Side (PCS1900 GPRS 4TS Middle Channel)

15. Simultaneous Transmission analysis

No.	Simultaneous Transmission Configurations	Head	Body-worn	Hotspot	Note
1	GSM(voice) + Bluetooth (data)	Yes	Yes		
2	GPRS (data) + Bluetooth (data)	Yes	Yes	Yes	

General note:
1. This device support VoIP in GPRS and WCDMA
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. EUT will choose either GSM or WCDMA according to the network signal condition; therefore, they will not operate simultaneously at any moment.
4. The reported SAR summation is calculated based on the same configuration and test position
5. 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 ≦50mm; whetn 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 1.0W/kg for 10-g SAR, when the test separation distances is >50mm.

Bluetooth Max power	Exposure position	Head	Hotspot	Body worn
	Test separation	0mm	10mm	10mm
6.00dBm	Estimated SAR (W/kg)	0.166W/kg	0.083W/kg	0.083W/kg

Head Exposure condition

WWAN PCE +Bluetooth DSS					
WWAN Band		Exposure Position	Max SAR (W/kg)		Summed SAR (W/kg)
			WWAN PCS	Bleutooth DTS	
GSM	GSM850	Left Cheek	0.481	0.166	**0.647**
		Left Tilted	0.361	0.166	0.527
		Right Cheek	0.423	0.166	0.589
		Right Tilted	0.327	0.166	0.493
	PCS1900	Left Cheek	0.420	0.166	0.586
		Left Tilted	0.301	0.166	0.467
		Right Cheek	0.357	0.166	0.523
		Right Tilted	0.256	0.166	0.422

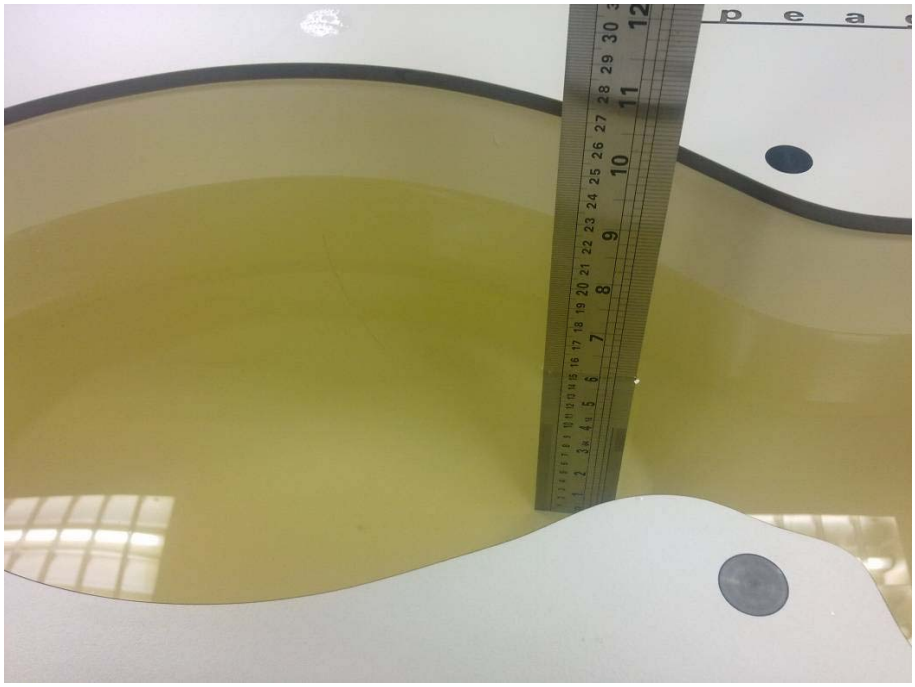
Hotspot Exposure condition

WWAN PCE + Bluetooth DSS					
WWAN Band		Exposure Position	Max SAR (W/kg)		Summed SAR (W/kg)
			WWAN PCS	Bleutooth DTS	
GSM	GSM850	Front	0.413	0.083	0.496
		Back	0.626	0.083	**0.709**
		Left side	0.275	0.083	0.358
		Right side	0.160	0.083	0.243
		Top side	0.000	0.083	0.083
		Bottom side	0.357	0.083	0.440
	PCS1900	Front	0.253	0.083	0.336
		Back	0.383	0.083	0.466
		Left side	0.169	0.083	0.252
		Right side	0.098	0.083	0.181
		Top side	0.000	0.083	0.083
		Bottom side	0.219	0.083	0.302

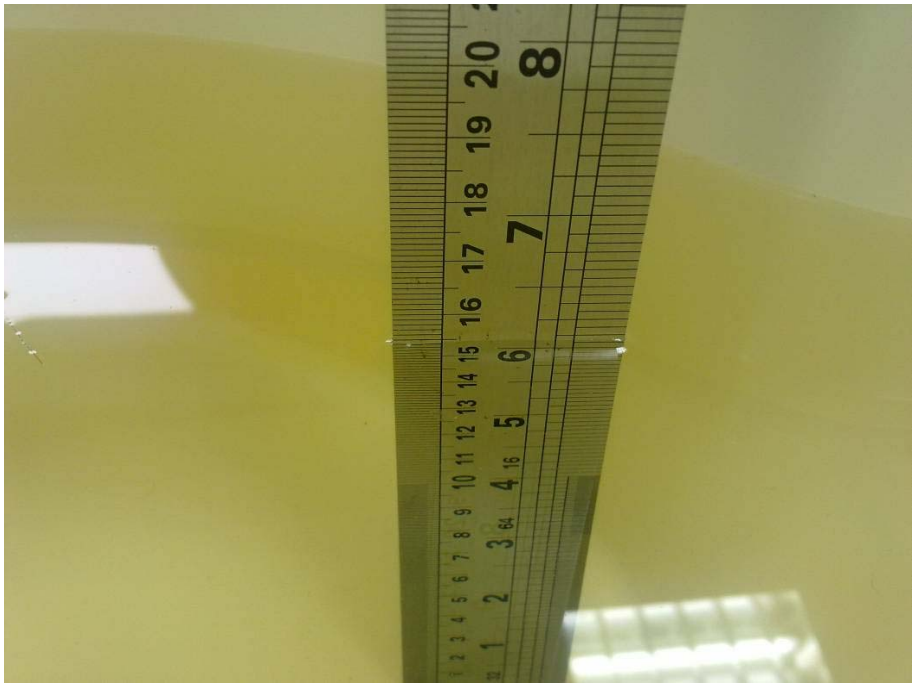
Body-Worn Accessory Exposure condition

WWAN PCE + Bluetooth DSS					
WWAN Band		Exposure Position	Max SAR (W/kg)		Summed SAR (W/kg)
			WWAN PCS	Bleutooth DTS	
GSM	GSM850	Front	0.413	0.083	0.496
		Back	0.626	0.083	**0.709**
		Back with headset	0.577	0.083	0.660
	PCS1900	Front	0.253	0.083	0.336
		Back	0.383	0.083	0.466

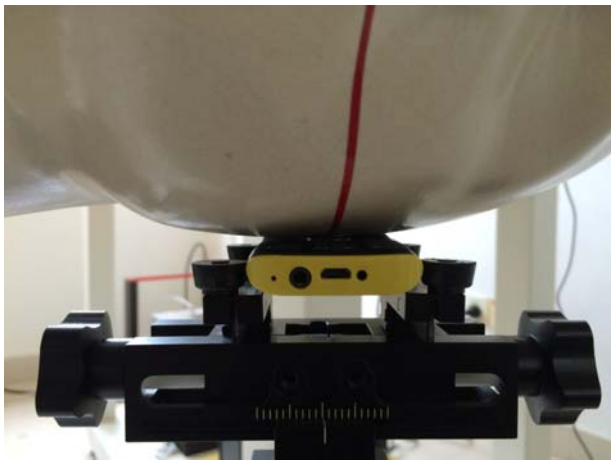
16. TestSetup Photos



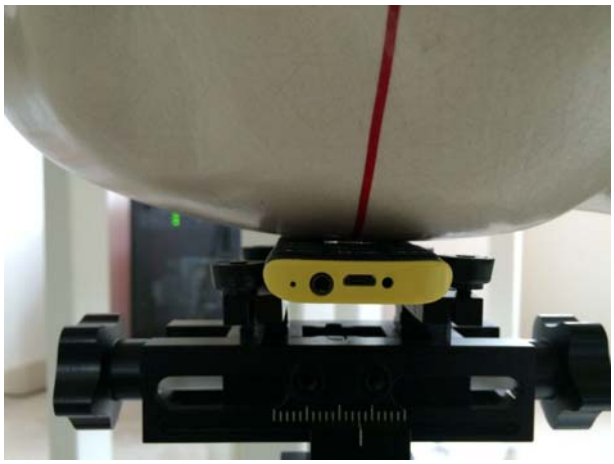
850MHz



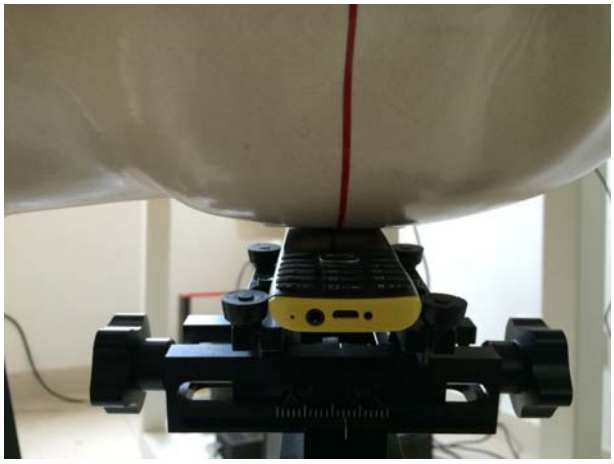
1900MHz



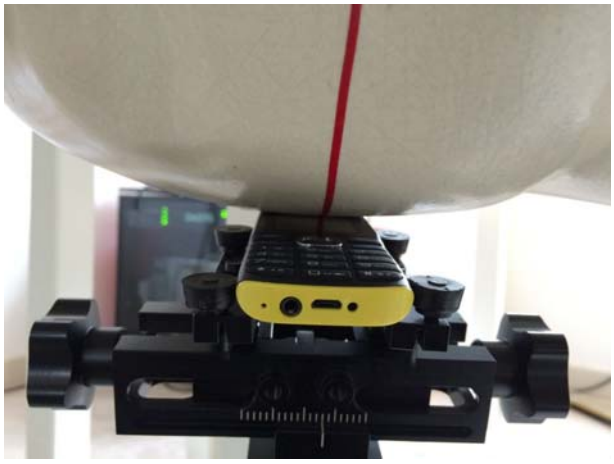
Left Head Touch



Right Head Touch



Left Head Tilt (15°)



Right Head Tilt (15°)

Body-worn Front Side (10mm)

Body-worn Rear Side (10mm)

17. External and Internal Photos of the EUT

Please reference to the report No.: TRE1510020101

---------End of Report----------

1.1. Probe Calibration Certificate

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 (Auden)**

Certificate No: ES3-3292_Aug15

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3292
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	August 15, 2015

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	03-Apr-15 (No. 217-01911)	Apr-16
Power sensor E4412A	MY41498087	03-Apr-15 (No. 217-01911)	Apr-16
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-15 (No. 217-01915)	Apr-16
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-15 (No. 217-01919)	Apr-16
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-15 (No. 217-01920)	Apr-16
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec13)	Dec-15
DAE4	SN: 660	13-Dec-14 (No. DAE4-660_Dec13)	Dec-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-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 15, 2015

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

Certificate No: ES3-3292_Aug15 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
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

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 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.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3292

Manufactured: July 6, 2010
Repaired: July 28, 2015
Calibrated: August 15, 2015

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