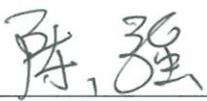
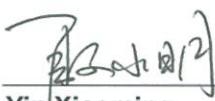


SAR TEST REPORT

Report No. 2014SAR241

FCC ID: SRQ-302ZT
Applicant: ZTE Corporation
Product: WCDMA/GSM (GPRS) Dual-Mode Digital
Mobile Phone
Model: 302ZT
HW Version: wmmB
SW Version: alpha1.0
Issue Date: 2014-10-13

Prepared by: 
Chen Qiang

Reviewed by: 
Yin Xiaoming

Approved by: 
Wang Jianrong
(General Manager) 

Remark: This report details the results of the testing carried out on the samples specified in this report, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. The report shall not be reproduced except in full, without written approval of the Company.

Standards

Applicable Limit Regulations	ANSI/IEEE C95.1-2005 Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields. 3 kHz to 300 GHz
	ANSI/IEEE C95.3-2002 Recommended Practice For Measurements and Computations of Radio Frequency Electromagnetic Fields with Respect to Human Exposure to such Fields. 100 kHz-300 GHz
Applicable Standards	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 Requirements for 100 MHz to 6 GHz
	KDB447498 D01: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
	KDB648474 D02: Review and Approval Policies for SAR Evaluation of Handsets with Multiple Transmitters and Antennas.

Conclusion

Localized Specific Absorption Rate (SAR) of this equipment has been measured in all cases requested by the relevant standards above. Maximum localized SAR is below exposure limits as well.

Change History

Version	Change Contents	Author	Date
V1.0	First edition	Chen Qiang	2014-10-13

Note: The last version will be invalid automatically while the new version is issued.

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1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **ZTE CORPORATION GSM Dual-Mode Digital Mobile Phone 302ZT** are as follows.

Highest standalone SAR Summary:

Exposure Position	Frequency Band	Maximum reported 1g SAR (W/kg)	Highest reported 1g SAR (W/kg)
Head	GSM1900	0.073	0.073
Body-worn (10mm)	GSM1900	0.765	0.765

This device is in 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 C95.1-2005,and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.

2. Administrative Information

2.1 Project Information

Date of start test 2014-09-03
Date of end test: 2014-09-03

2.2 Test Laboratory Information

Company: Shanghai Tejet Communications Technology Co., Ltd Testing Center
Address: Room 6205-6208, Building 6, No.399 Cailun Rd. Zhangjiang Hi-Tech
 Park, Shanghai, China
Post Code: 210203
Tel: +86-21-61650880
Fax: +86-21-61650881
Website: www.tejet.cn

2.3 Test Environment

Temperature: 20°C~25 °C
Relative Humidity: 20%~70%

3. Client Information

3.1 Applicant information

Company Name: ZTE Corporation
Address: ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China
City: Shenzhen
Postal Code: 518057
Country: China
Telephone: +86-755-86360200
Fax: +86-755-86360298

3.2 Manufacturer Information

Company Name: ZTE Corporation
Address: ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China
City: Shenzhen
Postal Code: 518057
Country: China
Telephone: +86-755-86360200
Fax: +86-755-86360298

4. Equipment Under Test (EUT) and Accessory Equipment (AE)

4.1 Information of EUT

Device Type	Portable device	
Product	WCDMA/GSM (GPRS) Dual-Mode Digital Mobile Phone	
Model	302ZT	
Type	Identical Prototype	
Exposure Category	Uncontrolled environment / general population	
Device operation configuration:		
Operating Mode(s):	PCS1900	
Test Modulation	(GSM)GMSK	
GPRS Operation Class	B	
GPRS Multislot Class	10	
Rated Output Power	PCS1900: 30dBm	
Antenna Type:	Internal antenna	
Operating Frequency Range(s):	Band	Tx(MHz)
	PCS1900	1850.2~1909.8
Power Class	PCS1900: 1, test with power level 0	

4.2 Identification of EUT

EUT ID	SN or IMEI	HW Version	SW Version	Received Date
TN08	864183022007784	wmmB	Alpha1.0	2014-09-03

*EUT ID: identify the test sample in the lab internally.

4.3 Identification of AE

AE ID*	Description
AE1	Battery
AE2	Travel Adaptor
AE3	Earphone

AE1

Model	ZEBAT1
Manufacturer	ZTE CORPORATION
Capacitance	1100mAh
Nominal Voltage	3.7V

AE2

Model	STC-A51A-Z
Manufacturer	DOKOCOM
Length of DC line	0cm with USB connector

AE3

Model	HMZ6-mU5
Manufacturer	ZTE CORPORATION
Length of DC line	110cm

*AE ID: identify the test sample in the lab internally.

5. Operational Conditions during Test

5.1 General description of test procedures

A communication link is set up with a system simulator by air link, and a call is established. The absolute radio frequency channel is allocated to low, middle and high respectively in the case of each band. The EUT is commanded to operate at maximum transmitting power.

Connection to the EUT is established via air interface with CMU200, and the EUT is set to maximum output power by CMU200. The antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the EUT by at least 30dB.

5.2 GSM Test Configuration

SAR test for GSM 1900, a communication link is set up with a system simulator by air link. Using CMU200 the power level is set to "0" in SAR of GSM 1900, The tests in the band of GSM1900 are performed in the mode of voice and data transfer function.

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 (Staubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic _field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (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.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY5 software.
- Remote control and teach pendant as well as 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.

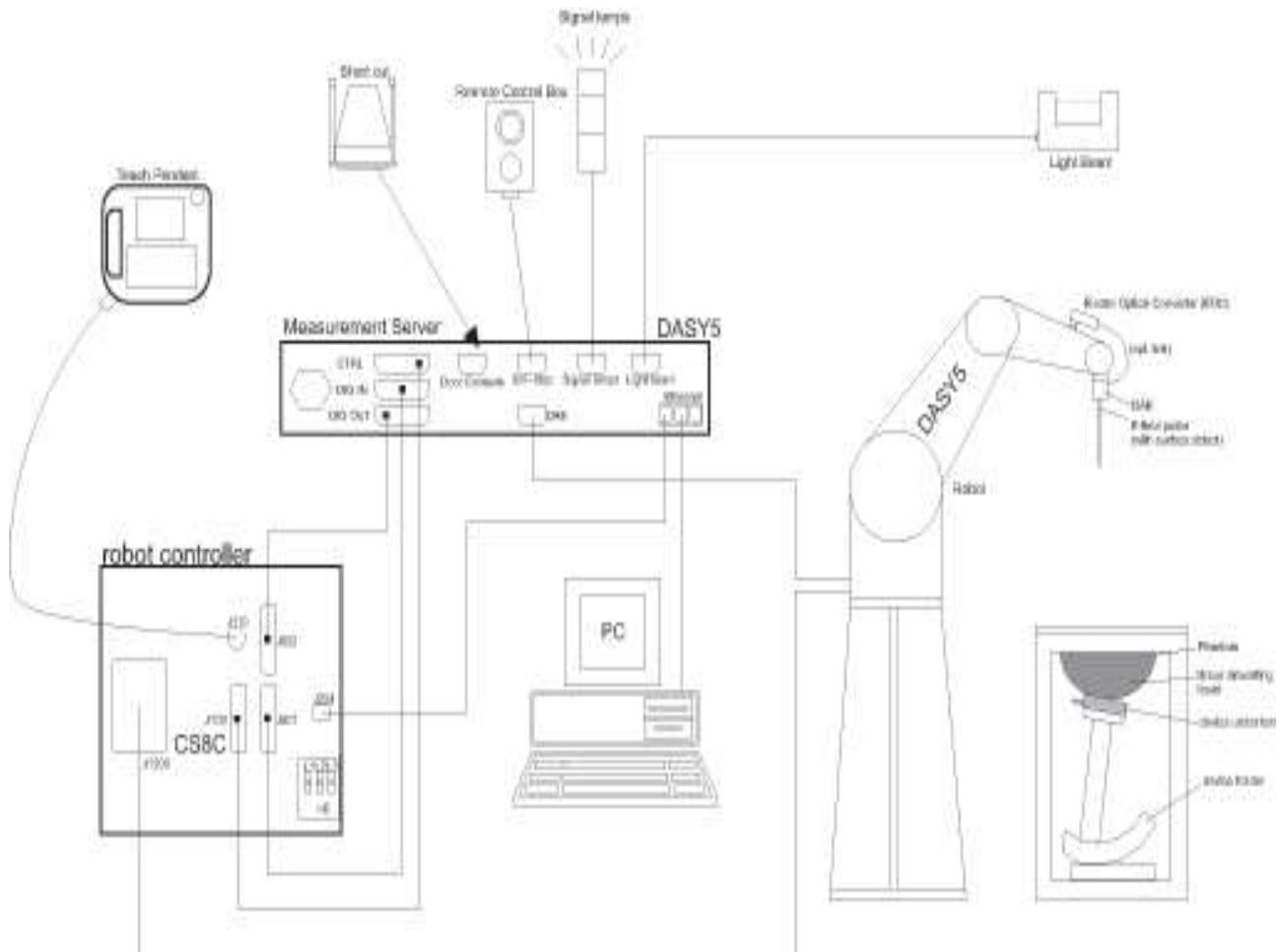


Figure 5-1 SAR Lab Test Measurement Set-up

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.

6.2.1 Es3DV3 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 850 and HSL 1750 Additional CF for other liquids and frequencies upon request
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μ W/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)

Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.



Figure 5-2.ES3DV3 E-field Probe



Figure 5-3. ES3DV3 E-field probe

6.2.2 E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy was evaluated and found to be better than $\pm 0.25\text{dB}$. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$\text{SAR} = C \frac{\Delta T}{\Delta t}$$

Where: Δt = Exposure time (30 seconds),
 C = Heat capacity of tissue (brain or muscle),
 ΔT = Temperature increase due to RF exposure.
 Or

$$\text{SAR} = \frac{|E|^2 \sigma}{\rho}$$

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m³).

6.3 Other Test Equipment

6.3.1 Device Holder for Transmitters

The DASY5 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 are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.



Figure 5-4. Device Holder

6.3.2 Phantom

The Generic Twin Phantom is constructed of a fiberglass shell integrated in a wooden frame. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

Shell Thickness	2±0.1 mm
Filling Volume	Approx. 20 liters
Dimensions	810 x 1000 x 500 mm (H x L x W)

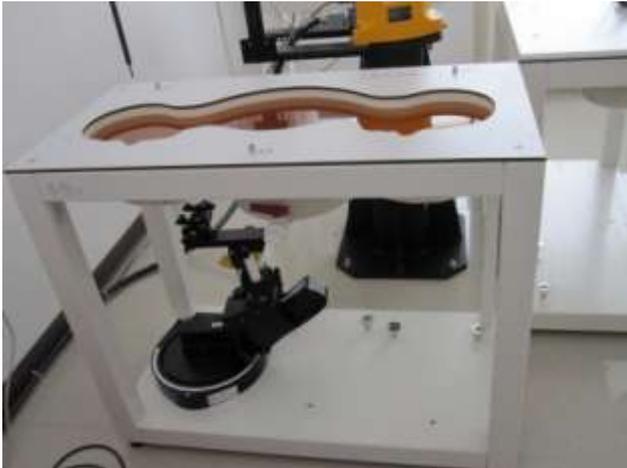


Figure 5-5. Generic Twin Phantom

6.4 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. $\pm 5\%$.

- 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 $\pm 0.1\text{mm}$). 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 $\pm 30^\circ$.)

- 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 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 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.

6.5 Data Storage and Evaluation

6.5.1 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.

6.5.2 Data Evaluation by SEMCAD

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	
	- Density	

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:

$$V_i = U_i + U_i^2 \cdot c f / d c p_i$$

With V_i = compensated signal of channel i (i = x, y, z)

U_i = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

dcp = diode compression point (DASY parameter)

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

E-field probes: $E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$

H-field probes: $H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$

With V_i = compensated signal of channel i (i = x, y, z)

Norm_i = sensor sensitivity of channel i (i = x, y, z)

[mV/(V/m)²] for E-field Probes

ConvF = sensitivity enhancement in solution

a_{ij} = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

H_i = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = (E_x^2 + E_y^2 + E_z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$SAR = (E_{tot}^2 \cdot \sigma) / (\rho \cdot 1000)$$

with **SAR** = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m

σ = conductivity in [mho/m] or [Siemens/m]

ρ = equivalent tissue density in g/cm³

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}^2 / 3770 \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

with P_{pwe} = equivalent power density of a plane wave in mW/cm^2

E_{tot} = total electric field strength in V/m

H_{tot} = total magnetic field strength in A/m

6.6 System check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulates, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the 6.2.1 and 6.2.2

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

System check is performed regularly on all frequency bands where tests are performed with the DASY 5 system.

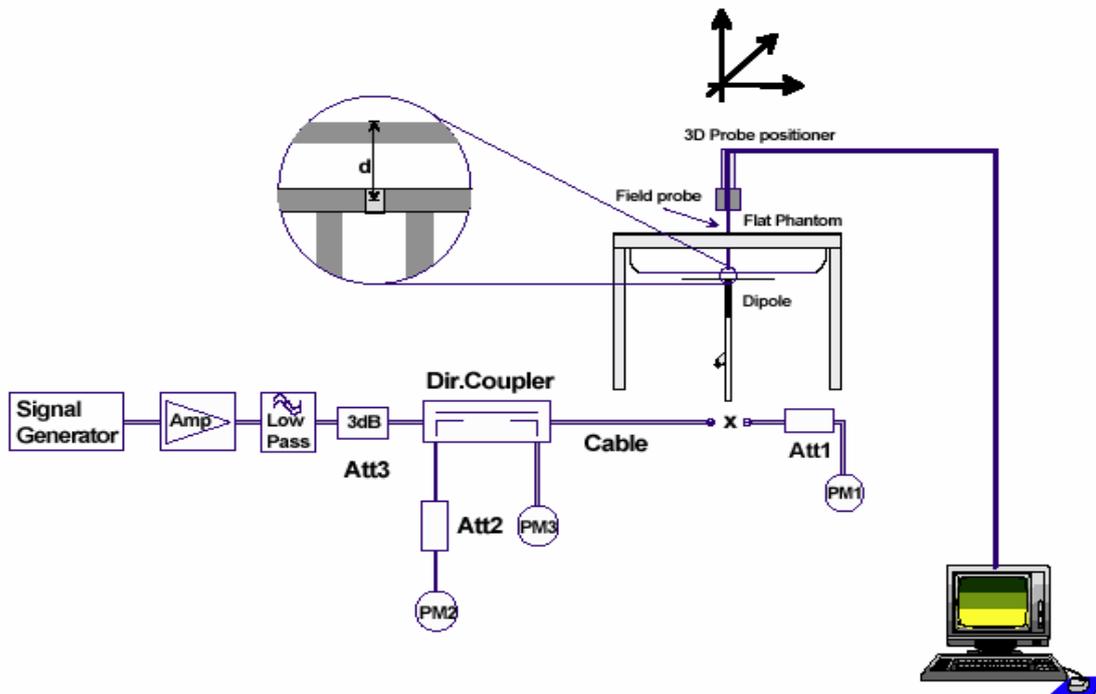


Figure 5-6. System Check Set-up

6.7 Equivalent Tissues

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 show the detail solution. It's

satisfying the latest tissue dielectric parameters requirements proposed by the OET 65.

MIXTURE%	FREQUENCY(head)1900MHz
Water	55.242
Glycol monobutyl	44.452
Salt	0.306
Dielectric Parameters Target Value	f=1900MHz $\epsilon=40.0$ $\sigma=1.40$
MIXTURE%	FREQUENCY(body)1900MHz
Water	69.91
Glycol monobutyl	29.96
Salt	0.13
Dielectric Parameters Target Value	f=1900MHz $\epsilon=53.3$ $\sigma=1.52$

7. Summary of Test Results

7.1 Conducted Output Power Measurement

7.1.1 Summary

The DUT is tested using a CMU200 communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted power.

Conducted output power was measured using an integrated RF connector and attached RF cable.

This result contains conducted output power for the EUT.

7.1.2 Conducted Power Results

GSM1900		Conducted output power(dBm)						
		low	middle	high				
		CH512	CH661	CH810				
		1850.2MHz	1880MHz	1909.8MHz				
GSM		29.0	29.0	29.1	(dB)	CH512	CH661	CH810
GPRS	1 TX-slot result	29.0	29.0	29.1	-9.03	19.97	19.97	20.07
	2 TX-slot result	28.5	28.4	28.6	-6.02	22.48	22.38	22.58

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

1 TX-slot =1 transmit time slot of 8 time slots

=>conducted power divided by (8/1) =>-9.03dB

2 TX-slot =2 transmit time slot of 8 time slots

=>conducted power divided by (8/2) =>-6.02dB

7.2 Test Results

7.2.1. Dielectric Performance

Dielectric Performance of Tissue Simulating Liquid

Frequency	Description	Dielectric Parameters ϵ_r	σ (s/m)	temp °C
1900MHz (head)	Target value	40.0	1.40	/
	5% window	38-42	1.33 -1.47	
	Measurement value 2014-09-03	39.46	1.38	21.7
1900MHz (body)	Target value	53.3	1.52	/
	5% window	50.63-55.96	1.44 -1.60	
	Measurement value 2014-09-03	52.36	1.49	22.0

7.2.2. System Check Results

System Check for tissue simulation liquid

Frequency	Description	SAR(W/kg)		Targeted SAR1g (W/kg)	Normalized SAR1g (W/kg)	Deviation (%)
		10g	1g			
1900MHz (head)	Recommended result ±10% window	5.21 4.69-5.73	9.69 8.72-10.66	/	/	/
	Measurement value 2014-09-03	4.96	9.74	39.3	38.96	-0.87
1900MHz (body)	Recommended result ±10% window	5.29 4.76-5.82	10.1 9.09-11.11	/	/	/
	Measurement value 2014-09-03	5.13	9.84	40.9	39.36	-3.77

Note: 1. the graph results see ANNEX B.1.

2. Recommended Values used derive from the calibration certificate and 250 mW is used as feeding power to the calibrated dipole.

7.2.3 Test Results

7.2.3.1 Summary of Measurement Results (PCS1900)

SAR Values (PCS1900)

Test Case		Measurement Result(W/kg)		Power Drift(dB)	Note
Different Test Position	Channel	1 g	Average		
Test position of Head					
Left head, Touch cheek	middle	0.056		0.15	
Left head, Tilt 15 Degree	middle	0.031		0.06	
Right head, Touch cheek	middle	0.029		-0.10	
Right head, Tilt 15 Degree	middle	0.037		0.04	
Left head, Touch cheek	low	0.058		0.08	max
	high	0.048		-0.00	
Test position of Body with GPRS(2UP) (Distance 10mm)					
Open_Towards phantom	middle	0.486		-0.09	
Open_Towards Ground	middle	0.471		-0.09	
Close_Towards phantom	middle	0.268		0.18	
Close_Towards Ground	middle	0.689		-0.12	
Close_Towards Ground	low	0.665		-0.11	
	high	0.698		-0.06	max
Worst case position of Body with (Distance 10mm)					
Close_Towards Ground	high	0.424		0.07	earphone

Note: 1. The value with blue color is the maximum SAR Value of test case of head and body in each test band.

2. Upper and lower frequencies were measured at the worst position.

3. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test

configuration is lower than the SAR limit (< 0.4W/kg), testing at the high and low channels is optional.

4.Per KDB 865664 d01v01, for each frequency band ,repeated SAR measurement is required only when the measured SAR is ≥ 0.8 (W/kg).

7.2.4 Maximum SAR

Test Case			Measurement Result (W/kg)	conducted power (dBm)	maximum power (dBm)	Maximum reported 1g SAR (W/kg)	Limit 1g SAR (W/kg)	
band	Different Test Position		Ch	1g Average				
GSM 1900	head	Left head, Touch cheek	low	0.058	29.0	30.0	0.073	1.6
	body	Close_Towards Ground	high	0.698	28.6	29.0	0.765	1.6

General Judgment: PASS

8. Test Equipments Utilized

No.	Name	Type	S/N	Calibration Date	Valid Period
01	Network analyzer	Agilent E5071E	MY46109425	Oct 24 th , 2013	One year
02	Dielectric Probe Kit	Agilent 85070E	MY44300524	No Calibration Requested	
03	Power meter	Agilent E4418B	MY50000852	Oct 24 th , 2013	One year
04	Power sensor	Agilent E9200B	MY50300011	Oct 24 th , 2013	One year
05	Signal Generator	Agilent N5182A	MY49071248	Oct 27 th , 2013	One year
06	Amplifier	ZHL-42W	QA1020005	No Calibration Requested	
07	BTS	CMU200	121464	Oct 24 th , 2013	One year
08	E-field Probe	ES3DV3	3241	Sep 06 th , 2013	One year
09	DAE	DAE4	1327	May 05 th , 2014	One year
10	Validation Kit 1900MHz	D1900V2	5d155	May 23 th , 2014	One year

9. Measurement Uncertainty

No	Source of Uncertainty	Type	Uncertainty value ± %	Probability Distribution	Div.	c_i (1 g)	c_i (10 g)	Standard Unc ± %, (1 g)	Standard Unc ± %, (10 g)	ν_i or ν_{eff}
1	System repetivity	A	2.7	N	1	1	1	2.7	2.7	9
<i>Measurement System</i>										
2	Probe Calibration	B	5.9	N	1	1	1	5.9	5.9	∞
3	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
4	Boundary Effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
5	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
6	Detection Limits	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
7	Readout Electronics	B	0.3	N	1	1	1	0.3	0.3	∞
8	Response Time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
9	Integration Time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
10	RF ambient conditions – noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	RF ambient conditions – reflections	B	0	R	$\sqrt{3}$	1	1	0	0	∞
12	Probe Positioner Mech. Restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
13	Probe Positioning with respect to Phantom Shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
14	Post-Processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
<i>Test Sample Related</i>										

15	Test Sample Positioning	A	3.3	N	1	1	1	3.3	3.3	71
16	Device Holder Uncertainty	A	4.1	N	1	1	1	4.1	4.1	5
17	Drift of Output Power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and Set-up										
18	Phantom Uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
19	Liquid Conductivity (target.)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
20	Liquid Conductivity (meas.)	A	2.06	N	1	0,64	0,43	1.7	1.4	43
21	Liquid Permittivity (target.)	B	5.0	R	$\sqrt{3}$	0,6	0,49	1.7	1.4	∞
22	Liquid Permittivity (meas.)	A	1.6	N	1	0,6	0,49	1.0	0.8	521
Combined standard uncertainty		$u_c = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$						10.54	10.34	
Expanded uncertainty (95 % confidence interval)		k=2						21.08	20.68	

ANNEX A: Detailed Test Results

Annex A.1 System Check Results

System check 1900head

Date/Time: 03/09/2014 08:40:36

Communication System: UID 10000, CW; Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Communication System PAR: 0 dB

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.381$ S/m; $\epsilon_r = 39.462$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.51, 5.51, 5.51); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: SAM2; Type: SAM; Serial: TP-1575
- Measurement SW: DASYS2, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

1900 head/d=10mm, Pin=250 mW/Area Scan (41x61x1): Interpolated grid:
dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 11.5 W/kg

1900 head/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

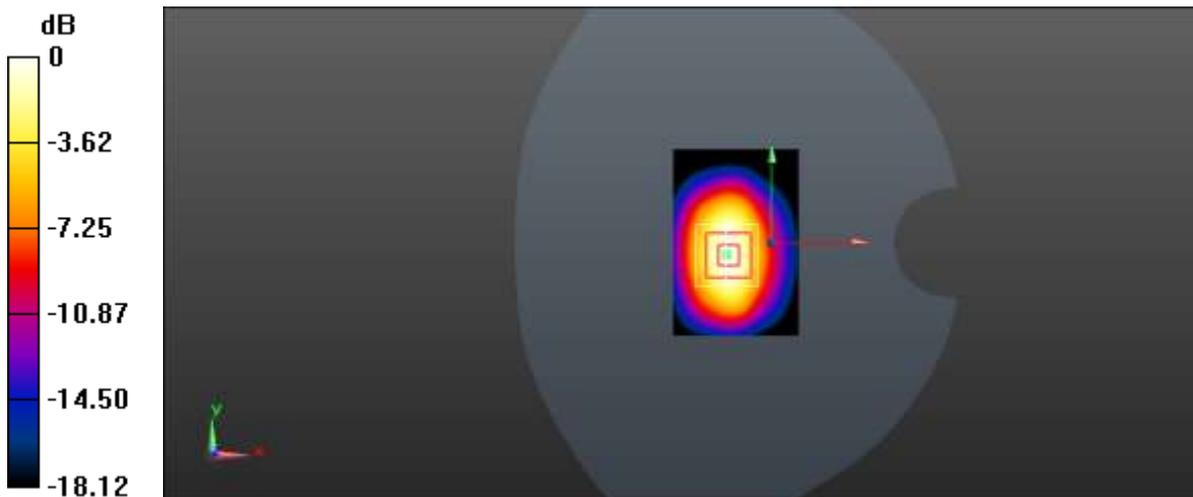
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.887 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 18.1 W/kg

SAR(1 g) = 9.74 W/kg; SAR(10 g) = 4.96 W/kg

Maximum value of SAR (measured) = 10.9 W/kg



0 dB = 10.7 W/kg = 10.29 dBW/kg

System check 1900body

Date/Time: 03/09/2014 13:49:23

Communication System: UID 0, CW (0); Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Communication System PAR: 0 dB

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.493$ S/m; $\epsilon_r = 52.357$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.18, 5.18, 5.18); Calibrated: 06/09/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASYS2, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

1900body/d=10mm, Pin=250 mW/Area Scan (61x71x1): Interpolated grid:
dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 12.6 W/kg

1900body/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

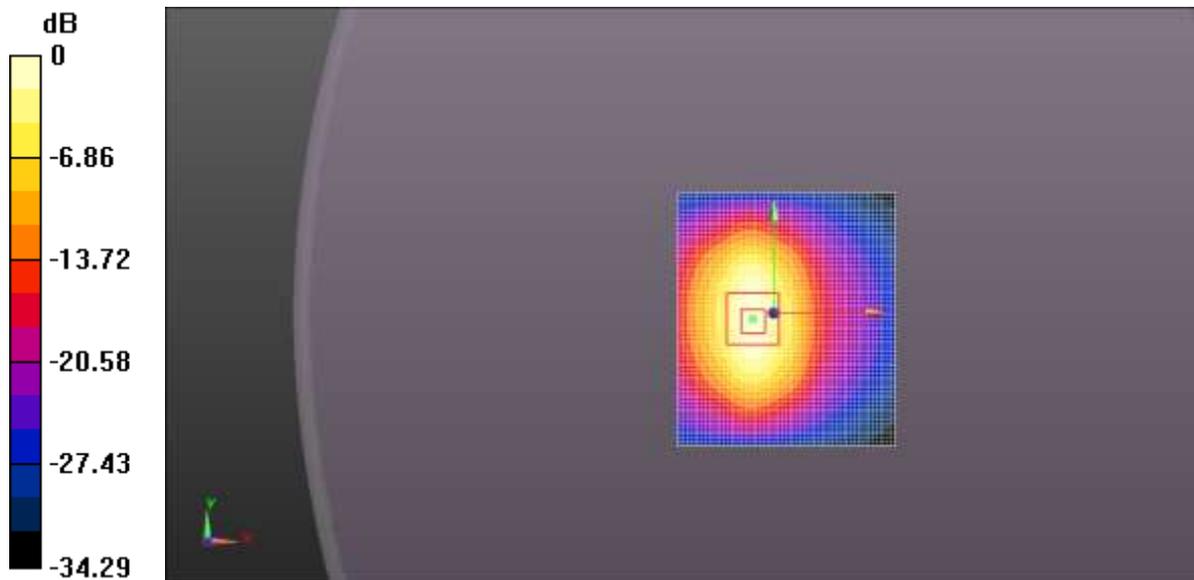
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 70.500 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 16.0 W/kg

SAR(1 g) = 9.84 W/kg; SAR(10 g) = 5.13 W/kg

Maximum value of SAR (measured) = 11.9 W/kg



0 dB = 12.6 W/kg = 11.01 dBW/kg

Annex A.2 Graph Result

GSM1900 left touch mid

Date/Time: 03/09/2014 10:46:22

Communication System: UID 0, GSM (0); Communication System Band: PCS1900(1850.0-1910.0MHz); Frequency: 1880 MHz; Communication System PAR: 9.191 dB

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.364$ S/m; $\epsilon_r = 39.144$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASYS5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.51, 5.51, 5.51); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: SAM2; Type: SAM; Serial: TP-1575
- Measurement SW: DASYS52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

left/touch mid/Area Scan (81x231x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.0626 W/kg

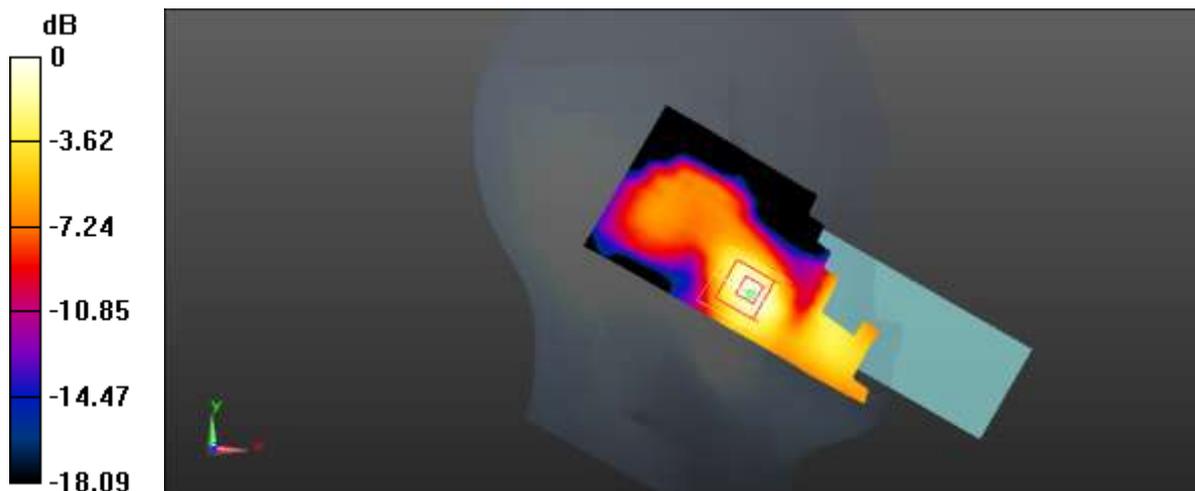
left/touch mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.695 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 0.0920 W/kg

SAR(1 g) = 0.056 W/kg; SAR(10 g) = 0.030 W/kg

Maximum value of SAR (measured) = 0.0625 W/kg



0 dB = 0.0625 W/kg = -12.04 dBW/kg

GSM1900 left tilt mid

Date/Time: 03/09/2014 11:18:56

Communication System: UID 0, GSM (0); Communication System Band: PCS1900(1850.0-1910.0MHz); Frequency: 1880 MHz; Communication System PAR: 9.191 dB

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.364$ S/m; $\epsilon_r = 39.144$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.51, 5.51, 5.51); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: SAM2; Type: SAM; Serial: TP-1575
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

left/tilt mid/Area Scan (81x231x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.0342 W/kg

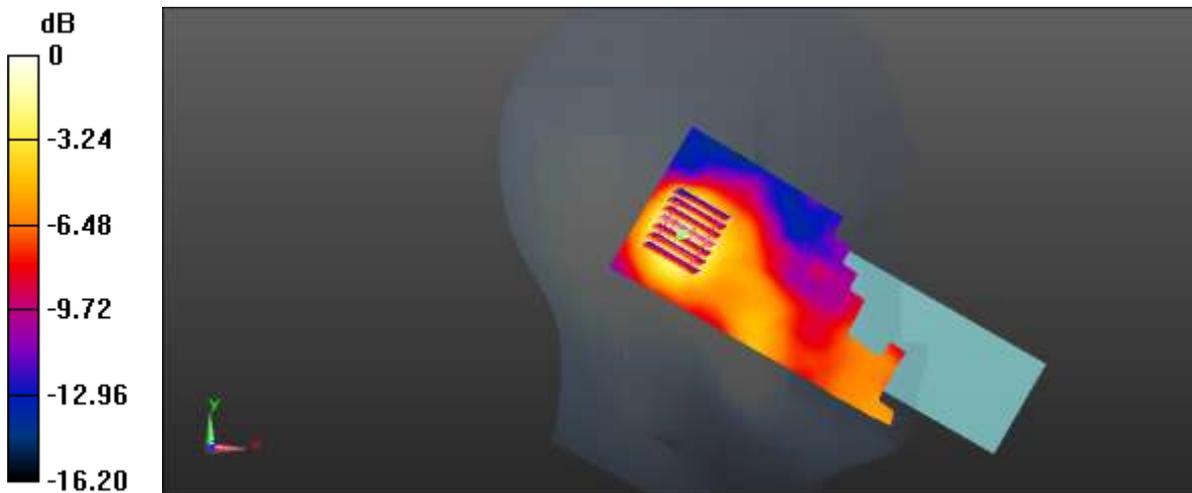
left/tilt mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.499 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.0550 W/kg

SAR(1 g) = 0.031 W/kg; SAR(10 g) = 0.018 W/kg

Maximum value of SAR (measured) = 0.0344 W/kg



0 dB = 0.0344 W/kg = -14.63 dBW/kg

GSM1900 right touch mid

Date/Time: 03/09/2014 09:30:58

Communication System: UID 0, GSM (0); Communication System Band: PCS1900(1850.0-1910.0MHz); Frequency: 1880 MHz; Communication System PAR: 9.191 dB

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.364$ S/m; $\epsilon_r = 39.144$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.51, 5.51, 5.51); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: SAM2; Type: SAM; Serial: TP-1575
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

right/touch mid/Area Scan (81x231x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.0366 W/kg

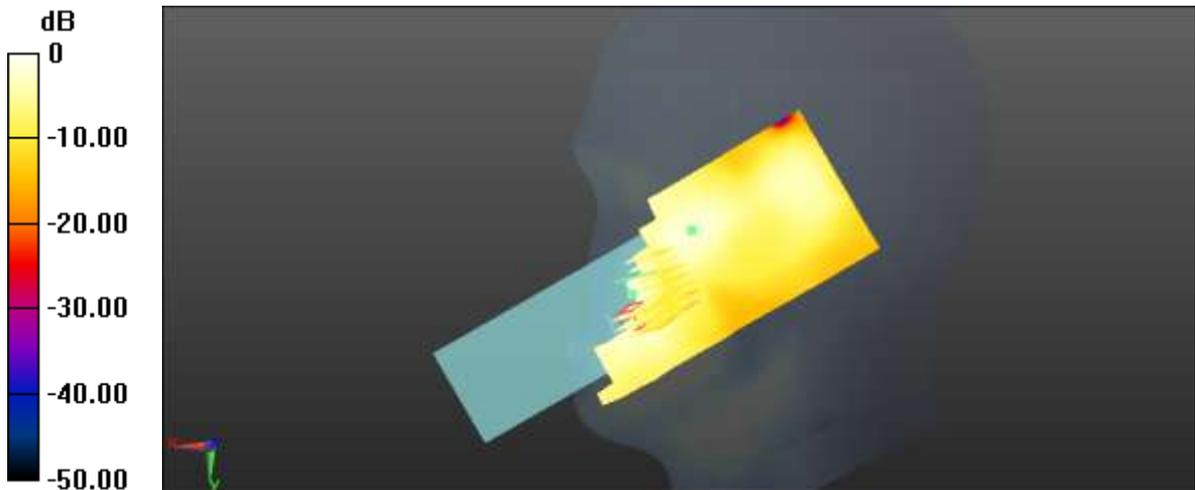
right/touch mid/Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.316 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 0.0530 W/kg

SAR(1 g) = 0.029 W/kg; SAR(10 g) = 0.015 W/kg

Maximum value of SAR (measured) = 0.0359 W/kg



0 dB = 0.0359 W/kg = -14.45 dBW/kg

GSM1900 right tilt mid

Date/Time: 03/09/2014 10:13:39

Communication System: UID 0, GSM (0); Communication System Band: PCS1900(1850.0-1910.0MHz); Frequency: 1880 MHz; Communication System PAR: 9.191 dB

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.364$ S/m; $\epsilon_r = 39.144$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.51, 5.51, 5.51); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: SAM2; Type: SAM; Serial: TP-1575
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

right/tilt mid/Area Scan (81x231x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.0406 W/kg

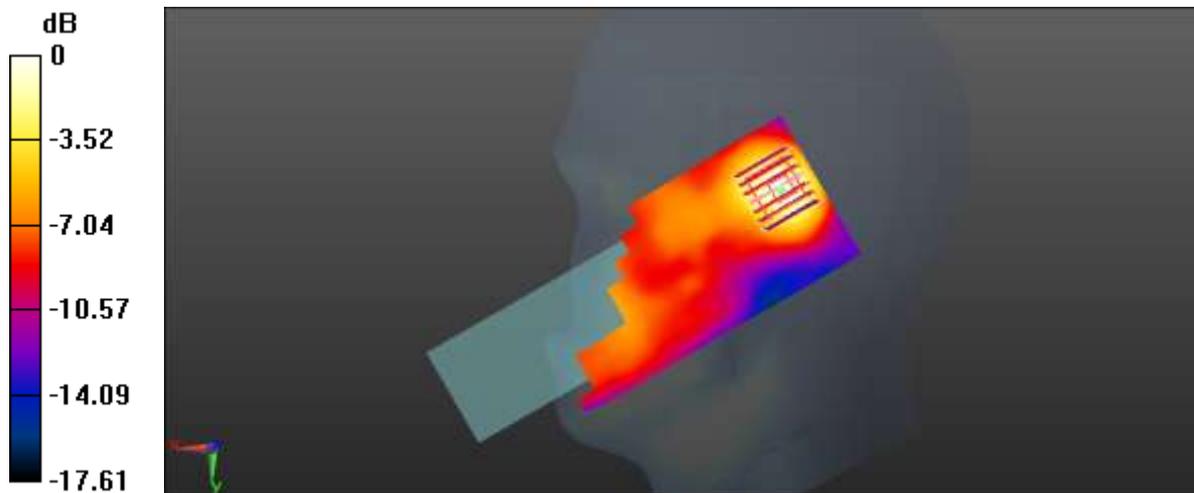
right/tilt mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.617 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.0620 W/kg

SAR(1 g) = 0.037 W/kg; SAR(10 g) = 0.021 W/kg

Maximum value of SAR (measured) = 0.0411 W/kg



0 dB = 0.0411 W/kg = -13.86 dBW/kg

GSM1900 left touch low

Date/Time: 03/09/2014 11:56:26

Communication System: UID 0, GSM (0); Communication System Band: PCS1900(1850.0-1910.0MHz); Frequency: 1850.2 MHz; Communication System PAR: 9.191 dB

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.339$ S/m; $\epsilon_r = 39.255$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASYS (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.51, 5.51, 5.51); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: SAM2; Type: SAM; Serial: TP-1575
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

left/touch low/Area Scan (81x231x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.0621 W/kg

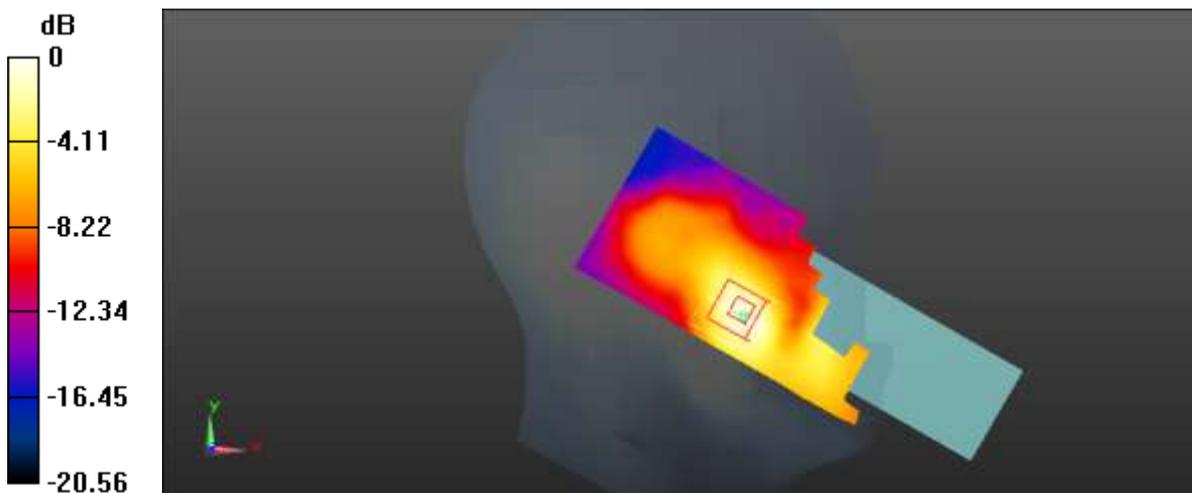
left/touch low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.810 V/m; Power Drift = 0.08 dB

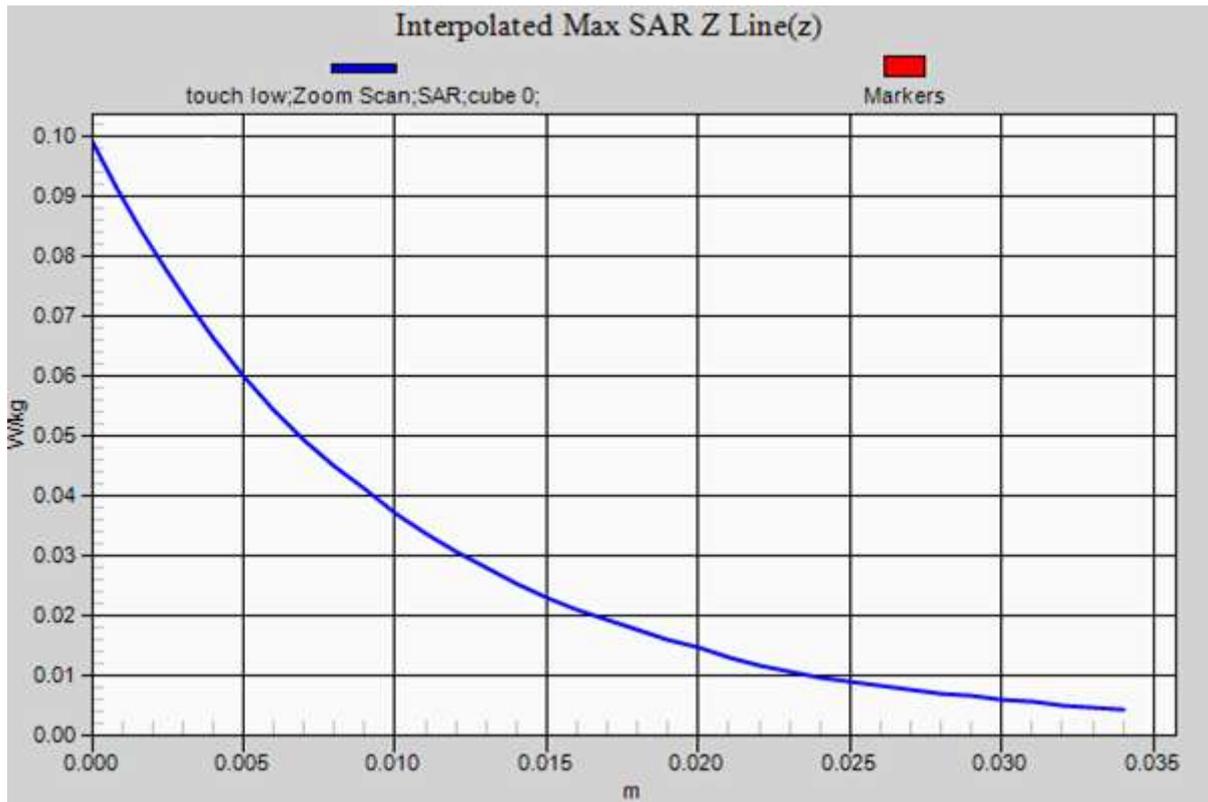
Peak SAR (extrapolated) = 0.0990 W/kg

SAR(1 g) = 0.058 W/kg; SAR(10 g) = 0.032 W/kg

Maximum value of SAR (measured) = 0.0655 W/kg



0 dB = 0.0655 W/kg = -11.84 dBW/kg



GSM1900 left touch high

Date/Time: 03/09/2014 12:34:33

Communication System: UID 0, GSM (0); Communication System Band: PCS1900(1850.0-1910.0MHz); Frequency: 1909.8 MHz; Communication System PAR: 9.191 dB

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.393$ S/m; $\epsilon_r = 39.011$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.51, 5.51, 5.51); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: SAM2; Type: SAM; Serial: TP-1575
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

left/touch high/Area Scan (81x231x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.0526 W/kg

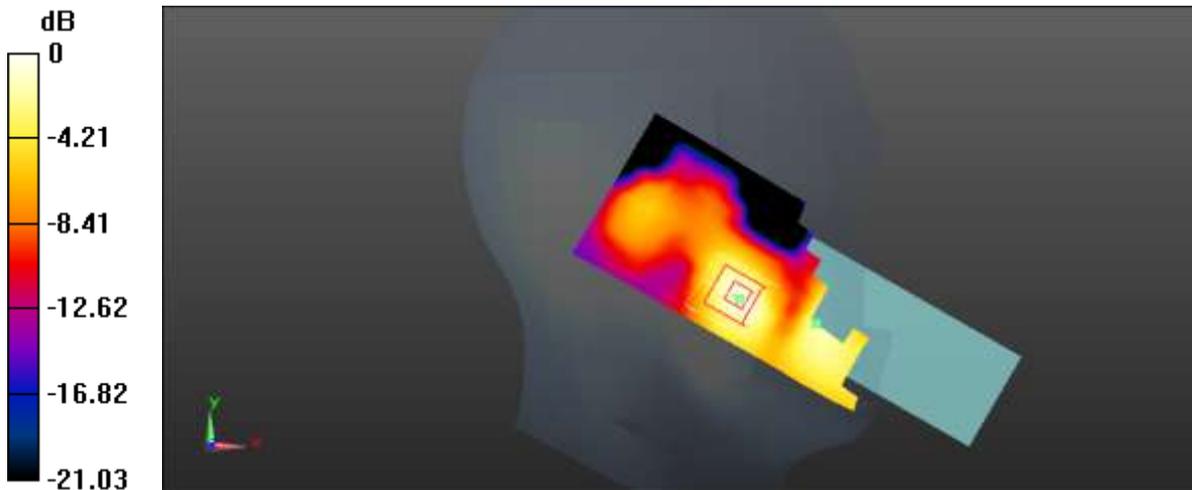
left/touch high/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.964 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 0.0820 W/kg

SAR(1 g) = 0.048 W/kg; SAR(10 g) = 0.025 W/kg

Maximum value of SAR (measured) = 0.0534 W/kg



0 dB = 0.0534 W/kg = -12.72 dBW/kg

GSM1900 towards phantom mid

Date/Time: 03/09/2014 15:05:11

Communication System: UID 0, GPRS/EGPRS(2UP) (0); Communication System Band: PCS1900; Frequency: 1880 MHz; Communication System PAR: 6.19 dB

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.477$ S/m; $\epsilon_r = 52.425$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.18, 5.18, 5.18); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASYS2, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

body/towards phantom mid/Area Scan (71x251x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

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

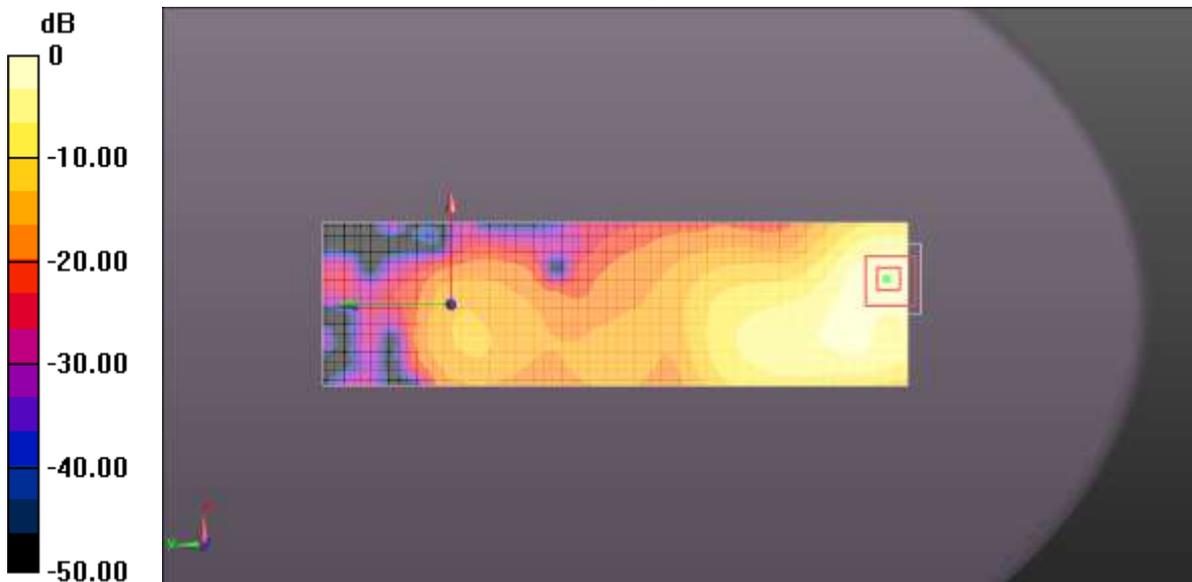
body/towards phantom mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.796 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.814 W/kg

SAR(1 g) = 0.486 W/kg; SAR(10 g) = 0.266 W/kg

Maximum value of SAR (measured) = 0.548 W/kg



0 dB = 0.576 W/kg = -2.40 dBW/kg

GSM1900 towards ground mid

Date/Time: 03/09/2014 15:59:30

Communication System: UID 0, GPRS/EGPRS(2UP) (0); Communication System Band: PCS1900; Frequency: 1880 MHz; Communication System PAR: 6.19 dB

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.477$ S/m; $\epsilon_r = 52.425$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.18, 5.18, 5.18); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

body/towards ground mid/Area Scan (71x251x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.522 W/kg

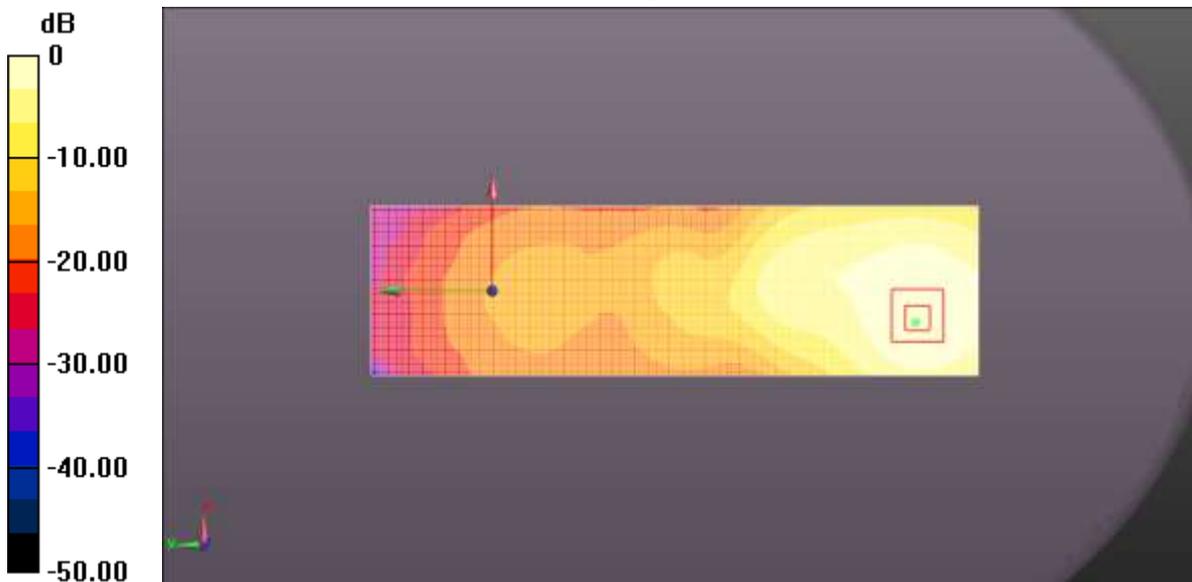
body/towards ground mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.116 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.741 W/kg

SAR(1 g) = 0.471 W/kg; SAR(10 g) = 0.286 W/kg

Maximum value of SAR (measured) = 0.513 W/kg



0 dB = 0.522 W/kg = -2.82 dBW/kg

GSM1900 close_towards phantom mid

Date/Time: 03/09/2014 16:53:57

Communication System: UID 0, GPRS/EGPRS(2UP) (0); Communication System Band: PCS1900; Frequency: 1880 MHz; Communication System PAR: 6.19 dB

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.477$ S/m; $\epsilon_r = 52.425$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.18, 5.18, 5.18); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

body2/close_towards phantom mid/Area Scan (71x151x1): Interpolated grid:
dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.332 W/kg

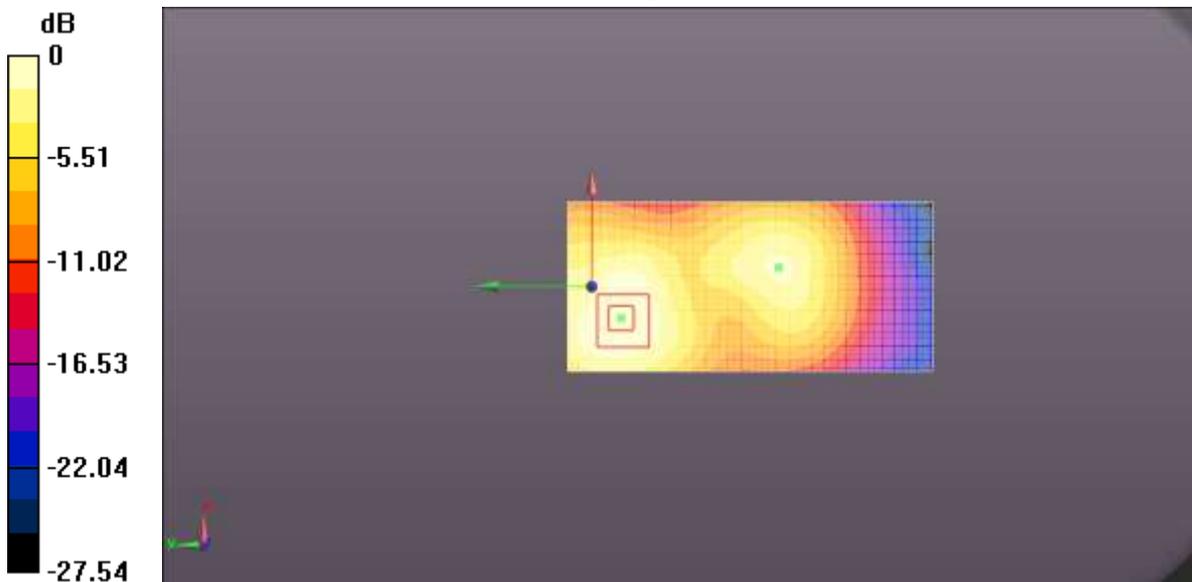
body2/close_towards phantom mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.597 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.401 W/kg

SAR(1 g) = 0.268 W/kg; SAR(10 g) = 0.165 W/kg

Maximum value of SAR (measured) = 0.293 W/kg



0 dB = 0.332 W/kg = -4.79 dBW/kg

GSM1900 close_towards ground mid

Date/Time: 03/09/2014 17:27:05

Communication System: UID 0, GPRS/EGPRS(2UP) (0); Communication System Band: PCS1900; Frequency: 1880 MHz; Communication System PAR: 6.19 dB

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.477$ S/m; $\epsilon_r = 52.425$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.18, 5.18, 5.18); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASYS2, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

body2/close_towards ground mid/Area Scan (71x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.760 W/kg

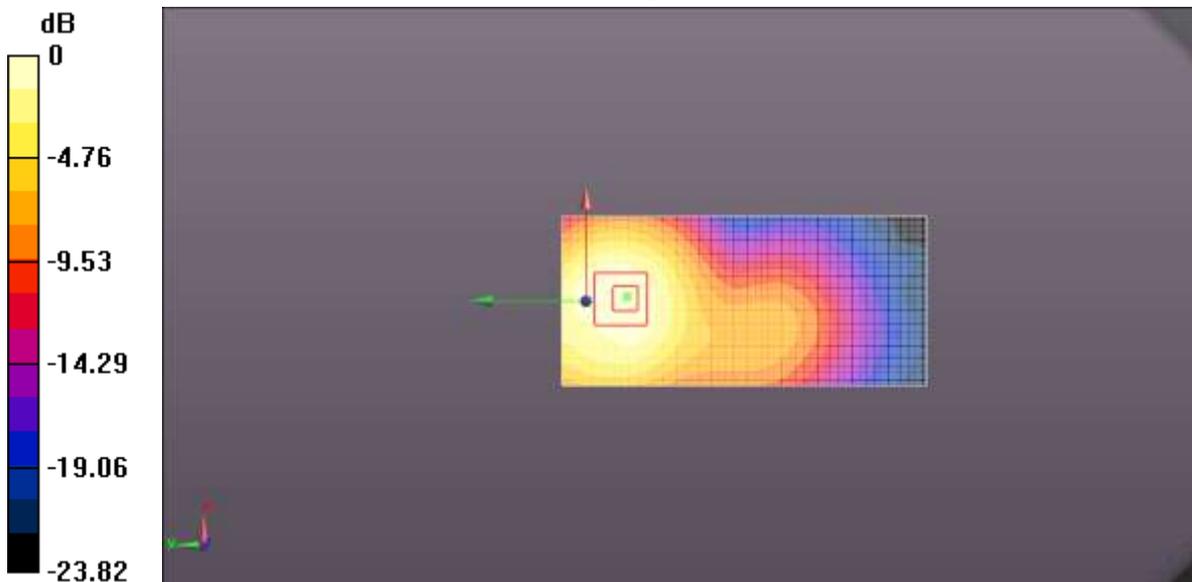
body2/close_towards ground mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 21.528 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 1.09 W/kg

SAR(1 g) = 0.689 W/kg; SAR(10 g) = 0.414 W/kg

Maximum value of SAR (measured) = 0.753 W/kg



0 dB = 0.760 W/kg = -1.19 dBW/kg

GSM1900 close_towards ground low

Date/Time: 03/09/2014 17:56:26

Communication System: UID 0, GPRS/EGPRS(2UP) (0); Communication System Band: PCS1900; Frequency: 1850.2 MHz; Communication System PAR: 6.19 dB

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.448$ S/m; $\epsilon_r = 52.486$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.18, 5.18, 5.18); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

body2/close_towards ground low/Area Scan (71x151x1): Interpolated grid:

$dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 0.731 W/kg

body2/close_towards ground low/Zoom Scan (7x7x7)/Cube 0: Measurement

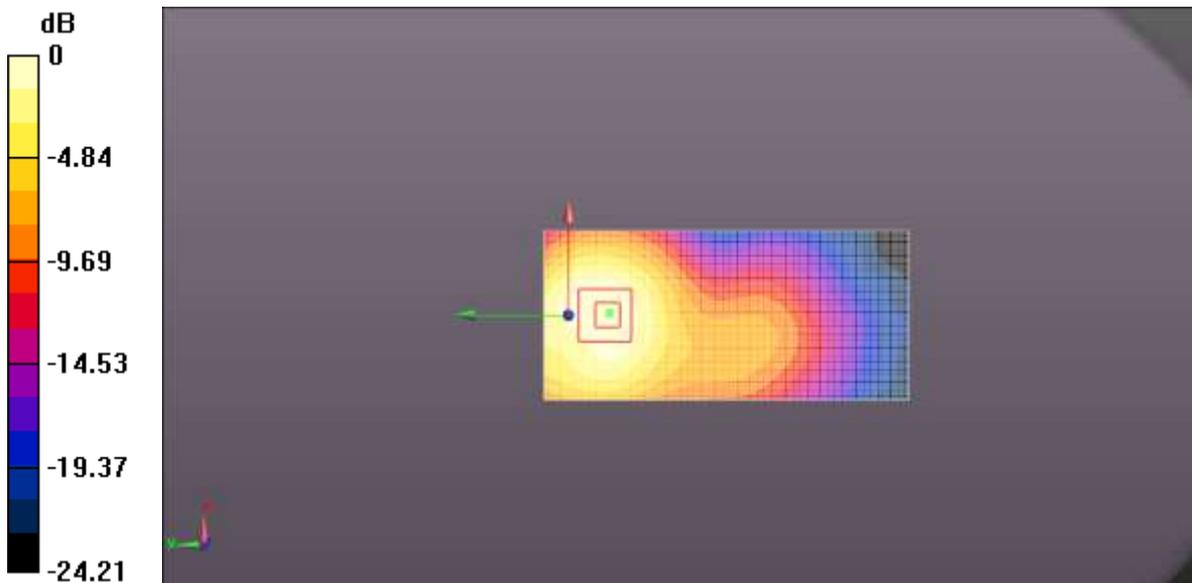
grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 20.811 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 1.04 W/kg

SAR(1 g) = 0.665 W/kg; SAR(10 g) = 0.398 W/kg

Maximum value of SAR (measured) = 0.732 W/kg



0 dB = 0.731 W/kg = -1.36 dBW/kg

GSM1900 close_towards ground high

Date/Time: 03/09/2014 18:25:26

Communication System: UID 0, GPRS/EGPRS(2UP) (0); Communication System Band: PCS1900; Frequency: 1909.8 MHz; Communication System PAR: 6.19 dB

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.503$ S/m; $\epsilon_r = 52.325$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.18, 5.18, 5.18); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

body2/close_towards ground high/Area Scan (71x151x1): Interpolated grid:
 $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 0.769 W/kg

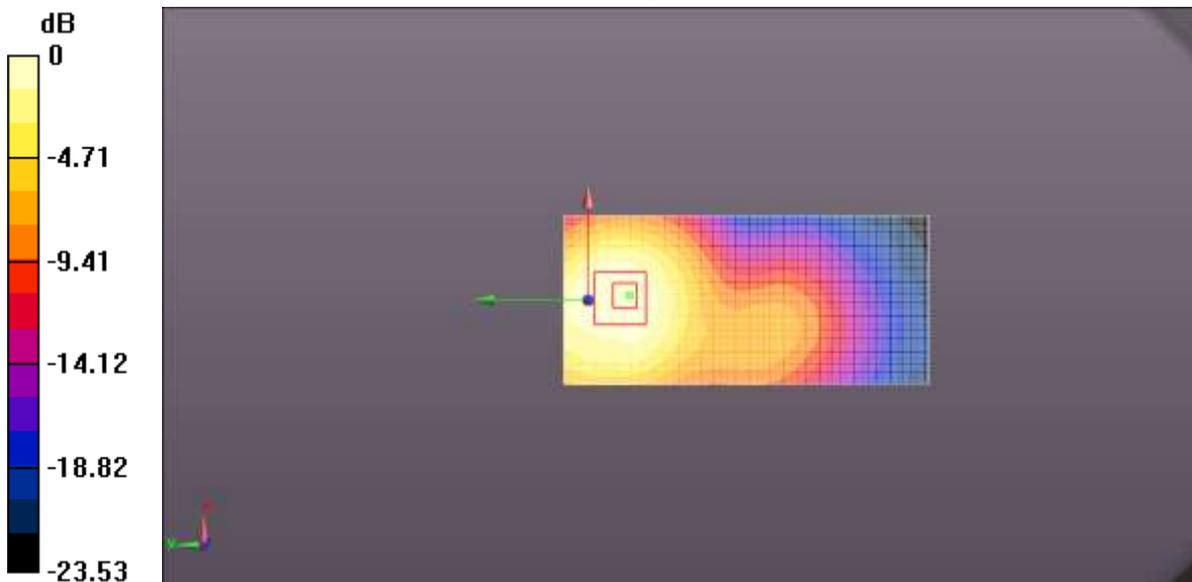
body2/close_towards ground high/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 22.265 V/m; Power Drift = -0.06 dB

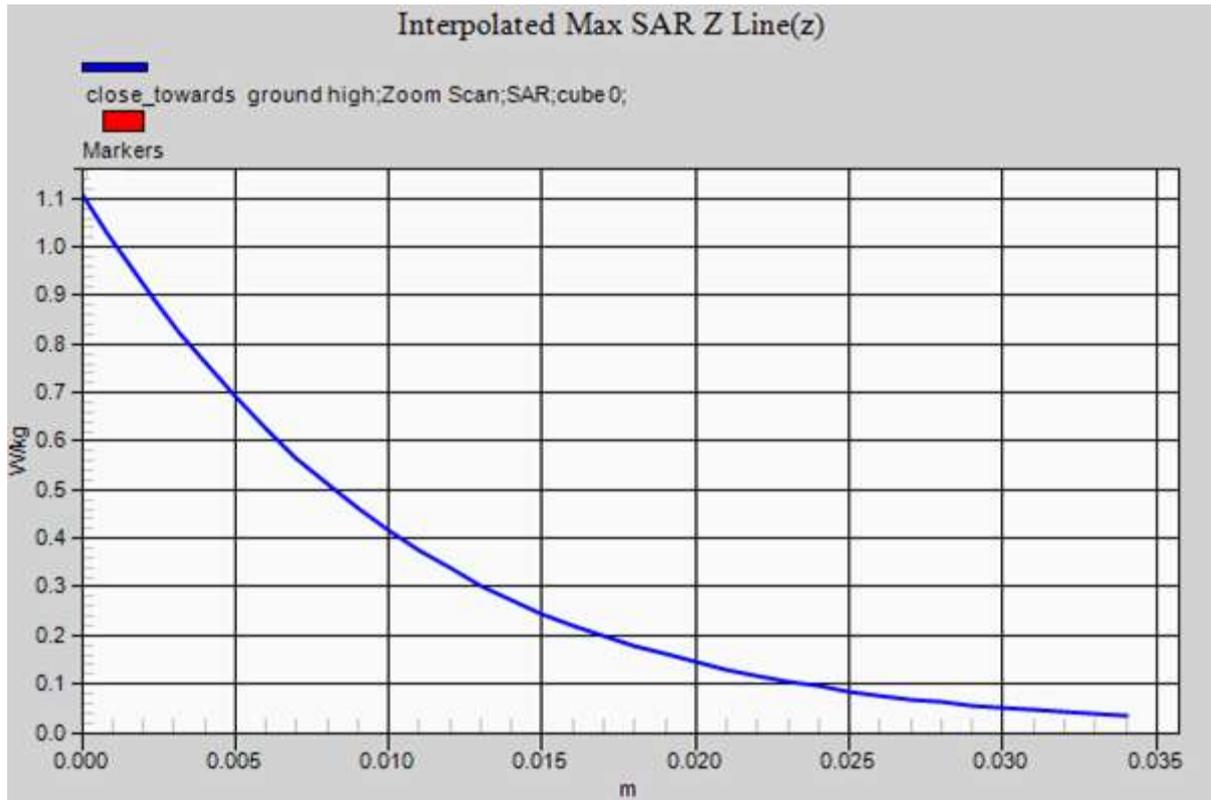
Peak SAR (extrapolated) = 1.11 W/kg

SAR(1 g) = 0.698 W/kg; SAR(10 g) = 0.421 W/kg

Maximum value of SAR (measured) = 0.764 W/kg



0 dB = 0.769 W/kg = -1.14 dBW/kg



GSM1900 close_towards ground high with earphone

Date/Time: 03/09/2014 18:56:01

Communication System: UID 0, GSM (0); Communication System Band: PCS1900(1850.0-1910.0MHz); Frequency: 1909.8 MHz; Communication System PAR: 9.191 dB

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.503$ S/m; $\epsilon_r = 52.325$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.18, 5.18, 5.18); Calibrated: 06/09/2013;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

body2/close_towards ground high with earphone/Area Scan (71x151x1):

Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.453 W/kg

body2/close_towards ground high with earphone/Zoom Scan (7x7x7)/Cube 0:

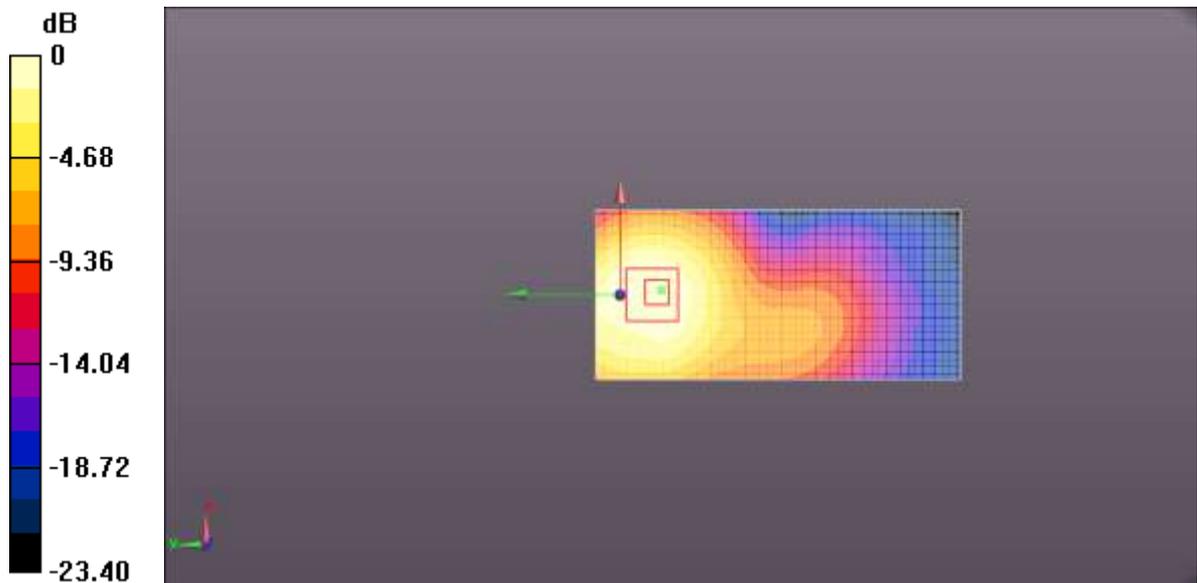
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.151 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.676 W/kg

SAR(1 g) = 0.424 W/kg; SAR(10 g) = 0.257 W/kg

Maximum value of SAR (measured) = 0.463 W/kg



0 dB = 0.453 W/kg = -3.44 dBW/kg

ANNEX B: Calibration Certificate

Annex B.1 Probe Calibration Certificate

TMC

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CALIBRATION LABORATORY

校准
CNAS L0442

Client **Tejet** Certificate No: **J13-2-2369**

CALIBRATION CERTIFICATE

Object: **ES3DV3 - SN:3241**

Calibration Procedure(s): **TMC-OS-E-02-195
Calibration Procedures for Dosimetric E-field Probes**

Calibration date: **September 6, 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 NRP2	101919	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Power sensor NRP-Z91	101547	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Power sensor NRP-Z91	101548	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Reference10dBAttenuator	BT0520	12-Dec-12(TMC,No.JZ12-867)	Dec-14
Reference20dBAttenuator	BT0267	12-Dec-12(TMC,No.JZ12-866)	Dec-14
Reference Probe EX3DV4	SN 3820	10-Dec-12(SPEAG,No.EX3-3820_Dec12)	Dec-13
Reference Probe EX3DV4	SN 3898	14-Jan-13(SPEAG,No.EX3-3898_Jan13)	Jan-14
DAE4	SN 777	22-Feb-13 (SPEAG, DAE4-777_Feb13)	Feb -14
Secondary Standards			
	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-13 (TMC, No.JW13-045)	Jun-14
Network Analyzer E5071C	MY46110673	15-Feb-13 (TMC, No.JZ13-781)	Feb-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: September 9, 2013

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



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CALIBRATION LABORATORY

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Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,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), $\theta=0$ 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 300MHz to 3GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- **NORM_{x,y,z}:** Assessed for E-field polarization $\theta=0$ ($f \leq 900\text{MHz}$ in TEM-cell; $f > 1800\text{MHz}$: waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E^2 -field uncertainty inside TSL (see below ConvF).
- **NORM(f)_{x,y,z} = NORM_{x,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.
- **DCP_{x,y,z}:** DCP are numerical linearization parameters assessed based on the data of power sweep (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.
- **A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}:** A,B,C 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 $f \leq 800\text{MHz}$) and inside waveguide using analytical field distributions based on power measurements for $f > 800\text{MHz}$. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,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 $\pm 50\text{MHz}$ to $\pm 100\text{MHz}$.
- **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 NORM_x (no uncertainty required).



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Probe ES3DV3

SN: 3241

Calibrated: August 31, 2013

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)



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DASY – Parameters of Probe: ES3DV3 - SN: 3241

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu V/(V/m)^2$) ^A	1.08	0.79	0.97	±10.8%
DCP(mV) ^B	105.8	108.2	107.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu V}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	190.5	±2.0%
		Y	0.0	0.0	1.0		158.6	
		Z	0.0	0.0	1.0		178.3	

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 Norm X, Y, Z do not affect the E²-field uncertainty inside TSL (see Page 5 and Page 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.



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DASY – Parameters of Probe: ES3DV3 - SN: 3241

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)
835	41.5	0.90	6.43	6.43	6.43	0.23	2.16	± 12%
900	41.5	0.97	6.44	6.44	6.44	0.27	1.98	± 12%
1750	40.1	1.37	5.65	5.65	5.65	0.34	2.09	± 12%
1900	40.0	1.40	5.51	5.51	5.51	0.38	1.92	± 12%
2450	39.2	1.80	4.90	4.90	4.90	0.80	1.16	± 12%

^C Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequency 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.



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DASY – Parameters of Probe: ES3DV3 - SN: 3241

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)
835	55.2	0.97	6.58	6.58	6.58	0.27	1.99	± 12%
900	55.0	1.05	6.66	6.66	6.66	0.31	1.90	± 12%
1750	53.4	1.49	5.31	5.31	5.31	0.32	2.46	± 12%
1900	53.3	1.52	5.18	5.18	5.18	0.32	2.57	± 12%
2450	52.7	1.95	4.87	4.87	4.87	0.84	1.21	± 12%

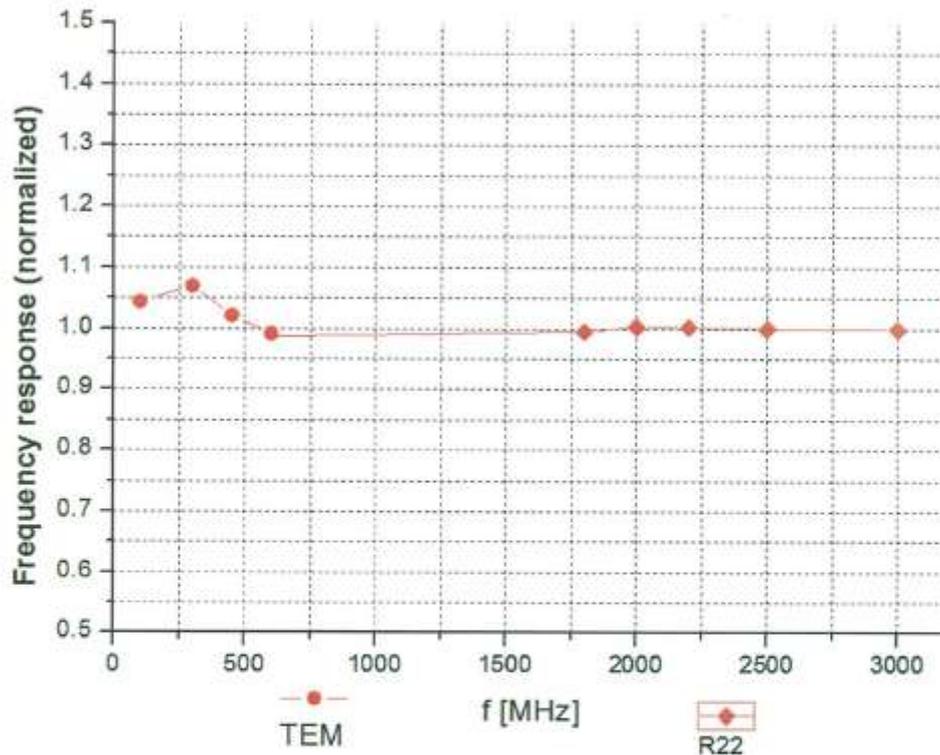
^C Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequency 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.



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



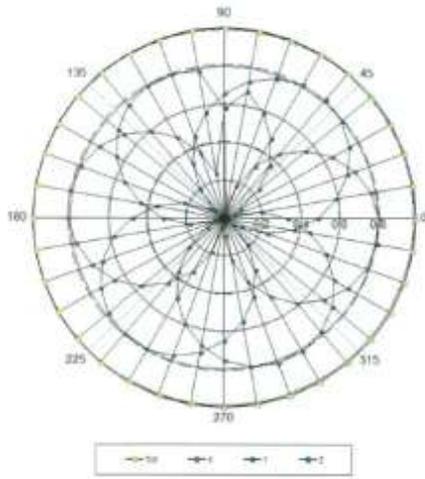
Uncertainty of Frequency Response of E-field: $\pm 7.5\%$ (k=2)



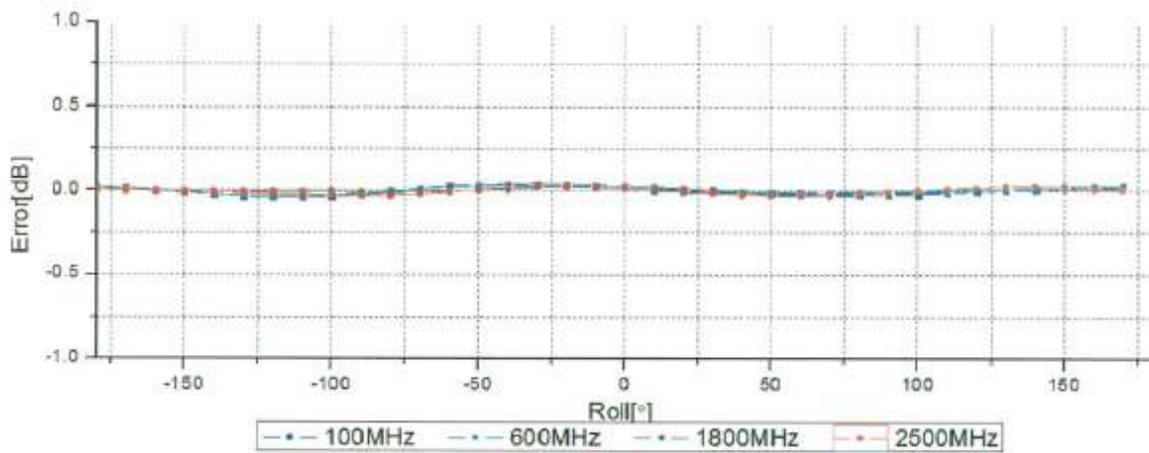
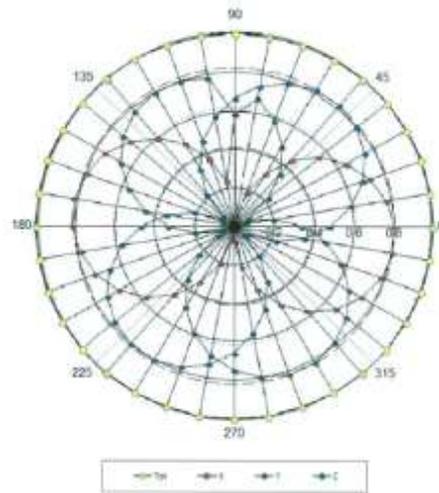
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Receiving Pattern (Φ), $\theta=0^\circ$

f=600 MHz, TEM

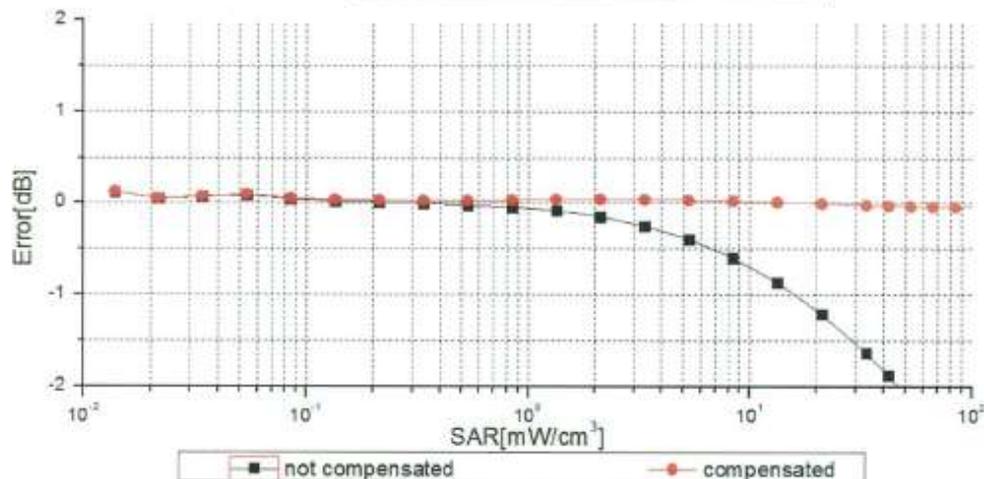
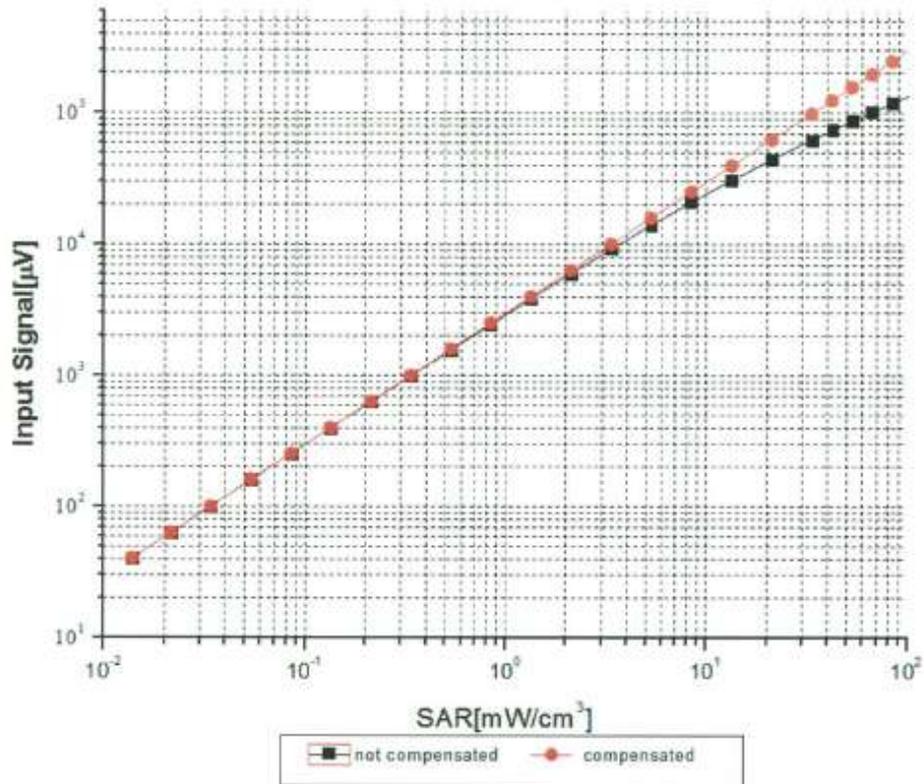


f=1800 MHz, R22



Uncertainty of Axial Isotropy Assessment: $\pm 0.9\%$ (k=2)

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

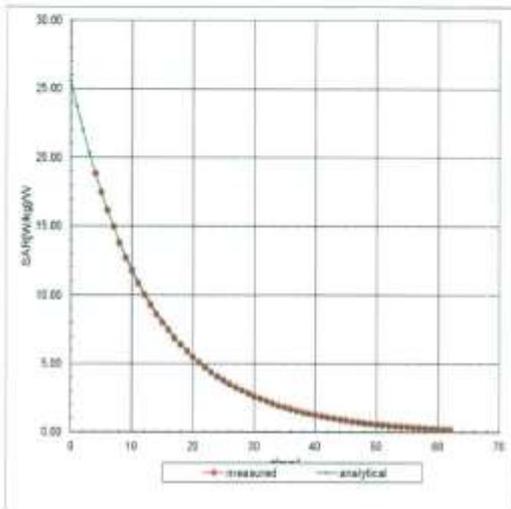
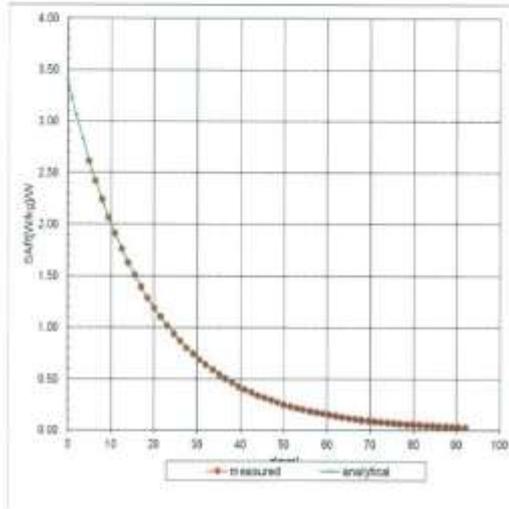


Uncertainty of Linearity Assessment: ±0.9% (k=2)

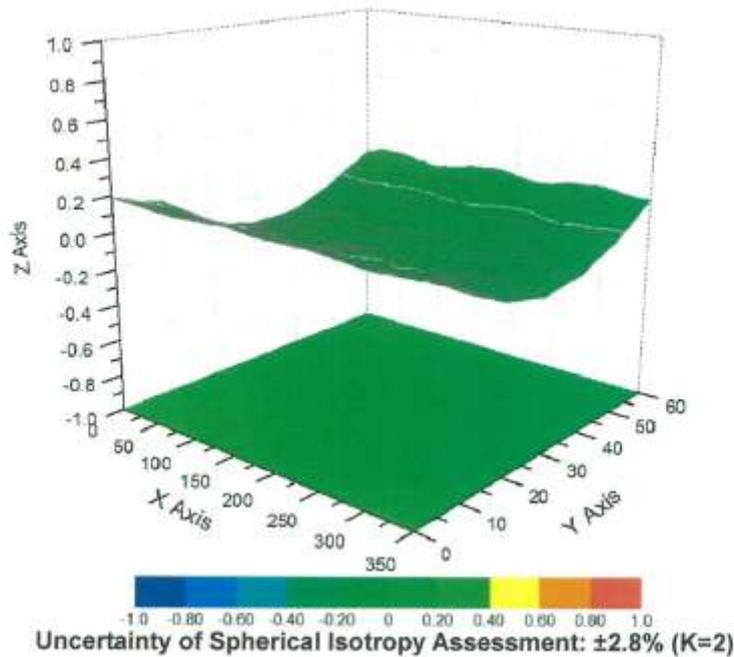
Conversion Factor Assessment

f=835 MHz, WGLS R9(H_convF)

f=1750 MHz, WGLS R22(H_convF)



Deviation from Isotropy in Liquid



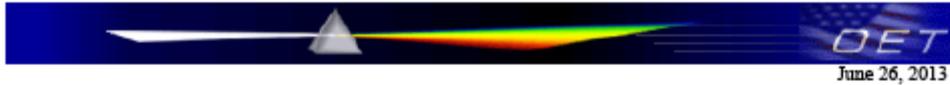


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DASY - Parameters of Probe: ES3DV3 - SN: 3241

Other Probe Parameters

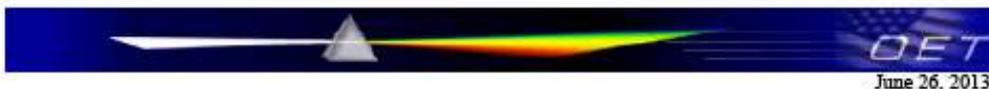
Sensor Arrangement	Triangular
Connector Angle (°)	149
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	4mm
Probe Tip to Sensor X Calibration Point	2mm
Probe Tip to Sensor Y Calibration Point	2mm
Probe Tip to Sensor Z Calibration Point	2mm
Recommended Measurement Distance from Surface	3mm



**Acceptable Conditions for SAR Measurements Using Probes and Dipoles
Calibrated under the SPEAG-TMC Dual-Logo Calibration Program to
Support FCC Equipment Certification**

The acceptable conditions for SAR measurements using probes, dipoles and DAEs calibrated by TMC (*Telecommunication Metrology Center of MITT in Beijing, China*), under the Dual-Logo Calibration Certificate program and quality assurance (QA) protocols established between SPEAG (*Schmid & Partner Engineering AG, Switzerland*) and TMC, to support FCC (*U.S. Federal Communications Commission*) equipment certification are defined and described in the following.

- 1) The agreement established between SPEAG and TMC is only applicable to calibration services performed by TMC where its clients (companies and divisions of such companies) are headquartered in the Greater China Region, including Taiwan and Hong Kong. This agreement is subject to renewal at the end of each calendar year between SPEAG and TMC. TMC shall inform the FCC of any changes or early termination to the agreement.
- 2) Only a subset of the calibration services specified in the SPEAG-TMC agreement, while it remains valid, are applicable to SAR measurements performed using such equipment for supporting FCC equipment certification. These are identified in the following.
 - a) Calibration of dosimetric (SAR) probes EX3DVx, ET3DVx and ES3DVx.
 - i) Free-space E-field and H-field probes, including those used for HAC (hearing aid compatibility) evaluation, temperature probes, other probes or equipment not identified in this document, when calibrated by TMC, are excluded and cannot be used for measurements to support FCC equipment certification.
 - ii) Signal specific and bundled probe calibrations based on PMR (probe modulation response) characteristics are handled according to the requirements of KDB 865664; that is, "Until standardized procedures are available to make such determination, the applicability of a signal specific probe calibration for testing specific wireless modes and technologies is determined on a case-by-case basis through KDB inquiries, including SAR system verification requirements."
 - b) Calibration of SAR system validation dipoles, excluding HAC dipoles.
 - c) Calibration of data acquisition electronics DAE3Vx, DAE4Vx and DAEasyVx.
 - d) For FCC equipment certification purposes, the frequency range of SAR probe and dipole calibrations is limited to 700 MHz - 6 GHz and provided it is supported by the equipment identified in the TMC QA protocol (a separate attachment to this document).
 - e) The identical system and equipment setup, measurement configurations, hardware, evaluation algorithms, calibration and QA protocols, including the format of calibration certificates and reports used by SPEAG shall be applied by TMC.
 - f) The calibrated items are only applicable to SPEAG DASY 4 and DASY 5 or higher version systems.



- 3) The SPEAG-TMC agreement includes specific protocols identified in the following to ensure the quality of calibration services provided by TMC under this SPEAG-TMC Dual-Logo calibration agreement are equivalent to the calibration services provided by SPEAG. TMC shall, upon request, provide copies of documentation to the FCC to substantiate program implementation.
 - a) The Inter-laboratory Calibration Evaluation (ILCE) stated in the TMC QA protocol shall be performed between SPEAG and TMC at least once every 12 months. The ILCE acceptance criteria defined in the TMC QA protocol shall be satisfied for the TMC, SPEAG and FCC agreements to remain valid.
 - b) Check of Calibration Certificate (CCC) shall be performed by SPEAG for all calibrations performed by TMC. Written confirmation from SPEAG is required for TMC to issue calibration certificates under the SPEAG-TMC Dual-Logo calibration program. Quarterly reports for all calibrations performed by TMC under the program are also issued by SPEAG.
 - c) The calibration equipment and measurement system used by TMC shall be verified before each calibration service according to the specific reference SAR probes, dipoles, and DAE calibrated by SPEAG. The results shall be reproducible and within the defined acceptance criteria specified in the TMC QA protocol before each actual calibration can commence. TMC shall maintain records of the measurement and calibration system verification results for all calibrations.
 - d) Quality Check of Calibration (QCC) certificates shall be performed by SPEAG at least once every 12 months. SPEAG shall visit TMC facilities to verify the laboratory, equipment, applied procedures and plausibility of randomly selected certificates.
- 4) A copy of this document, to be updated annually, shall be provided to TMC clients that accept calibration services according to the SPEAG-TMC Dual-Logo calibration program, which should be presented to a TCB (*Telecommunication Certification Body*), to facilitate FCC equipment approval.
- 5) TMC shall address any questions raised by its clients or TCBs relating to the SPEAG-TMC Dual-Logo calibration program and inform the FCC and SPEAG of any critical issues.

Change Note: Revised on June 26 to clarify the applicability of PMR and Bundled probe calibrations according to the requirements of KDB 865664.

Annex B.2 DAE4 Calibration Certificate

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



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Accreditation No.: **SCS 108**

Client **Tejet (Auden)**

Certificate No: **DAE4-1327_May14**

CALIBRATION CERTIFICATE			
Object	DAE4 - SD 000 D04 BJ - SN: 1327		
Calibration procedure(s)	QA CAL-06.v26 Calibration procedure for the data acquisition electronics (DAE)		
Calibration date:	May 05, 2014		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Kethley Multimeter Type 2001	SN: 0810278	01-Oct-13 (No:13976)	Oct-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-14 (in house check)	In house check: Jan-15
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-14 (in house check)	In house check: Jan-15
Calibrated by:	Name R.Mayoraz	Function Technician	Signature
Approved by:	Name Fin Bombolt	Function Deputy Technical Manager	Signature
			Issued: May 5, 2014
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**Calibration Laboratory of
Schmid & Partner
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Zeughausstrasse 43, 8004 Zurich, Switzerland



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Accreditation No.: **SCS 108**

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 following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - *DC Voltage Measurement Linearity*: Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - *Common mode sensitivity*: Influence of a positive or negative common mode voltage on the differential measurement.
 - *Channel separation*: Influence of a voltage on the neighbor channels not subject to an input voltage.
 - *AD Converter Values with inputs shorted*: Values on the internal AD converter corresponding to zero input voltage
 - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
 - *Input Offset Current*: Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - *Input resistance*: Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - *Low Battery Alarm Voltage*: Typical value for information. Below this voltage, a battery alarm signal is generated.
 - *Power consumption*: Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 μ V , 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	404.896 \pm 0.02% (k=2)	404.741 \pm 0.02% (k=2)	404.940 \pm 0.02% (k=2)
Low Range	3.99218 \pm 1.50% (k=2)	3.99097 \pm 1.50% (k=2)	3.99813 \pm 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	187.0 $^{\circ}$ \pm 1 $^{\circ}$
---	-------------------------------------

Appendix
1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	200036.27	0.51	0.00
Channel X + Input	20005.01	1.05	0.01
Channel X - Input	-20004.10	1.80	-0.01
Channel Y + Input	200033.33	-2.28	-0.00
Channel Y + Input	20003.31	-0.48	-0.00
Channel Y - Input	-20006.17	-0.06	0.00
Channel Z + Input	200033.50	-2.00	-0.00
Channel Z + Input	20002.83	-0.90	-0.00
Channel Z - Input	-20008.51	-2.38	0.01

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	2000.09	-0.19	-0.01
Channel X + Input	200.72	0.41	0.20
Channel X - Input	-199.42	0.24	-0.12
Channel Y + Input	2000.87	0.57	0.03
Channel Y + Input	200.02	-0.13	-0.06
Channel Y - Input	-198.35	1.42	-0.71
Channel Z + Input	2000.46	0.16	0.01
Channel Z + Input	199.68	-0.59	-0.29
Channel Z - Input	-201.15	-1.34	0.67

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-1.49	-2.80
	-200	4.58	3.19
Channel Y	200	15.02	14.91
	-200	-16.06	-16.06
Channel Z	200	-9.51	-9.74
	-200	8.51	8.58

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-0.85	-2.41
Channel Y	200	6.24	-	0.57
Channel Z	200	9.93	4.38	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	16000	14679
Channel Y	16291	17597
Channel Z	15620	15519

5. Input Offset Measurement

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

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	0.55	-0.77	1.82	0.52
Channel Y	0.60	-0.77	2.34	0.63
Channel Z	-0.49	-2.84	1.48	0.79

6. Input Offset Current

Nominal input circuitry offset current on all channels: $\lt; 25\mu A$

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

Annex B.3 D1900V2 Calibration Certificate



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Client **TEJET** Certificate No: **Z14-97044**

CALIBRATION CERTIFICATE

Object: **D1900V2 - SN: 5d155**

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

Calibration date: **May 23, 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)℃ 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 EX3DV4 DAE4	SN 3846	3- Sep-13 (SPEAG, No.EX3-3846_Sep13)	Sep-14
	SN 1331	23-Jan-14 (SPEAG, DAE4-1331_Jan14)	Jan -15
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:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: January 24, 2014

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

**Glossary:**

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM _{x,y,z}
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- 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
- 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
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- 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 \pm 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 \pm 0.2) °C	40.3 \pm 6 %	1.37 mho/m \pm 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.69 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	39.3 mW / g \pm 20.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.21 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	21.0 mW / g \pm 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 \pm 0.2) °C	52.7 \pm 6 %	1.48 mho/m \pm 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.1 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	40.9 mW / g \pm 20.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.29 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.3 mW / g \pm 20.4 % (k=2)



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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.7Ω- 7.35jΩ
Return Loss	- 22.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	52.0Ω- 6.48jΩ
Return Loss	- 23.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.211 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

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DASY5 Validation Report for Head TSL

Date: 21.05.2014

Test Laboratory: TMC, Beijing, China

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN: 5d155

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used; $f = 1900$ MHz; $\sigma = 1.372$ S/m; $\epsilon_r = 40.27$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(7.57, 7.57, 7.57); Calibrated: 2013-09-03;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2014-01-23
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=xx mW,

dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0; Measurement grid:

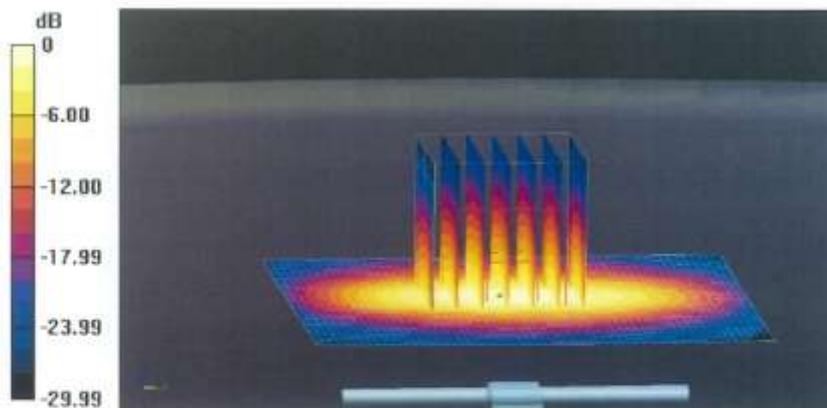
dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.2 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 18.0 W/kg

SAR(1 g) = 9.69 W/kg; SAR(10 g) = 5.21 W/kg

Maximum value of SAR (measured) = 14.0 W/kg



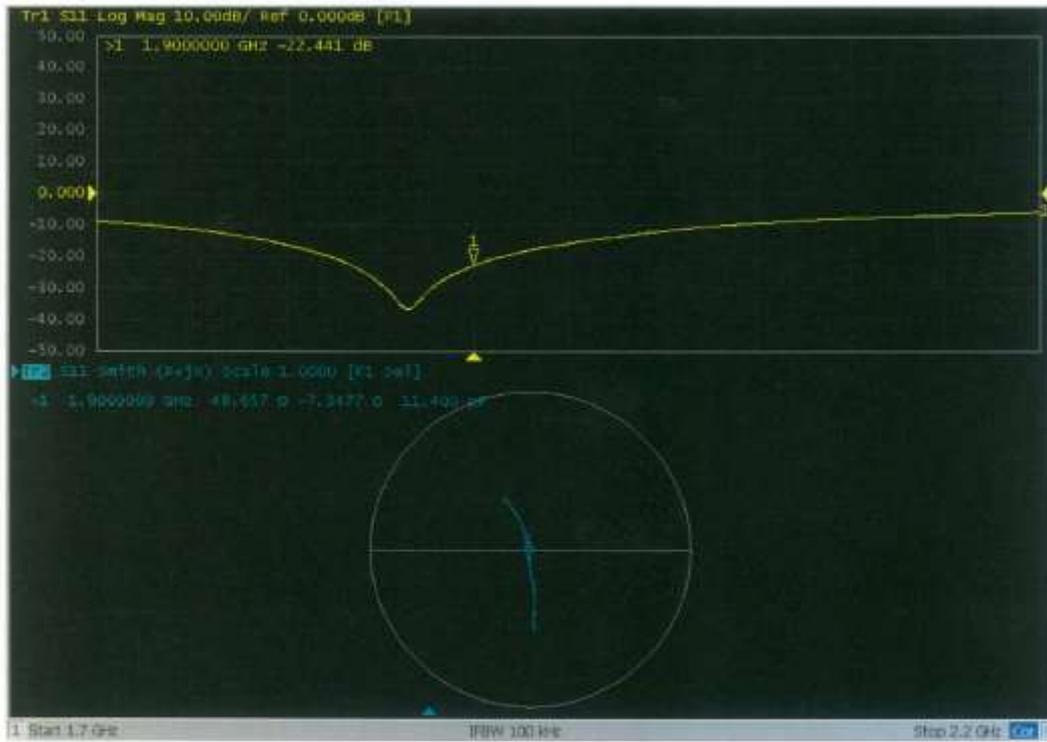
0 dB = 14.0 W/kg = 11.46 dBW/kg



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Impedance Measurement Plot for Head TSL





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DASY5 Validation Report for Body TSL

Date: 22.05.2014

Test Laboratory: TMC, Beijing, China

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN: 5d155

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.48$ S/m; $\epsilon_r = 52.72$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(7.03, 7.03, 7.03); Calibrated: 2013-09-03;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2014-01-23
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=xx mW,

dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

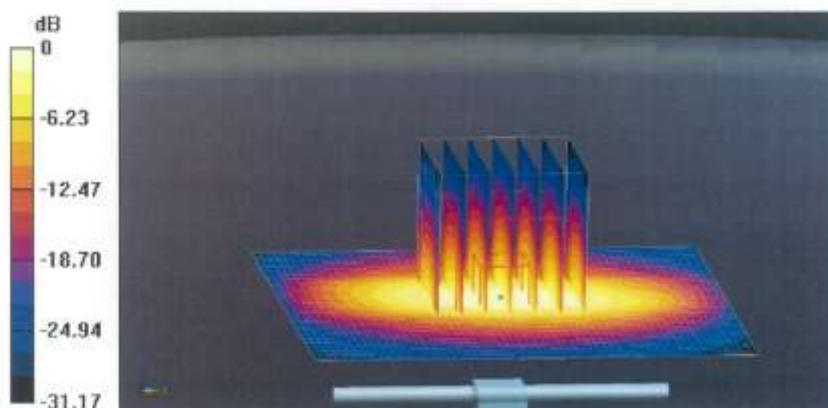
dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.2 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 18.0 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.29 W/kg

Maximum value of SAR (measured) = 14.3 W/kg



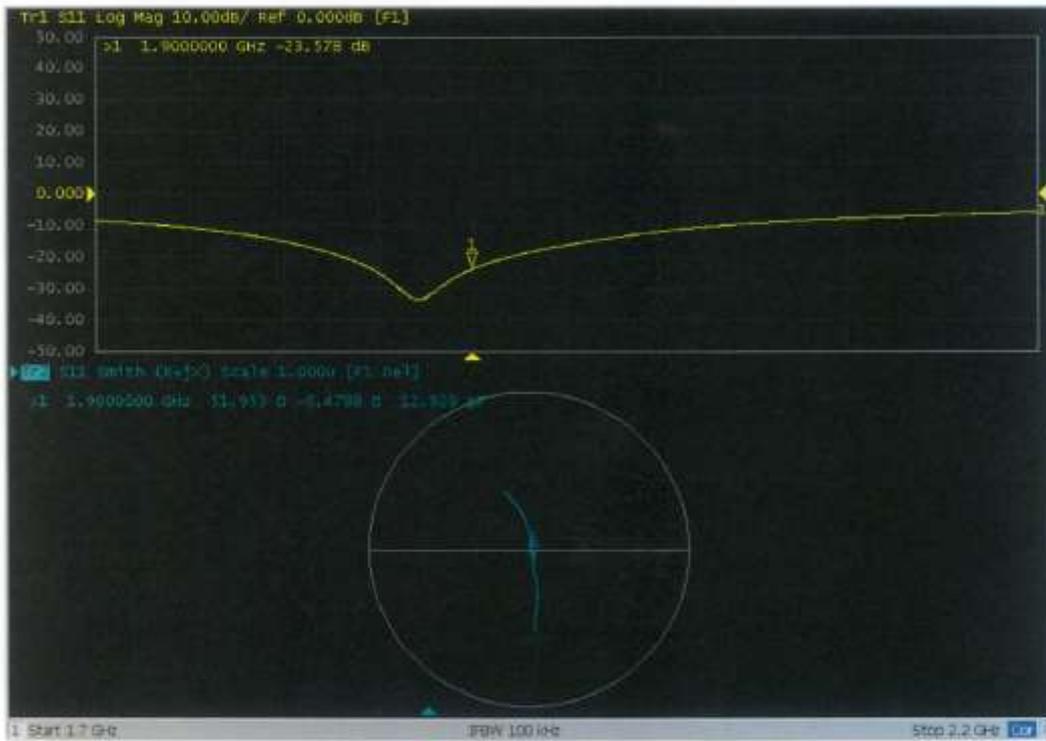
0 dB = 14.1 W/kg = 11.49 dBW/kg

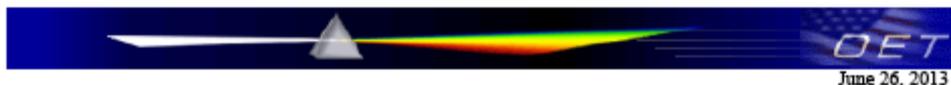


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Impedance Measurement Plot for Body TSL

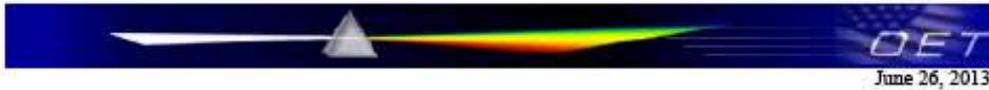




**Acceptable Conditions for SAR Measurements Using Probes and Dipoles
Calibrated under the SPEAG-TMC Dual-Logo Calibration Program to
Support FCC Equipment Certification**

The acceptable conditions for SAR measurements using probes, dipoles and DAEs calibrated by TMC (*Telecommunication Metrology Center of MITT in Beijing, China*), under the Dual-Logo Calibration Certificate program and quality assurance (QA) protocols established between SPEAG (*Schmid & Partner Engineering AG, Switzerland*) and TMC, to support FCC (*U.S. Federal Communications Commission*) equipment certification are defined and described in the following.

- 1) The agreement established between SPEAG and TMC is only applicable to calibration services performed by TMC where its clients (companies and divisions of such companies) are headquartered in the Greater China Region, including Taiwan and Hong Kong. This agreement is subject to renewal at the end of each calendar year between SPEAG and TMC. TMC shall inform the FCC of any changes or early termination to the agreement.
- 2) Only a subset of the calibration services specified in the SPEAG-TMC agreement, while it remains valid, are applicable to SAR measurements performed using such equipment for supporting FCC equipment certification. These are identified in the following.
 - a) Calibration of dosimetric (SAR) probes EX3DVx, ET3DVx and ES3DVx.
 - i) Free-space E-field and H-field probes, including those used for HAC (hearing aid compatibility) evaluation, temperature probes, other probes or equipment not identified in this document, when calibrated by TMC, are excluded and cannot be used for measurements to support FCC equipment certification.
 - ii) Signal specific and bundled probe calibrations based on PMR (probe modulation response) characteristics are handled according to the requirements of KDB 865664; that is, "Until standardized procedures are available to make such determination, the applicability of a signal specific probe calibration for testing specific wireless modes and technologies is determined on a case-by-case basis through KDB inquiries, including SAR system verification requirements."
 - b) Calibration of SAR system validation dipoles, excluding HAC dipoles.
 - c) Calibration of data acquisition electronics DAE3Vx, DAE4Vx and DAEasyVx.
 - d) For FCC equipment certification purposes, the frequency range of SAR probe and dipole calibrations is limited to 700 MHz - 6 GHz and provided it is supported by the equipment identified in the TMC QA protocol (a separate attachment to this document).
 - e) The identical system and equipment setup, measurement configurations, hardware, evaluation algorithms, calibration and QA protocols, including the format of calibration certificates and reports used by SPEAG shall be applied by TMC.
 - f) The calibrated items are only applicable to SPEAG DASY 4 and DASY 5 or higher version systems.



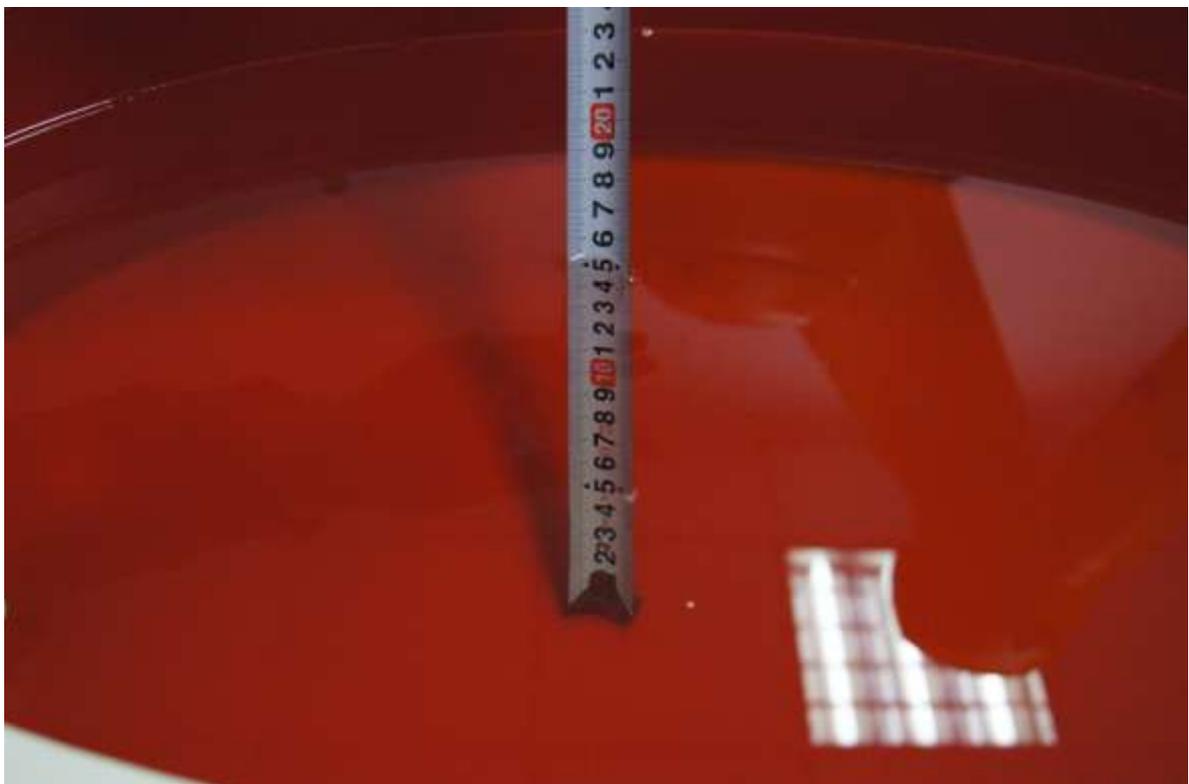
- 3) The SPEAG-TMC agreement includes specific protocols identified in the following to ensure the quality of calibration services provided by TMC under this SPEAG-TMC Dual-Logo calibration agreement are equivalent to the calibration services provided by SPEAG. TMC shall, upon request, provide copies of documentation to the FCC to substantiate program implementation.
 - a) The Inter-laboratory Calibration Evaluation (ILCE) stated in the TMC QA protocol shall be performed between SPEAG and TMC at least once every 12 months. The ILCE acceptance criteria defined in the TMC QA protocol shall be satisfied for the TMC, SPEAG and FCC agreements to remain valid.
 - b) Check of Calibration Certificate (CCC) shall be performed by SPEAG for all calibrations performed by TMC. Written confirmation from SPEAG is required for TMC to issue calibration certificates under the SPEAG-TMC Dual-Logo calibration program. Quarterly reports for all calibrations performed by TMC under the program are also issued by SPEAG.
 - c) The calibration equipment and measurement system used by TMC shall be verified before each calibration service according to the specific reference SAR probes, dipoles, and DAE calibrated by SPEAG. The results shall be reproducible and within the defined acceptance criteria specified in the TMC QA protocol before each actual calibration can commence. TMC shall maintain records of the measurement and calibration system verification results for all calibrations.
 - d) Quality Check of Calibration (QCC) certificates shall be performed by SPEAG at least once every 12 months. SPEAG shall visit TMC facilities to verify the laboratory, equipment, applied procedures and plausibility of randomly selected certificates.
- 4) A copy of this document, to be updated annually, shall be provided to TMC clients that accept calibration services according to the SPEAG-TMC Dual-Logo calibration program, which should be presented to a TCB (*Telecommunication Certification Body*), to facilitate FCC equipment approval.
- 5) TMC shall address any questions raised by its clients or TCBs relating to the SPEAG-TMC Dual-Logo calibration program and inform the FCC and SPEAG of any critical issues.

Change Note: Revised on June 26 to clarify the applicability of PMR and Bundled probe calibrations according to the requirements of KDB 865664.

ANNEX C: Test Layout



Picture C.1: Specific Absorption Rate Test Layout



Picture C.2: Liquid depth in the flat Phantom (1900 MHz) (15.3cm deep)



Picture C.3: liquid depth in the head Phantom (1900 MHz) (15.2cm deep)

-----END OF REPORT-----