SAR TEST REPORT

Applicant	MobiWire SAS
FCC ID	QPN-DAKOTA
Brand	MobiWire
Product	2G Feature phone
Model	Dakota
Report No.	RXA1603-0036SAR01R3
Issue Date	May 9, 2016

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **IEEE 1528- 2013, ANSI/IEEE C95.1-1991.** The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Reviewed by: Jiangpeng Lan/ Manager

Approved by: Kai Xu/ Director

TESTING
No. L2264

TA Technology (Shanghai) Co., Ltd.

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1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd).**The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above. This report must not be used by the client to claim product certification, approval, or endorsement by CNAS or any government agencies.

1.2 Test facility

CNAS (accreditation number:L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (recognition number is 428261)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.

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1.4 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

2 Statement of Compliance

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

Table 2.1: Highest Reported SAR

Mode	Highest Reported SAR (W/kg)			
	1g SAR Head	1g SAR Body-worn (Separation 10mm)	1g SAR Hotspot (Separation 10mm)	10g SAR Extremity (Separation 0mm)
GSM 850	0.68	0.55	1.45	NA
GSM 1900	0.58	0.62	1.16	NA
Wi-Fi	0.19	0.11	0.11	NA
Bluetooth	NA	NA	NA	NA
Date of Testing:	April 11, 2016~ April 12, 2016			
Note: The device is in compliance with SAR for Uncontrolled Environment /General Population exposure limits (1.6 W/kg and 4.0 W/kg) specified in ANSI/IEEE C95.1-1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.				

Table 2.2: Highest Simultaneous Transmission SAR

Exposure Configuration	1g SAR Head	1g SAR Body-worn (Separation 10mm)	1g SAR Hotspot (Separation 10mm)	10g SAR Extremity (Separation 0mm)
Highest Simultaneous Transmission SAR (W/kg)	0.86	0.73	1.56	NA
Note: The detail for simultaneous transmission consideration is described in chapter 10.				

3 Description of Equipment under Test

Client Information

Applicant	MobiWire SAS
Applicant address	79 AVENUE FRANCOIS ARAGO 92017 NANTERRE CEDEX France.
Manufacturer	MOBIWIRE MOBILES (NINGBO) CO.,LTD
Manufacturer address	No.999,Dacheng East Road,Fenghua City,Zhejiang

Accessory Equipment Details

Name	Model	Manufacturer	Capacity
Battery	178102335 (NL11)	Ningbo Veken Battery Co., Ltd.	1400mAh
Earphone	JWEP0750-M01	Shenzhen Juwei Electronics Co.,Ltd	/

General Technologies

EUT Stage:	Production Unit
Model:	Dakota
IMEI:	359816061159386
Hardware Version:	V01
Software Version:	V01
Antenna Type:	Internal Antenna
Device Class:	B
Power Class:	GSM 850:4 GSM 1900:1
Power Level	GSM 850:level 5 GSM 1900:level 0

Wireless Technology and Frequency Range

Wireless Technology		Modulation	Operating mode	Tx (MHz)
GSM	850	Voice(GMSK) GPRS(GMSK) EGPRS(GMSK,8PSK)	☐Multi-slot Class:8-1UP ☐Multi-slot Class:10-2UP ☒Multi-slot Class:12-4UP ☐Multi-slot Class:33-4UP	824 ~ 849
	1900			1850 ~ 1910
	Does this device support DTM (Dual Transfer Mode)? ☐Yes ☒No			
BT	2.4G	Version 3.0 EDR		2402 ~2480
Wi-Fi	2.4G	DSSS,OFDM	802.11b/g/n (HT20)	2402 ~2472
	Does this device support 2.4G MIMO ☐Yes ☒No			

4 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE 1528- 2013, ANSI/IEEE C95.1-1991, the following FCC Published RF exposure KDB procedures:

248227 D01 SAR meas for 802.11 v02r02
447498 D01 General RF Exposure Guidance v06
648474 D04 Handset SAR v01r03
865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
865664 D02 RF Exposure Reporting v01r02
941225 D06 Hotspot Mode v02r01

5 Operational Conditions during Test

5.1 Test Positions

5.1.1 Against Phantom Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

The positions used in the measurements were according to IEEE 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".

5.1.2 Body Worn Configuration

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations.

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. Per FCC KDB Publication 648474 D04, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person’s face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

5.2 Measurement Variability

Per FCC KDB Publication 865664 D01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:
1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

5.3 Test Configuration

5.3.1 GSM Test Configuration

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot. The allowed power reduction in the multi-slot configuration is as following:

Output power of reductions:

Table 5.1: The allowed power reduction in the multi-slot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power,(dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

5.3.2 WiFi Test Configuration

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the *initial test position(s)* by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The *initial test position(s)* is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the *reported* SAR for the *initial test position* is:

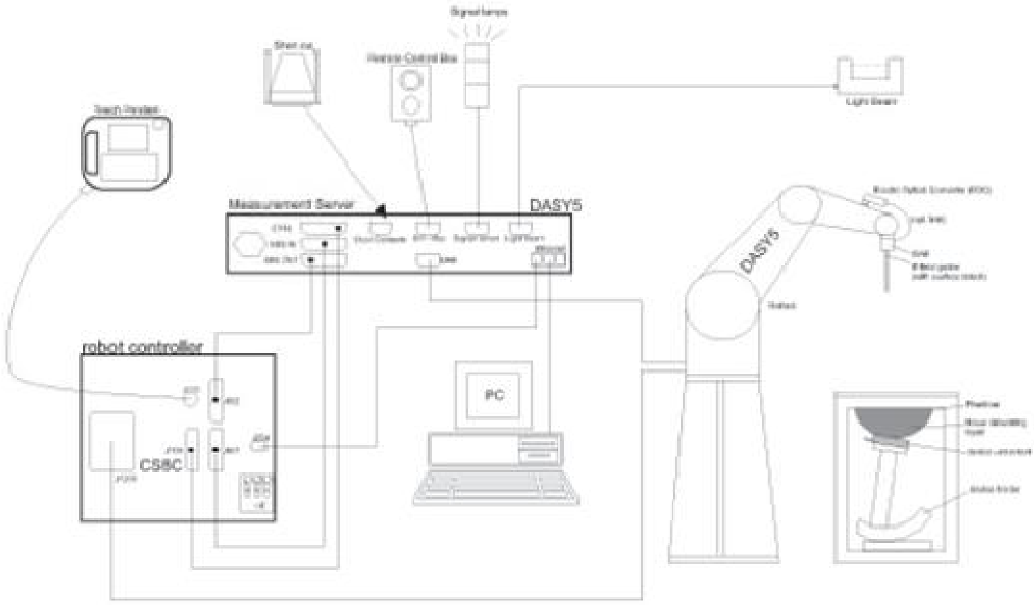
- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the *initial test position* to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the *reported* SAR is ≤ 0.8 W/kg or all required test positions are tested.
    - ✧ For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
    - ✧ When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the *initial test position* and subsequent test positions, when the *reported* SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the *reported* SAR is ≤ 1.2 W/kg or all required test channels are considered.
    - ✧ The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.

To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

6 SAR Measurements System Configuration

6.1 SAR Measurement Set-up

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



- ➢ A standard high precision 6-axis robot 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 or Win7 and the DASY software.
- ➢ Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- ➢ The phantom, the device holder and other accessories according to the targeted measurement.

6.2 DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

EX3DV4 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	ISO/IEC 17025 calibration service available
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μW/g to > 100 mW/g Linearity: ± 0.2dB (noise: typically < 1 μW/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure Scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. 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 bellow 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.

$$SAR = C\Delta T/\Delta t$$

Where: Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

Or

$$SAR = |E|^2\sigma/\rho$$

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

6.3 SAR Measurement Procedure

Power Reference Measurement

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

Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.
Area scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

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

Zoom Scan

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

Zoom scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

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

Volume Scan Procedures

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

Power Drift Monitoring

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

7 Main Test Equipment

Name of Equipment	Manufacturer	Type/Model	Serial Number	Last Cal.	Cal. Due Date
Network analyzer	Agilent	E5071B	MY42404014	2015-05-25	2016-05-24
Dielectric Probe Kit	HP	85070E	US44020115	No Calibration Requested	
Power meter	Agilent	E4417A	GB41291714	2015-05-22	2016-05-21
Power sensor	Agilent	N8481H	MY50350004	2015-05-25	2016-05-24
Power sensor	Agilent	E9327A	US40441622	2015-05-25	2016-05-24
Dual directional coupler	Agilent	778D-012	50519	No Calibration Requested	
Dual directional coupler	Agilent	777D	50146	No Calibration Requested	
Amplifier	INDEXSAR	IXA-020	0401	No Calibration Requested	
Wideband radio communication tester	R&S	CMW 500	113645	2015-05-25	2016-05-24
E-field Probe	SPEAG	EX3DV4	3677	2015-12-10	2016-12-09
DAE	SPEAG	DAE4	871	2015-11-17	2016-11-16
Validation Kit 835MHz	SPEAG	D835V2	4d020	2014-08-28	2017-08-27
Validation Kit 1900MHz	SPEAG	D1900V2	5d060	2014-09-01	2017-08-31
Validation Kit 2450MHz	SPEAG	D2450V2	786	2014-09-01	2017-08-31
Temperature Probe	Tianjin jinming	JM222	AA1009129	2015-05-22	2016-05-21
Hygrothermograph	Tianjin jinming	WS-1	64591	2015-05-25	2016-05-24

8 Tissue Dielectric Parameter Measurements & System Verification

8.1 Tissue Verification

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance.

Target values

Frequency (MHz)		Water (%)	Salt (%)	Sugar (%)	Glycol (%)	Preventol (%)	Cellulose (%)	ε_r	σ(s/m)
835	head	41.45	1.45	56	0	0.1	1.0	41.5	0.90
	body	52.5	1.4	45	0	0.1	1.0	55.2	0.97
1900	head	55.242	0.306	0	44.452	0	0	40.0	1.40
	body	69.91	0.13	0	29.96	0	0	53.3	1.52
2450	head	62.7	0.5	0	36.8	0	0	39.2	1.80
	body	73.2	0.1	0	26.7	0	0	52.7	1.95

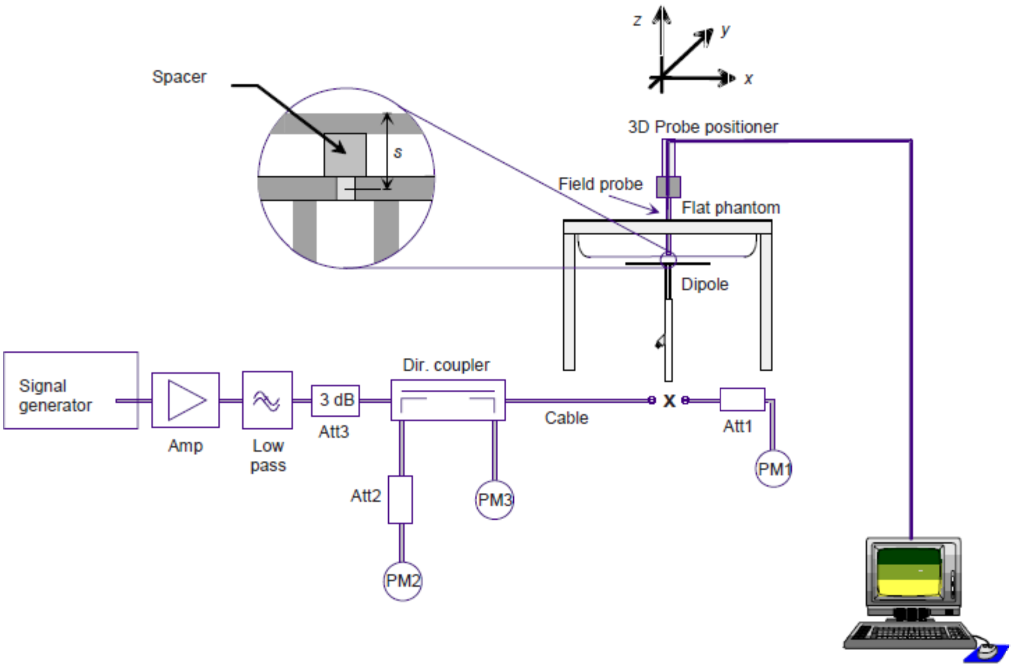
Measurements results

Frequency(MHz)		Test Date	Temp ℃	Measured Dielectric Parameters		Target Dielectric Parameters		Limit (Within ±5%)	
				ε_r	σ(s/m)	ε_r	σ(s/m)	Dev ε_r(%)	Dev σ(%)
835	head	4/11/2016	21.5	41.86	0.94	41.5	0.90	0.87	4.44
	body	4/11/2016	21.5	54.17	0.96	55.2	0.97	-1.87	-1.03
1900	head	4/11/2016	21.5	40.72	1.41	40.0	1.40	1.80	0.71
	body	4/11/2016	21.5	52.57	1.51	53.3	1.52	-1.37	-0.66
2450	head	4/12/2016	21.5	38.31	1.83	39.2	1.80	-2.27	1.67
	body	4/12/2016	21.5	52.50	1.98	52.7	1.95	-0.38	1.54
Note: The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.									

8.2 System Performance Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured using the dielectric probe kit and the network analyzer. A system check measurement for every day was made following the determination of the dielectric parameters of the Tissue simulates, using the dipole validation kit. The dipole antenna was placed under the flat section of the twin SAM phantom.

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



Picture 1 System Performance Check setup

Picture 2 Setup Photo

Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (< - 20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB 865664 D01:

Head Liquid					
	Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
Dipole D835V2 SN: 4d020	8/28/2014	-30.1	/	48.6	/
	8/27/2015	-31.1	3.3%	49.7	1.1Ω
Dipole D1900V2 SN: 5d060	9/1/2014	-22.8	/	54.1	/
	8/31/2015	-23.7	3.9%	55.4	1.3Ω
Dipole D2450V2 SN: 786	9/1/2014	-23.6	/	57.1	/
	8/31/2015	-23.9	1.3%	57.4	0.3Ω
Body Liquid					
	Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
Dipole D835V2 SN: 4d020	8/28/2014	-23.3	/	54.0	/
	8/27/2015	-23.9	2.6%	53.5	0.5Ω
Dipole D1900V2 SN: 5d060	9/1/2014	-21.6	/	57.6	/
	8/31/2015	-20.8	3.7%	57.3	0.3Ω
Dipole D2450V2 SN: 786	9/1/2014	-23.7	/	56.0	/
	8/31/2015	-24	1.3%	55.8	0.2Ω

System Check results

Frequency (MHz)		Test Date	Temp ℃	250mW Measured SAR_{1g} (W/kg)	1W Normalized SAR_{1g} (W/kg)	1W Target SAR_{1g} (W/kg)	Limit (Within ±10%) Dev (%)	Plot No.
835	Head	4/11/2016	21.5	2.44	9.76	9.54	2.31	1
	Body	4/11/2016	21.5	2.41	9.64	9.54	1.05	2
1900	Head	4/11/2016	21.5	9.48	37.92	39.20	-3.27	3
	Body	4/11/2016	21.5	9.93	39.72	40.00	-0.70	4
2450	Head	4/12/2016	21.5	13.7	54.8	52.50	4.38	5
	Body	4/12/2016	21.5	12.5	50.0	52.40	-4.58	6
Note：Target Values used derive from the calibration certificate Data Storage and Evaluation.								

9 Normal and Maximum Output Power

KDB 447498 D01 at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

9.1 GSM Mode

<table>
<tr><th colspan="2" rowspan="2">GSM 850</th><th colspan="3">Burst Average Power(dBm)</th><th rowspan="3">Division Factors (dB)</th><th colspan="3">Frame-Average Power(dBm)</th><th rowspan="3">Burst Tune-up Limit (dBm)</th></tr>
<tr></tr>
<tr><th colspan="2">Tx Channel</th><th>128</th><th>190</th><th>251</th><th>128</th><th>190</th><th>251</th></tr>
<tr><th colspan="2">Frequency(MHz)</th><th>824.2</th><th>836.6</th><th>848.8</th><th></th><th>824.2</th><th>836.6</th><th>848.8</th><th></th></tr>
<tr><td colspan="2">GSM(GMSK)</td><td>32.36</td><td>32.40</td><td>32.39</td><td>9.03</td><td>23.33</td><td>23.37</td><td>23.36</td><td>32.50</td></tr>
<tr><td rowspan="4">GPRS (GMSK)</td><td>1Txslot</td><td>32.32</td><td>32.37</td><td>32.36</td><td>9.03</td><td>23.29</td><td>23.34</td><td>23.33</td><td>32.50</td></tr>
<tr><td>2Txslots</td><td>31.41</td><td>31.47</td><td>31.48</td><td>6.02</td><td>25.39</td><td>25.45</td><td>25.46</td><td>31.50</td></tr>
<tr><td>3Txslots</td><td>29.68</td><td>29.74</td><td>29.76</td><td>4.26</td><td>25.42</td><td>25.48</td><td>25.50</td><td>30.00</td></tr>
<tr><td>4Txslots</td><td>28.95</td><td>29.00</td><td>29.02</td><td>3.01</td><td>25.94</td><td>25.99</td><td>26.01</td><td>29.50</td></tr>
<tr><th colspan="2">GSM 1900</th><th colspan="3">Power(dBm)</th><th rowspan="3">Division Factors (dB)</th><th colspan="3">Power(dBm)</th><th rowspan="3">Burst Tune-up Limit (dBm)</th></tr>
<tr><th colspan="2">Tx Channel</th><th>512</th><th>661</th><th>810</th><th>512</th><th>661</th><th>810</th></tr>
<tr><th colspan="2">Frequency(MHz)</th><th>1850.2</th><th>1880</th><th>1909.8</th><th>1850.2</th><th>1880</th><th>1909.8</th></tr>
<tr><td colspan="2">GSM(GMSK)</td><td>29.49</td><td>29.30</td><td>29.11</td><td>9.03</td><td>20.46</td><td>20.27</td><td>20.08</td><td>29.50</td></tr>
<tr><td rowspan="4">GPRS (GMSK)</td><td>1Txslot</td><td>29.46</td><td>29.32</td><td>29.10</td><td>9.03</td><td>20.43</td><td>20.29</td><td>20.07</td><td>29.50</td></tr>
<tr><td>2Txslots</td><td>28.60</td><td>28.64</td><td>28.58</td><td>6.02</td><td>22.58</td><td>22.62</td><td>22.56</td><td>29.00</td></tr>
<tr><td>3Txslots</td><td>26.78</td><td>26.98</td><td>27.14</td><td>4.26</td><td>22.52</td><td>22.72</td><td>22.88</td><td>27.50</td></tr>
<tr><td>4Txslots</td><td>26.02</td><td>26.25</td><td>26.45</td><td>3.01</td><td>23.01</td><td>23.24</td><td>23.44</td><td>26.50</td></tr>
<tr><td colspan="10">Notes: The worst-case configuration and mode for SAR testing is determined to be as follows:
1. Standalone: GSM 850 GMSK (GPRS) mode with 4 time slots for Max power, GSM 1900 GMSK (GPRS) mode with 4 time slots for Max power, based on the output power measurements above.</td></tr>
</table>

9.2 WLAN Mode

Band	Mode	Data Rate	Channel/Frequency(MHz)			Tune-up Limit (dBm)
			1/2412	6/2437	11/2462	
2.4G	80.2 11b	1M	14.15	13.44	12.46	14.5
		2M	14.08	13.29	12.24	
		5.5M	13.88	13.03	12.28	
		11M	13.85	12.90	11.91	
	80.2 11g	6M	11.06	10.33	9.34	11.5
		9M	10.87	10.19	9.19	
		12M	10.77	10.07	9.07	
		18M	10.53	9.65	8.82	
		24M	10.33	9.40	8.58	
		36M	9.87	8.99	7.93	
		48M	9.40	8.61	7.62	
		54M	9.23	8.28	7.47	
	80.2 11n (HT20)	6.5M	11.03	10.15	9.29	11.5
		13M	10.77	9.87	9.07	
		19.5M	10.53	9.61	8.80	
		26M	10.16	9.41	8.41	
		39M	9.76	8.97	7.94	
		52M	9.37	8.62	7.52	
		58.5M	9.21	8.19	7.39	
		65M	9.05	8.11	7.95	

Note. 1. SAR is not required when the maximum output power in 802.11g/n HT20/HT 40 channels less than 802. 11b.

2. The Tx power is set to 18 for 802.11 b mode, set to 15 for 802.11 g mode, is set to 12 for 802.11 n HT20 mode by software.

9.3 Bluetooth Mode

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Tune-up Limit (dBm)
GFSK(dBm)	4.02	3.20	4.08	4.50
π/4DQPSK(dBm)	3.80	2.94	3.81	4.00
8DPSK(dBm)	4.11	3.24	4.17	4.50

Per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

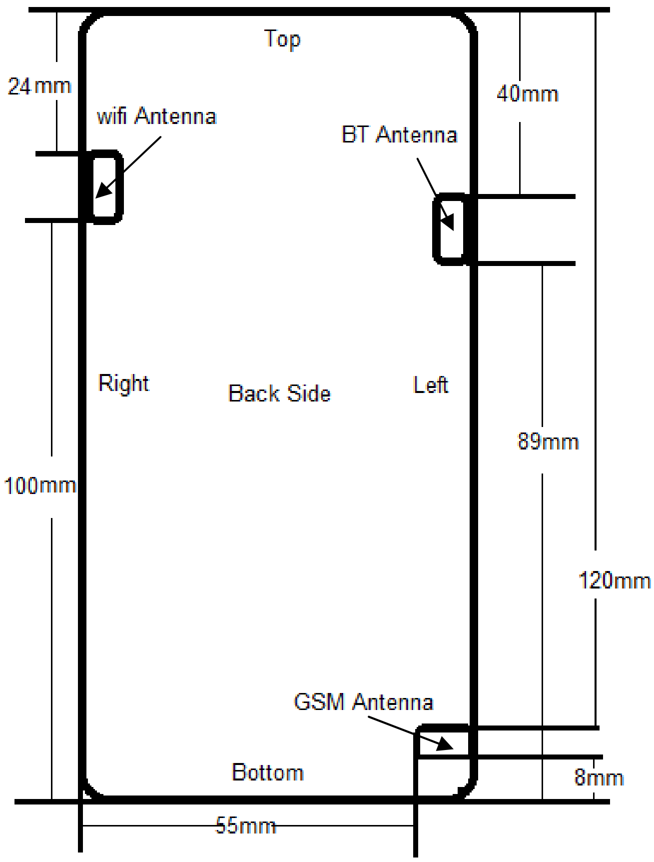
- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Per KDB 447498 D01, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Bluetooth	Distance(mm)	MAX Power (dBm)	Ratio	Evaluation
Head	5	4.50	0.87	No
Body	10	4.50	0.44	No

10 Measured and Reported (Scaled) SAR Results

10.1 EUT Antenna Locations



Overall (Length x Width): 132 mm x 57 mm Overall Diagonal: 134 mm/Display Diagonal: 61 mm						
Distance of the Antenna to the EUT surface/edge						
Antenna	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
GSM Antenna	0	0	0	55	120	8
Wi-Fi Antenna	0	0	55	0	24	101
BT Antenna	0	0	0	56	40	89
Hotspot mode, Positions for SAR tests						
Mode	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
GSM 850/1900	Yes	Yes	Yes	N/A	N/A	Yes
2.4GHz WLAN	Yes	Yes	N/A	Yes	Yes	N/A
Note: 1. Per KDB 941225 D06, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.						

10.2 Measured SAR Results

Table 1: GSM 850

Test Position	Cover Type	Channel/ Frequency (MHz)	Time slot	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Head SAR											
Left Cheek	standard	251/848.8	GSM	1:8.3	32.50	32.39	0.024	0.663	1.03	0.680	7
		190/836.6	GSM	1:8.3	32.50	32.40	-0.163	0.531	1.02	0.543	/
		128/824.2	GSM	1:8.3	32.50	32.36	-0.018	0.401	1.03	0.414	/
Left Tilt	standard	190/836.6	GSM	1:8.3	32.50	32.40	0.099	0.527	1.02	0.539	/
Right Cheek	standard	190/836.6	GSM	1:8.3	32.50	32.40	0.113	0.525	1.02	0.537	/
Right Tilt	standard	190/836.6	GSM	1:8.3	32.50	32.40	-0.074	0.281	1.02	0.288	/
Body-worn (Distance 10mm)											
Back Side	standard	190/836.6	GSM	1:8.3	32.50	32.40	-0.028	0.540	1.02	0.553	8
Front Side	standard	190/836.6	GSM	1:8.3	32.50	32.40	-0.041	0.513	1.02	0.525	/
Hotspot (Distance 10mm)											
Back Side	standard	251/848.8	4Txslots	1:2.07	29.50	29.02	0.072	1.010	1.12	1.128	/
	standard	190/836.6	4Txslots	1:2.07	29.50	29.00	-0.029	1.220	1.12	1.369	/
	standard	128/824.2	4Txslots	1:2.07	29.50	28.95	0.014	1.280	1.14	1.453	9
Front Side	standard	251/848.8	4Txslots	1:2.07	29.50	29.02	0.063	1.110	1.12	1.240	/
	standard	190/836.6	4Txslots	1:2.07	29.50	29.00	-0.045	1.080	1.12	1.212	/
	standard	128/824.2	4Txslots	1:2.07	29.50	28.95	-0.072	0.993	1.14	1.127	/
Left Edge	standard	190/836.6	4Txslots	1:2.07	29.50	29.00	-0.037	0.265	1.12	0.297	/
Right Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	190/836.6	4Txslots	1:2.07	29.50	29.00	0.037	0.048	1.12	0.054	/
Back Side	Earphone	128/824.2	GSM	1:8.3	32.50	32.36	-0.055	0.515	1.03	0.532	/
Back Side	Repeat	128/824.2	4Txslots	1:2.07	29.50	28.95	0.031	1.090	1.14	1.237	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

3. When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.

4. Per FCC KDB Publication 648474 D04, SAR was evaluated without a headset connected to the device. Since the reported SAR was ≤ 1.2 W/kg, no additional SAR evaluations using a headset cable were required.

Measurement Variability

Test Position	Channel/ Frequency(MHz)	MAX Measured SAR_{1g} (W/kg)	1^{st} Repeated SAR_{1g} (W/kg)	Ratio
Back Side	128/824.2	1.280	1.090	1.17

Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

Table 2: GSM 1900

Test Position	Cover Type	Channel/ Frequency (MHz)	Time slot	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Head SAR											
Left Cheek	standard	661/1880	GSM	1:8.3	29.50	29.30	0.045	0.553	1.05	0.579	10
Left Tilt	standard	661/1880	GSM	1:8.3	29.50	29.30	-0.090	0.109	1.05	0.114	/
Right Cheek	standard	661/1880	GSM	1:8.3	29.50	29.30	-0.105	0.304	1.05	0.318	/
Right Tilt	standard	661/1880	GSM	1:8.3	29.50	29.30	0.001	0.102	1.05	0.107	/
Body-worn (Distance 10mm)											
Back Side	standard	661/1880	GSM	1:8.3	29.50	29.30	0.003	0.596	1.05	0.624	11
Front Side	standard	661/1880	GSM	1:8.3	29.50	29.30	0.026	0.459	1.05	0.481	/
Hotspot (Distance 10mm)											
Back Side	standard	810/1909.8	4Txslots	1:2.07	26.50	26.45	-0.030	1.090	1.01	1.103	12
	standard	661/1880	4Txslots	1:2.07	26.50	26.25	0.031	1.060	1.06	1.123	/
	standard	512/1850.2	4Txslots	1:2.07	26.50	26.02	-0.106	1.030	1.12	1.150	/
Front Side	standard	810/1909.8	4Txslots	1:2.07	26.50	26.45	0.030	0.844	1.01	0.854	/
	standard	661/1880	4Txslots	1:2.07	26.50	26.25	0.020	0.826	1.06	0.875	/
	standard	512/1850.2	4Txslots	1:2.07	26.50	26.02	0.041	0.784	1.12	0.876	/
Left Edge	standard	661/1880	4Txslots	1:2.07	26.50	26.25	-0.007	0.218	1.06	0.231	/
Right Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	661/1880	4Txslots	1:2.07	26.50	26.25	0.034	0.556	1.06	0.589	/
Back Side	Earphone	512/1850.2	GSM	1:8.3	29.50	29.49	-0.168	0.967	1.00	0.969	/
Back Side	Repeat	810/1909.8	4Txslots	1:2.07	26.50	26.02	-0.045	1.040	1.12	1.162	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s).

3. When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.

4. Per FCC KDB Publication 648474 D04, SAR was evaluated without a headset connected to the device. Since the reported SAR was ≤ 1.2 W/kg, no additional SAR evaluations using a headset cable were required.

Measurement Variability

Test Position	Channel/ Frequency(MHz)	MAX Measured SAR (1g)	1^{st} Repeated SAR_{1g} (W/kg)	Ratio
Back Side	810/1909.8	1.090	1.040	1.048

Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.

2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

Table 3: Wi-Fi

Test Position	Cover Type	Channel/ Frequency (MHz)	Mode 802.11b	Duty Cycle	Area Scan Max.SAR (W/Kg)	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Head SAR												
Left Cheek	standard	1/2412	DSSS	1:1	0.14	14.00	13.45	-0.120	0.158	1.14	0.179	/
Left Tilt	standard	1/2412	DSSS	1:1	0.083	14.00	13.45	0.150	0.086	1.14	0.097	/
Right Cheek	standard	1/2412	DSSS	1:1	0.167	14.00	13.45	0.033	0.170	1.14	0.193	13
Right Tilt	standard	1/2412	DSSS	1:1	0.135	14.00	13.45	0.026	0.136	1.14	0.154	/
Body-worn & Hotspot (Distance 10mm)												
Back Side	standard	1/2412	DSSS	1:1	0.094	14.00	13.45	0.039	0.097	1.14	0.110	14
Front Side	standard	1/2412	DSSS	1:1	0.0726	14.00	13.45	0.068	0.069	1.14	0.078	/
Hotspot (Distance 10mm)												
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	standard	1/2412	DSSS	1:1	0.0625	14.00	13.45	0.077	0.038	1.14	0.043	/
Top Edge	standard	1/2412	DSSS	1:1	0.0301	14.00	13.45	0.020	0.029	1.14	0.032	/
Bottom Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: 1. The value with blue color is the maximum SAR Value of each test band.

Table 4: BT

Band	Configuration	Frequency (MHz)	Maximum Power (dBm)	Separation Distance (mm)	Estimated SAR （W/kg)
Bluetooth	Head	2441	4.50	5	0.117
	Body-worn	2441	4.50	10	0.059

For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 based on the formula below.
(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm; where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.

10.3 Simultaneous SAR

Simultaneous Transmission Analysis

Simultaneous Transmission Configurations	Head	Body-worn
GSM Voice + BT	Yes	N/A
GSM DATA + BT	N/A	Yes
GSM Voice + Wi-Fi	Yes	N/A
GSM DATA + Wi-Fi	N/A	Yes
BT+ Wi-Fi	N/A	Yes

About BT and GSM

SAR_{1g}(W/kg) / Test Position	GSM 850	GSM 1900	BT	MAX. ΣSAR_{1g}
Left Cheek	**0.680**	0.579	**0.117**	0.797
Left Tilt	**0.539**	0.114	**0.117**	0.656
Right Cheek	**0.537**	0.318	**0.117**	0.654
Right Tilt	**0.288**	0.107	**0.117**	0.405
Body-worn, Back Side	0.553	**0.624**	**0.059**	0.683
Body-worn, Front Side	**0.525**	0.481	**0.059**	0.584
Hotspot, Back Side	**1.453**	1.162	**0.059**	1.512
Hotspot, Front Side	**1.240**	0.876	**0.059**	1.299
Left Edge	**0.297**	0.231	**0.059**	0.356
Right Edge	N/A	N/A	N/A	N/A
Top Edge	N/A	N/A	N/A	N/A
Bottom Edge	0.054	**0.589**	N/A	0.589

Note: 1. The value with blue color is the maximum ΣSAR_{1g} Value.
2. MAX. ΣSAR_{1g} =Unlicensed SARMAX +Licensed SARMAX
3. MAX. ΣSAR_{1g} = 1.512 W/kg <1.6 W/kg
4. so the Simultaneous transimition SAR with volum scan are not required for BT and Main-Antenna.

About Wi-Fi and GSM

Test Position \ SAR_{1g}(W/kg)	GSM 850	GSM 1900	Wi-Fi	MAX. ΣSAR_{1g}
Left Cheek	**0.680**	0.579	**0.179**	0.859
Left Tilt	**0.539**	0.114	**0.097**	0.636
Right Cheek	**0.537**	0.318	**0.193**	0.730
Right Tilt	**0.288**	0.107	**0.154**	0.442
Body-worn, Back Side	0.553	**0.624**	**0.110**	0.734
Body-worn, Front Side	**0.525**	0.481	**0.078**	0.603
Hotspot, Back Side	**1.453**	1.162	**0.110**	1.563
Hotspot, Front Side	**1.240**	0.876	**0.078**	1.318
Left Edge	**0.297**	0.231	**N/A**	0.297
Right Edge	N/A	N/A	**0.043**	0.043
Top Edge	N/A	N/A	**0.032**	0.032
Bottom Edge	0.054	**0.589**	**N/A**	0.589

Note: 1. The value with blue color is the maximum ΣSAR_{1g} Value.
2. MAX. ΣSAR_{1g} =Unlicensed SARMAX +Licensed SARMAX
3. MAX. ΣSAR_{1g} = 1.563 W/kg <1.6 W/kg
4. so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi and Main-Antenna.

About Wi-Fi and BT

Test Position \ SAR_{1g}(W/kg)	BT	Wi-Fi	MAX. ΣSAR_{1g}
Left Cheek	**0.117**	**0.179**	0.296
Left Tilt	**0.117**	**0.097**	0.214
Right Cheek	**0.117**	**0.193**	0.310
Right Tilt	**0.117**	**0.154**	0.271
Body-worn, Back Side	**0.059**	**0.110**	0.169
Body-worn, Front Side	**0.059**	**0.078**	0.137
Hotspot, Back Side	**0.059**	**0.110**	0.169
Hotspot, Front Side	**0.059**	**0.078**	0.137
Left Edge	**0.059**	**N/A**	0.059
Right Edge	N/A	**0.043**	0.043
Top Edge	N/A	**0.032**	0.032
Bottom Edge	N/A	**N/A**	N/A

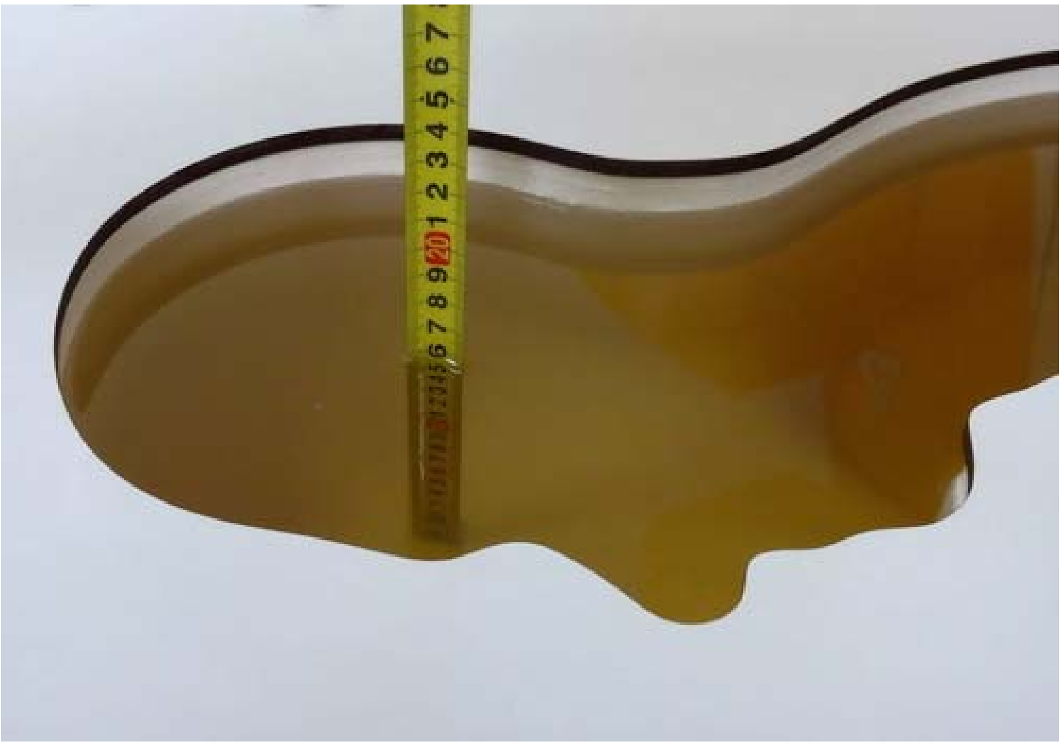
Note: 1. The value with blue color is the maximum ΣSAR_{1g} Value.
2. MAX. ΣSAR_{1g} =Unlicensed SARMAX +Licensed SARMAX
3. MAX. ΣSAR_{1g} = 0.310 W/kg <1.6 W/kg
4. so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi and BT.

5. Measurement Uncertainty

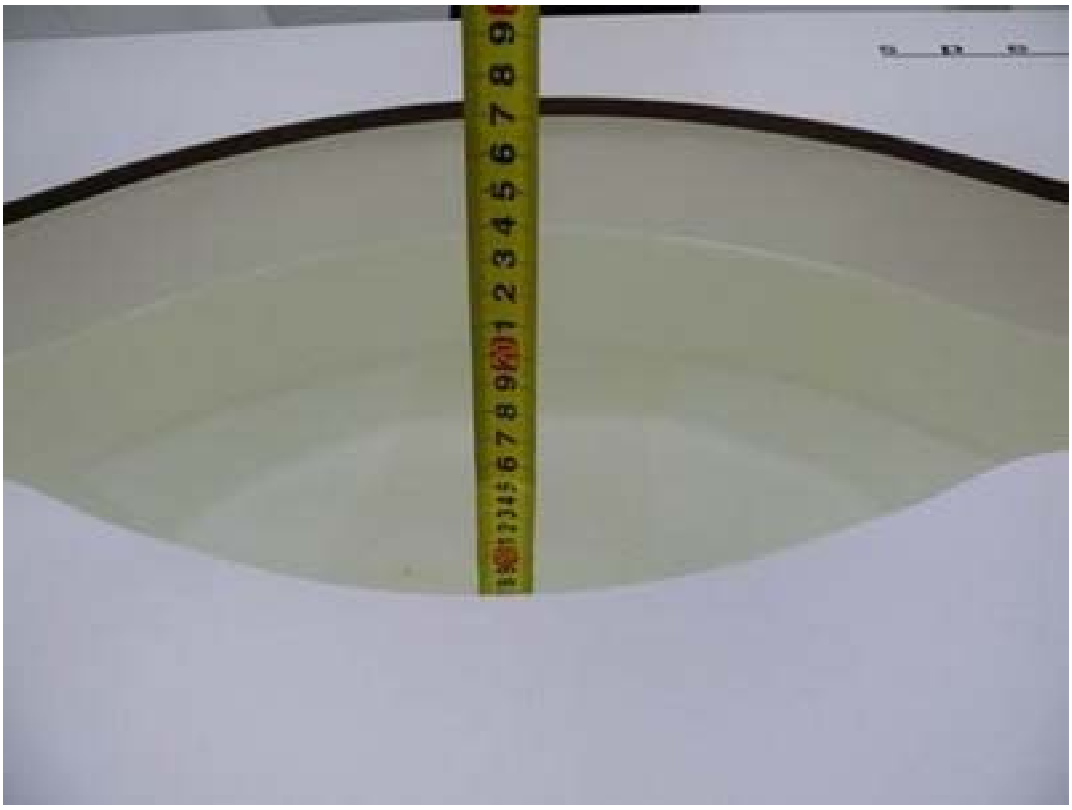
Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528- 2013 is not required in SAR reports submitted for equipment approval.

ANNEX A: Test Layout

Picture 3: Liquid depth in the flat Phantom (835MHz, 15.4cm depth)

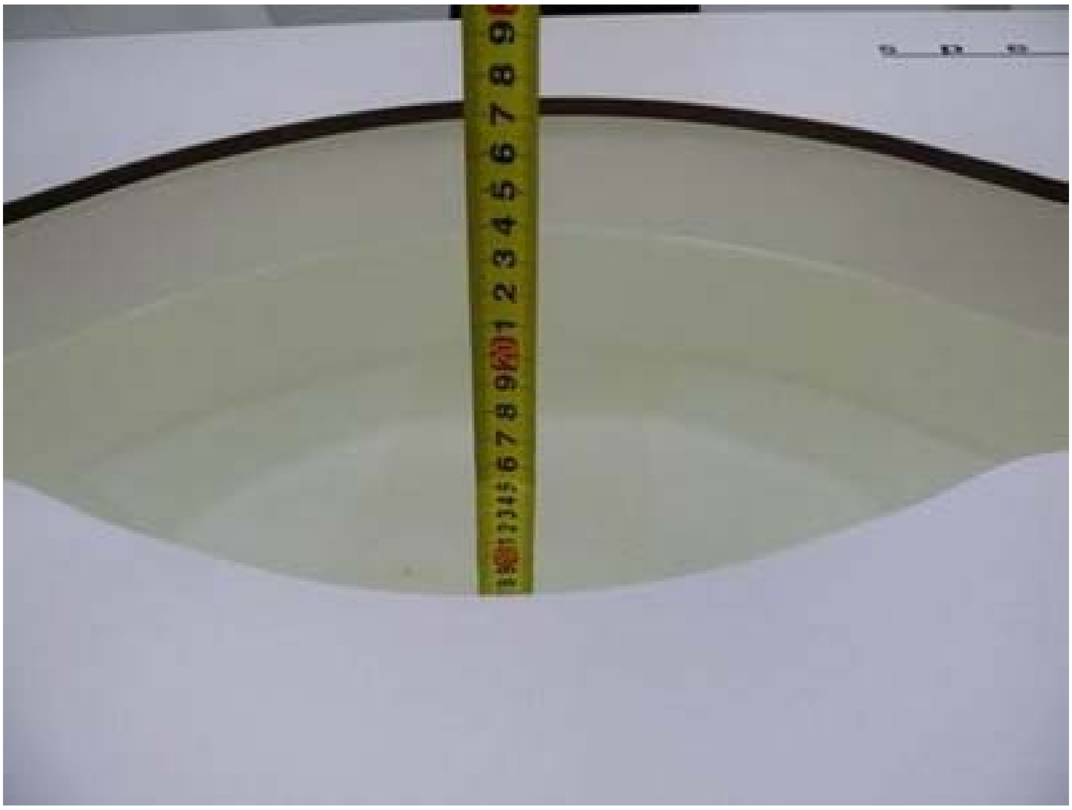


Picture 4: Liquid depth in the head Phantom (835MHz, 15.3cm depth)



Picture 5: Liquid depth in the flat Phantom (1900 MHz**,** 15.2cm depth)

Picture 6: liquid depth in the head Phantom (1900 MHz, 15.3cm depth)



Picture 7: Liquid depth in the flat Phantom (2450 MHz, 15.3cm depth)

Picture 8: Liquid depth in the head Phantom (2450 MHz, 15.4cm depth)

ANNEX B: System Check Results

Plot 1 System Performance Check at 835 MHz Head TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Date: 4/11/2016

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

Medium parameters used: f = 835 MHz; σ = 0.94 mho/m; ε_r = 41.86; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.35, 9.35, 9.35); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 2.64 mW/g

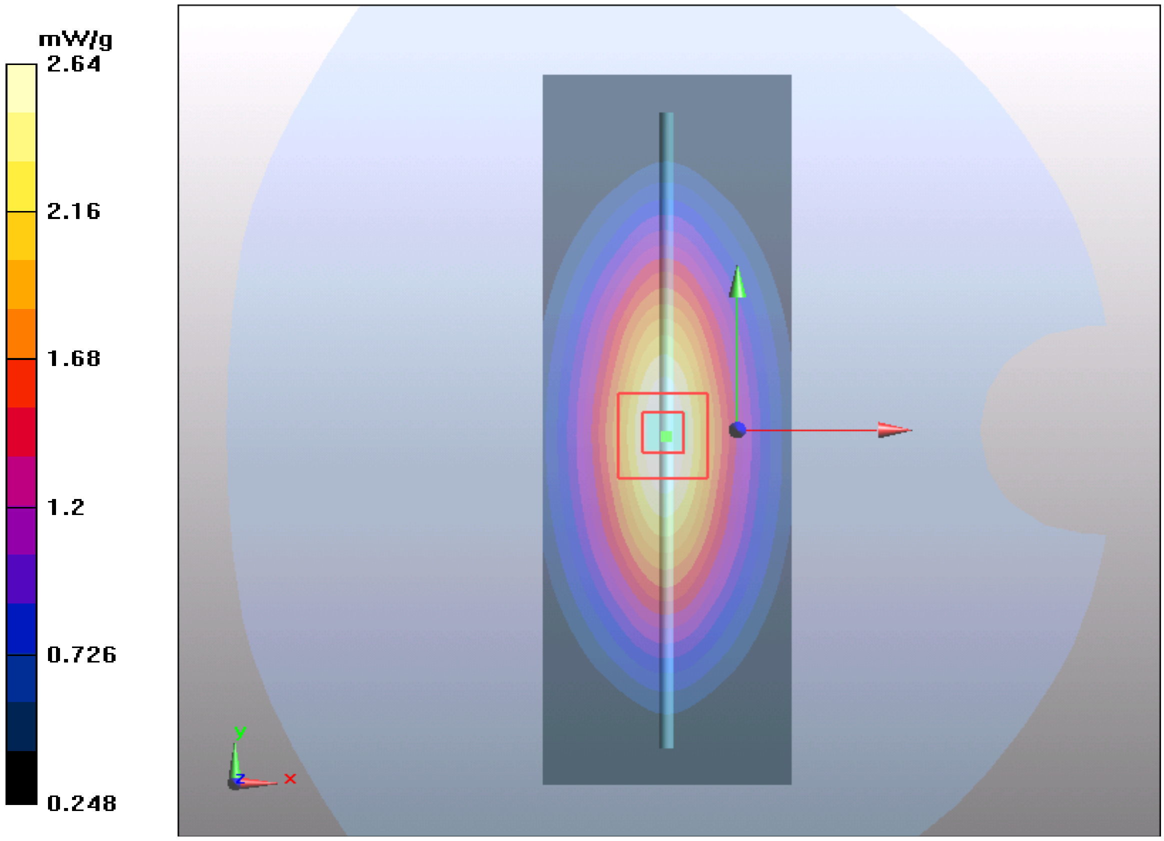
d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.4 V/m; Power Drift = -0.076 dB

Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 2.64 mW/g



Plot 2 System Performance Check at 835 MHz Body TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Date: 4/11/2016

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

Medium parameters used: f = 835 MHz; σ = 0.96 mho/m; ε_r = 54.17; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.42, 9.42, 9.42); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

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

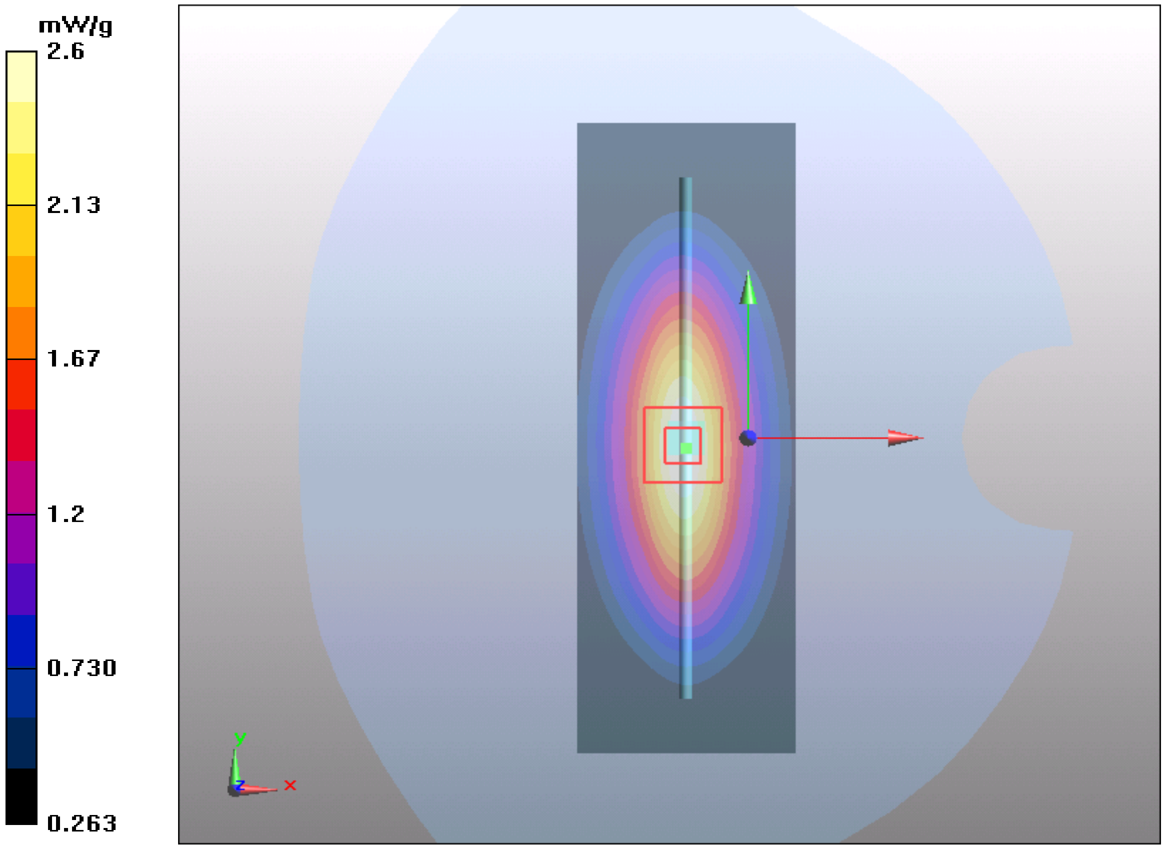
d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.9 V/m; Power Drift = -0.058 dB

Peak SAR (extrapolated) = 3.5 W/kg

SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 2.6 mW/g



Plot 3 System Performance Check at 1900 MHz Head TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Date: 4/11/2016

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

Medium parameters used: f = 1900 MHz; σ = 1.41 mho/m; ε_r = 40.72; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.96, 7.96, 7.96); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 11.3 mW/g

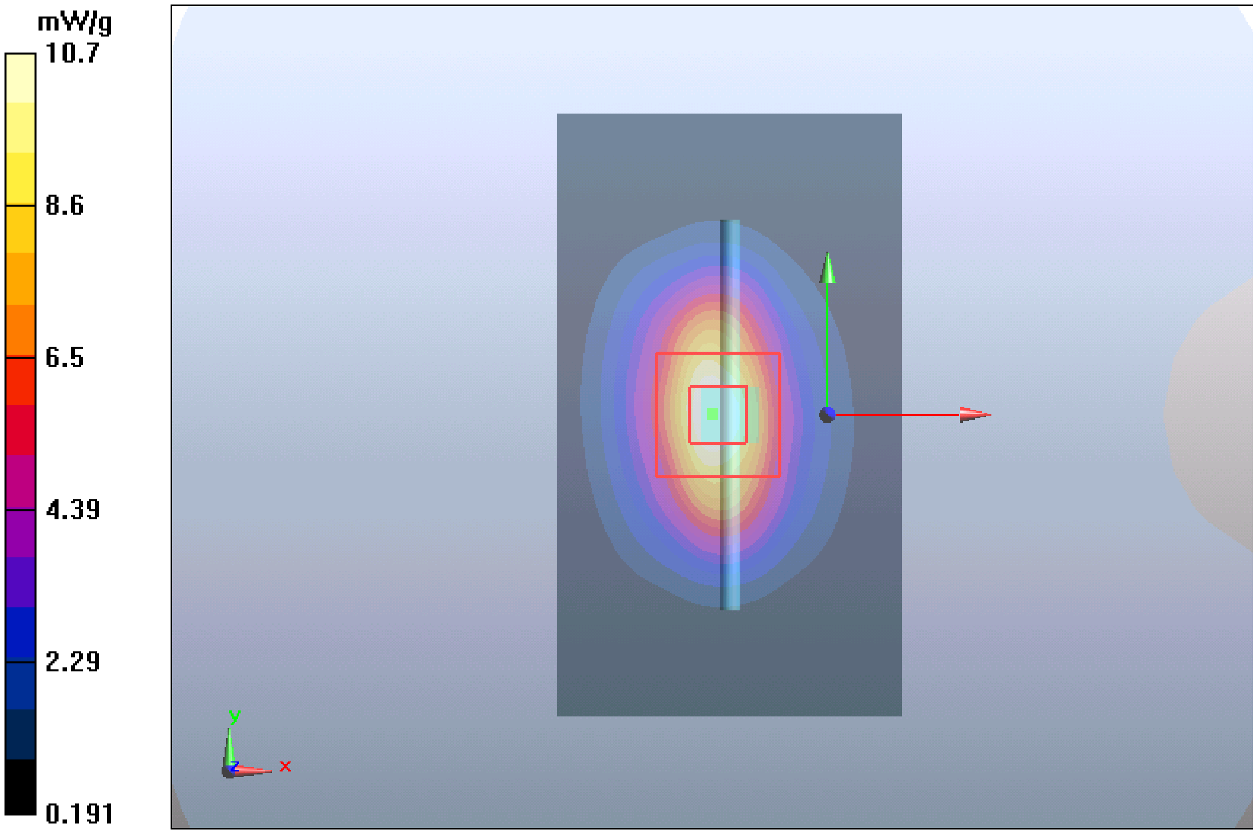
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 85.5 V/m; Power Drift = 0.028 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.48 mW/g; SAR(10 g) = 4.9 mW/g

Maximum value of SAR (measured) = 10.7 mW/g



Plot 4 System Performance Check at 1900 MHz Body TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Date: 4/11/2016

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

Medium parameters used: f = 1900 MHz; σ = 1.51 mho/m; ε_r = 52.57; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.42, 7.42, 7.42); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 12.2 mW/g

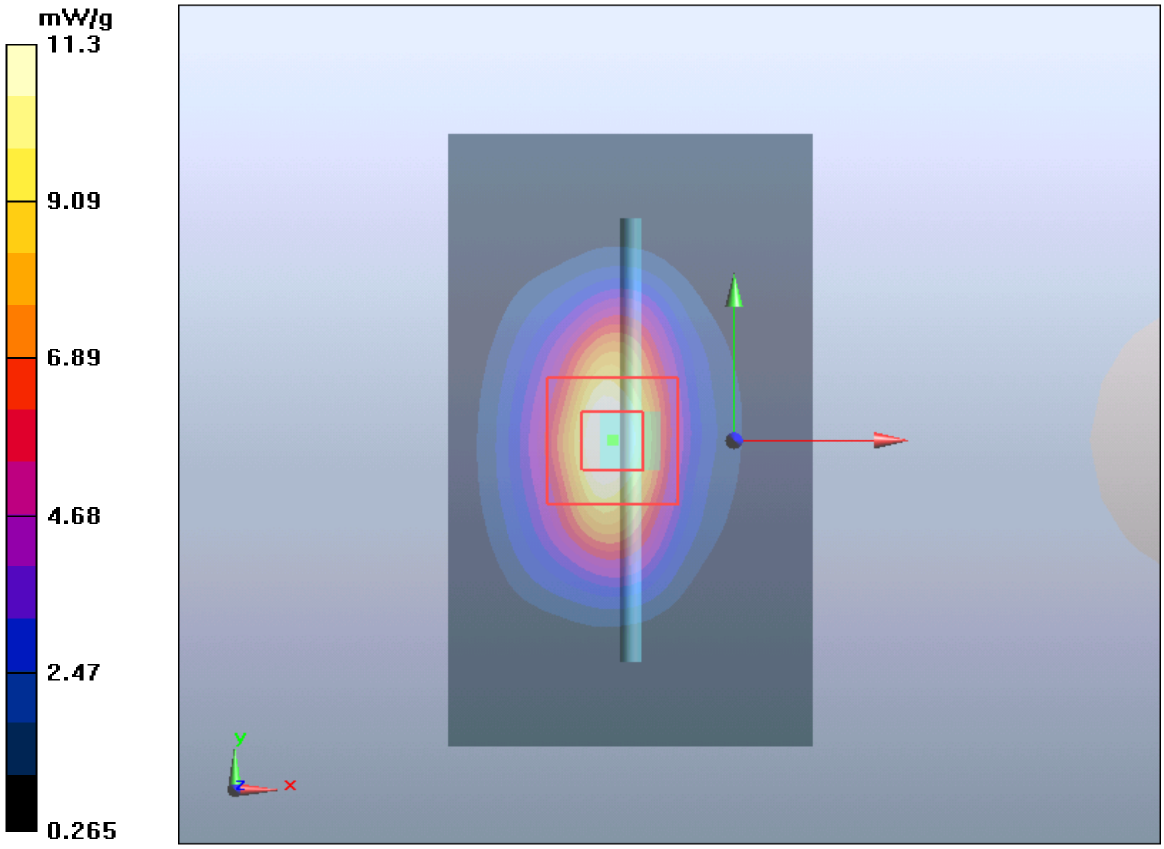
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 82.3 V/m; Power Drift = 0.068 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.93 mW/g; SAR(10 g) = 5.25 mW/g

Maximum value of SAR (measured) = 11.3 mW/g



Plot 5 System Performance Check at 2450 MHz Head TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

Date: 4/12/2016

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

Medium parameters used: f = 2450 MHz; σ = 1.83 mho/m; ε_r = 38.31; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.39, 7.39, 7.39); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 18.2 mW/g

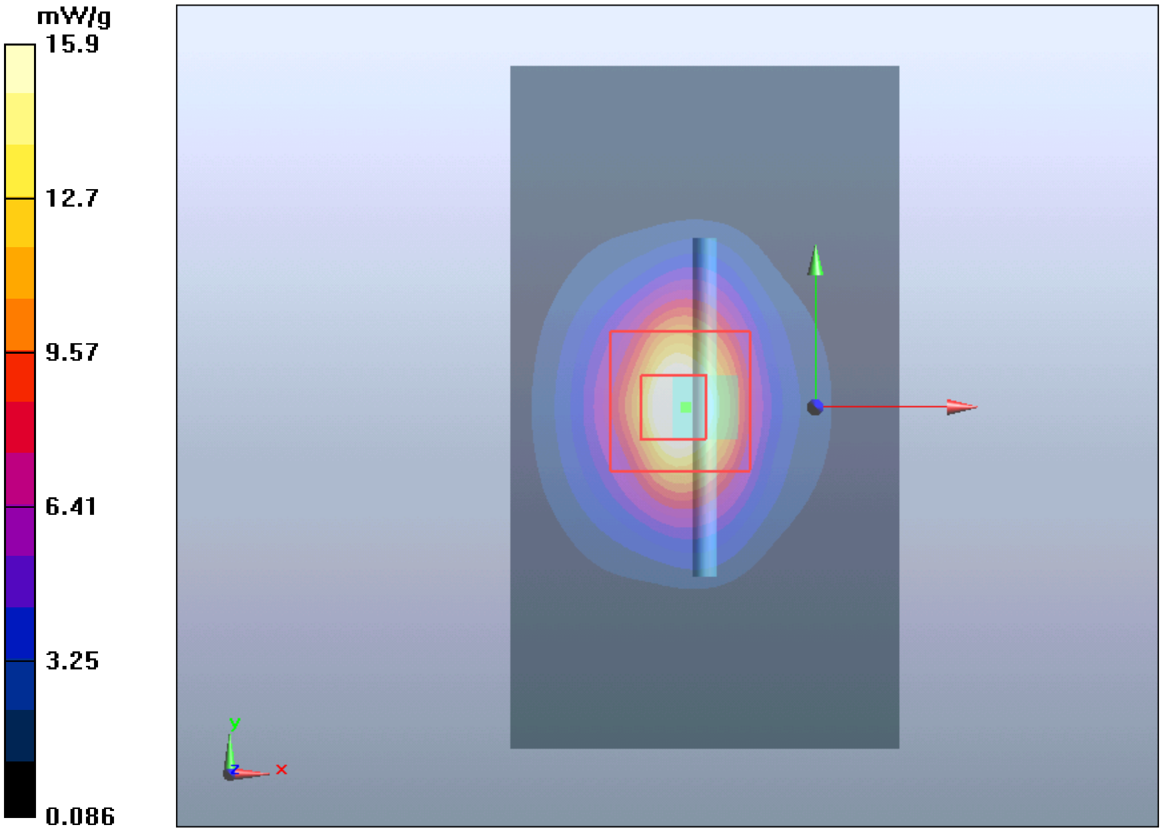
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.8 V/m; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 30 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.22 mW/g

Maximum value of SAR (measured) = 15.9 mW/g



Plot 6 System Performance Check at 2450 MHz Body TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

Date: 4/12/2016

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

Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.22, 7.22, 7.22); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM2; Type: SAM; Serial: TP-1524

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 16 mW/g

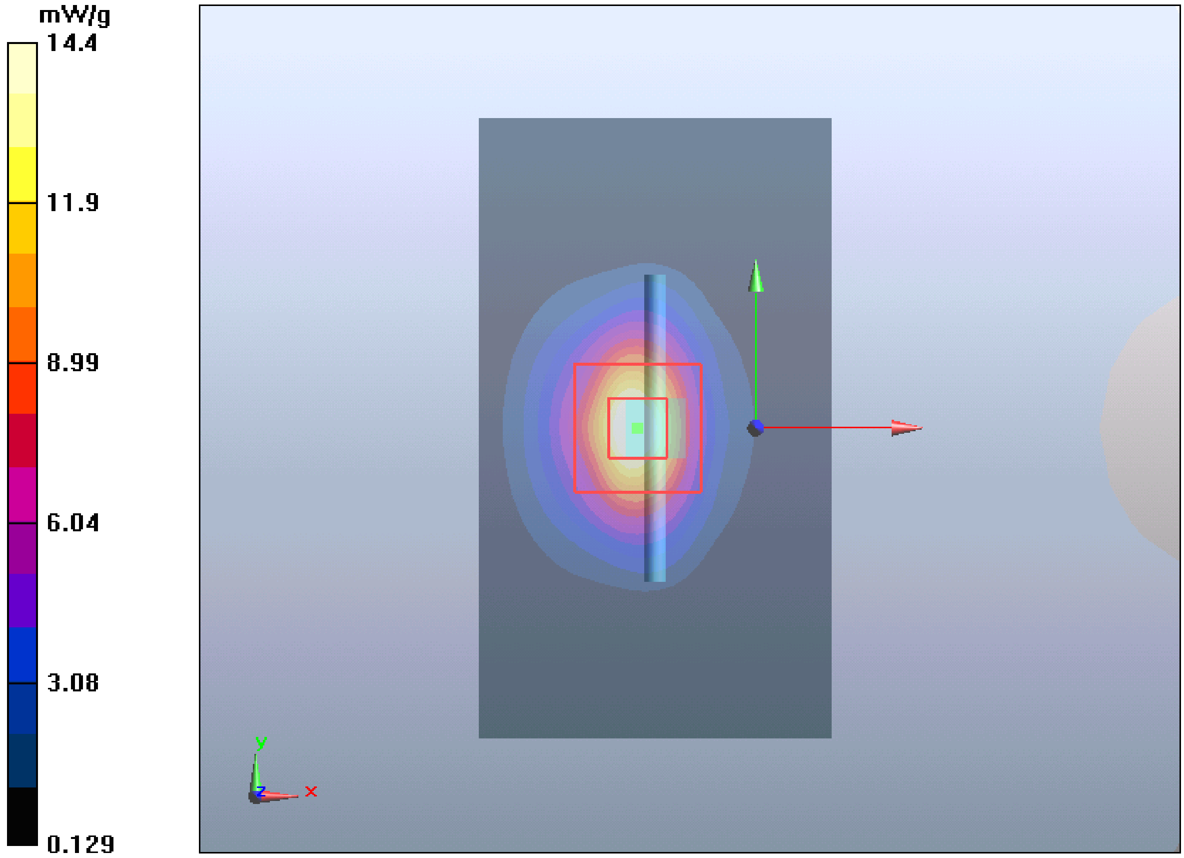
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.2 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 25.4 W/kg

SAR(1 g) = 12.5 mW/g; SAR(10 g) = 6.20 mW/g

Maximum value of SAR (measured) = 14.4 mW/g



ANNEX C: Highest Graph Results

Plot 7 GSM 850 Left Cheek High

Date: 4/11/2016

Communication System: UID 0, GSM850; Frequency: 848.8 MHz;Duty Cycle: 1:8.3

Medium parameters used: f = 849 MHz; σ = 0.951 S/m; ε_r = 41.707; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.35, 9.35, 9.35); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM 11; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek High/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.701 W/kg

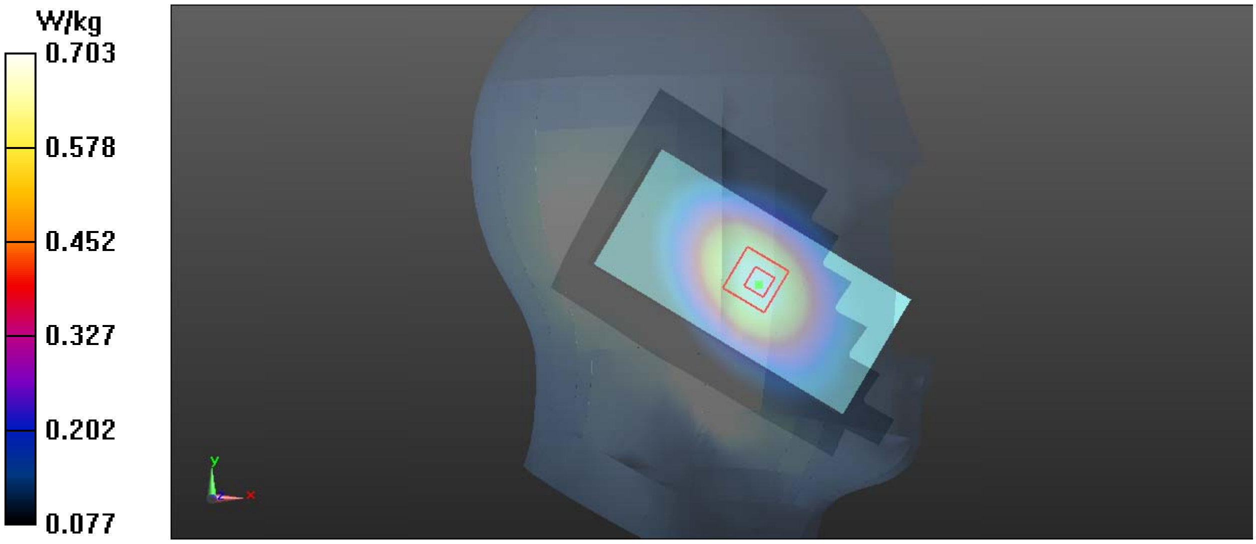
Left Cheek High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.903 V/m; Power Drift = 0.024 dB

Peak SAR (extrapolated) = 0.807 W/kg

SAR(1 g) = 0.663 W/kg; SAR(10 g) = 0.495 W/kg

Maximum value of SAR (measured) = 0.703 W/kg



Plot 8 GSM 850 Back Side Middle (Distance 10mm)

Date: 4/11/2016

Communication System: GSM850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3

Medium parameters used: f = 837 MHz; σ = 0.967 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.42, 9.42, 9.42); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM 11; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (61x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.576 mW/g

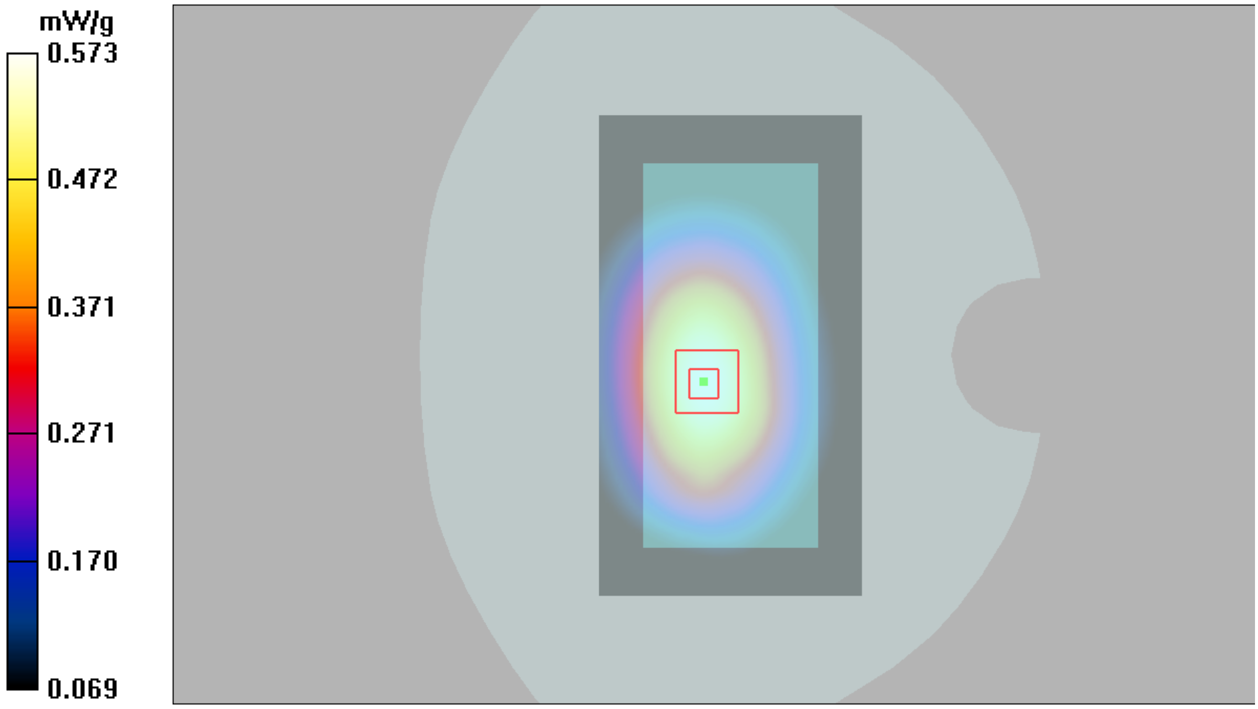
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.4 V/m; Power Drift = -0.028 dB

Peak SAR (extrapolated) = 0.678 W/kg

SAR(1 g) = 0.540 mW/g; SAR(10 g) = 0.395 mW/g

Maximum value of SAR (measured) = 0.573 mW/g



Plot 9 GSM 850 GPRS (4Txslots) Back Side Low (SIM 1, Distance 10mm)

Date: 4/11/2016

Communication System: UID 0, GSM850 + GPRS(4Up); Frequency: 824.2 MHz;Duty Cycle: 1:2.075

Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.955 S/m; ε_r = 54.272; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.42, 9.42, 9.42); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM 11; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Low/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.35 W/kg

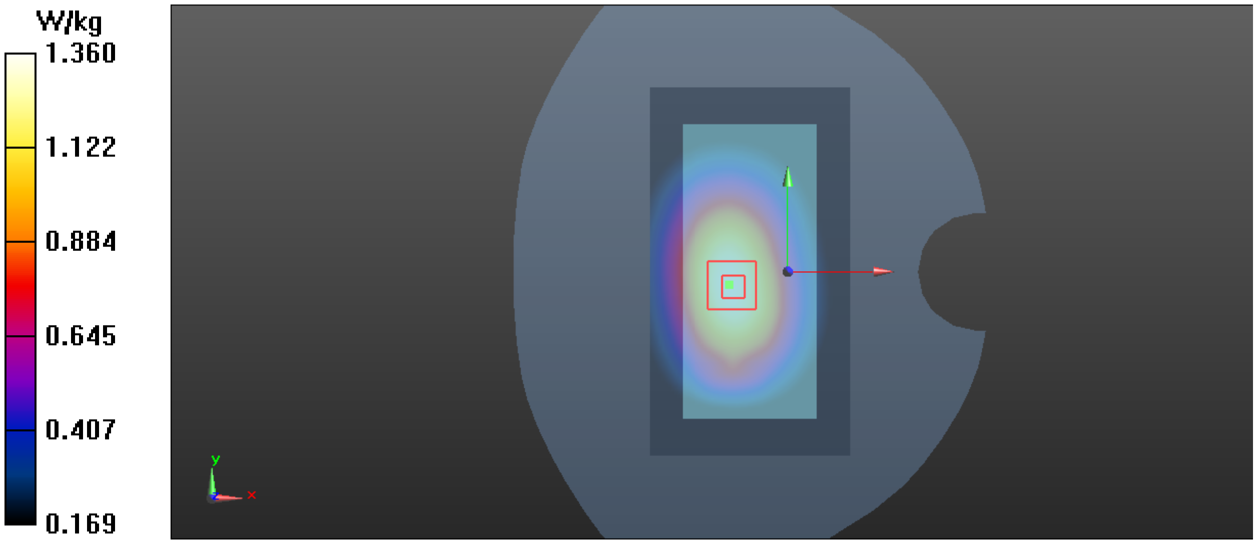
Back Side Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 36.32 V/m; Power Drift = 0.014 dB

Peak SAR (extrapolated) = 1.68 W/kg

SAR(1 g) = 1.28 W/kg; SAR(10 g) = 0.935 W/kg

Maximum value of SAR (measured) = 1.36 W/kg



Plot 10 GSM 1900 Left Cheek Middle

Date: 4/11/2016

Communication System: UID 0, PCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3

Medium parameters used: f = 1880 MHz; σ = 1.386 S/m; ε_r = 40.8; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.96, 7.96, 7.96); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.633 W/kg

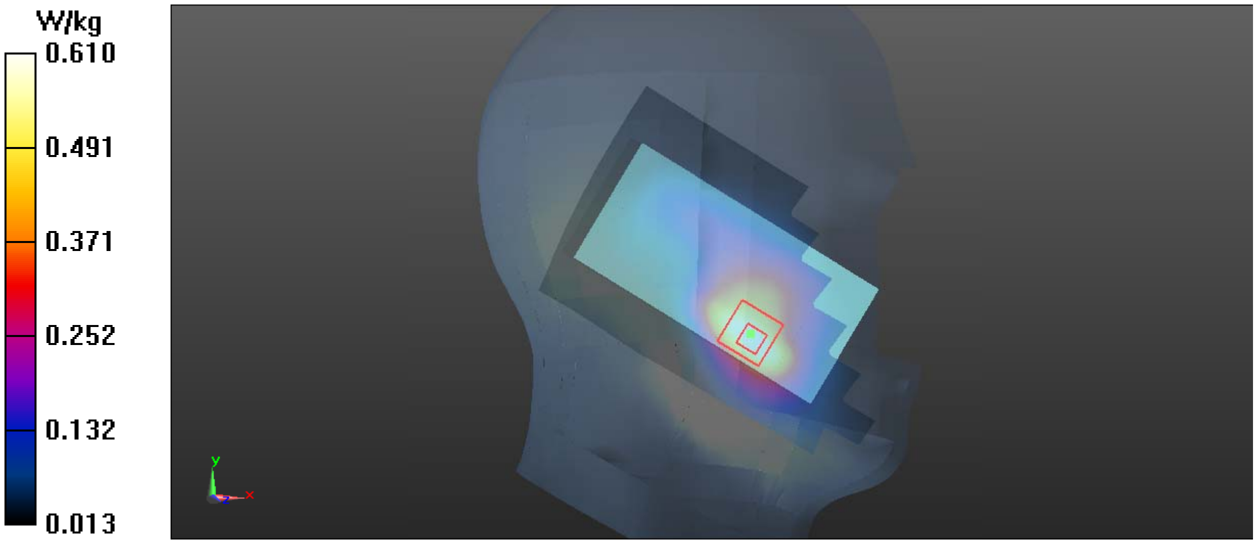
Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.326 V/m; Power Drift = 0.045 dB

Peak SAR (extrapolated) = 0.898 W/kg

SAR(1 g) = 0.553 W/kg; SAR(10 g) = 0.324 W/kg

Maximum value of SAR (measured) = 0.610 W/kg



Plot 11 GSM 1900 Back Side Middle (Distance 10mm)

Date: 4/11/2016

Communication System: PCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3

Medium parameters used: f = 1880 MHz; σ = 1.49 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.42, 7.42, 7.42); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 2015-11-17

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (61x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.640 mW/g

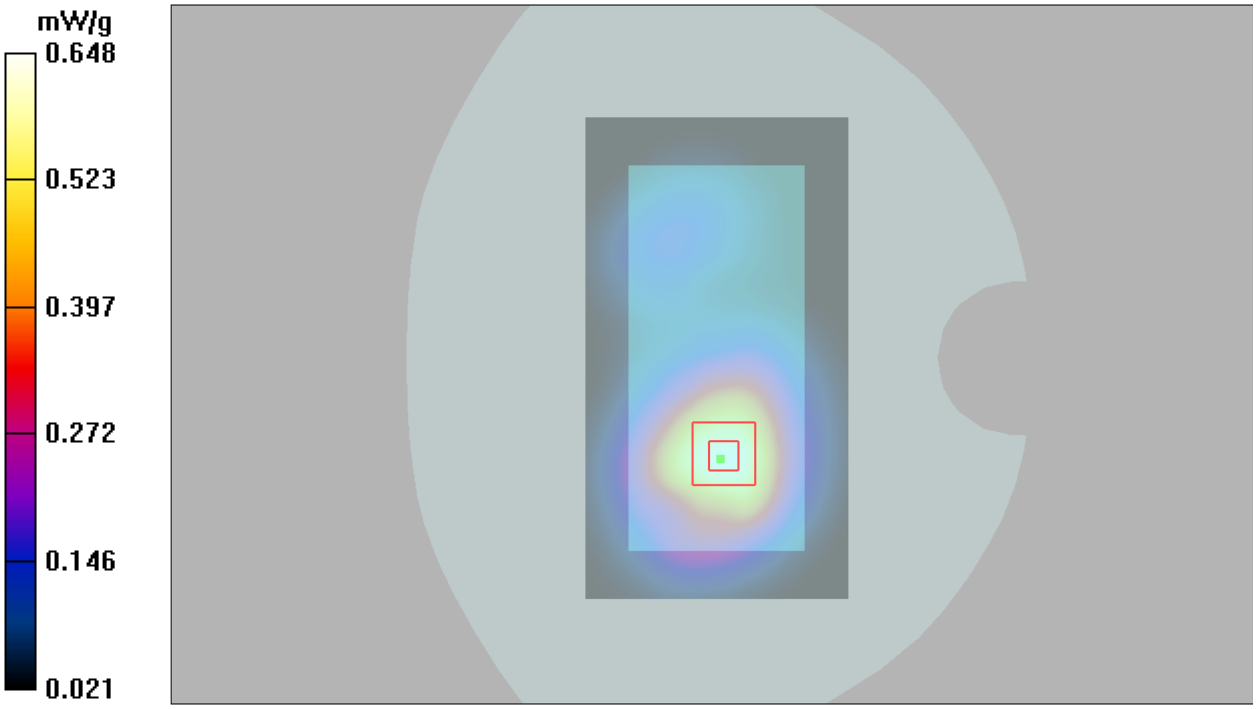
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.7 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 0.938 W/kg

SAR(1 g) = 0.596 mW/g; SAR(10 g) = 0.368 mW/g

Maximum value of SAR (measured) = 0.648 mW/g



Plot 12 GSM 1900 GPRS (4Txslots) Back Side High (Distance 10mm)

Date: 4/11/2016

Communication System: UID 0, PCS 1900+GPRS(4Up); Frequency: 1909.8 MHz;Duty Cycle: 1:2.075

Medium parameters used: f = 1910 MHz; σ = 1.525 S/m; ε_r = 52.593; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.42, 7.42, 7.42); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side High/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.16 W/kg

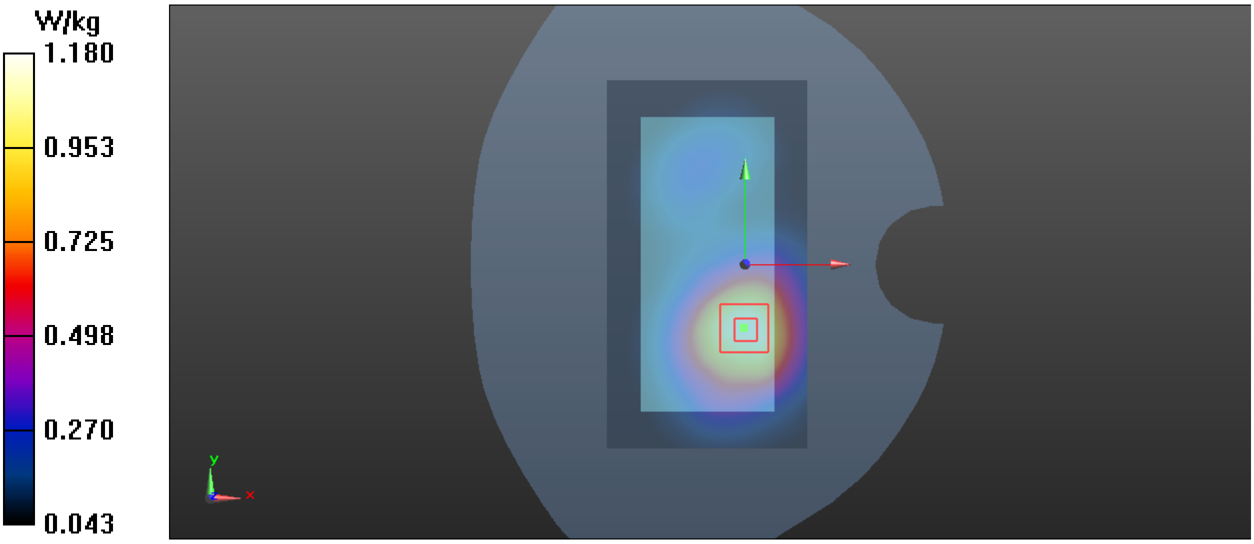
Back Side High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.31 V/m; Power Drift = -0.030 dB

Peak SAR (extrapolated) = 1.72 W/kg

SAR(1 g) = 1.090 W/kg; SAR(10 g) = 0.671 W/kg

Maximum value of SAR (measured) = 1.18 W/kg



Plot 13 802.11b Right Cheek Low

Date: 4/12/2016

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; σ = 1.771 S/m; ε_r = 38.872; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.39, 7.39, 7.39); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Cheek Low/Area Scan (81x141x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.187 W/kg

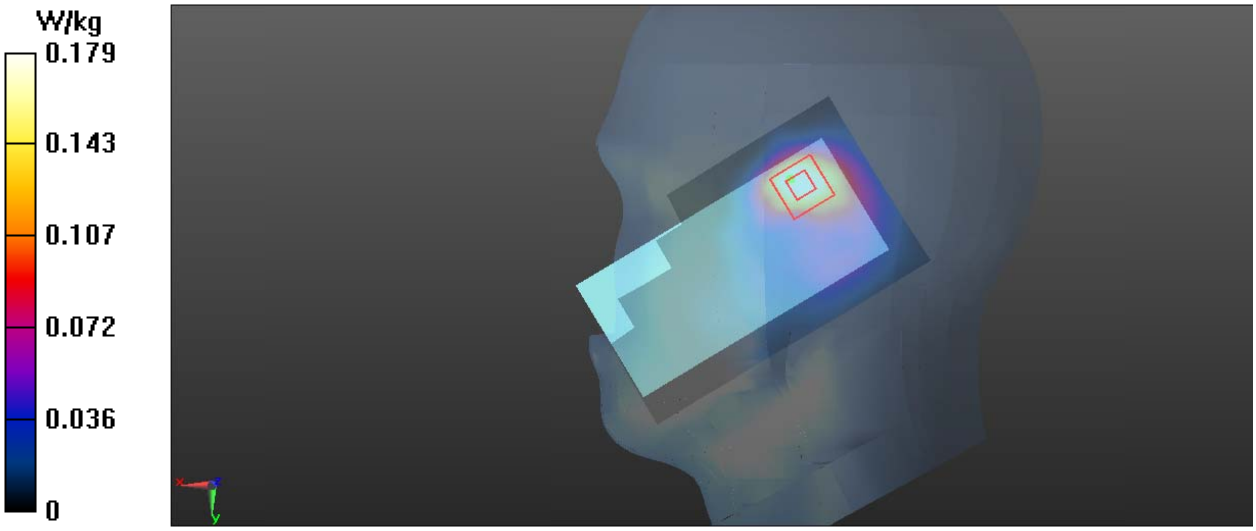
Right Cheek Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.822 V/m; Power Drift = 0.033 dB

Peak SAR (extrapolated) = 0.310 W/kg

SAR(1 g) = 0.170 W/kg; SAR(10 g) = 0.089 W/kg

Maximum value of SAR (measured) = 0.179 W/kg



Plot 14 802.11b Back Side Low (Distance 10mm)

Date: 4/12/2016

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; σ = 1.933 S/m; ε_r = 52.614; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.22, 7.22, 7.22); Calibrated: 12/10/2015;

Electronics: DAE4 Sn871; Calibrated: 11/17/2015

Phantom: SAM 2; Type: SAM;

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Low/Area Scan (81x141x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.107 W/kg

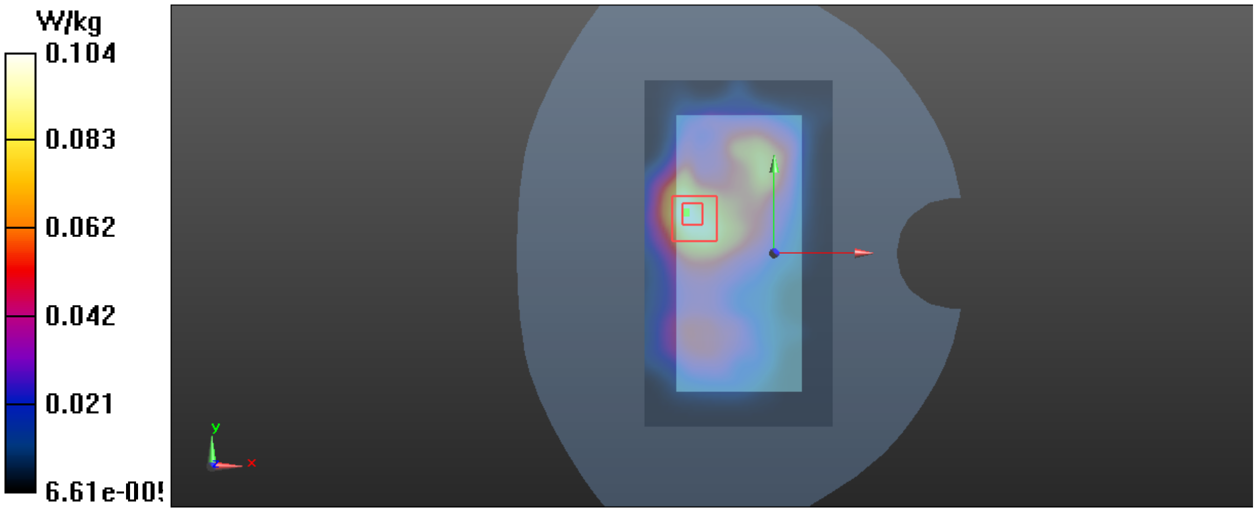
Back Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.239 V/m; Power Drift = 0.039 dB

Peak SAR (extrapolated) = 0.168 W/kg

SAR(1 g) = 0.097 W/kg; SAR(10 g) = 0.055 W/kg

Maximum value of SAR (measured) = 0.104 W/kg



ANNEX D: Probe Calibration Certificate

In Collaboration with speag CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

CALIBRATION No. L0570

Client TA(Shanghai) Certificate No: Z15-97193

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3677
Calibration Procedure(s)	FD-Z11-2-004-01 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	December 10, 2015

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

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ 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-15 (CTTL, No.J15X04256)	Jun-16
Power sensor NRP-Z91	101547	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
Power sensor NRP-Z91	101548	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
Reference10dBAttenuator	18N50W-10dB	13-Mar-14(TMC,No.JZ14-1103)	Mar-16
Reference20dBAttenuator	18N50W-20dB	13-Mar-14(TMC,No.JZ14-1104)	Mar-16
Reference Probe EX3DV4	SN 7307	27-Feb-15(SPEAG,No.EX3-7307_Feb15)	Feb-16
DAE4	SN 771	27-Jan-15(SPEAG, No.DAE4-771_Jan15)	Jan -16
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-15 (CTTL, No.J15X04255)	Jun-16
Network Analyzer E5071C	MY46110673	03-Feb-15 (CTTL, No.J15X00728)	Feb-16

	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: December 11, 2015

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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,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≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. 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 NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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Probe EX3DV4

SN: 3677

Calibrated: December 10, 2015

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)^A	0.40	0.46	0.40	±10.8%
DCP(mV)^B	100.6	103.2	101.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	172.8	±2.1%
		Y	0.0	0.0	1.0		187.6	
		Z	0.0	0.0	1.0		171.1	

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 E^2-field uncertainty inside TSL (see Page 5 and Page 6).
^{B} Numerical linearization parameter: uncertainty not required.
^{E} Uncertainly 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/EASY – Parameters of Probe: EX3DV4 – SN: 3677

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[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	9.69	9.69	9.69	0.13	1.00	±12%
850	41.5	0.92	9.35	9.35	9.35	0.14	1.23	±12%
1750	40.1	1.37	7.98	7.98	7.98	0.17	1.21	±12%
1900	40.0	1.40	7.96	7.96	7.96	0.13	1.52	±12%
2300	39.5	1.67	7.60	7.60	7.60	0.44	0.74	±12%
2450	39.2	1.80	7.39	7.39	7.39	0.51	0.72	±12%
2600	39.0	1.96	7.18	7.18	7.18	0.27	1.20	±12%
5200	36.0	4.66	5.58	5.58	5.58	0.38	1.25	±13%
5300	35.9	4.76	5.34	5.34	5.34	0.37	1.23	±13%
5600	35.5	5.07	4.85	4.85	4.85	0.40	1.10	±13%
5800	35.3	5.27	4.81	4.81	4.81	0.40	1.32	±13%

[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.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

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 [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	9.71	9.71	9.71	0.20	1.00	±12%
850	55.2	0.99	9.42	9.42	9.42	0.15	1.52	±12%
1750	53.4	1.49	7.65	7.65	7.65	0.15	1.52	±12%
1900	53.3	1.52	7.42	7.42	7.42	0.15	1.42	±12%
2300	52.9	1.81	7.39	7.39	7.39	0.42	0.85	±12%
2450	52.7	1.95	7.22	7.22	7.22	0.29	1.27	±12%
2600	52.5	2.16	6.95	6.95	6.95	0.32	1.07	±12%
5200	49.0	5.30	4.93	4.93	4.93	0.40	1.30	±13%
5300	48.9	5.42	4.69	4.69	4.69	0.40	1.20	±13%
5600	48.5	5.77	4.18	4.18	4.18	0.42	1.30	±13%
5800	48.2	6.00	4.23	4.23	4.23	0.42	1.20	±13%

[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.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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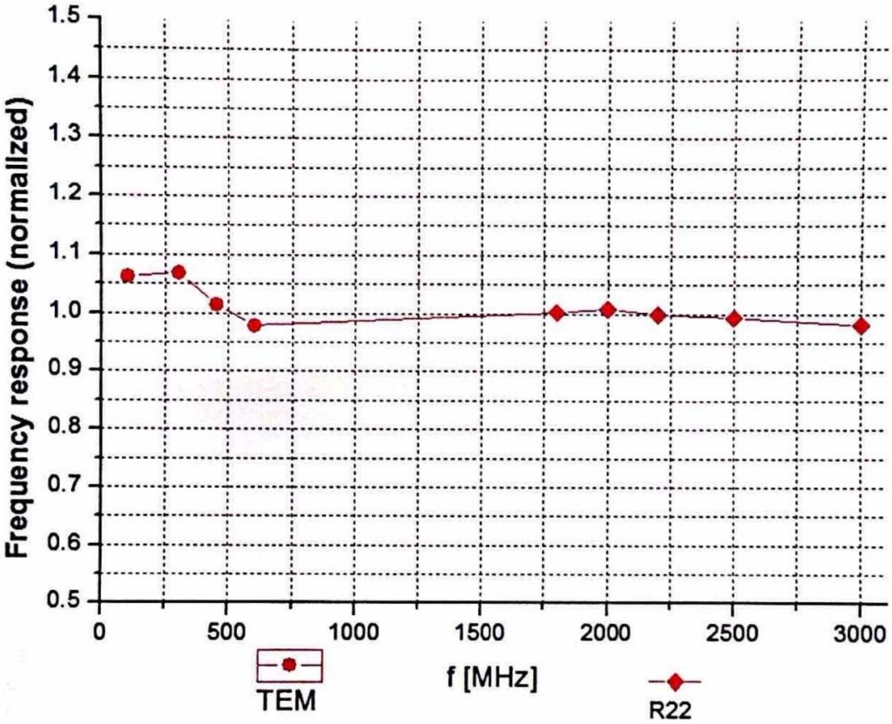
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.5% (k=2)

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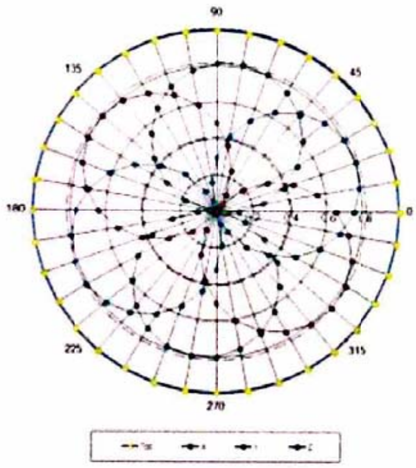
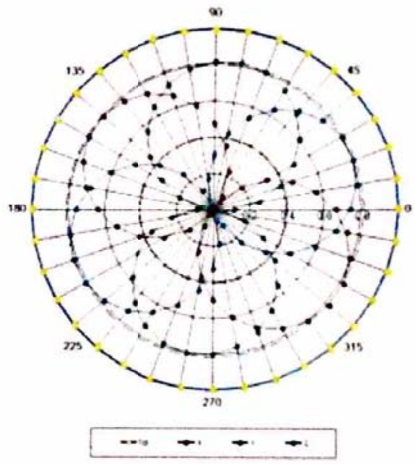
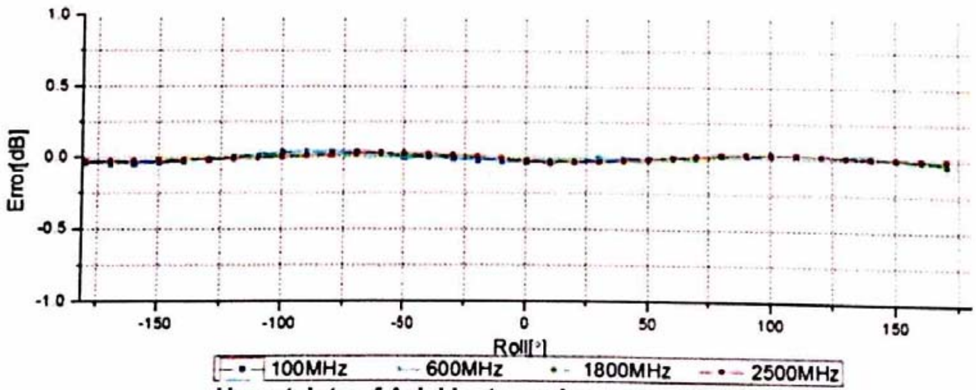
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM **f=1800 MHz, R22**







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

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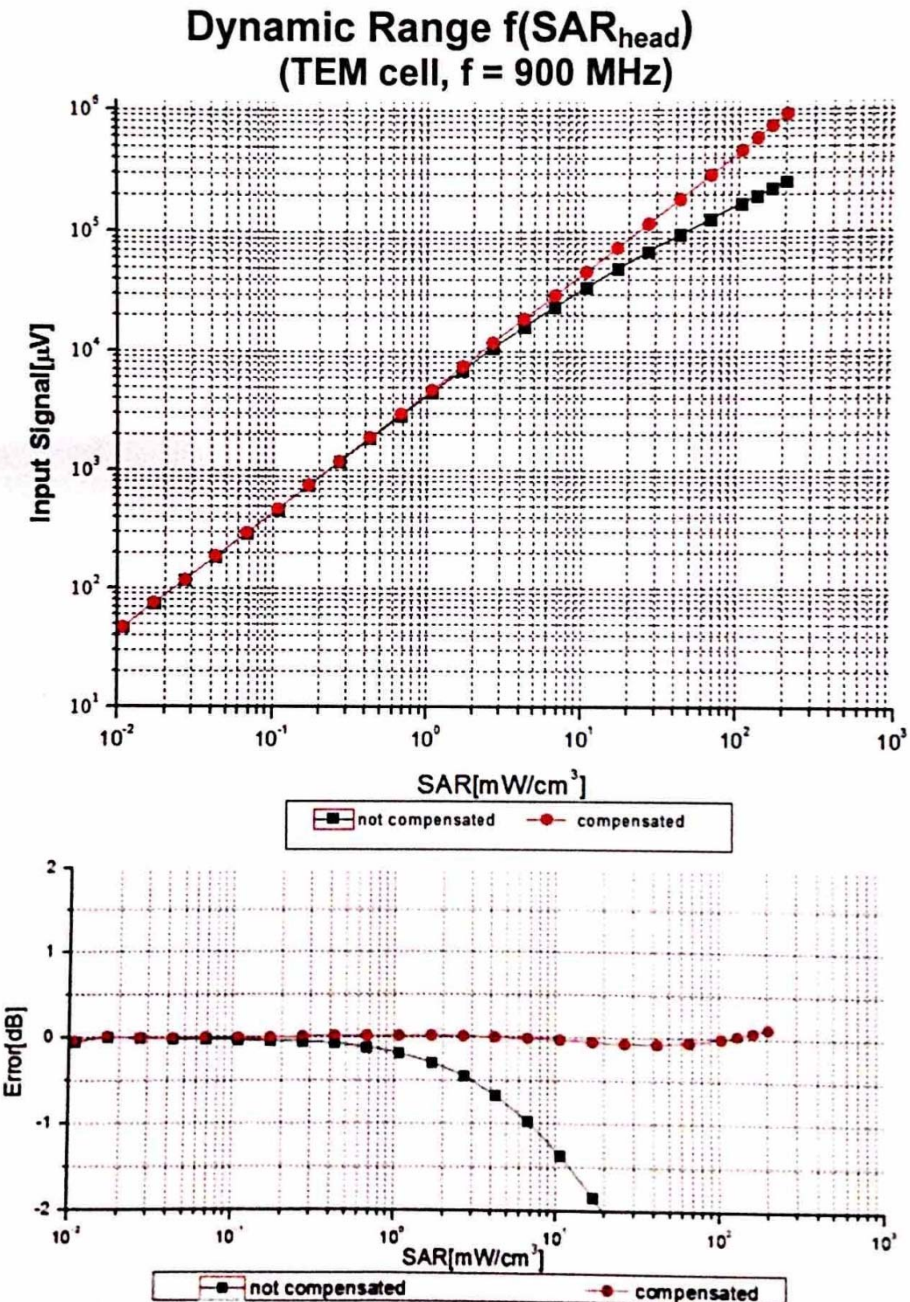

Uncertainty of Linearity Assessment: ±0.9% (k=2)

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