SAR TEST REPORT

No. I18Z61602-SEM01

For

TCL Communication Ltd.

Tablet

Model Name: 9009G

With

Hardware Version: V03

Software Version: J5L

FCC ID: 2ACCJBT14

Issued Date: 2018-10-25

TESTING
NVLAP LAB CODE 600118-0

Note:

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The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

Test Laboratory:

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REPORT HISTORY

Report Number	Revision	Issue Date	Description
I18Z61602-SEM01	Rev.0	2018-10-22	Initial creation of test report
I18Z61602-SEM01	Rev.1	2018-10-25	1. Update Table 12.1 2. Update KDB on P23&31

TABLE OF CONTENT

1 Test Laboratory

1.1 Testing Location

Company Name:	CTTL(Shouxiang)
Address:	No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

1.2 Testing Environment

Temperature:	18°C~25 °C,
Relative humidity:	30%~ 70%
Ground system resistance:	< 0.5 Ω
Ambient noise & Reflection:	< 0.012 W/kg

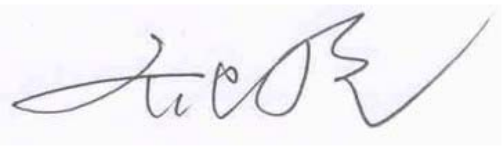
1.3 Project Data

Project Leader:	Qi Dianyuan
Test Engineer:	Lin Xiaojun
Testing Start Date:	October 1, 2018
Testing End Date:	October 3, 2018

1.4 Signature

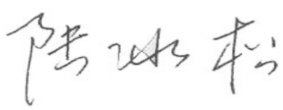
Lin Xiaojun

(Prepared this test report)



Qi Dianyuan

(Reviewed this test report)



Lu Bingsong

Deputy Director of the laboratory

(Approved this test report)

2 Statement of Compliance

The maximum results of SAR found during testing for TCL Communication Ltd. Tablet 9009G is as follows:

Table 2.1: Highest Reported SAR (1g)

Exposure Configuration	Technology Band	Highest Reported SAR 1g (W/Kg)	Equipment Class
Head (Separation Distance 0mm)	GSM 850	0.14	PCE
	PCS 1900	0.06	
	UMTS FDD 2	0.10	
	UMTS FDD 5	0.05	
	WLAN 2.4 GHz	1.27	DTS
Hotspot (Separation Distance 10mm)	GSM 850	0.66	PCE
	PCS 1900	0.42	
	UMTS FDD 2	0.42	
	UMTS FDD 5	0.38	
	WLAN 2.4 GHz	0.12	DTS

The SAR values found for the Mobile Phone are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1g tissue according to the ANSI C95.1-1992.

For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal and which provides a minimum separation distance of 10 mm between this device and the body of the user. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

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

The measurement together with the test system set-up is described in annex C of this test report. A detailed description of the equipment under test can be found in chapter 4 of this test report.

The highest reported SAR value is obtained at the case of **(Table 2.1),** and the values are**:** 1.27 **W/kg (1g).**

Table 2.2: The sum of reported SAR values for main antenna and WiFi

	Position	Main antenna	WiFi	Sum
Highest reported SAR value for Head	Right hand, Touch cheek (W1900)	0.10	1.27	**1.37**
Highest reported SAR value for Body	Front (GSM850)	0.66	0.12	**0.78**

Table 2.3: The sum of reported SAR values for main antenna and BT

	Position	Main antenna	BT	Sum
Maximum reported SAR value for Head	Left hand, Touch cheek (GSM 850)	0.14	0.33	**0.47**
Maximum reported SAR value for Body	Front (GSM 850)	0.66	0.17	**0.83**

[1] - Estimated SAR for Bluetooth (see the table 13.3)

According to the above tables, the highest sum of reported SAR values is 1.37 **W/kg (1g)**. The detail for simultaneous transmission consideration is described in chapter 13.

3 Client Information

3.1 Applicant Information

Company Name:	TCL Communication Ltd.
Address /Post:	7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052
Country:	China
Contact Person:	Gong Zhizhou
E-mail:	zhizhou.gong@tcl.com
Telephone:	0086-755-36611722

3.2 Manufacturer Information

Company Name:	TCL Communication Ltd.
Address /Post:	7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052
Country:	China
Contact Person:	Gong Zhizhou
E-mail:	zhizhou.gong@tcl.com
Telephone:	0086-755-36611722

4 Equipment Under Test (EUT) and Ancillary Equipment (AE)

4.1 About EUT

Description:	Tablet
Model name:	9009G
Operating mode(s):	GSM 850/900/1800/1900 WCDMA850/900/1900/2100,BT, WLAN
Tested Tx Frequency:	825 – 848.8 MHz (GSM 850)
	1850.2 – 1910 MHz (GSM 1900)
	826.4–846.6 MHz (WCDMA 850 Band V)
	1852.4–1907.6 MHz (WCDMA1900 Band II)
	2412 – 2462 MHz (Wi-Fi 2.4G)
GPRS/EGPRS Multislot Class:	12
GPRS capability Class:	B
Test device Production information:	Production unit
Device type:	Portable device
Antenna type:	Integrated antenna
Accessories/Body-worn configurations:	Headset
Hotspot mode:	Support

4.2 Internal Identification of EUT used during the test

EUTID	IMEI	HW Version	SW Version
1	352317100200502	V03	J5L
2	352317100200387	V03	J5L
3	352317100200361	V03	J5L

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

Note: It is performed to test SAR with the EUT1&2 and conducted power with the EUT3.

4.3 Internal Identification of AE used during the test

AE ID	Description	Model	SN	Manufactor
AE1	Battery	CAC2580038C7	/	VEKEN
AE2	Headset	CCB3160A15C1	/	JUWEI
AE3	Headset	CCB3160A15C4	/	MEIHAO

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

5 TEST METHODOLOGY

5.1 Applicable Limit Regulations

ANSI C95.1–1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

5.2 Applicable Measurement Standards

IEEE 1528–2013: Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

KDB447498 D01 General RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

KDB648474 D04 Handset SAR v01r03: SAR Evaluation Considerations for Wireless Handsets.

KDB941225 D01 SAR test for 3G devices v03r01: SAR Measurement Procedures for 3G Devices

KDB248227 D01 802.11 Wi-Fi SAR v02r02: SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS

KDB865664 D01SAR measurement 100 MHz to 6 GHz v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz.

KDB865664 D02 RF Exposure Reporting v01r02: RF Exposure Compliance Reporting and Documentation Considerations

KDB941225 D06 Hot Spot SAR v02r01: SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

6 Specific Absorption Rate (SAR)

6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

6.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ) . The equation description is as below:

$$SAR = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho dv}\right)$$

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by

$$SAR = c\left(\frac{\delta T}{\delta t}\right)$$

Where: C is the specific head capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

Where: σ is the conductivity of the tissue, ρ is the mass density of tissue and E is the RMS electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

7 Tissue Simulating Liquids

7.1 Targets for tissue simulating liquid

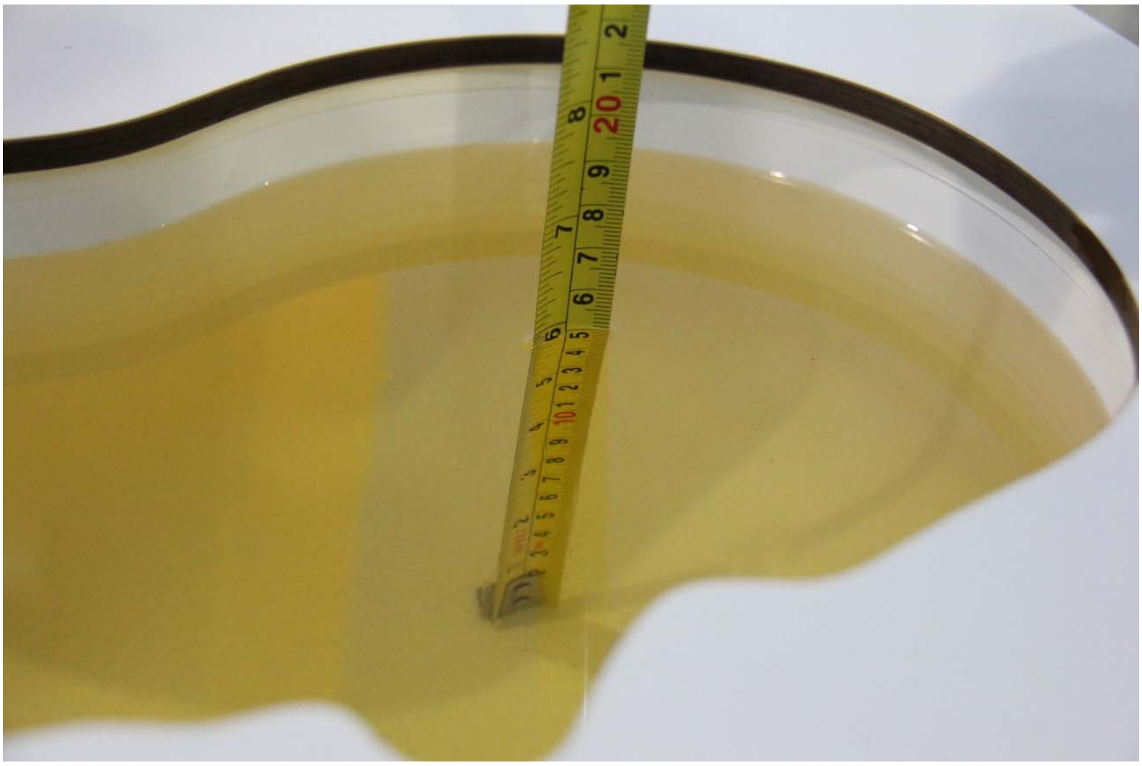
Table 7.1: Targets for tissue simulating liquid

Frequency(MHz)	Liquid Type	Conductivity(σ)	± 5% Range	Permittivity(ε)	± 5% Range
835	Head	0.90	0.86～0.95	41.5	39.4～43.6
835	Body	0.97	0.92～1.02	55.2	52.4～58.0
1900	Head	1.40	1.33～1.47	40.0	38.0～42.0
1900	Body	1.52	1.44～1.60	53.3	50.6～56.0
2450	Head	1.80	1.71～1.89	39.2	37.2～41.2
2450	Body	1.95	1.85～2.05	52.7	50.1～55.3

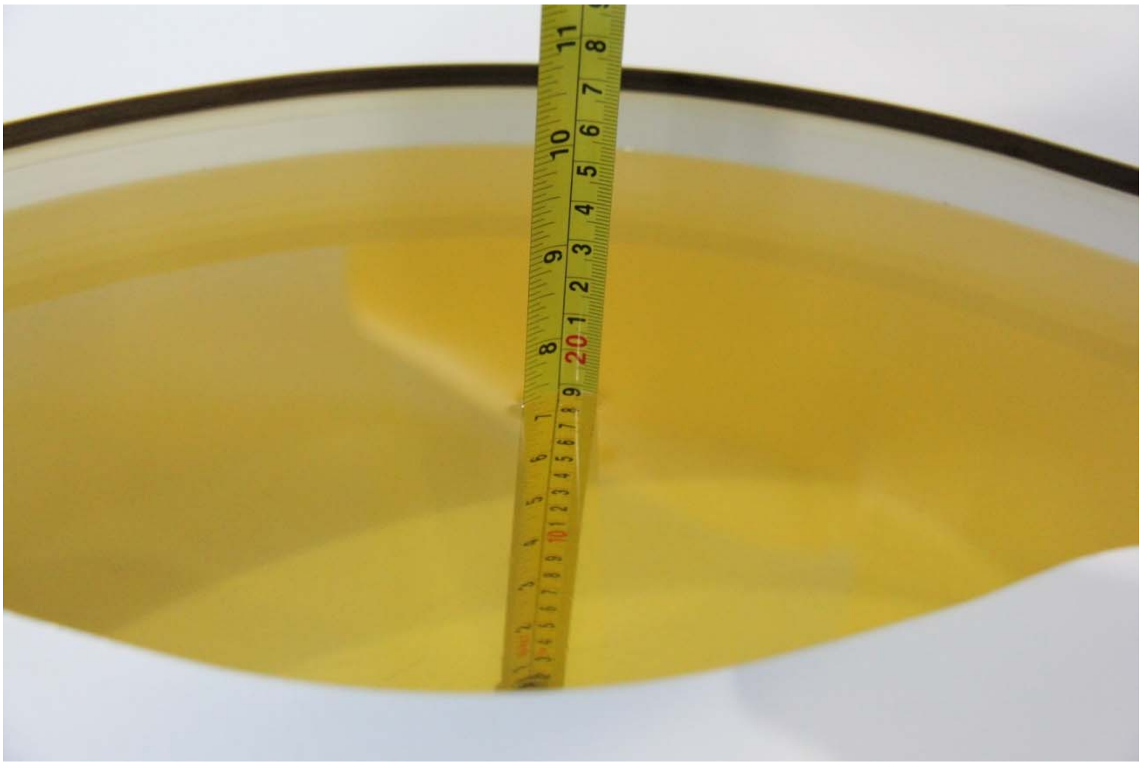
7.2 Dielectric Performance

Table 7.2: Dielectric Performance of Tissue Simulating Liquid

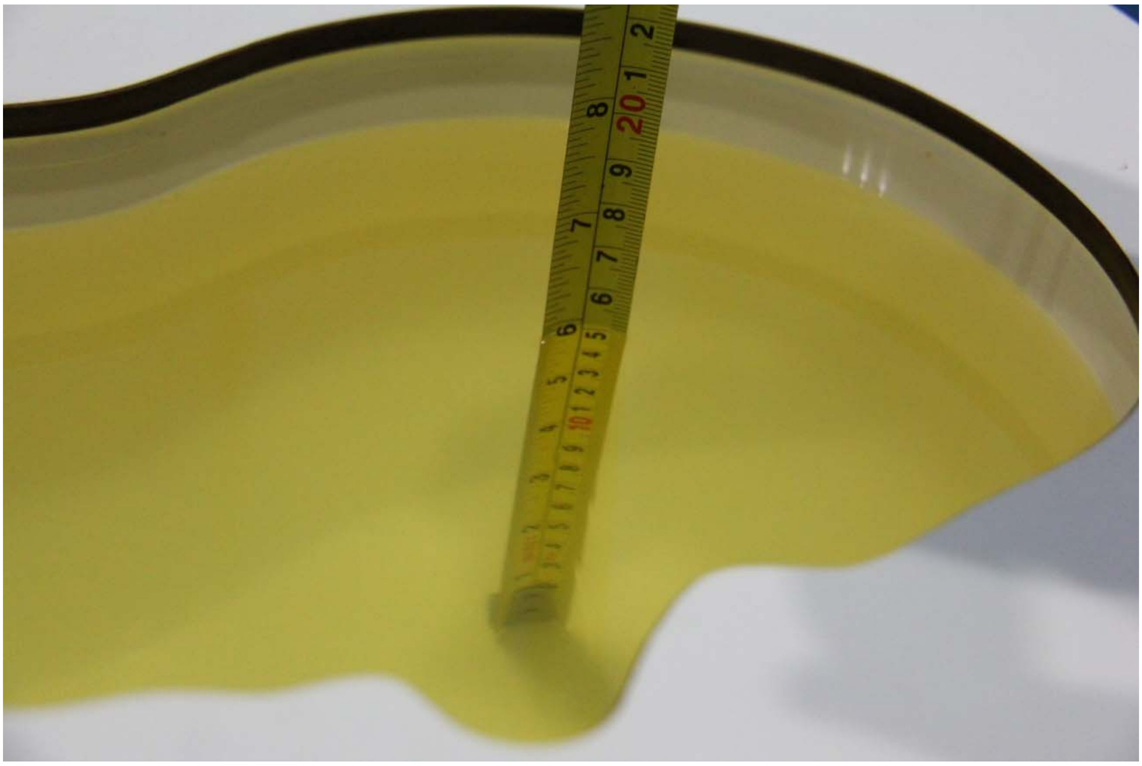
Measurement Date yyyy/mm/dd	Frequency	Type	Permittivity ε	Drift (%)	Conductivity σ (S/m)	Drift (%)
2018/10/1	835 MHz	Head	40.8	-1.69	0.889	-1.22
		Body	55.11	-0.16	0.973	0.31
2018/10/2	1900 MHz	Head	40.02	0.05	1.41	0.71
		Body	53.22	-0.15	1.52	0.00
2018/10/3	2450 MHz	Head	38.58	-1.58	1.8	0.00
		Body	53.3	1.14	1.941	-0.46



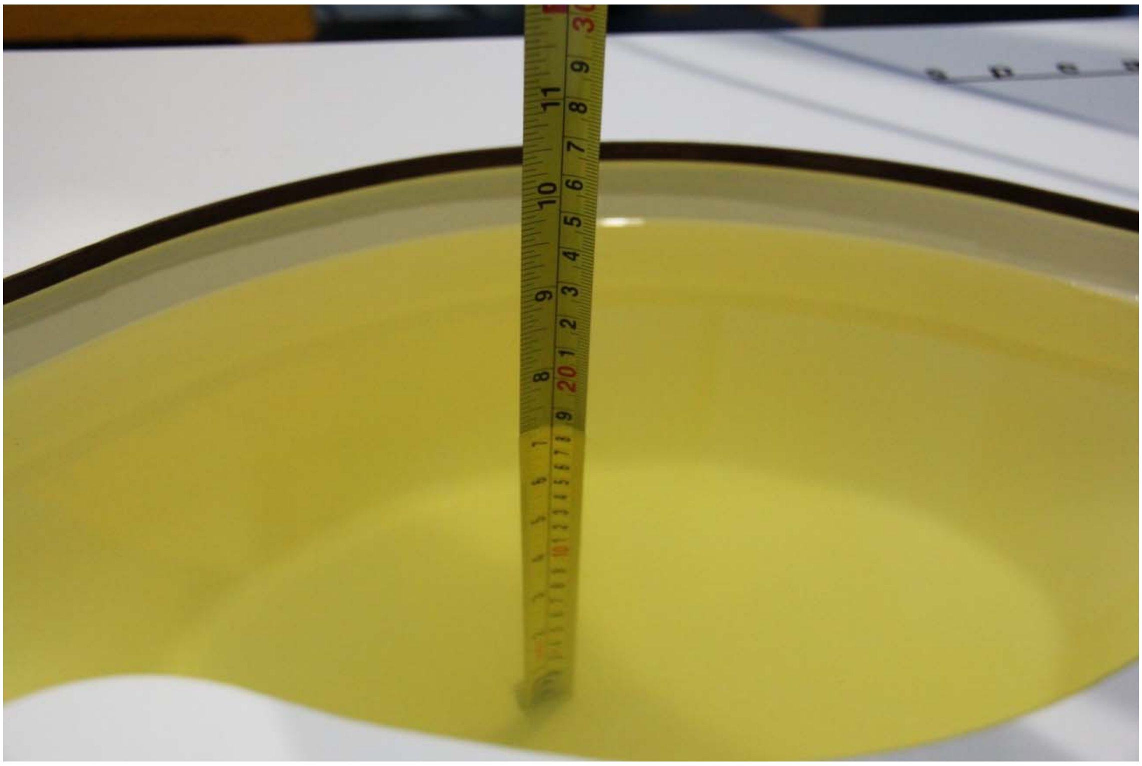
Picture 7-1 Liquid depth in the Head Phantom (835MHz)



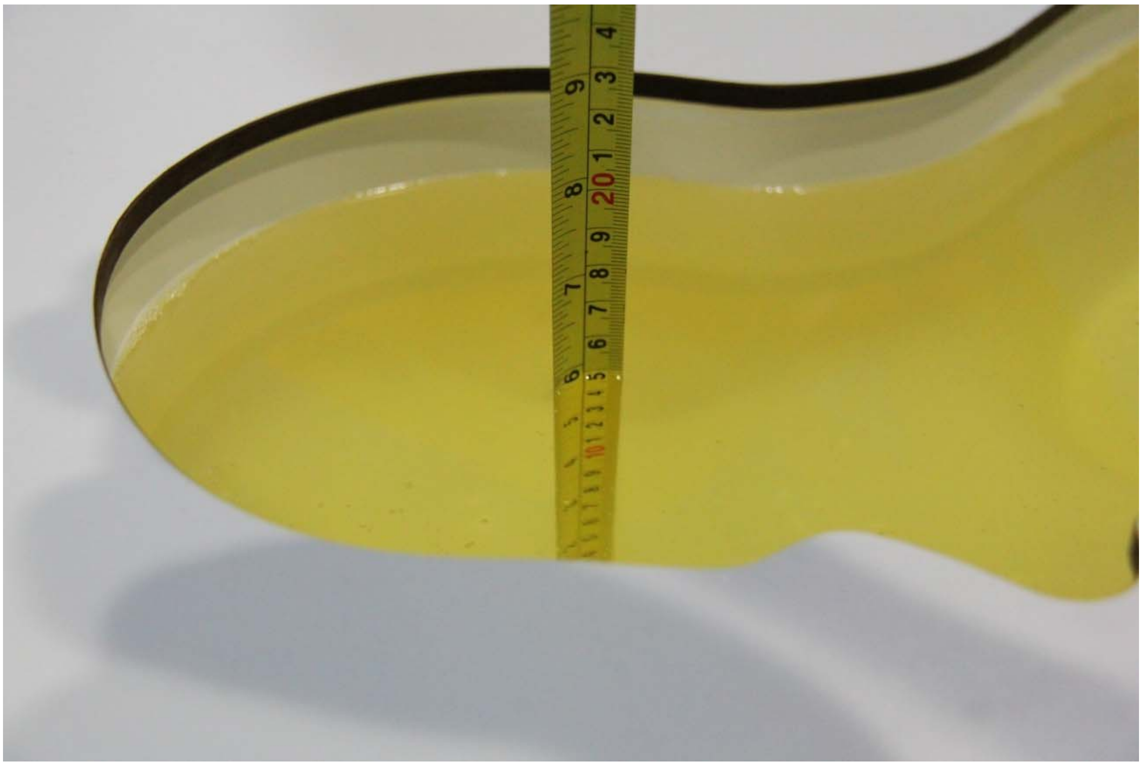
Picture 7-2 Liquid depth in the Flat Phantom (835MHz)



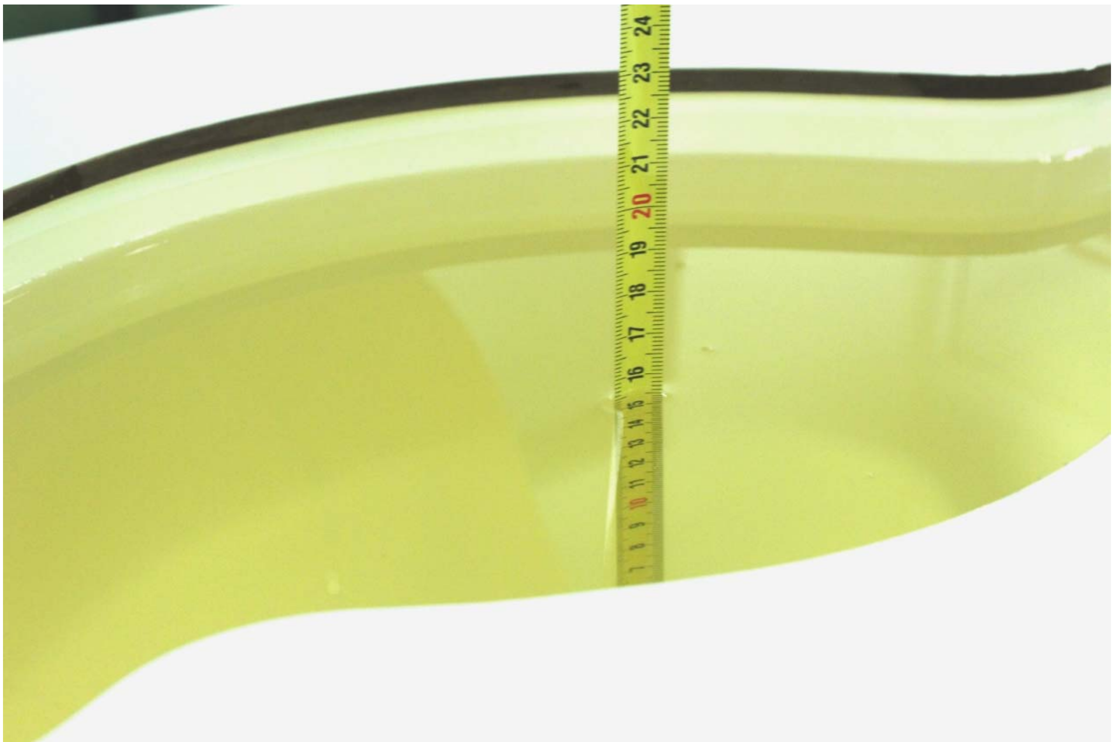
Picture 7-3 Liquid depth in the Head Phantom (1900 MHz)



Picture 7-4 Liquid depth in the Flat Phantom (1900MHz)



Picture 7-5 Liquid depth in the Head Phantom (2450MHz)

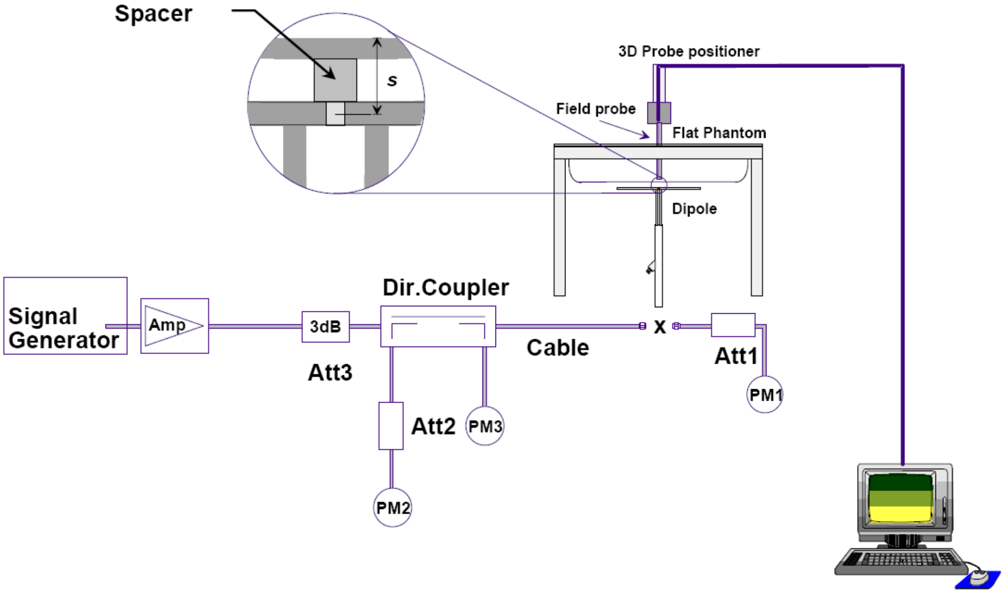


Picture 7-6 Liquid depth in the Flat Phantom (2450MHz)

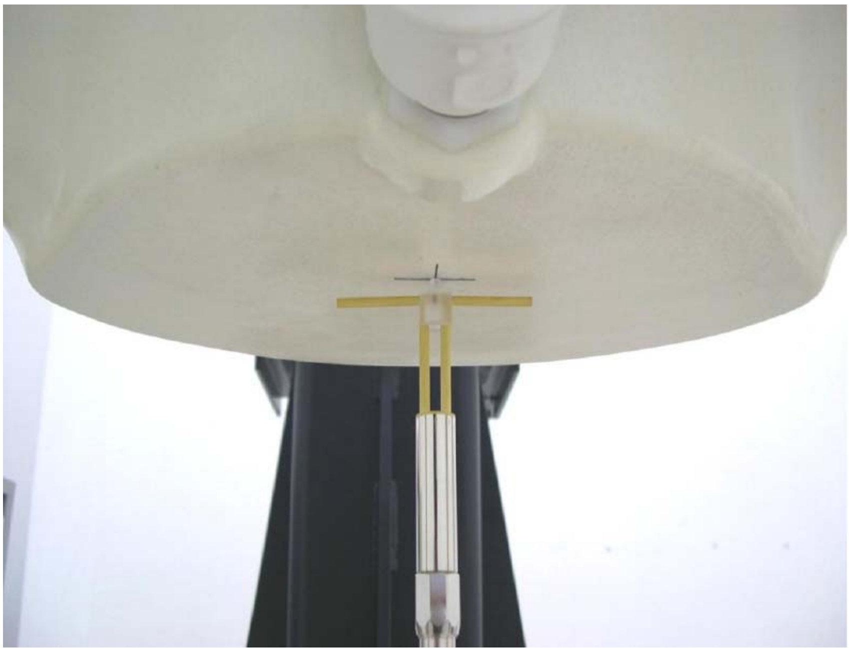
8 System verification

8.1 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



Picture 8.1 System Setup for System Evaluation



Picture 8.2 Photo of Dipole Setup

8.2 System Verification

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device.

The system verification results are required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR. The details are presented in annex B.

Table 8.1: System Verification of Head

Measurement Date (yyyy-mm-dd)	Frequency	Target value (W/kg)		Measured value (W/kg)		Deviation	
		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average
2018/10/1	835 MHz	6.06	9.37	6.16	9.4	1.65%	0.32%
2018/10/2	1900 MHz	21.0	40.0	20.8	39.44	-0.95%	-1.40%
2018/10/3	2450 MHz	24.7	52.2	24.84	51.16	0.57%	-1.99%

Table 8.2: System Verification of Body

Measurement Date (yyyy-mm-dd)	Frequency	Target value (W/kg)		Measured value (W/kg)		Deviation	
		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average
2018/10/1	835 MHz	6.12	9.41	6.2	9.48	1.31%	0.74%
2018/10/2	1900 MHz	21.5	40.5	21.6	40.44	0.47%	-0.15%
2018/10/3	2450 MHz	23.8	50.4	23.84	50.48	0.17%	0.16%

9 Measurement Procedures

9.1 Tests to be performed

In order to determine the highest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes shall be tested for each frequency band according to steps 1 to 3 below. A flowchart of the test process is shown in picture 9.1.

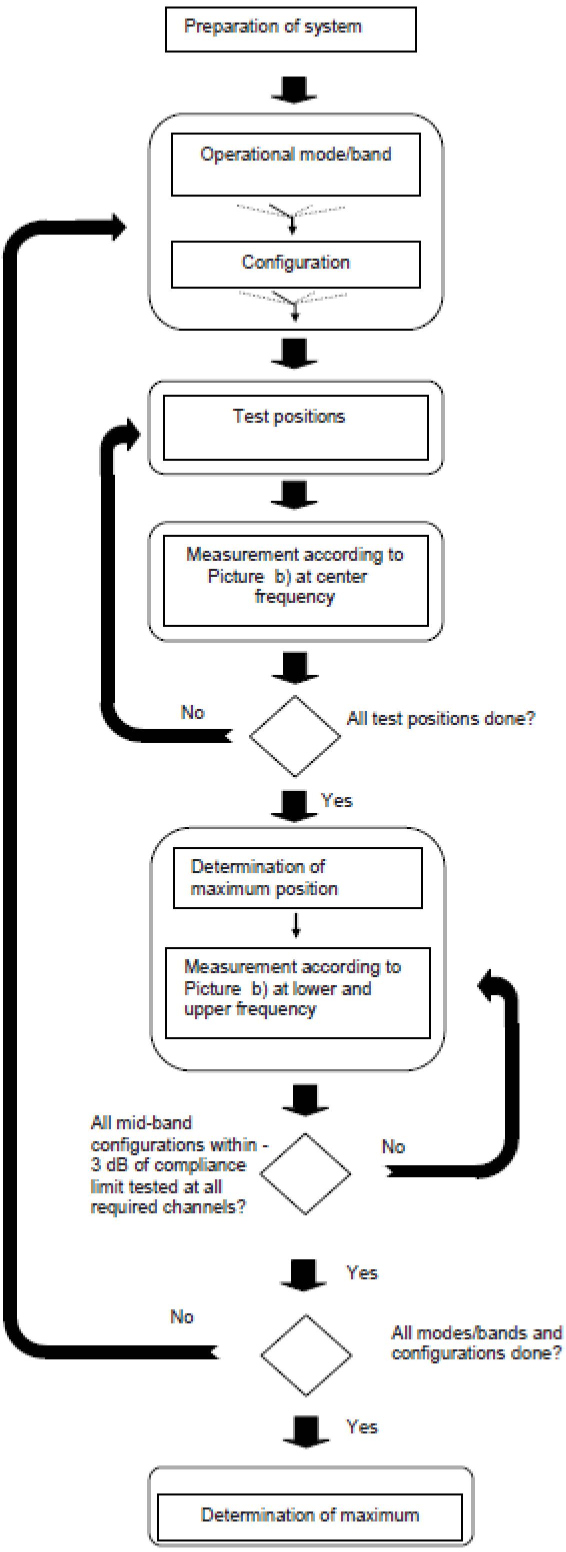
Step 1: The tests described in 9.2 shall be performed at the channel that is closest to the center of the transmit frequency band (f_c) for:

a) all device positions (cheek and tilt, for both left and right sides of the SAM phantom, as described in annex D),
b) all configurations for each device position in a), e.g., antenna extended and retracted, and
c) all operational modes, e.g., analogue and digital, for each device position in a) and configuration in b) in each frequency band.

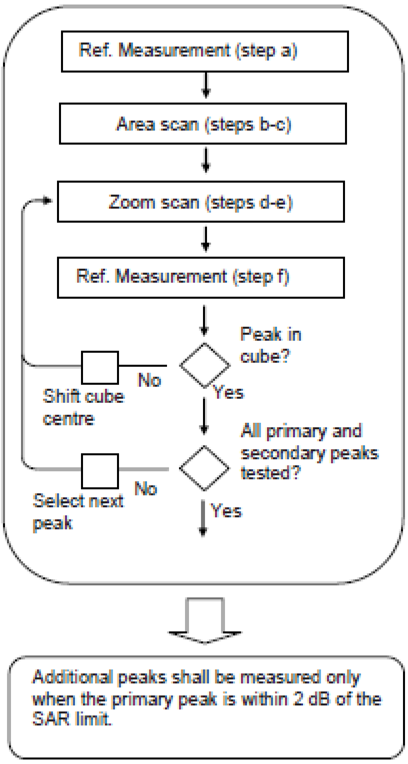
If more than three frequencies need to be tested according to 11.1 (i.e., N_c > 3), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

Step 2: For the condition providing highest peak spatial-average SAR determined in Step 1, perform all tests described in 9.2 at all other test frequencies, i.e., lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the peak spatial-average SAR value determined in Step 1 is within 3 dB of the applicable SAR limit, it is recommended that all other test frequencies shall be tested as well.

Step 3: Examine all data to determine the highest value of the peak spatial-average SAR found in Steps 1 to 2.



Picture a – Tests to be performed



Picture b – General procedure

Picture 9.1 Block diagram of the tests to be performed

9.2 General Measurement Procedure

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements and fully documented in SAR reports to qualify for TCB approval. Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2013. The results should be documented as part of the system validation records and may be requested to support test results when all the measurement parameters in the following table are not satisfied.

<table>
<tr><th colspan="3"></th><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5·$\Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</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 ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

9.3 WCDMA Measurement Procedures for SAR

The following procedures are applicable to WCDMA handsets operating under 3GPP Release99, Release 5 and Release 6. The default test configuration is to measure SAR with an established radio link between the DUT and a communication test set using a 12.2kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations (DPCCH & $DPDCH_n$), HSDPA and HSPA (HSUPA/HSDPA) modes according to output power, exposure conditions and device operating capabilities. Both uplink and downlink should be configured with the same RMC or AMR, when required. SAR for Release 5 HSDPA and Release 6 HSPA are measured using the applicable FRC (fixed reference channel) and E-DCH reference channel configurations. Maximum output power is verified according to applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. When Maximum Power Reduction (MPR) is not implemented according to Cubic Metric (CM) requirements for Release 6 HSPA, the following procedures do not apply.

For Release 5 HSDPA Data Devices:

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}	CM/dB
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15	15/15	64	12/15	24/25	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

For Release 6 HSPA Data Devices

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM (dB)	MPR (dB)	AG Index	E-TFCI
1	11/15	15/15	64	11/15	22/15	209/225	1039/225	4	1	1.5	1.5	20	75
2	6/15	15/15	64	6/15	12/15	12/15	12/15	4	1	1.5	1.5	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 β_{ed2}:47/15	4	2	1.5	1.5	15	92
4	2/15	15/15	64	2/15	4/15	4/15	56/75	4	1	1.5	1.5	17	71
5	15/15	15/15	64	15/15	24/15	30/15	134/15	4	1	1.5	1.5	21	81

Rel.8 DC-HSDPA (Cat 24)

SAR test exclusion for Rel.8 DC-HSDPA must satisfy the SAR test exclusion requirements of Rel.5 HSDPA. SAR test exclusion for DC-HSDPA devices is determined by power measurements according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to qualify for SAR test exclusion.

9.4 Bluetooth & Wi-Fi Measurement Procedures for SAR

Normal network operating configurations are not suitable for measuring the SAR of 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure that the results are consistent and reliable.

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

9.5 Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in section 14 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

10 Area Scan Based 1-g SAR

10.1 Requirement of KDB

According to the KDB447498 D01 v06, when the implementation is based the specific polynomial fit
algorithm as presented at the 29th Bioelectromagnetics Society meeting (2007) and the estimated 1-g SAR is ≤ 1.2 W/kg, a zoom scan measurement is not required provided it is also not needed for any other purpose; for example, if the peak SAR location required for simultaneous transmission SAR test exclusion can be determined accurately by the SAR system or manually to discriminate between distinctive peaks and scattered noisy SAR distributions from area scans.

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

10.2 Fast SAR Algorithms

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

In the initial study, an approximation algorithm based on Linear fit was developed. The accuracy of the algorithm has been demonstrated across a broad frequency range (136-2450 MHz) and for both 1- and 10-g averaged SAR using a sample of 264 SAR measurements from 55 wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithm are 1.2% and 5.8% for 1- and 10-g averaged SAR, respectively. The paper describing the algorithm in detail is expected to be published in August 2004 within the Special Issue of Transactions on MTT.

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

11 Conducted Output Power

11.1 GSM Measurement result

During the process of testing, the EUT was controlled via Agilent Digital Radio Communication tester (E5515C) to ensure the maximum power transmission and proper modulation. This result contains conducted output power for the EUT. In all cases, the measured peak output power should be greater and within 5% than EMI measurement.

Table 11-1 GSM850 #1

GSM850 #1								
		Measured Power (dBm)				Frame Burst Power （dBm）		
Config	Tune-up	CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz	Caculation	CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz
GSM Speech	33.50	32.50	32.54	32.49				
GPRS 1 Txslot	33.50	32.51	32.53	32.48	-9.03	23.48	23.50	23.45
GPRS 2 Txslots	31.50	30.98	31.00	30.96	-6.02	24.96	24.98	24.94
GPRS 3 Txslots	29.50	28.96	29.00	28.96	-4.26	24.70	24.74	24.70
GPRS 4 Txslots	28.00	27.48	27.51	27.49	-3.01	24.47	24.50	24.48
EGPRS GMSK 1 Txslot	33.50	32.47	32.51	32.47	-9.03	23.44	23.48	23.44
EGPRS GMSK 2 Txslots	31.50	30.95	30.98	30.95	-6.02	24.93	24.96	24.93
EGPRS GMSK 3 Txslots	29.50	28.94	28.98	28.96	-4.26	24.68	24.72	24.70
EGPRS GMSK 4 Txslots	28.00	27.45	27.50	27.48	-3.01	24.44	24.49	24.47
EGPRS 8PSK 1 Txslot	26.50	24.74	24.74	24.83	-9.03	15.71	15.71	15.80
EGPRS 8PSK 2 Txslots	25.00	24.16	23.48	23.54	-6.02	18.14	17.46	17.52
EGPRS 8PSK 3 Txslots	24.00	22.32	22.43	22.42	-4.26	18.06	18.17	18.16
EGPRS 8PSK 4 Txslots	22.50	20.90	20.91	20.93	-3.01	17.89	17.90	17.92

Table 11-2 PCS1900 #1

PCS1900 #1								
		Measured Power (dBm)				Frame Burst Power （dBm）		
Config	Tune-up	CH810 1909.8 MHz	CH661 1880 MHz	CH512 1850.2 MHz	Caculation	CH810 1909.8 MHz	CH661 1880 MHz	CH512 1850.2 MHz
GSM Speech	31.00	29.97	30.00	30.03				
GPRS 1 Txslot	31.00	29.94	29.99	30.02	-9.03	20.91	20.96	20.99
GPRS 2 Txslots	29.00	27.72	27.87	27.94	-6.02	21.70	21.85	21.92
GPRS 3 Txslots	27.00	25.97	25.94	25.92	-4.26	21.71	21.68	21.66
GPRS 4 Txslots	25.50	24.55	24.49	24.46	-3.01	21.54	21.48	21.45
EGPRS GMSK 1 Txslot	31.00	29.96	30.00	30.03	-9.03	20.93	20.97	21.00
EGPRS GMSK 2 Txslots	29.00	27.74	27.89	27.95	-6.02	21.72	21.87	21.93
EGPRS GMSK 3 Txslots	27.00	25.99	25.95	25.93	-4.26	21.73	21.69	21.67
EGPRS GMSK 4 Txslots	25.50	24.57	24.50	24.47	-3.01	21.56	21.49	21.46
EGPRS 8PSK 1 Txslot	26.50	24.95	25.74	25.18	-9.03	15.92	16.71	16.15
EGPRS 8PSK 2 Txslots	25.50	23.94	24.12	24.26	-6.02	17.92	18.10	18.24
EGPRS 8PSK 3 Txslots	24.50	22.80	22.84	22.94	-4.26	18.54	18.58	18.68
EGPRS 8PSK 4 Txslots	23.00	21.43	21.40	21.60	-3.01	18.42	18.39	18.59

NOTES:

Division Factors

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

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

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

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

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

According to the conducted power as above, the body measurements are performed with 2Txslots for 850MHz and 1900MHz.

11.2 WCDMA Measurement result

Table 11-3 WCDMA1900-BII #1

WCDMA1900-BII #1					
			Measured Power (dBm)		
Item		Tune-up	CH9538 1907.6 MHz	CH9400 1880 MHz	CH9262 1852.4 MHz
WCDMA	RMC	23.50	22.46	22.67	22.73
HSUPA	subtest1	23.00	21.45	21.59	21.76
	subtest2	23.00	21.44	21.63	21.72
	subtest3	23.00	21.06	21.09	21.24
	subtest4	23.00	21.51	21.67	21.79
	subtest5	23.00	21.52	21.63	21.79
HSPA+	\	\	\	\	\
DC-HSDPA	subtest1	23.00	22.83	22.91	22.94
	subtest2	23.00	22.77	22.95	22.99
	subtest3	23.00	22.78	22.94	22.94
	subtest4	23.00	22.76	22.89	22.97

Table 11-4 WCDMA850-BV #1

WCDMA850-BV #1					
			Measured Power (dBm)		
Item		Tune-up	CH4233 846.6 MHz	CH4182 835.4 MHz	CH4132 826.4 MHz
WCDMA	RMC	23.50	22.51	22.58	22.65
HSUPA	subtest1	23.00	21.98	22.04	22.06
	subtest2	23.00	21.94	22.03	22.06
	subtest3	23.00	21.51	21.58	21.66
	subtest4	23.00	21.93	22.03	22.06
	subtest5	23.00	21.96	22.07	22.08
HSPA+	\	\	\	\	\
DC-HSDPA	subtest1	23.00	22.82	22.85	22.75
	subtest2	23.00	22.81	22.84	22.79
	subtest3	23.00	22.89	22.82	22.78
	subtest4	23.00	22.88	22.87	22.76

11.3 Wi-Fi and BT Measurement result

The output power of BT antenna is as following:

Table 11-5 Bluetooth Power

Bluetooth Power				
Mode	Channel	Frequence	Tune-up	Measured
GFSK	78	2480 MHz	9	7.66
	39	2441 MHz	9	7.05
	0	2402 MHz	9	7.53
EDR2M-4_DQPSK	78	2480 MHz	8	7.19
	39	2441 MHz	8	6
	0	2402 MHz	8	7.03
EDR3M-8DPSK	78	2480 MHz	8	7.24
	39	2441 MHz	8	6.09
	0	2402 MHz	8	7.01

The average conducted power for Wi-Fi is as following:

Table 11-6 WLAN2450 #1

WLAN2450 #1						
Band	Mode	Channel	Frequence	Data Rate	Tune-up	Measured
WLAN 2.4G 20M	802.11b	11	2462 MHz	5.5Mbps	18.50	18.22
		6	2437 MHz		18.50	17.98
		1	2412 MHz		18.50	17.18
		11	2462 MHz	2Mbps	18.50	18.01
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	1Mbps	18.50	17.99
		6	2437 MHz		18.50	17.81
		1	2412 MHz		18.50	17.07
		11	2462 MHz	11Mbps	18.50	18.11
		6	2437 MHz		/	/
		1	2412 MHz		/	/
	802.11g	11	2462 MHz	6Mbps	18.00	16.73
		6	2437 MHz		18.00	16.68
		1	2412 MHz		18.00	16.29
		11	2462 MHz	9Mbps	18.00	16.70
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	12Mbps	18.00	16.69
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	18Mbps	18.00	16.76
		6	2437 MHz		18.00	16.27
		1	2412 MHz		18.00	16.31
		11	2462 MHz	24Mbps	18.00	16.60
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	36Mbps	18.00	16.61
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	48Mbps	18.00	16.67
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	54Mbps	18.00	16.65
		6	2437 MHz		/	/
		1	2412 MHz		/	/
	802.11n 20M	11	2462 MHz	MCS0	18.00	16.72
		6	2437 MHz		18.00	16.44
		1	2412 MHz		18.00	16.26
		11	2462 MHz	MCS1	18.00	16.64
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	MCS2	18.00	16.74
		6	2437 MHz		18.00	16.48
		1	2412 MHz		18.00	16.08
		11	2462 MHz	MCS3	18.00	16.72
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	MCS4	18.00	16.71
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	MCS5	17.00	15.59
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	MCS6	17.00	15.60
		6	2437 MHz		/	/
		1	2412 MHz		/	/
		11	2462 MHz	MCS7	17.00	15.57
		6	2437 MHz		/	/
		1	2412 MHz		/	/

WLAN 2.4G 40M	802.11n 40M	9	2452 MHz	MCS0	17.00	15.81
		6	2437 MHz		17.00	15.78
		3	2422 MHz		17.00	15.65
		9	2452 MHz	MCS1	17.00	15.83
		6	2437 MHz		17.00	15.71
		3	2422 MHz		17.00	15.61
		9	2452 MHz	MCS2	17.00	15.80
		6	2437 MHz		/	/
		3	2422 MHz		/	/
		9	2452 MHz	MCS3	17.00	15.77
		6	2437 MHz		/	/
		3	2422 MHz		/	/
		9	2452 MHz	MCS4	17.00	15.79
		6	2437 MHz		/	/
		3	2422 MHz		/	/
		9	2452 MHz	MCS5	17.00	15.49
		6	2437 MHz		/	/
		3	2422 MHz		/	/
		9	2452 MHz	MCS6	17.00	15.82
		6	2437 MHz		/	/
		3	2422 MHz		/	/
		9	2452 MHz	MCS7	17.00	15.75
		6	2437 MHz		/	/
		3	2422 MHz		/	/

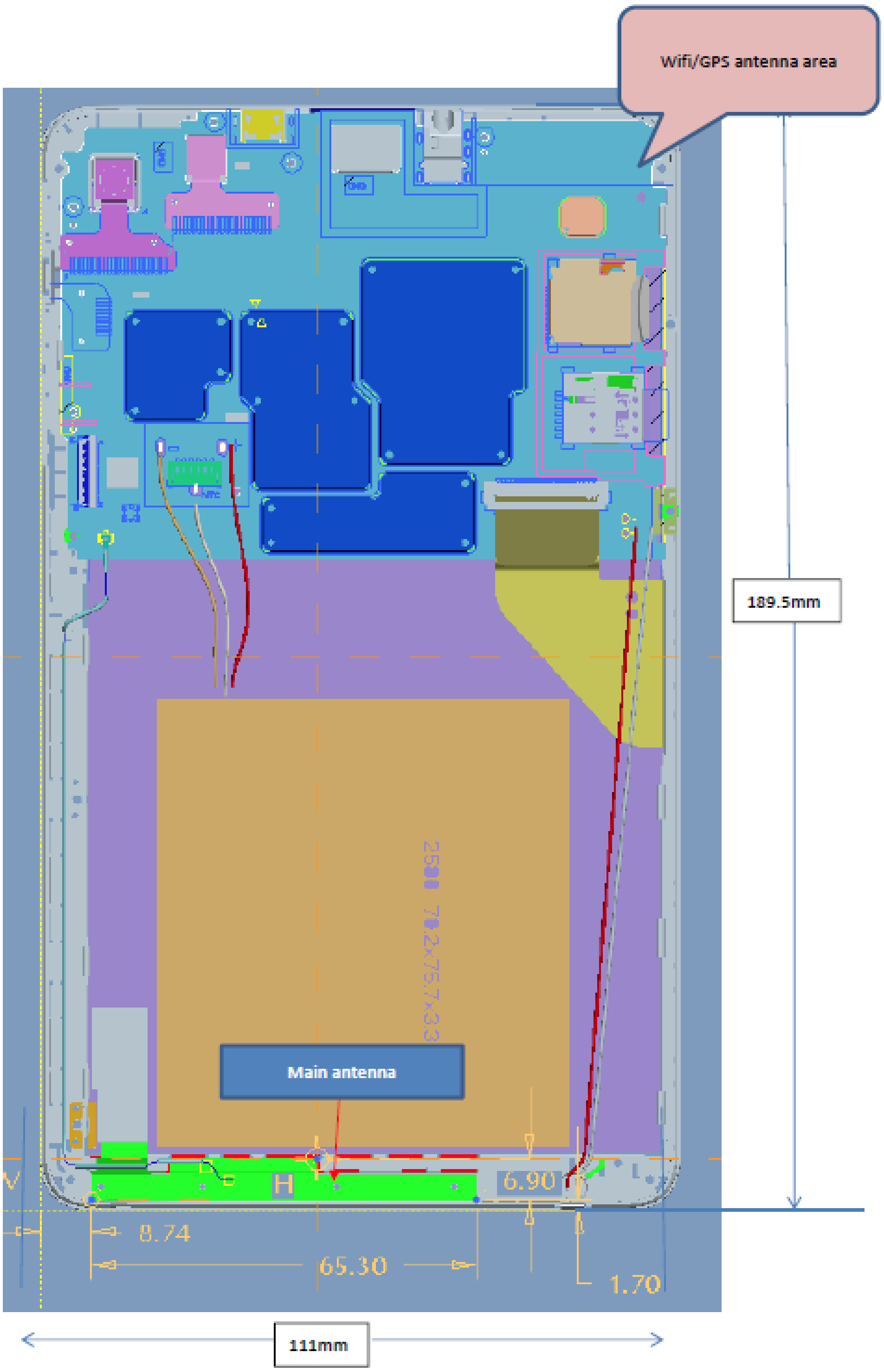
12 Simultaneous TX SAR Considerations

12.1 Introduction

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

For this device, the BT and Wi-Fi can transmit simultaneous with other transmitters.

12.2 Transmit Antenna Separation Distances



Picture 12.1 Antenna Locations

12.3 SAR Measurement Positions

According to the KDB941225 D06 Hot Spot SAR v02r01, the edges with less than 2.5 cm distance to the antennas need to be tested for SAR.

SAR measurement positions						
Mode	Front	Rear	Left edge	Right edge	Top edge	Bottom edge
Main antenna	Yes	Yes	No	Yes	No	Yes
WLAN	Yes	Yes	Yes	No	Yes	No

12.4 Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied. The 1-g SAR test exclusion threshold 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, where

- 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

Table 12.1: Standalone SAR test exclusion considerations

Band/Mode	F(GHz)	Position	SAR test exclusion threshold (mW)	RF output power		SAR test exclusion
				dBm	mW	
Bluetooth	2.441	Head	9.6	9.00	7.94	Yes
		Body	19.2	9.00	7.94	Yes
2.4GHz WLAN 802.11 b	2.45	Head	9.58	18.50	70.79	No
		Body	19.17	18.50	70.79	No

13 Evaluation of Simultaneous

Table 13.1: The sum of reported SAR values for main antenna and WiFi

	Position	Main antenna	WiFi	Sum
Highest reported SAR value for Head	Right hand, Touch cheek (W1900)	0.10	1.27	**1.37**
Highest reported SAR value for Body	Front (GSM850)	0.66	0.12	**0.78**

Table 13.2: The sum of reported SAR values for main antenna and BT

	Position	Main antenna	BT	Sum
Maximum reported SAR value for Head	Left hand, Touch cheek (GSM 850)	0.14	0.33	**0.47**
Maximum reported SAR value for Body	Front (GSM850)	0.66	0.17	**0.83**

[1] - Estimated SAR for Bluetooth (see the table 13.3)

Table 13.3: Estimated SAR for Bluetooth

Mode/Band	F (GHz)	Position	Distance (mm)	Upper limit of power *		Estimated$_{1g}$ (W/kg)
				dBm	mW	
Bluetooth	2.441	Head	5	9	7.94	0.33
Bluetooth	2.441	Body	10	9	7.94	0.17

* - Maximum possible output power declared by manufacturer

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
(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.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

Conclusion:
According to the above tables, the sum of reported SAR values is<1.6W/kg. So the simultaneous transmission SAR with volume scans is not required.

14 SAR Test Result

It is determined by user manual for the distance between the EUT and the phantom bottom.
The distance is 10mm and just applied to the condition of body worn accessory.
It is performed for all SAR measurements with area scan based 1-g SAR estimation (Fast SAR). A zoom scan measurement is added when the estimated 1-g SAR is the highest measured SAR in each exposure configuration, wireless mode and frequency band combination or more than 1.2W/kg.
The calculated SAR is obtained by the following formula:

$$\text{Reported SAR} = \text{Measured SAR} \times 10^{(\text{P}_{\text{Target}} - \text{P}_{\text{Measured}})/10}$$

Where P_{Target} is the power of manufacturing upper limit;
$P_{Measured}$ is the measured power in chapter 11.

Mode	Duty Cycle
Speech for GSM850/1900	1:8.3
GPRS&EGPRS for GSM850/1900	1:4
WCDMA&WiFi	1:1

14.1 SAR results

Table 14-1 GSM850 #1 Head

GSM850 #1 Head								
Ambient Temperature:			22.6			Liquid Temperature:		22.4
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz	CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz
GSM	Tune-up		33.50	33.50	33.50	Scaling factor*		
	Slot Average Power [dBm]		32.50	32.54	32.49	1.26	1.25	1.26
	Left Cheek	1g SAR	0.112	0.09	0.076	0.14	0.11	0.10
		10g SAR	0.092	0.075	0.062	0.12	0.09	0.08
		Deviation	0.01	-0.06	0.03	0.01	-0.06	0.03
	Left Tilt	1g SAR		0.049			0.06	
		10g SAR		0.042			0.05	
		Deviation		0.1			0.10	
	Right Cheek	1g SAR		0.067			0.08	
		10g SAR		0.058			0.07	
		Deviation		0.07			0.07	
	Right Tilt	1g SAR		0.044			0.05	
		10g SAR		0.037			0.05	
		Deviation		0.07			0.07	

Table 14-2 GSM850 #1 Body

GSM850 #1 Body								
Ambient Temperature:		22.6				Liquid Temperature:		22.4
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz	CH251 848.8 MHz	CH190 836.6 MHz	CH128 824.2 MHz
GPRS 2 Txslots	Tune-up		31.50	31.50	31.50	Scaling factor*		
	Slot Average Power [dBm]		30.98	31.00	30.96	1.13	1.12	1.13
	Front	1g SAR	0.583	0.446	0.401	0.66	0.50	0.45
		10g SAR	0.388	0.299	0.264	0.44	0.34	0.30
		Deviation	-0.1	0.05	0.09	-0.10	0.05	0.09
	Rear	1g SAR		0.305			0.34	
		10g SAR		0.211			0.24	
		Deviation		-0.02			-0.02	
	Right edge	1g SAR		0.048			0.05	
		10g SAR		0.033			0.04	
		Deviation		0.08			0.08	
	Bottom edge	1g SAR		0.181			0.20	
		10g SAR		0.115			0.13	
		Deviation		-0.03			-0.03	
EGPRS GMSK 2 Txslots	Tune-up		31.50	31.50	31.50	Scaling factor*		
	Slot Average Power [dBm]		30.95	30.98	30.95	1.14	1.13	1.14
	Front	1g SAR	0.561			0.64		
		10g SAR	0.331			0.38		
		Deviation	0.02			0.02		

Table 14-3 PCS1900 #1 Head

PCS1900 #1 Head								
Ambient Temperature:			22.6		Liquid Temperature:		22.4	
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH810 1909.8	CH661 1880 MHz	CH512 1850.2	CH810 1909.8	CH661 1880 MHz	CH512 1850.2
GSM	Tune-up		31.00	31.00	31.00	Scaling factor*		
	Slot Average Power [dBm]		29.97	30.00	30.03	1.27	1.26	1.25
	Left Cheek	1g SAR		0.037			0.05	
		10g SAR		0.023			0.03	
		Deviation		-0.08			-0.08	
	Left Tilt	1g SAR		0.027			0.03	
		10g SAR		0.016			0.02	
		Deviation		0.08			0.08	
	Right Cheek	1g SAR	0.046	0.042	0.04	0.06	0.05	0.05
		10g SAR	0.027	0.026	0.025	0.03	0.03	0.03
		Deviation	0.04	0.08	-0.01	0.04	0.08	-0.01
	Right Tilt	1g SAR		0.016			0.02	
		10g SAR		0.01			0.01	
		Deviation		0.08			0.08	

Table 14-4 PCS1900 #1 Body

PCS1900 #1 Body								
Ambient Temperature:		22.6			Liquid Temperature:		22.4	
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH810 1909.8	CH661 1880 MHz	CH512 1850.2	CH810 1909.8	CH661 1880 MHz	CH512 1850.2
GPRS 2 Txslots	Tune-up		29.00	29.00	29.00	Scaling factor*		
	Slot Average Power [dBm]		27.72	27.87	27.94	1.34	1.30	1.28
	Front	1g SAR	0.312	0.236	0.211	0.42	0.31	0.27
		10g SAR	0.169	0.131	0.118	0.23	0.17	0.15
		Deviation	-0.11	0.02	-0.05	-0.11	0.02	-0.05
	Rear	1g SAR		0.155			0.20	
		10g SAR		0.09			0.12	
		Deviation		0.03			0.03	
	Right edge	1g SAR		0.045			0.06	
		10g SAR		0.028			0.04	
		Deviation		0.09			0.09	
	Bottom edge	1g SAR		0.217			0.28	
		10g SAR		0.12			0.16	
		Deviation		0.13			0.13	
EGPRS GMSK 2 Txslots	Tune-up		29.00	29.00	29.00	Scaling factor*		
	Slot Average Power [dBm]		27.74	27.89	27.95	1.34	1.29	1.27
	Front	1g SAR	0.296			0.40		
		10g SAR	0.161			0.22		
		Deviation	0.03			0.03		

Table 14-5 WCDMA1900-BII #1Head

WCDMA1900-BII #1Head								
Ambient Temperature:		22.6				Liquid Temperature:		22.4
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH9538 1907.6 MHz	CH9400 1880 MHz	CH9262 1852.4 MHz	CH9538 1907.6 MHz	CH9400 1880 MHz	CH9262 1852.4 MHz
RMC	Tune-up		23.50	23.50	23.50	Scaling factor*		
	Slot Average Power [dBm]		22.46	22.67	22.73	1.27	1.21	1.19
	Left Cheek	1g SAR		0.066			0.08	
		10g SAR		0.04			0.05	
		Deviation		0			0.00	
	Left Tilt	1g SAR		0.053			0.06	
		10g SAR		0.032			0.04	
		Deviation		0.09			0.09	
	Right Cheek	1g SAR	0.078	0.083	0.067	0.10	0.10	0.08
		10g SAR	0.047	0.051	0.039	0.06	0.06	0.05
		Deviation	0.08	0.08	0.03	0.08	0.08	0.03
	Right Tilt	1g SAR		0.037			0.04	
		10g SAR		0.022			0.03	
		Deviation		-0.07			-0.07	

Table 14-6 WCDMA1900-BII #1Body

WCDMA1900-BII #1Body								
Ambient Temperature:		22.6				Liquid Temperature:		22.4
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH9538 1907.6 MHz	CH9400 1880 MHz	CH9262 1852.4 MHz	CH9538 1907.6 MHz	CH9400 1880 MHz	CH9262 1852.4 MHz
RMC	Tune-up		23.50	23.50	23.50	Scaling factor*		
	Slot Average Power [dBm]		22.46	22.67	22.73	1.27	1.21	1.19
	Front	1g SAR	0.328	0.292	0.258	0.42	0.35	0.31
		10g SAR	0.178	0.165	0.151	0.23	0.20	0.18
		Deviation	-0.08	0.03	0.09	-0.08	0.03	0.09
	Rear	1g SAR		0.204			0.25	
		10g SAR		0.123			0.15	
		Deviation		0.04			0.04	
	Right edge	1g SAR		0.056			0.07	
		10g SAR		0.036			0.04	
		Deviation		0.01			0.01	
	Bottom edge	1g SAR		0.268			0.32	
		10g SAR		0.153			0.19	
		Deviation		0.13			0.13	

Table 14-7 WCDMA850-BV #1Head

WCDMA850-BV #1Head								
Ambient Temperature: 22.6					Liquid Temperature: 22.4			
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH4233 846.6 MHz	CH4182 835.4 MHz	CH4132 826.4 MHz	CH4233 846.6 MHz	CH4182 835.4 MHz	CH4132 826.4 MHz
RMC	Tune-up		23.50	23.50	23.50	Scaling factor*		
	Slot Average Power [dBm]		22.51	22.58	22.65	1.26	1.24	1.22
	Left Cheek	1g SAR	0.038	0.04	0.039	0.05	0.05	0.05
		10g SAR	0.032	0.033	0.032	0.04	0.04	0.04
		Deviation	-0.11	0.06	-0.02	-0.11	0.06	-0.02
	Left Tilt	1g SAR		0.022			0.03	
		10g SAR		0.02			0.02	
		Deviation		0.1			0.10	
	Right Cheek	1g SAR		0.034			0.04	
		10g SAR		0.029			0.04	
		Deviation		0.04			0.04	
	Right Tilt	1g SAR		0.022			0.03	
		10g SAR		0.02			0.02	
		Deviation		-0.07			-0.07	

Table 14-8 WCDMA850-BV #1Body

WCDMA850-BV #1Body								
Ambient Temperature: 22.6					Liquid Temperature: 22.4			
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH4233 846.6 MHz	CH4182 835.4 MHz	CH4132 826.4 MHz	CH4233 846.6 MHz	CH4182 835.4 MHz	CH4132 826.4 MHz
RMC	Tune-up		23.50	23.50	23.50	Scaling factor*		
	Slot Average Power [dBm]		22.51	22.58	22.65	1.26	1.24	1.22
	Front	1g SAR	0.302	0.264	0.233	0.38	0.33	0.28
		10g SAR	0.203	0.171	0.159	0.25	0.21	0.19
		Deviation	-0.05	0.02	0.09	-0.05	0.02	0.09
	Rear	1g SAR		0.182			0.22	
		10g SAR		0.127			0.16	
		Deviation		-0.11			-0.11	
	Left edge	1g SAR		0.04			0.05	
		10g SAR		0.028			0.03	
		Deviation		0.05			0.05	
	Right edge	1g SAR		0.043			0.05	
		10g SAR		0.031			0.04	
		Deviation		0.08			0.08	
	Bottom edge	1g SAR		0.079			0.10	
		10g SAR		0.052			0.06	
		Deviation		0.01			0.01	

14.2 Full SAR

Test Band	Channel	Frequency	Tune-Up	Measured Power	Test Position	Measured 10g SAR	Measured 1g SAR	Reported 10g SAR	Reported 1g SAR	Power Drift	Figure
GSM850	251	848.8 MHz	33.5	32.50	Left Cheek	0.092	0.112	0.12	0.14	0.01	Fig A.1
GSM850	251	848.8 MHz	31.5	30.98	Front	0.388	0.583	0.44	0.66	-0.1	Fig A.2
PCS1900	810	1909.8 MHz	31	29.97	Right Cheek	0.027	0.046	0.03	0.06	0.04	Fig A.3
PCS1900	810	1909.8 MHz	29	27.72	Front	0.169	0.312	0.23	0.42	-0.11	Fig A.4
WCDMA1900-BII	9400	1880 MHz	23.5	22.67	Right Cheek	0.051	0.083	0.06	0.10	0.08	Fig A.5
WCDMA1900-BII	9538	1907.6 MHz	23.5	22.46	Front	0.178	0.328	0.23	0.42	-0.08	Fig A.6
WCDMA850-BV	4182	835.4 MHz	23.5	22.58	Left Cheek	0.033	0.04	0.04	0.05	0.06	Fig A.7
WCDMA850-BV	4233	846.6 MHz	23.5	22.51	Front	0.203	0.302	0.25	0.38	-0.05	Fig A.8
WLAN2450	11	2462 MHz	18.5	18.22	Right Cheek	0.516	1.19	0.55	1.27	0.07	Fig A.9
WLAN2450	11	2462 MHz	18.5	18.22	Front	0.057	0.114	0.06	0.12	0.06	Fig A.10

14.3 WLAN Evaluation

According to the KDB248227 D01, SAR is measured for 802.11b DSSS using the initial test position procedure.

Note1: When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest estimated 1-g SAR conditions determined by area scans, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg.

Note2: For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Note3: According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

Table 14-9 WLAN2450 #1 Head Fast SAR

WLAN2450 #1 Head Fast SAR								
Ambient Temperature: 22.6						Liquid Temperature: 22.4		
Rate	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			11	6	1	11	6	1
			2462 MHz	2437 MHz	2412 MHz			
802.11b 5.5Mbps	Tune up		18.5	18.5	18.5	Scaling factor*		
	Slot Average Power [dBm]		18.22	17.98	17.18	1.07	1.13	1.36
	Left Cheek	1g Fast SAR	0.236			0.25		
		10g SAR	0.13			0.14		
		Deviation	-0.08			-0.08		
	Left Tilt	1g Fast SAR	0.26			0.28		
		10g SAR	0.131			0.14		
		Deviation	0.04			0.04		
	Right Cheek	1g Fast SAR	1.1			1.17		
		10g SAR	0.539			0.57		
		Deviation	0.07			0.07		
	Right Tilt	1g Fast SAR	0.536			0.57		
		10g SAR	0.274			0.29		
		Deviation	0.02			0.02		

Table 14-10 WLAN2450 #1 Head Full SAR

WLAN2450 #1 Head Full SAR								
Ambient Temperature: 22.6						Liquid Temperature: 22.4		
Rate	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			11	6	1	11	6	1
			2462 MHz	2437 MHz	2412 MHz			
802.11b 5.5Mbps	Tune up		18.5	18.5	18.5	Scaling factor*		
	Slot Average Power [dBm]		18.22	17.98	17.18	1.07	1.13	1.36
	Right Cheek	1g Full SAR	1.19	1.12	0.835	1.27	1.26	1.13
		10g SAR	0.516	0.491	0.371	0.55	0.55	0.50
		Deviation	0.07	0.09	-0.06	0.07	0.09	-0.06
	Right Tilt	1g Full SAR	0.56			0.60		
		10g SAR	0.258			0.28		
		Deviation	0.02			0.02		

Table 14-11 WLAN2450 #1 Body Fast SAR

WLAN2450 #1 Body Fast SAR								
Ambient Temperature: 22.6						Liquid Temperature: 22.4		
Rate	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			11	6	1	11	6	1
			2462 MHz	2437 MHz	2412 MHz			
802.11b 5.5Mbps	Tune up		18.5	18.5	18.5	Scaling factor*		
	Slot Average Power [dBm]		18.22	17.98	17.18	1.07	1.13	1.36
	Front	1g Fast SAR	0.115			0.12		
		10g SAR	0.064			0.07		
		Deviation	0.06			0.06		
	Rear	1g Fast SAR	0.11			0.12		
		10g SAR	0.055			0.06		
		Deviation	-0.08			-0.08		
	Top edge	1g Fast SAR	0.046			0.05		
		10g SAR	0.028			0.03		
		Deviation	-0.07			-0.07		
	Left edge	1g Fast SAR	0.054			0.06		
		10g SAR	0.03			0.03		
		Deviation	-0.01			-0.01		

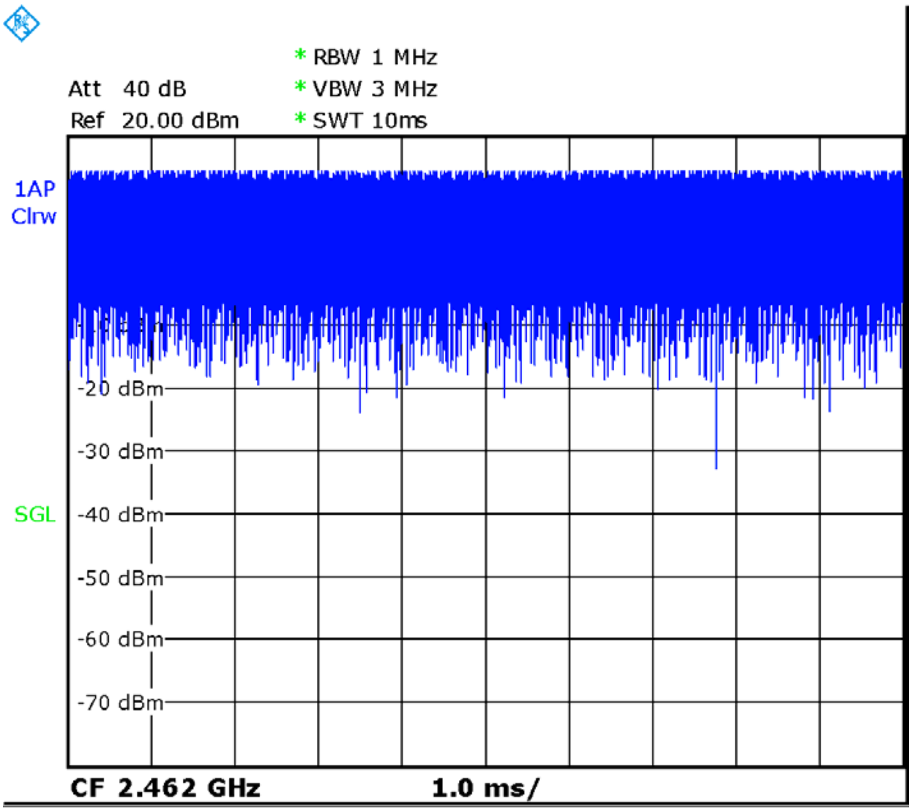
Table 14-12 WLAN2450 #1 Body Full SAR

WLAN2450 #1 Body Full SAR								
Ambient Temperature: 22.6						Liquid Temperature: 22.4		
Rate	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			11	6	1	11	6	1
			2462 MHz	2437 MHz	2412 MHz			
802.11b 5.5Mbps	Tune up		18.5	18.5	18.5	Scaling factor*		
	Slot Average Power [dBm]		18.22	17.98	17.18	1.07	1.13	1.36
	Front	1g Full SAR	0.114			0.12		
		10g SAR	0.057			0.06		
		Deviation	0.06			0.06		

According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. The scaled reported SAR is presented as below							
Frequency		Test Position	Actual duty factor	maximum duty factor	Reported SAR(1g)(W/kg)	Scaled reported SAR(1g)(W/kg)	Figure
MHz	Ch.						
2462 MHz	11	Right Cheek	100.00%	100%	1.27	1.27	Fig.A.9

According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. The scaled reported SAR is presented as below							
Frequency		Test Position	Actual duty factor	maximum duty factor	Reported SAR(1g)(W/kg)	Scaled reported SAR(1g)(W/kg)	Figure
MHz	Ch.						
2462 MHz	11	Front	100.00%	100%	0.12	0.12	Fig.A.10

SAR is not required for OFDM because the 802.11b adjusted SAR ≤ 1.2 W/kg.



Picture 14.1 Duty factor plot

15 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

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

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

Mode	CH	Freq	Test Poisition	Original SAR (W/kg)	First Repeated SAR(W/kg)	The Ratio
WLAN2450	11	2462MHz	Right Cheek	1.19	1.17	1.02

16 Measurement Uncertainty

16.1 Measurement Uncertainty for Normal SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.0	N	1	1	1	6.0	6.0	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	N	1	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RFambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521

Combined standard uncertainty			$u_c^{'} = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$					9.55	9.43	257
Expanded uncertainty (confidence interval of 95 %)			$u_e = 2u_c$					19.1	18.9	

16.2 Measurement Uncertainty for Normal SAR Tests (3~6GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.55	N	1	1	1	6.55	6.55	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. restrictions	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
12	Probe positioning with respect to phantom shell	B	6.7	R	$\sqrt{3}$	1	1	3.9	3.9	∞
13	Post-processing	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and set-up										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞

	(target)									
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c' = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$						10.7	10.6	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						21.4	21.1	

16.3 Measurement Uncertainty for Fast SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.0	N	1	1	1	6.0	6.0	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. Restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
14	Fast SAR z-Approximation	B	7.0	R	$\sqrt{3}$	1	1	4.0	4.0	∞
Test sample related										
15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
16	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	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	1.32	0.89	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		$u_c^{'} = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						10.4	10.3	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						20.8	20.6	

16.4 Measurement Uncertainty for Fast SAR Tests (3~6GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.55	N	1	1	1	6.55	6.55	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
3	Boundary effect	B	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	∞
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	∞
11	Probe positioned mech. Restrictions	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
12	Probe positioning with respect to phantom shell	B	6.7	R	$\sqrt{3}$	1	1	3.9	3.9	∞
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
14	Fast SAR z-Approximation	B	14.0	R	$\sqrt{3}$	1	1	8.1	8.1	∞
Test sample related										
15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71

16	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	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	1.32	0.89	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		$u_c^{'} = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						13.5	13.4	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						27.0	26.8	

17 MAIN TEST INSTRUMENTS

Table 17.1: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	E5071C	MY46110673	January 24, 2018	One year
02	Power meter	NRVD	102083	November 01, 2017	One year
03	Power sensor	NRV-Z5	100542		
04	Signal Generator	E4438C	MY49071430	January 2,2018	One Year
05	Amplifier	60S1G4	0331848	No Calibration Requested	
06	BTS	E5515C	MY50263375	January 23, 2018	One year
08	E-field Probe	SPEAG EX3DV4	7514	August 27,2018	One year
09	DAE	SPEAG DAE4	1525	September 18, 2018	One year
10	Dipole Validation Kit	SPEAG D835V2	4d069	July 19, 2017	Three years
11	Dipole Validation Kit	SPEAG D1900V2	5d101	July 26, 2017	Three years
12	Dipole Validation Kit	SPEAG D2450V2	853	July 21, 2017	Three years

END OF REPORT BODY

ANNEX A Graph Results

GSM850_CH251 Left Cheek

Date: 10/1/2018

Electronics: DAE4 Sn1525

Medium: head 835 MHz

Medium parameters used: f = 848.8 MHz; σ = 0.902 mho/m; εr = 40.78; ρ = 1000 kg/m^3

Ambient Temperature: 22.6°C, Liquid Temperature: 22.4°C

Communication System: GSM850 848.8 MHz Duty Cycle: 1:8.3

Probe: EX3DV4 – SN7514 ConvF(10.28,10.28,10.28)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.120 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.145 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.133 W/kg
SAR(1 g) = 0.112 W/kg; SAR(10 g) = 0.092 W/kg
Maximum value of SAR (measured) = 0.121 W/kg

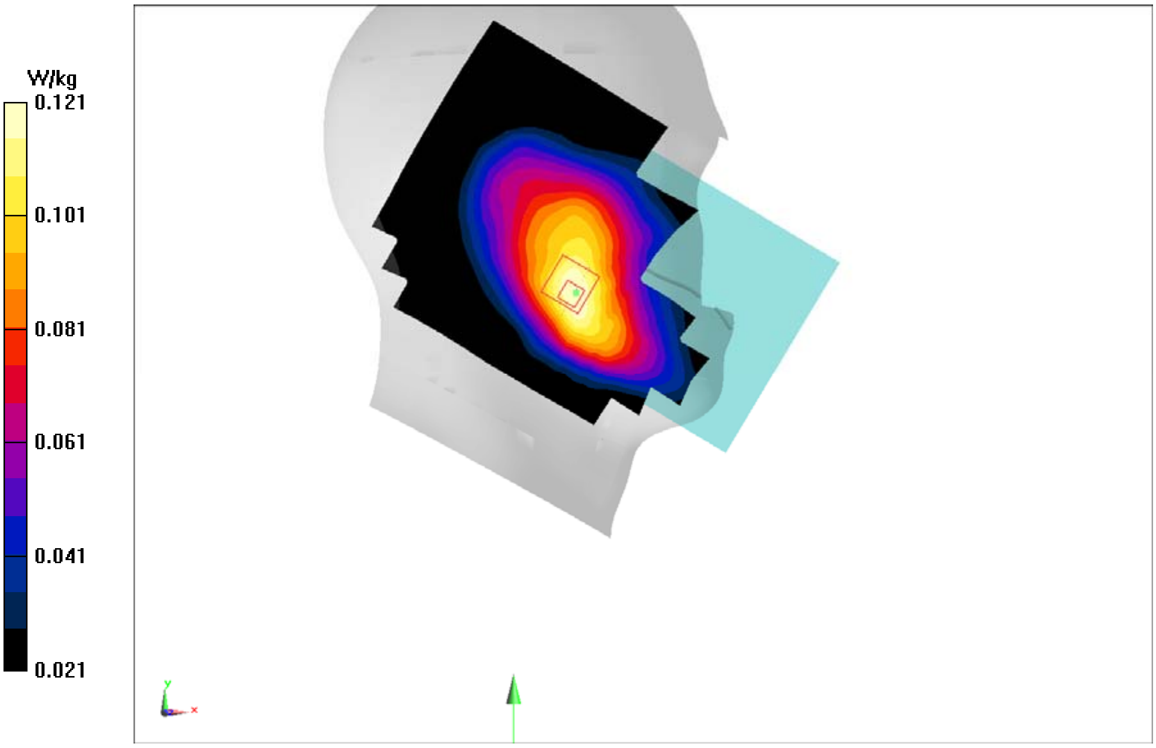


Fig A.1

GSM850_CH251 Front
Date: 10/1/2018
Electronics: DAE4 Sn1525
Medium: body 835 MHz
Medium parameters used: f = 848.8 MHz; σ = 0.986 mho/m; εr = 55.09; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C, Liquid Temperature: 22.4°C
Communication System: GSM850 848.8 MHz Duty Cycle: 1:4
Probe: EX3DV4 – SN7514 ConvF(10.21,10.21,10.21)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.686 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.80 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 0.865 W/kg
SAR(1 g) = 0.583 W/kg; SAR(10 g) = 0.388 W/kg
Maximum value of SAR (measured) = 0.672 W/kg

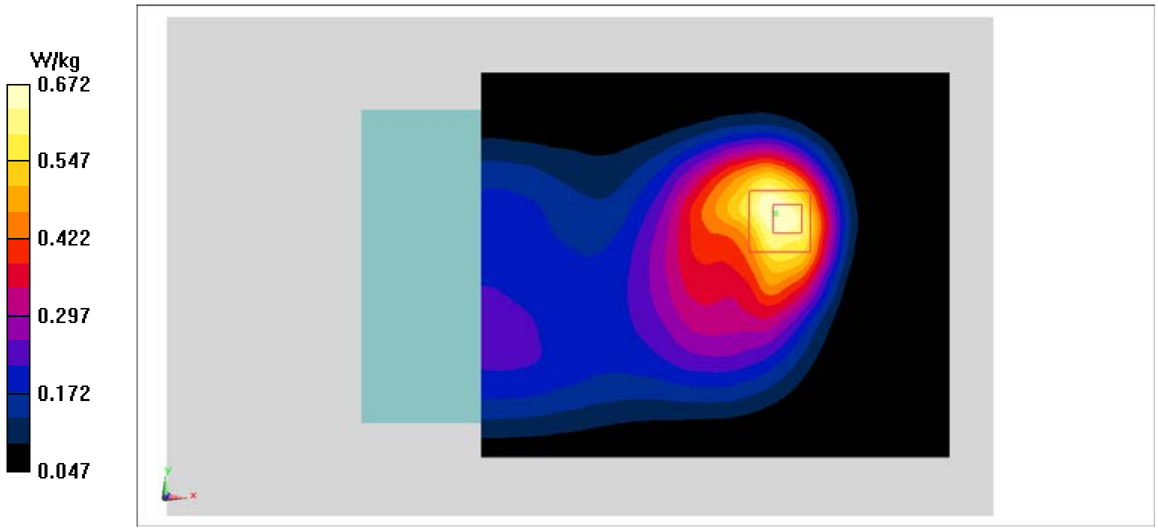


Fig A.2

PCS1900_CH810 Right Cheek
Date: 10/2/2018
Electronics: DAE4 Sn1525
Medium: head 1900 MHz
Medium parameters used: f = 1909.8 MHz; σ = 1.42 mho/m; εr = 40.01; ρ = 1000 kg/m^3
Ambient Temperature: 22.6ºC, Liquid Temperature: 22.4ºC
Communication System: PCS1900 1909.8 MHz Duty Cycle: 1:8.3
Probe: EX3DV4 – SN7514 ConvF(8.39,8.39,8.39)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0580 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.550 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.0680 W/kg
SAR(1 g) = 0.046 W/kg; SAR(10 g) = 0.027 W/kg
Maximum value of SAR (measured) = 0.0539 W/kg

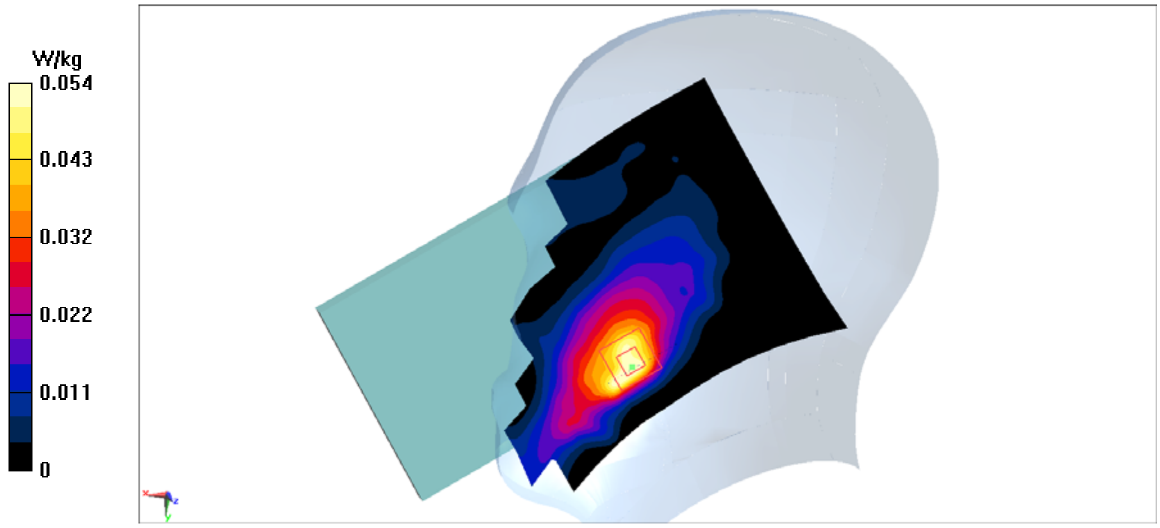


Fig A.3

PCS1900_CH810 Front
Date: 10/2/2018
Electronics: DAE4 Sn1525
Medium: body 1900 MHz
Medium parameters used: f = 1909.8 MHz; σ = 1.53 mho/m; εr = 53.21; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C, Liquid Temperature: 22.4°C
Communication System: PCS1900 1909.8 MHz Duty Cycle: 1:4
Probe: EX3DV4 – SN7514 ConvF(8.32,8.32,8.32)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.378 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.246 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 0.532 W/kg
SAR(1 g) = 0.312 W/kg; SAR(10 g) = 0.169 W/kg
Maximum value of SAR (measured) = 0.385 W/kg

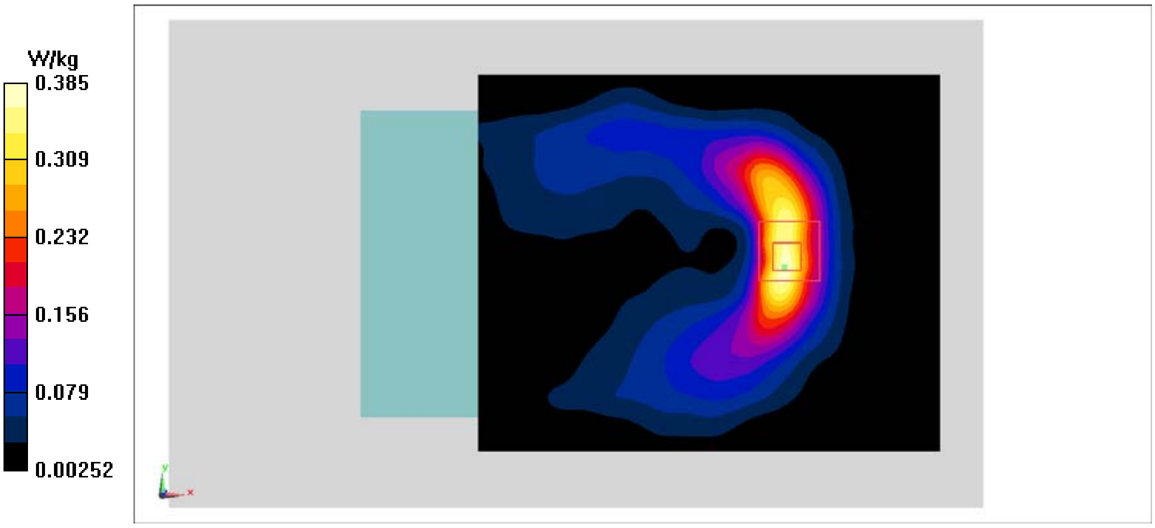


Fig A.4

WCDMA1900-BII_CH9400 Right Cheek
Date: 10/2/2018
Electronics: DAE4 Sn1525
Medium: head 1900 MHz
Medium parameters used: f = 1880 MHz; σ = 1.391 mho/m; εr = 40.04; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C, Liquid Temperature: 22.4°C
Communication System: WCDMA1900-BII 1880 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(8.39,8.39,8.39)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0935 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.677 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.122 W/kg
SAR(1 g) = 0.083 W/kg; SAR(10 g) = 0.051 W/kg
Maximum value of SAR (measured) = 0.0954 W/kg

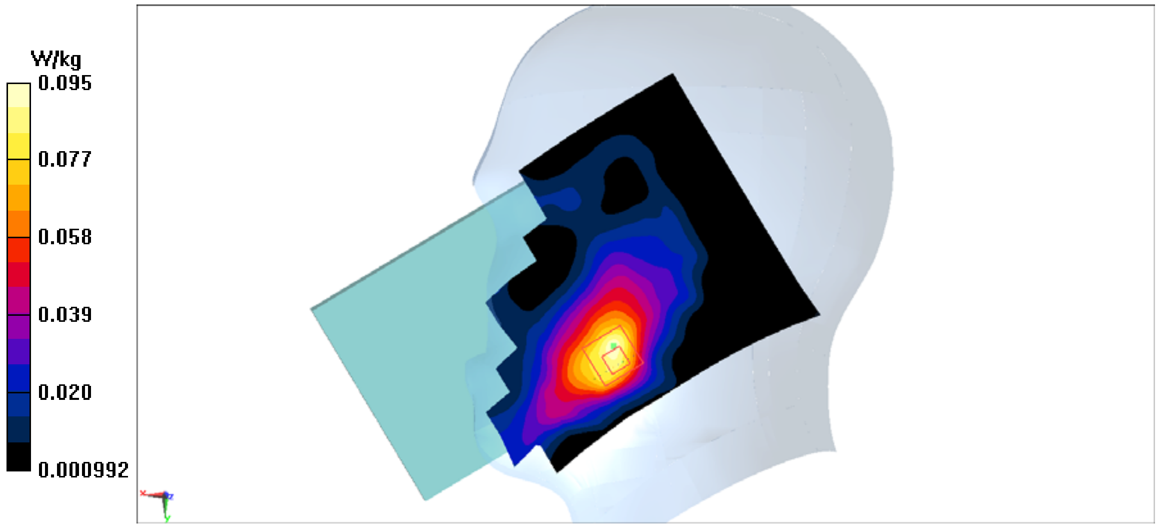


Fig A.5

WCDMA1900-BII_CH9538 Front
Date: 10/2/2018
Electronics: DAE4 Sn1525
Medium: body 1900 MHz
Medium parameters used: f = 1907.6 MHz; σ = 1.528 mho/m; εr = 53.21; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C, Liquid Temperature: 22.4°C
Communication System: WCDMA1900-BII 1907.6 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(8.32,8.32,8.32)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.352 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.863 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.566 W/kg
SAR(1 g) = 0.328 W/kg; SAR(10 g) = 0.178 W/kg
Maximum value of SAR (measured) = 0.399 W/kg

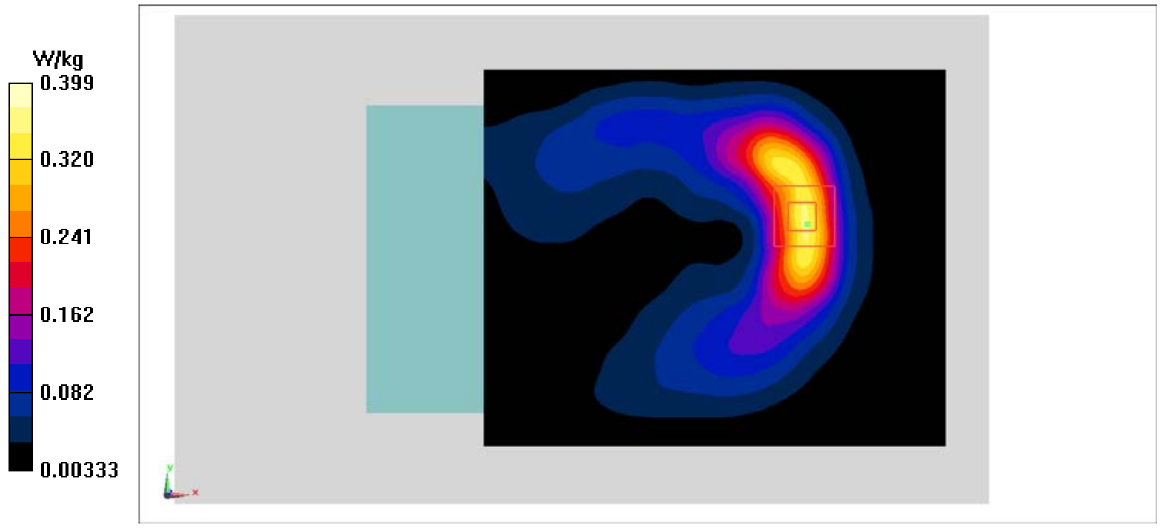


Fig A.6

WCDMA850-BV_CH4182 Left Cheek
Date: 10/1/2018
Electronics: DAE4 Sn1525
Medium: head 835 MHz
Medium parameters used: f = 835.4 MHz; σ = 0.889 mho/m; εr = 40.8; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C, Liquid Temperature: 22.4°C
Communication System: WCDMA850-BV 835.4 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(10.28,10.28,10.28)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0454 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.831 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.0470 W/kg
SAR(1 g) = 0.04 W/kg; SAR(10 g) = 0.033 W/kg
Maximum value of SAR (measured) = 0.0424 W/kg

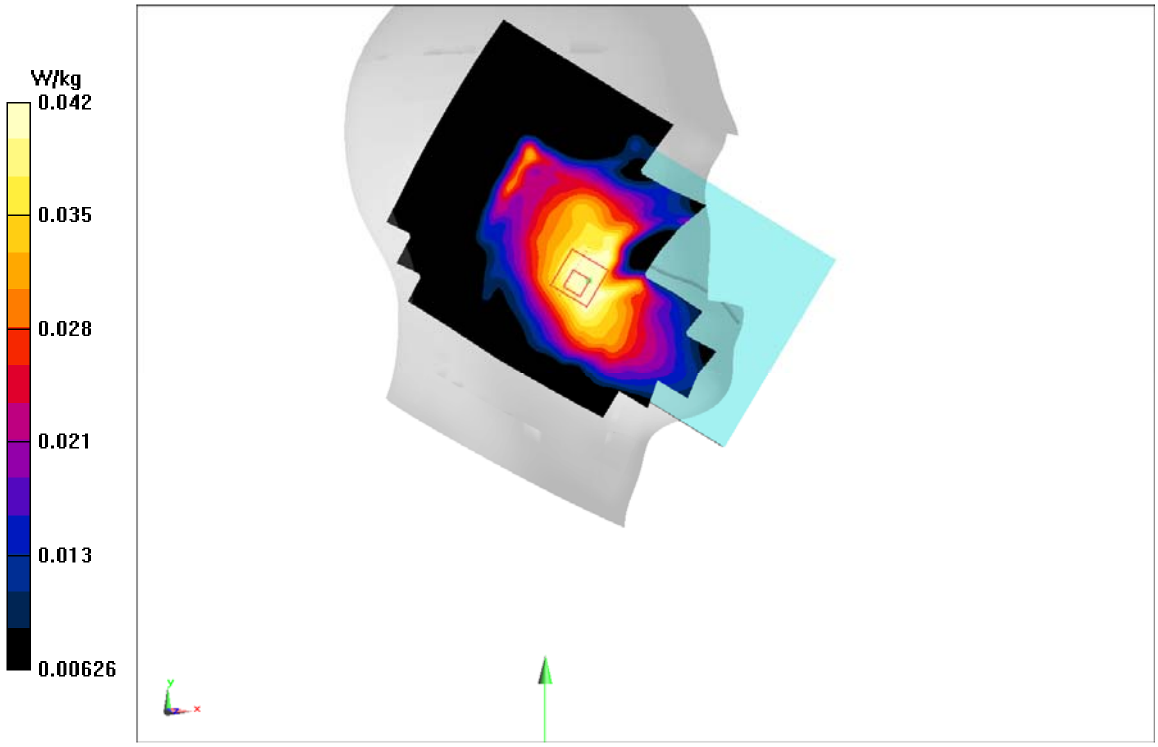


Fig A.7

WCDMA850-BV_CH4233 Front
Date: 10/1/2018
Electronics: DAE4 Sn1525
Medium: body 835 MHz
Medium parameters used: f = 846.6 MHz; σ = 0.984 mho/m; εr = 55.1; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C, Liquid Temperature: 22.4°C
Communication System: WCDMA850-BV 846.6 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(10.21,10.21,10.21)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.342 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.45 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.446 W/kg
SAR(1 g) = 0.302 W/kg; SAR(10 g) = 0.203 W/kg
Maximum value of SAR (measured) = 0.356 W/kg

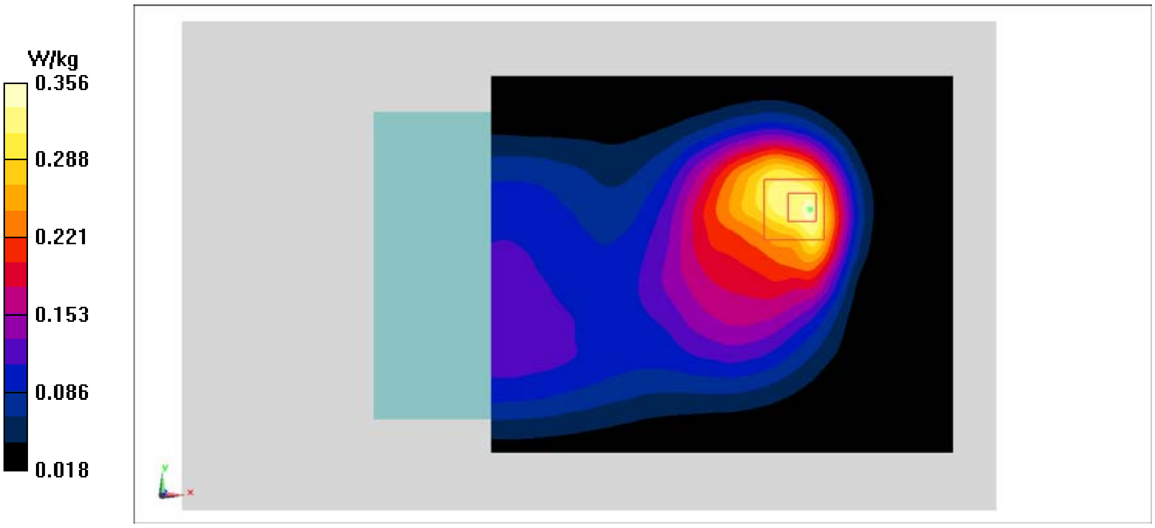


Fig A.8

WLAN2450_CH11 Right Cheek
Date: 10/3/2018
Electronics: DAE4 Sn1525
Medium: head 2450 MHz
Medium parameters used: f = 2462 MHz; σ = 1.811 mho/m; εr = 38.57; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C, Liquid Temperature: 22.4°C
Communication System: WLAN2450 2462 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(7.89,7.89,7.89)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.60 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.25 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 2.77 W/kg
SAR(1 g) = 1.19 W/kg; SAR(10 g) = 0.516 W/kg
Maximum value of SAR (measured) = 1.58 W/kg

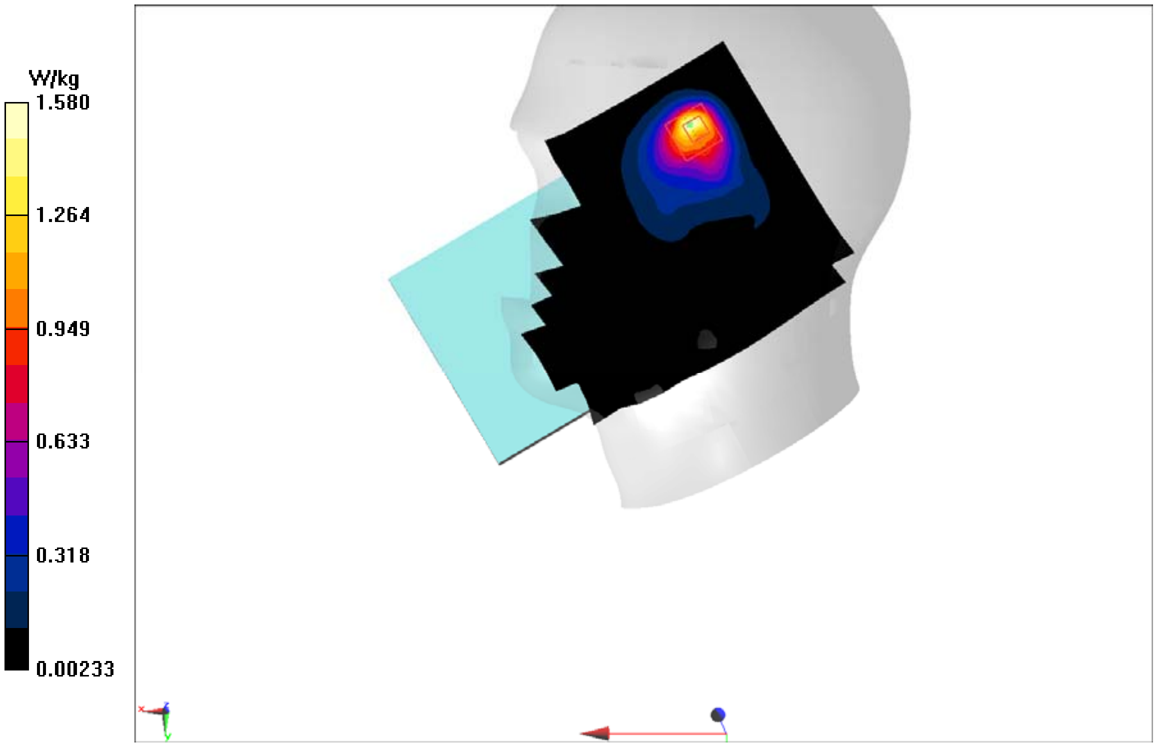


Fig A.9

WLAN2450_CH11 Front
Date: 10/3/2018
Electronics: DAE4 Sn1525
Medium: body 2450 MHz
Medium parameters used: f = 2462 MHz; σ = 1.952 mho/m; εr = 53.29; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C, Liquid Temperature: 22.4°C
Communication System: WLAN2450 2462 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(8.09,8.09,8.09)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.139 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.172 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.217 W/kg
SAR(1 g) = 0.114 W/kg; SAR(10 g) = 0.057 W/kg
Maximum value of SAR (measured) = 0.145 W/kg

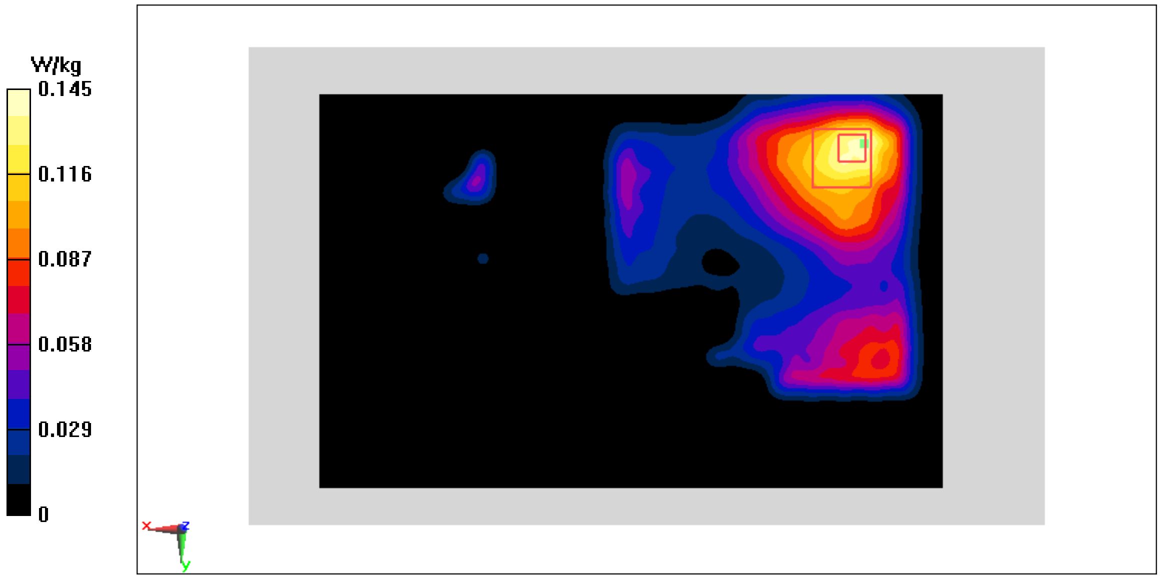


Fig A.10

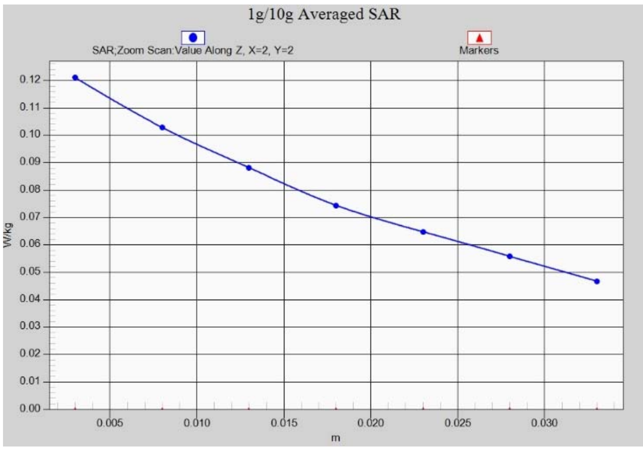


Fig.A.1- 1 Z-Scan at power reference point (GSM850)

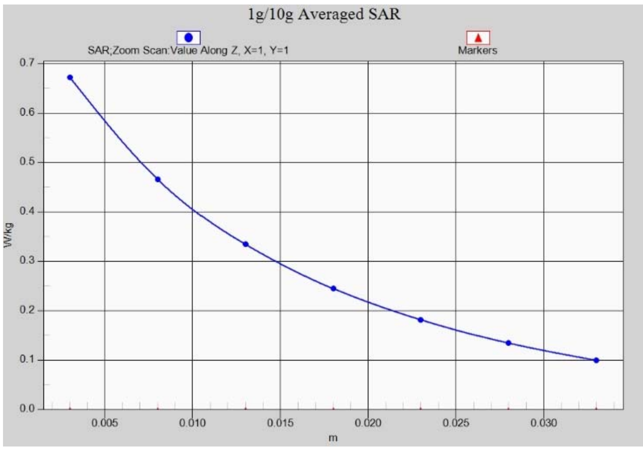


Fig.A.1- 2 Z-Scan at power reference point (GSM850)

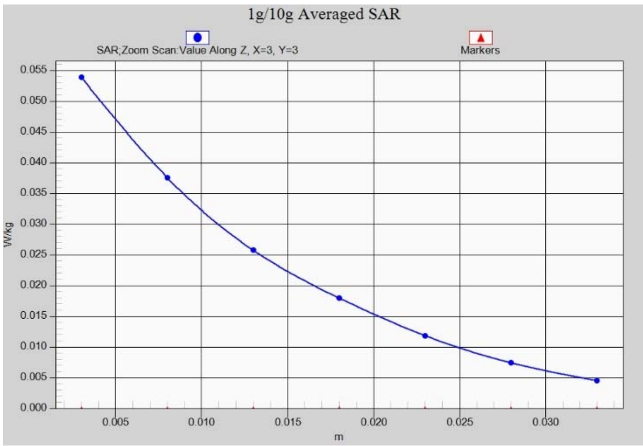


Fig.A.1- 3 Z-Scan at power reference point (PCS1900)

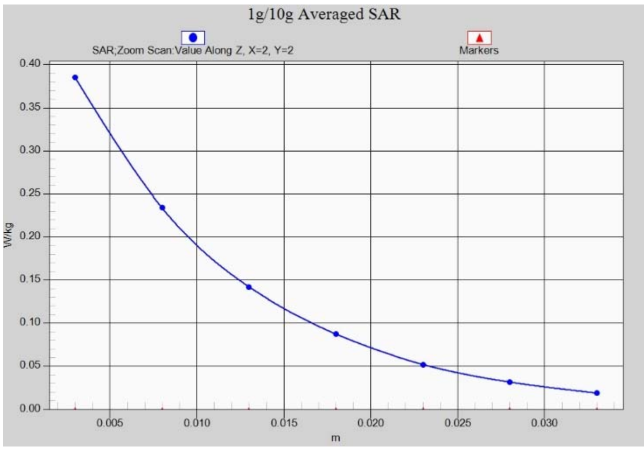


Fig.A.1- 4 Z-Scan at power reference point (PCS1900)

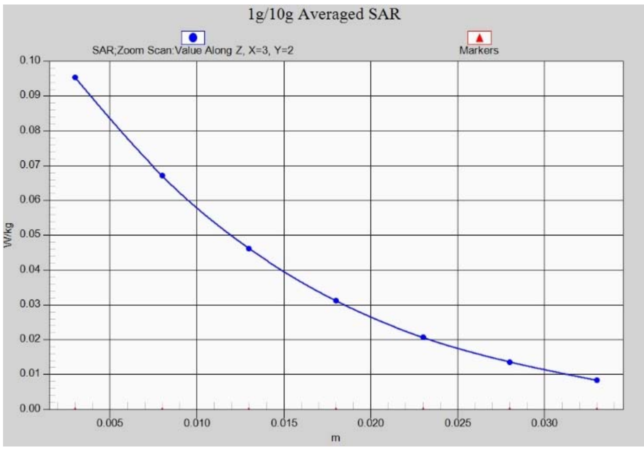


Fig.A.1- 5 Z-Scan at power reference point (W1900)

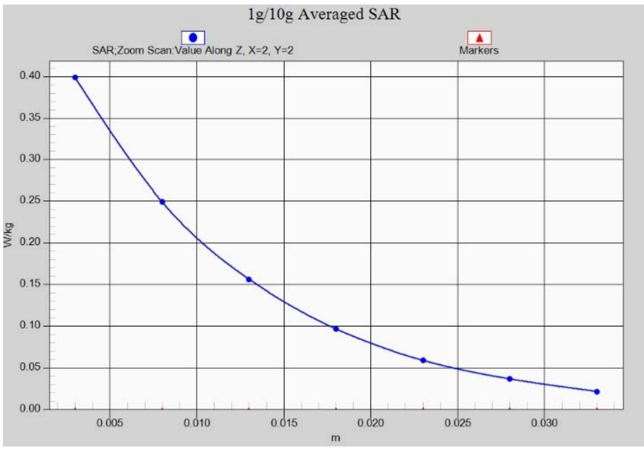


Fig.A.1- 6 Z-Scan at power reference point (W1900)

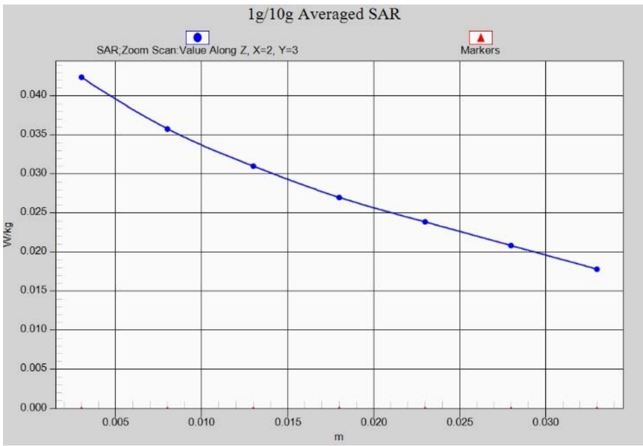


Fig.A.1- 7 Z-Scan at power reference point (W850)

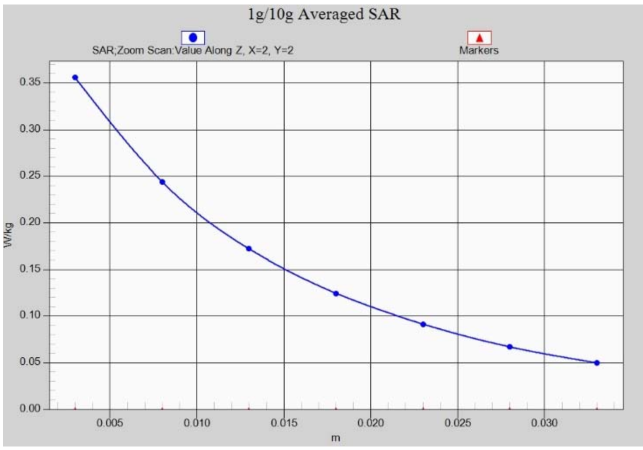


Fig.A.1- 8 Z-Scan at power reference point (W850)

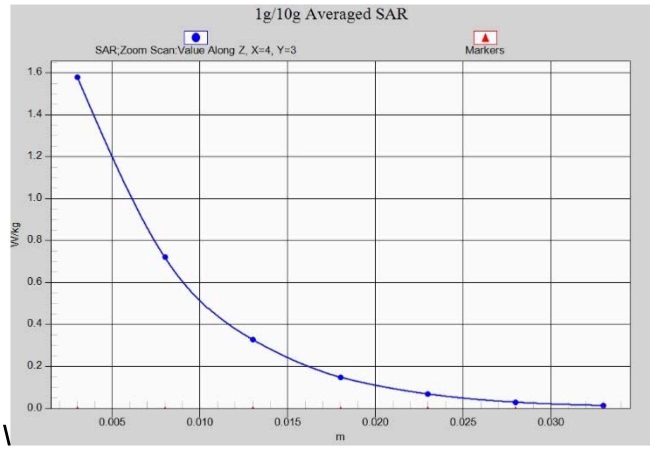


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Fig.A.1- 9 Z-Scan at power reference point (Wifi2450)

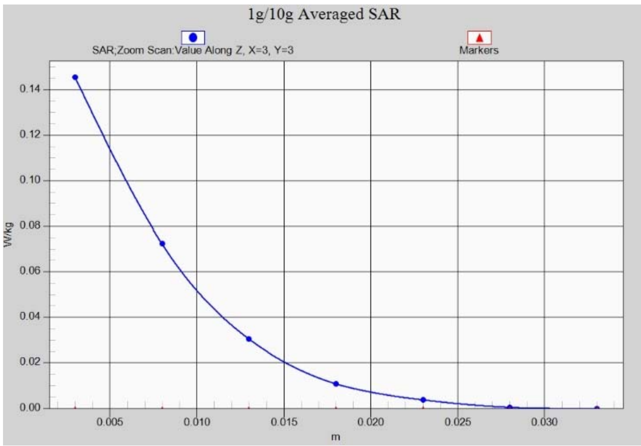


Fig.A.1- 10 Z-Scan at power reference point (Wifi2450)

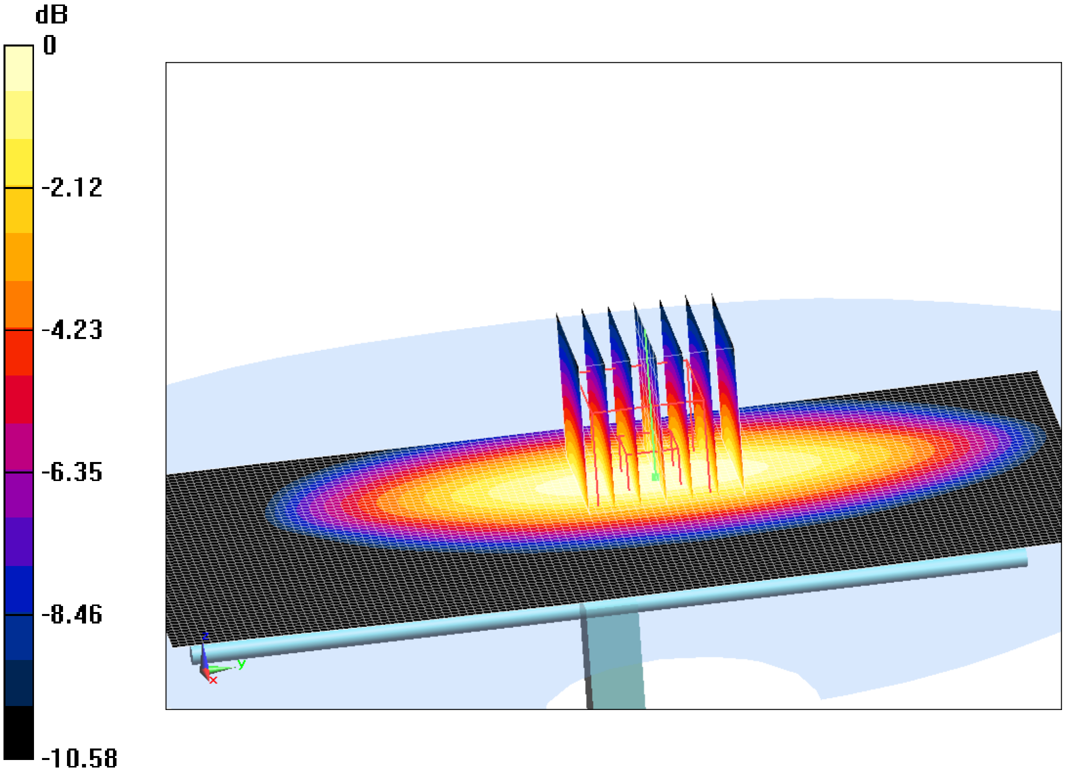
ANNEX B System Verification Results

835 MHz

Date: 10/1/2018
Electronics: DAE4 Sn1525
Medium: Head 835 MHz
Medium parameters used: f = 835 MHz; σ =0.889 mho/m; ε_r = 40.8; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C Liquid Temperature: 22.4°C
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(10.28,10.28,10.28)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 65.45 V/m; Power Drift = 0.06
Fast SAR: SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.51 W/kg
Maximum value of SAR (interpolated) = 3.79 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =65.45 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 4.05 W/kg
SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.54 W/kg
Maximum value of SAR (measured) = 3.52 W/kg



0 dB = 3.52 W/kg = 5.47 dB W/kg

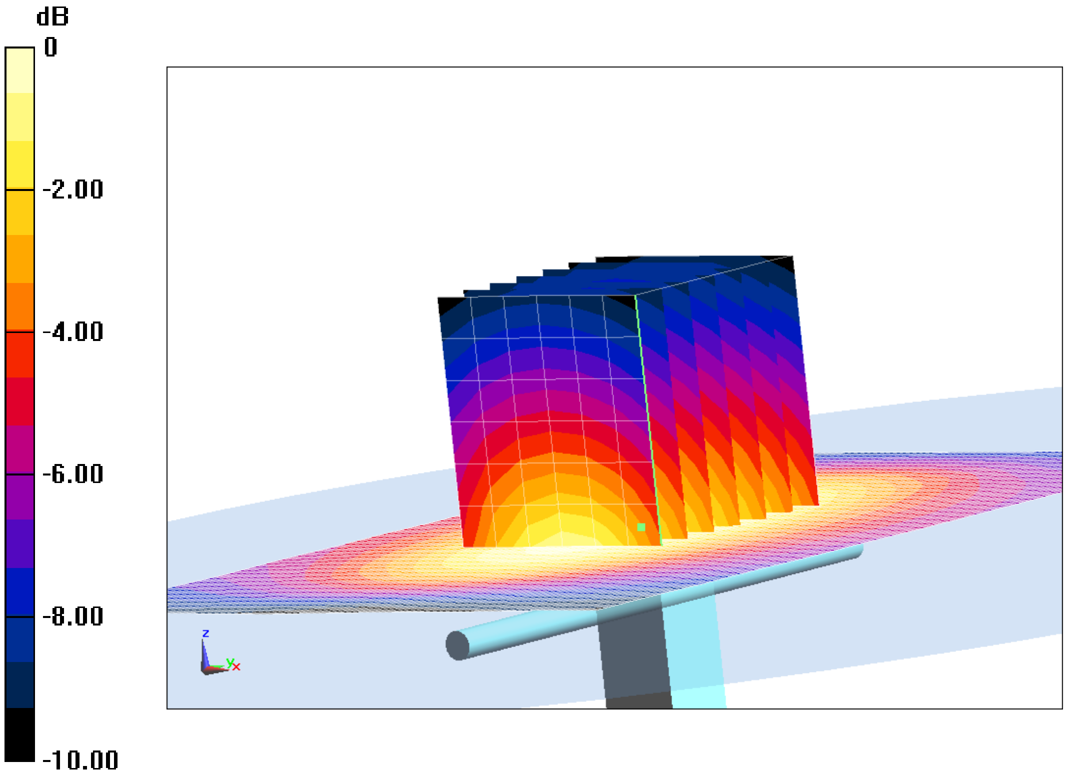
Fig.B.1 validation 835 MHz 250mW

835 MHz

Date: 10/1/2018
Electronics: DAE4 Sn1525
Medium: Body 835 MHz
Medium parameters used: f = 835 MHz; σ =0.973 mho/m; ε_r = 55.11; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C Liquid Temperature: 22.4°C
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(10.21,10.21,10.21)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 58.78 V/m; Power Drift = -0.02
Fast SAR: SAR(1 g) = 2.36 W/kg; SAR(10 g) = 1.51 W/kg
Maximum value of SAR (interpolated) = 3.53 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =58.78 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.73 W/kg
SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 3.23 W/kg



0 dB = 3.23 W/kg = 5.09 dB W/kg

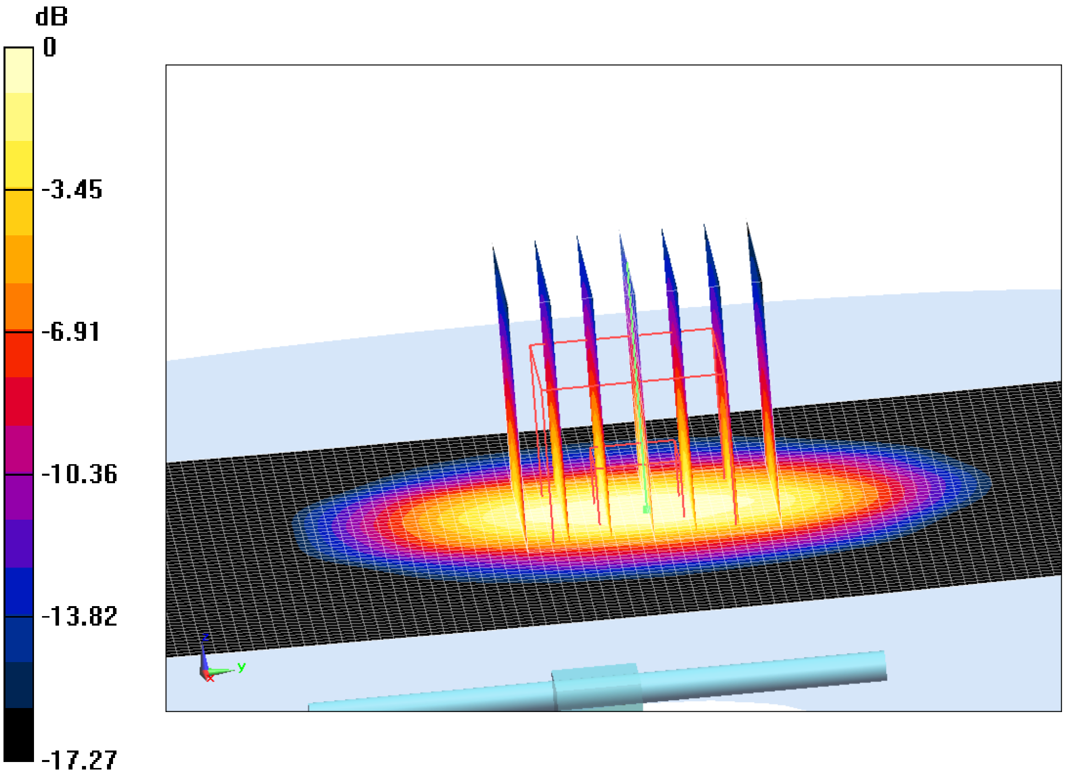
Fig.B.2 validation 835 MHz 250mW

1900 MHz

Date: 10/2/2018
Electronics: DAE4 Sn1525
Medium: Head 1900 MHz
Medium parameters used: f = 1900 MHz; σ =1.41 mho/m; ε_r = 40.02; ρ = 1000 kg/m^3
Ambient Temperature: 22.6ºC Liquid Temperature: 22.4ºC
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(8.39,8.39,8.39)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 105.68 V/m; Power Drift = -0.05
Fast SAR: SAR(1 g) = 9.82 W/kg; SAR(10 g) = 5.22 W/kg
Maximum value of SAR (interpolated) = 15.07 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =105.68 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 18.21 W/kg
SAR(1 g) = 9.86 W/kg; SAR(10 g) = 5.2 W/kg
Maximum value of SAR (measured) = 14.93 W/kg



0 dB = 14.93 W/kg = 11.74 dB W/kg

Fig.B.3 validation 1900 MHz 250mW

1900 MHz

Date: 10/2/2018
Electronics: DAE4 Sn1525
Medium: Body 1900 MHz
Medium parameters used: f = 1900 MHz; σ =1.52 mho/m; ε_r = 53.22; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C Liquid Temperature: 22.4°C
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(8.32,8.32,8.32)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 101.41 V/m; Power Drift = -0.09

Fast SAR: SAR(1 g) = 10.08 W/kg; SAR(10 g) = 5.37 W/kg

Maximum value of SAR (interpolated) = 17.65 W/kg

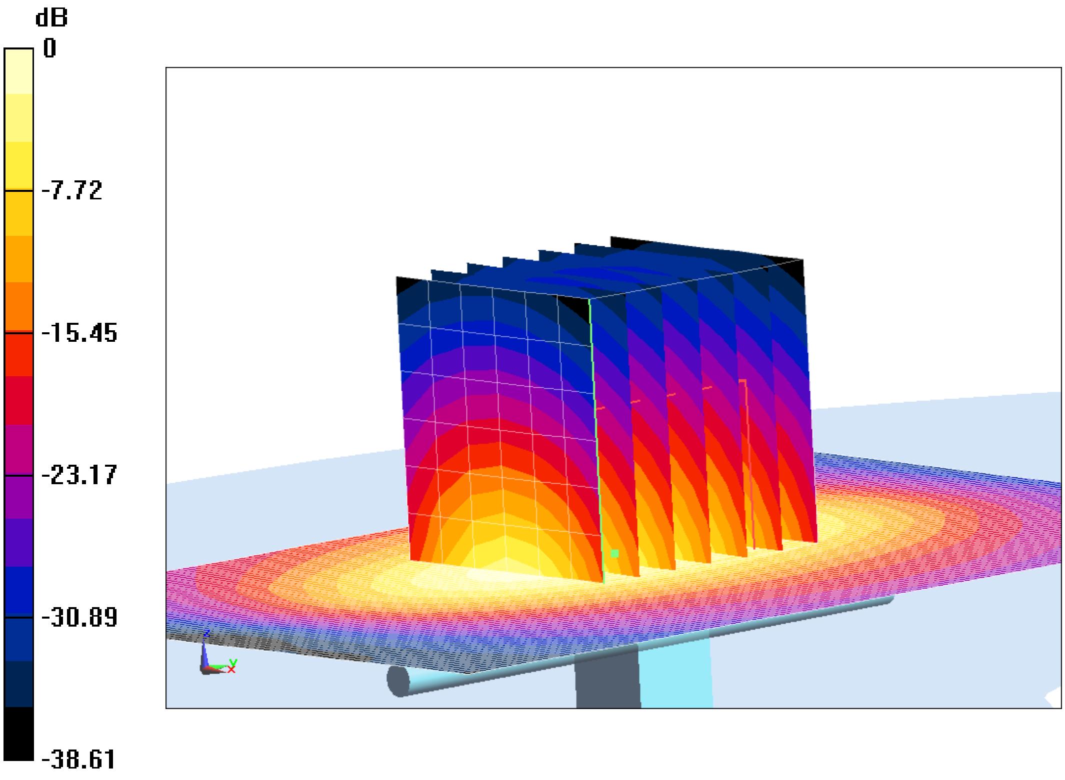
System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =101.41 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 17.94 W/kg

SAR(1 g) = 10.11 W/kg; SAR(10 g) = 5.4 W/kg

Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.52 dB W/kg

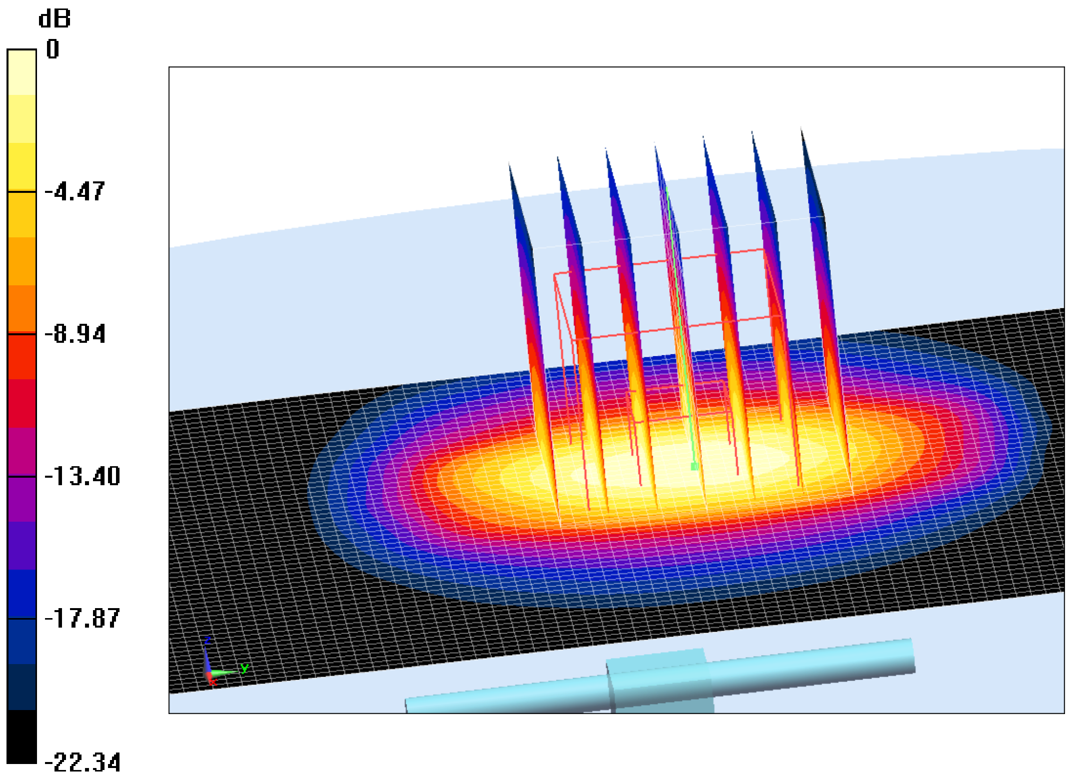
Fig.B.4 validation 1900 MHz 250mW

2450 MHz

Date: 10/3/2018
Electronics: DAE4 Sn1525
Medium: Head 2450 MHz
Medium parameters used: f = 2450 MHz; σ =1.8 mho/m; ε_r = 38.58; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C Liquid Temperature: 22.4°C
Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(7.89,7.89,7.89)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 112.52 V/m; Power Drift = 0.02
Fast SAR: SAR(1 g) = 12.83 W/kg; SAR(10 g) = 6.13 W/kg
Maximum value of SAR (interpolated) = 21.06 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =112.52 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 26.48 W/kg
SAR(1 g) = 12.79 W/kg; SAR(10 g) = 6.21 W/kg
Maximum value of SAR (measured) = 21.78 W/kg



0 dB = 21.78 W/kg = 13.38 dB W/kg

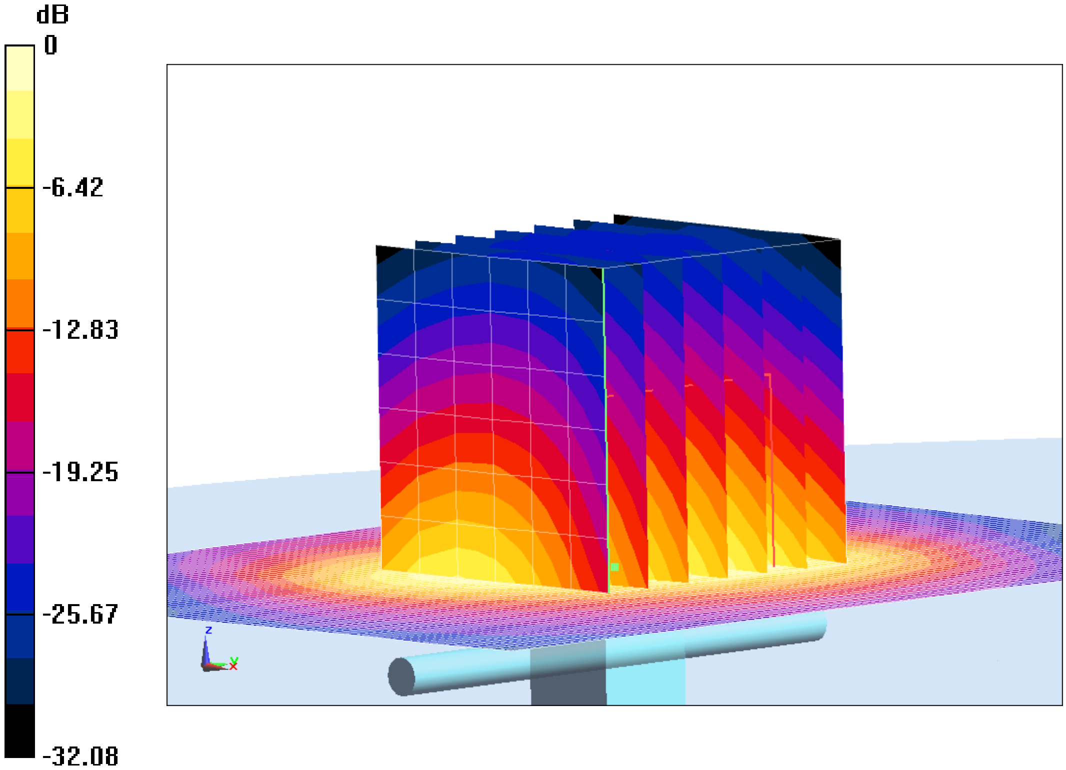
Fig.B.5 validation 2450 MHz 250mW

2450 MHz

Date: 10/3/2018
Electronics: DAE4 Sn1525
Medium: Body 2450 MHz
Medium parameters used: f = 2450 MHz; σ =1.941 mho/m; ε_r = 53.3; ρ = 1000 kg/m^3
Ambient Temperature: 22.6°C Liquid Temperature: 22.4°C
Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7514 ConvF(8.09,8.09,8.09)

System Validation /Area Scan (81x191x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 105.16 V/m; Power Drift = 0.07
Fast SAR: SAR(1 g) = 12.4 W/kg; SAR(10 g) = 5.86 W/kg
Maximum value of SAR (interpolated) = 25.65 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value =105.16 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 25.2 W/kg
SAR(1 g) = 12.62 W/kg; SAR(10 g) = 5.96 W/kg
Maximum value of SAR (measured) = 19.67 W/kg



0 dB = 19.67 W/kg = 12.94 dB W/kg

Fig.B.6 validation 2450 MHz 250mW

The SAR system verification must be required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR.

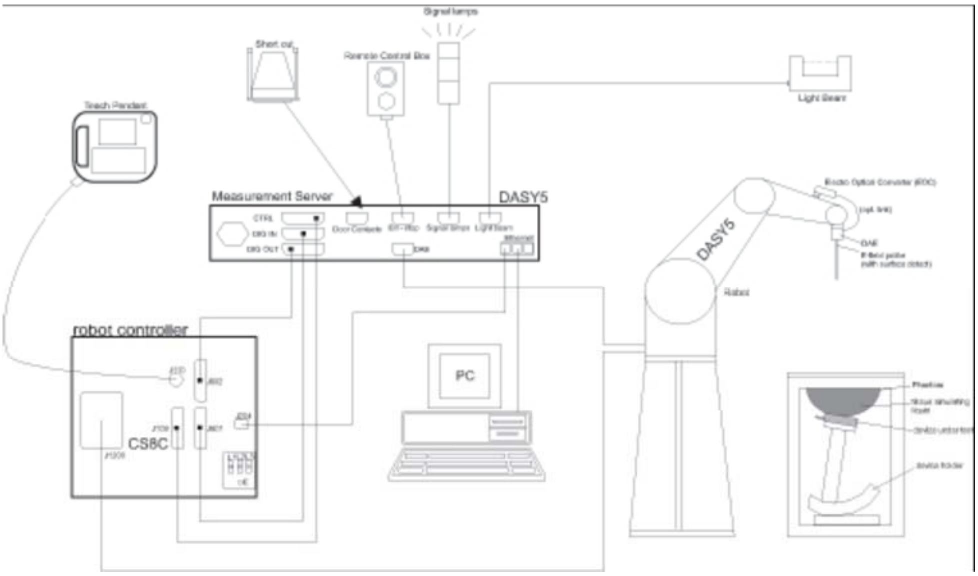
Table B.1 Comparison between area scan and zoom scan for system verification

Date	Band	Position	Area scan (1g)	Zoom scan (1g)	Drift (%)
2018/10/1	835	Head	2.35	2.35	0.00
	835	Body	2.36	2.37	-0.42
2018/10/2	1900	Head	9.82	9.86	-0.41
	1900	Body	10.08	10.11	-0.30
2018/10/3	2450	Head	12.83	12.79	0.31
	2450	Body	12.4	12.62	-1.74

ANNEX C SAR Measurement Setup

C.1 Measurement Set-up

The Dasy4 or DASY5 system for performing compliance tests is illustrated above graphically. This system consists of the following items:



Picture C.1 SAR Lab Test Measurement Set-up

- A standard high precision 6-axis robot (Stäubli 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 DASY4 or DASY5 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.

C.2 Dasy4 or DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 or DASY5 software reads the reflection durning a software approach and looks for the maximum using 2nd ord curve fitting. The approach is stopped at reaching the maximum.

Probe Specifications:

Model: ES3DV3, EX3DV4

Frequency Range: 10MHz — 6.0GHz(EX3DV4)
10MHz — 4GHz(ES3DV3)

Calibration: In head and body simulating tissue at Frequencies from 835 up to 5800MHz

Linearity: ± 0.2 dB(30 MHz to 6 GHz) for EX3DV4
± 0.2 dB(30 MHz to 4 GHz) for ES3DV3

Dynamic Range: 10 mW/kg — 100W/kg

Probe Length: 330 mm

Probe Tip Length: 20 mm

Body Diameter: 12 mm

Tip Diameter: 2.5 mm (3.9 mm for ES3DV3)

Tip-Center: 1 mm (2.0mm for ES3DV3)

Application: SAR Dosimetry Testing
Compliance tests of mobile phones
Dosimetry in strong gradient fields

Picture C.2 Near-field Probe

Picture C.3 E-field Probe

C.3 E-field Probe Calibration

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm^2) using an RF Signal generator, TEM cell, and RF Power Meter.

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and inn a waveguide or other methodologies 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 until the three channels show the maximum reading. The power density readings equates to 1 mW/ cm^2.

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

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

Where:

Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

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

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

C.4 Other Test Equipment

C.4.1 Data Acquisition Electronics(DAE)

The data acquisition electronics consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

PictureC.4: DAE

C.4.2 Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90XL; DASY5: RX160L) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchron motors; no stepper motors)
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

Picture C.5 DASY 4

Picture C.6 DASY 5

C.4.3 Measurement Server

The Measurement server is based on a PC/104 CPU broad with CPU (dasy4: 166 MHz, Intel Pentium; DASY5: 400 MHz, Intel Celeron), chipdisk (DASY4: 32 MB; DASY5: 128MB), RAM (DASY4: 64 MB, DASY5: 128MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O broad, which is directly connected to the PC/104 bus of the CPU broad.

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Devices from any other supplier could seriously damage the measurement server.

Picture C.7 Server for DASY 4

Picture C.8 Server for DASY 5

C.4.4 Device Holder for Phantom

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

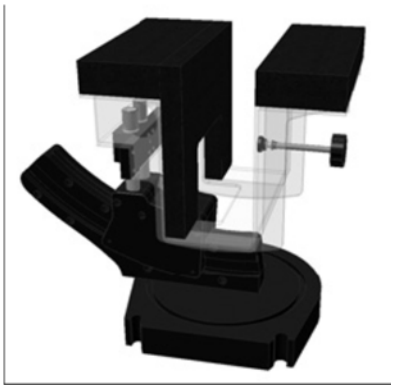
The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference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

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ =0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

<Laptop Extension Kit>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin-SAM and ELI phantoms.

Picture C.9-1: Device Holder



Picture C.9-2: Laptop Extension Kit

C.4.5 Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to

Represent the 90th percentile of the population. The phantom enables the dissymmetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. 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. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

Shell Thickness: 2 ± 0. 2 mm

Filling Volume: Approx. 25 liters

Dimensions: 810 x l000 x 500 mm (H x L x W)

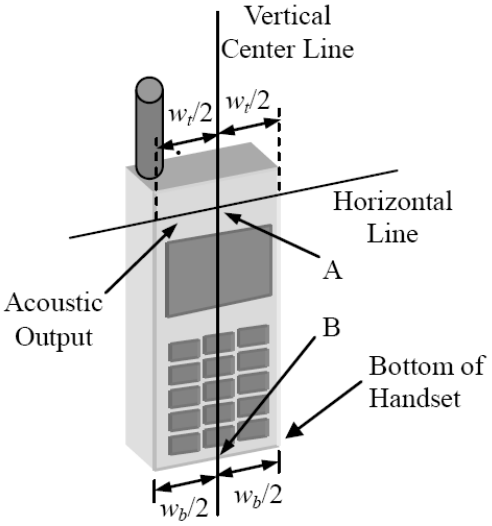
Available: Special

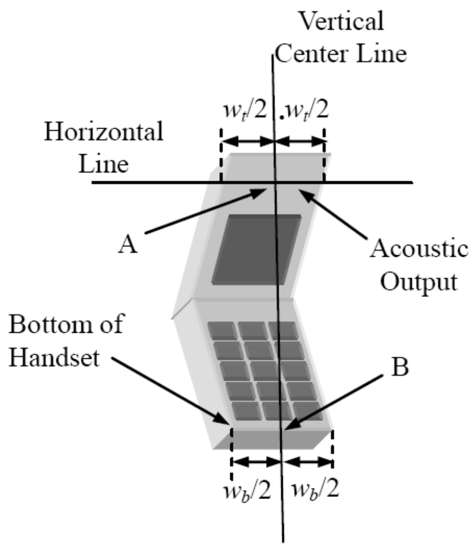
Picture C.10: SAM Twin Phantom

ANNEX D Position of the wireless device in relation to the phantom

D.1 General considerations

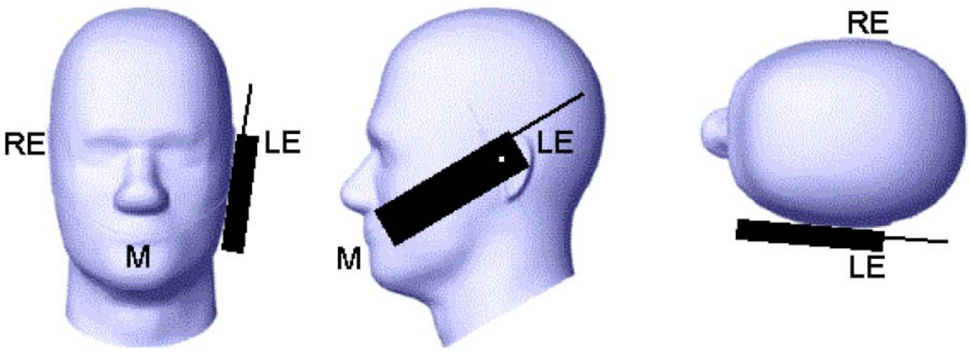
This standard specifies two handset test positions against the head phantom – the “cheek” position and the “tilt” position.



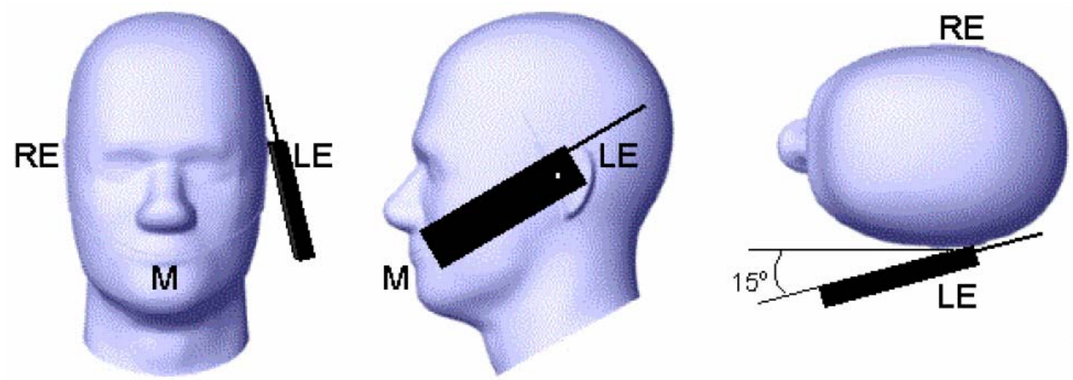


W_t	Width of the handset at the level of the acoustic
W_b	Width of the bottom of the handset
A	Midpoint of the width W_t of the handset at the level of the acoustic output
B	Midpoint of the width W_b of the bottom of the handset

Picture D.1-a Typical “fixed” case handset Picture D.1-b Typical “clam-shell” case handset



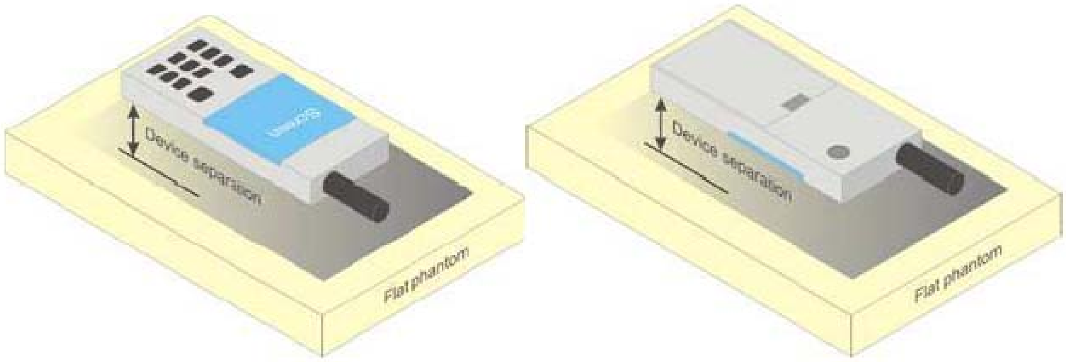
Picture D.2 Cheek position of the wireless device on the left side of SAM



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

D.2 Body-worn device

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



Picture D.4 Test positions for body-worn devices

D.3 Desktop device

A typical example of a desktop device is a wireless enabled desktop computer placed on a table or desk when used.

The DUT shall be positioned at the distance and in the orientation to the phantom that corresponds to the intended use as specified by the manufacturer in the user instructions. For devices that employ an external antenna with variable positions, tests shall be performed for all antenna positions specified. Picture 8.5 show positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat phantom.