SAR TEST REPORT

No. I17Z60078-SEM03

For

TCL Communication Ltd.

LTE / UMTS / GSM mobile phone

Model Name: VFD 610

With

Hardware Version:PIO

Software Version: v6KC5

FCC ID: 2ACCJH071

Issued Date:2017-4-12

Note:

The test results in this test report relate only to the devices specified in this report.This report shall not be reproduced except in full without the written approval of CTTL.

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REPORT HISTORY

Report Number	Revision	Issue Date	Description
I17Z60078-SEM03	Rev.0	2017-3-30	Initial creation of test report
I17Z60078-SEM03	Rev.1	2017-4-7	1. Update the table 14-9 for 100RB test configuration of LTE B7 head on page 44 2. Update the table 14-11 for B2 position of Wifi head on page 47 3. Update the table 13.2 for position of BT body on page 37
I17Z60078-SEM03	Rev.2	2017-4-12	Update the table 2.3 on page 7

TABLE OF CONTENT

1 TEST LABORATORY 5
1.1 TESTING LOCATION 5
1.2 TESTING ENVIRONMENT 5
1.3 PROJECT DATA 5
1.4 SIGNATURE 5
2 STATEMENT OF COMPLIANCE 6
3 CLIENT INFORMATION 8
3.1 APPLICANT INFORMATION 8
3.2 MANUFACTURER INFORMATION 8
4 EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE) 9
4.1 ABOUT EUT 9
4.2 INTERNAL IDENTIFICATION OF EUT USED DURING THE TEST 9
4.3 INTERNAL IDENTIFICATION OF AE USED DURING THE TEST 9
5 TEST METHODOLOGY 10
5.1 APPLICABLE LIMIT REGULATIONS 10
5.2 APPLICABLE MEASUREMENT STANDARDS 10
6 SPECIFIC ABSORPTION RATE (SAR) 11
6.1 INTRODUCTION 11
6.2 SAR DEFINITION 11
7 TISSUE SIMULATING LIQUIDS 12
7.1 TARGETS FOR TISSUE SIMULATING LIQUID 12
7.2 DIELECTRIC PERFORMANCE 12
8 SYSTEM VERIFICATION 17
8.1 SYSTEM SETUP 17
8.2 SYSTEM VERIFICATION 18
9 MEASUREMENT PROCEDURES 19
9.1 TESTS TO BE PERFORMED 19
9.2 GENERAL MEASUREMENT PROCEDURE 21
9.3 WCDMA MEASUREMENT PROCEDURES FOR SAR 22
9.4 SAR MEASUREMENT FOR LTE 23
9.5 BLUETOOTH & WI-FI MEASUREMENT PROCEDURES FOR SAR 23
9.6 POWER DRIFT 24
10 AREA SCAN BASED 1-G SAR 24
10.1 REQUIREMENT OF KDB 24
10.2 FAST SAR ALGORITHMS 24
11 CONDUCTED OUTPUT POWER 25

11.1 GSM MEASUREMENT RESULT 25
11.2 WCDMA MEASUREMENT RESULT 26
11.3 LTE MEASUREMENT RESULT 27
11.4 WI-FI AND BT MEASUREMENT RESULT 29

12 SIMULTANEOUS TX SAR CONSIDERATIONS 31

12.1 INTRODUCTION 31
12.2 TRANSMIT ANTENNA SEPARATION DISTANCES 31
12.3 SAR MEASUREMENT POSITIONS 31
12.4 STANDALONE SAR TEST EXCLUSION CONSIDERATIONS 32

13 EVALUATION OF SIMULTANEOUS 33

14 SAR TEST RESULT 39

14.1 VALUATION OF MULTI-BATTERIES 39
14.2 SAR RESULTS 40
14.3 FULL SAR 46
14.4 WLAN EVALUATION 47

15 SAR MEASUREMENT VARIABILITY 50

16 MEASUREMENT UNCERTAINTY 51

16.1 MEASUREMENT UNCERTAINTY FOR NORMAL SAR TESTS (300MHZ~3GHZ) 51
16.2 MEASUREMENT UNCERTAINTY FOR NORMAL SAR TESTS (3~6GHZ) 52
16.3 MEASUREMENT UNCERTAINTY FOR FAST SAR TESTS (300MHZ~3GHZ) 53
16.4 MEASUREMENT UNCERTAINTY FOR FAST SAR TESTS (3~6GHZ) 54

17 MAIN TEST INSTRUMENTS 56

ANNEX A GRAPH RESULTS 57

ANNEX B SYSTEM VERIFICATION RESULTS 81

ANNEX C SAR MEASUREMENT SETUP 90

ANNEX D POSITION OF THE WIRELESS DEVICE IN RELATION TO THE PHANTOM 96

ANNEX E EQUIVALENT MEDIA RECIPES 99

ANNEX F SYSTEM VALIDATION 100

ANNEX G PROBE CALIBRATION CERTIFICATE 101

ANNEX H DIPOLE CALIBRATION CERTIFICATE 112

ANNEX I ACCREDITATION CERTIFICATE 144

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:	February 15, 2017
Testing End Date:	February 19, 2017

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. LTE / UMTS / GSM mobile phone VFD 610 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	0.36	PCE
	PCS 1900	0.28	
	WCDMA1900-BII	0.70	
	WCDMA850-BV	0.65	
	LTE2500-FDD7	1.29	
	WLAN 2450	0.78	DTS
Hotspot (Separation Distance 10mm)	GSM 850	0.53	PCE
	PCS 1900	0.51	
	WCDMA1900-BII	0.99	
	WCDMA850-BV	0.78	
	LTE2500-FDD7	1.02	
	WLAN 2450	0.15	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**:** 1.29 **W/kg (1g).**

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

	Position	**Main antenna**	**WiFi**	**Sum**	**Distance (mm)**	**Ratio**
Highest reported SAR value for Head	Right hand, Touch cheek	1.14	0.78	**1.92**	88.55	0.030
		1.29		**2.07**	88.56	0.034
		1.25		**2.03**	85.05	0.034
		0.92		**1.70**	87.99	0.025
		1.03		**1.81**	88.75	0.027
		1.06		**1.84**	88.75	0.028
		1.16		**1.94**	88.75	0.030
		1.21		**1.99**	88.75	0.032
Highest reported SAR value for Body	Rear	0.99	0.15	**1.14**	/	/

According to the KDB 447498 D01, when the sum of SAR is larger than the limit, SAR test exclusion is determined by the SAR to peak location separation ratio. The ratio is determined by $(SAR1 + SAR2)^{1.5}/Ri$, rounded to two decimal digits, and must be ≤ 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.

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

	Position	Main antenna	BT*	Sum
Highest reported SAR value for Head	Right hand, Touch cheek	1.29	0.23	**1.52**
Highest reported SAR value for Body	Front	1.02	0.12	**1.14**

BT* - Estimated SAR for Bluetooth (see the table 13.3)

According to the evaluation of all values, the highest sum of reported SAR values is **2.07 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:	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203
City:	Shanghai
Postal Code:	201203
Country:	China
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Telephone:	0086-21-31363544
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3.2 Manufacturer Information

Company Name:	TCL Communication Ltd.
Address /Post:	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203
City:	Shanghai
Postal Code:	201203
Country:	China
Contact Person:	Gong Zhizhou
E-mail:	zhizhou.gong@tcl.com
Telephone:	0086-21-31363544
Fax:	0086-21-61460602

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

4.1 About EUT

Description:	LTE / UMTS / GSM mobile phone
Model name:	VFD 610
Operating mode(s):	GSM 850/900/1800/1900 WCDMA850/900/1900/2100 LTE B1/3/7/8/20/28, 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)
	2502.5 – 2567.5 MHz (LTE Band 7)
	2412 – 2462 MHz (Wi-Fi 2.4G)
GPRS/EGPRS Multislot Class:	12
GPRS capability Class:	12
Test device Production information:	Production unit
Device type:	Portable device
Antenna type:	Integrated antenna
Accessories/Body-worn configurations:	Headset
Hotspot mode:	Support
Product dimension	Long 144.5mm ;Wide 71.95mm ; Overall Diagonal 161.4mm

4.2 Internal Identification of EUT used during the test

EUTID	IMEI	HW Version	SW Version
1	354032080104677	PIO	v6KC5
2	354032080104099	PIO	v6KC5
3	354032080104198	PIO	v6KC5

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

Note: It is performed to test SAR with the EUT1 to 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	CAC2400033CJ	\	Costlight
AE2	Battery	CAC2400035C2	\	SCUD
AE3	Headset	CCB0049A12C1	\	Juwei
AE4	Headset	CCB0049A12C4	\	Meihao
AE5	Headset	CCB0049A11C1	\	Juwei
AE6	Headset	CCB0049A11C4	\	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

KDB941225 D05 SAR for LTE Devices v02r05: SAR Evaluation Considerations for LTE 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

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

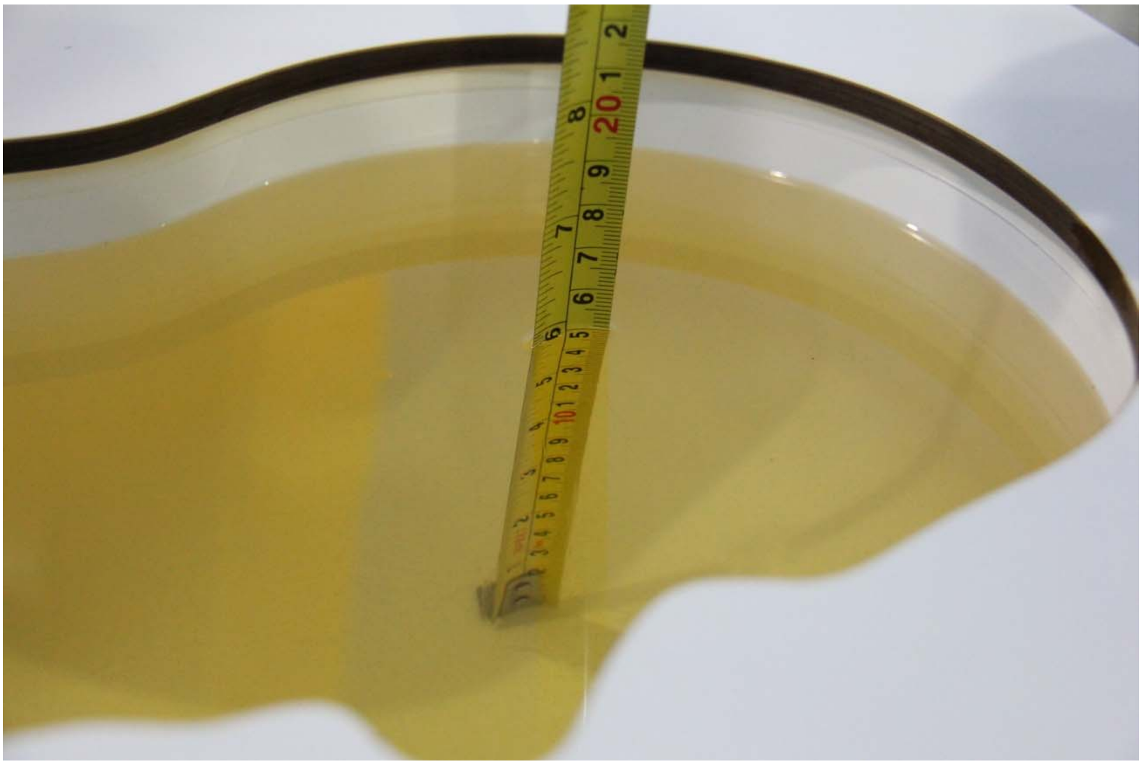
Frequency(MHz)	Liquid Type	Conductivity(σ)	± 5% Range	Permittivity(ε)	± 5% Range
835	Head	0.90	0.86～0.95	41.5	39.4～43.6
835	Body	0.97	0.92～1.02	55.2	52.4～58.0
1900	Head	1.40	1.33～1.47	40.0	38.0～42.0
1900	Body	1.52	1.44～1.60	53.3	50.6～56.0
2450	Head	1.80	1.71～1.89	39.2	37.2～41.2
2450	Body	1.95	1.85～2.05	52.7	50.1～55.3
2600	Head	1.96	1.86～2.06	39.01	37.06～40.96
2600	Body	2.16	2.05～2.27	52.5	49.9～55.1

7.2 Dielectric Performance

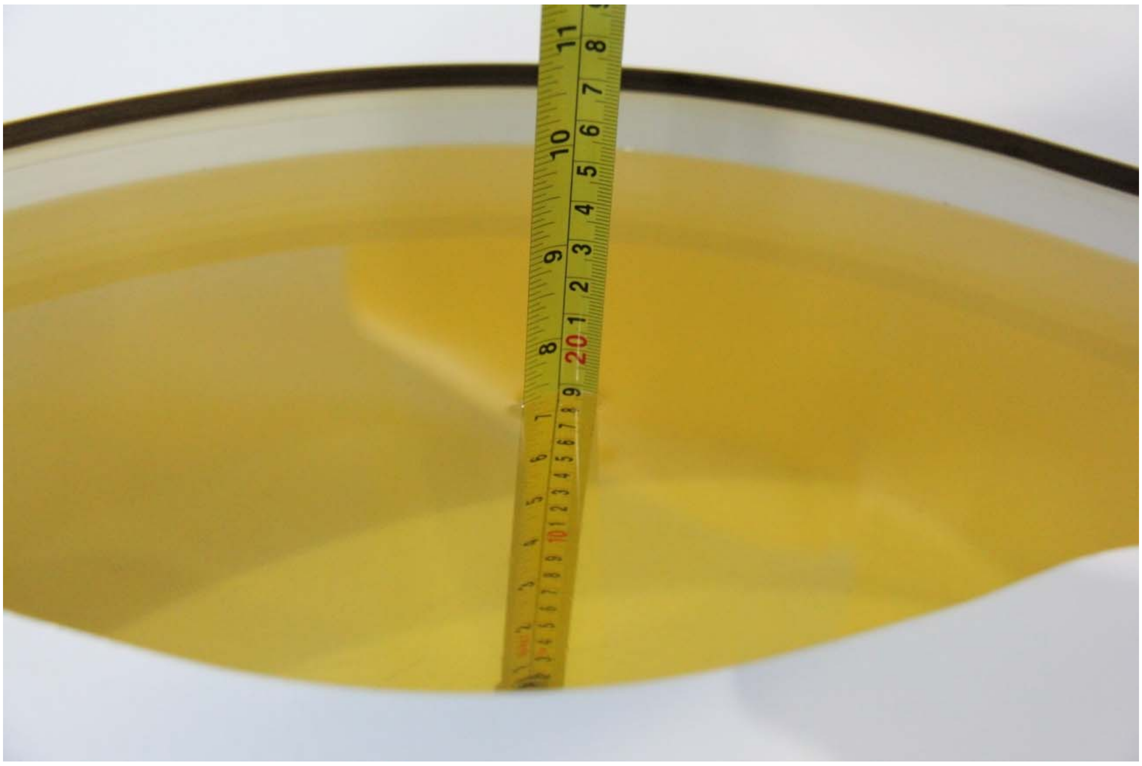
Table 7.2: Dielectric Performance of Tissue Simulating Liquid

Measurement Date (yyyy-mm-dd)	Type	Frequency	Permittivity ε	Drift (%)	Conductivity σ (S/m)	Drift (%)
2017-2-15	Head	835 MHz	41.26	-0.58	0.896	-0.44
	Body	835 MHz	56.21	1.83	0.961	-0.93
2017-2-17	Head	1900 MHz	39.95	-0.12	1.405	0.36
	Body	1900 MHz	53.11	-0.36	1.511	-0.59
2017-2-18	Head	2450 MHz	38.86	-0.87	1.835	1.94
	Body	2450 MHz	51.98	-1.37	1.989	2.00
2017-2-14	Head	2600 MHz	39.38	0.95	1.954	-0.31
	Body	2600 MHz	51.58	-1.75	2.185	1.16

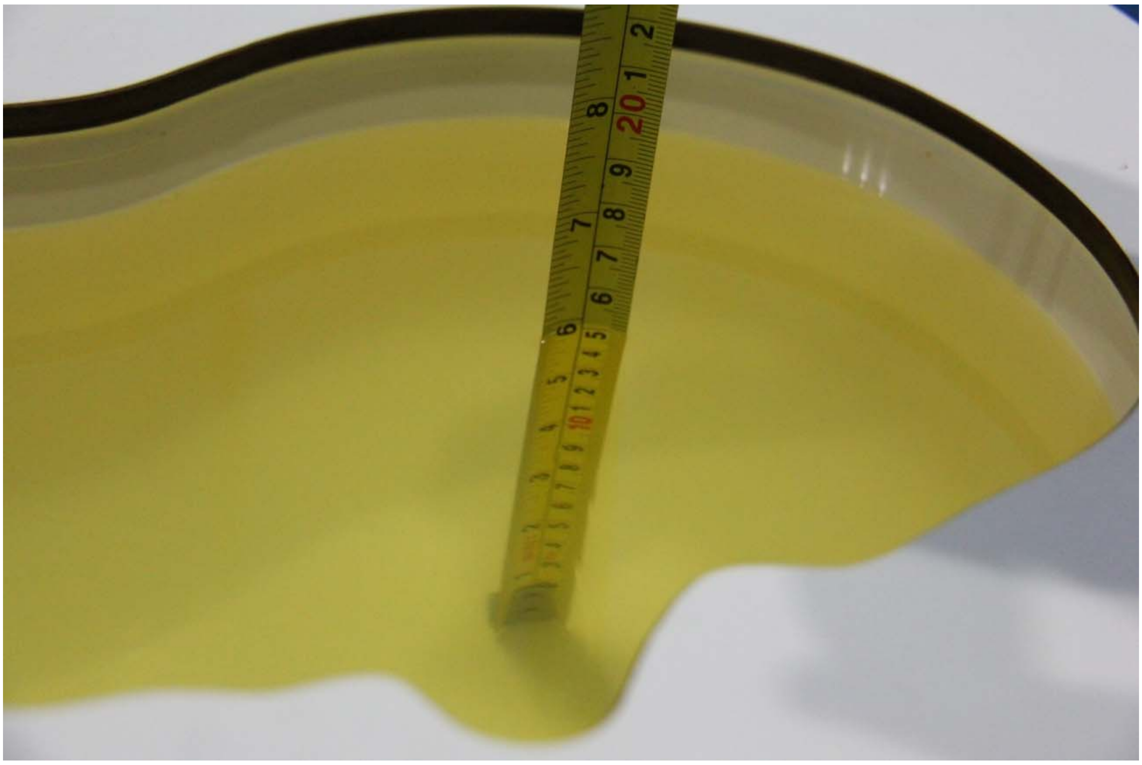
Note: The liquid temperature is 22.0℃



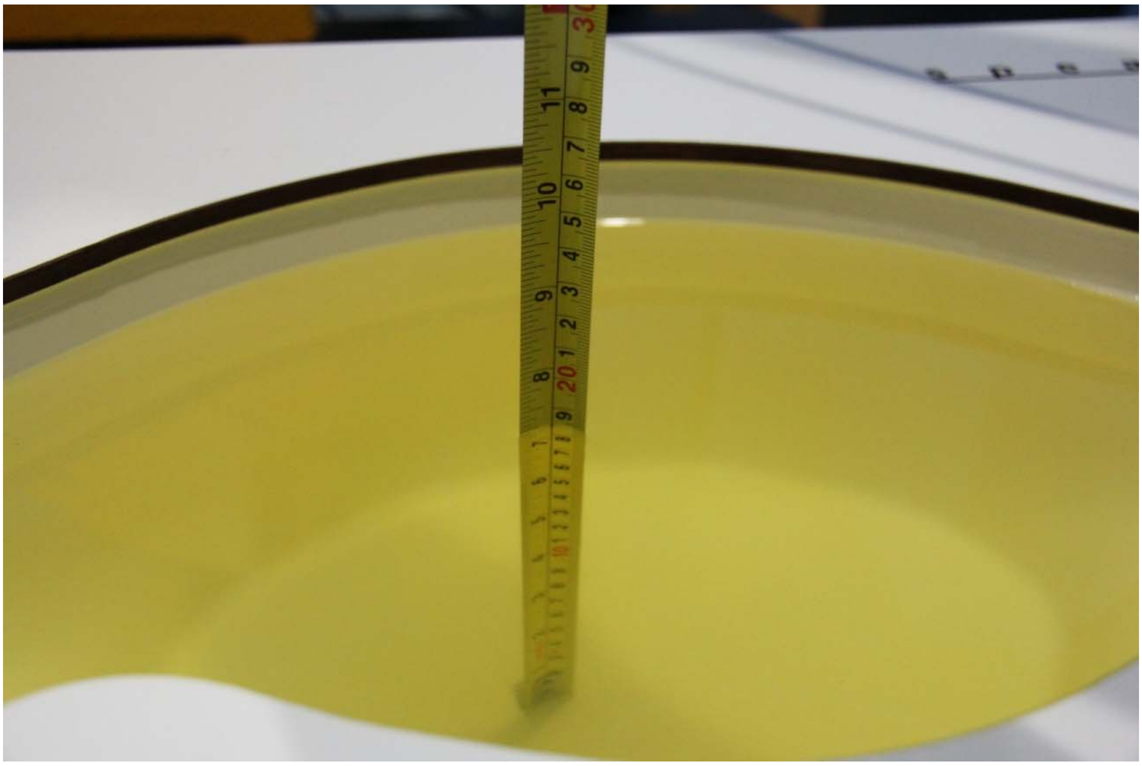
Picture 7-1 Liquid depth in the Head Phantom (835MHz)



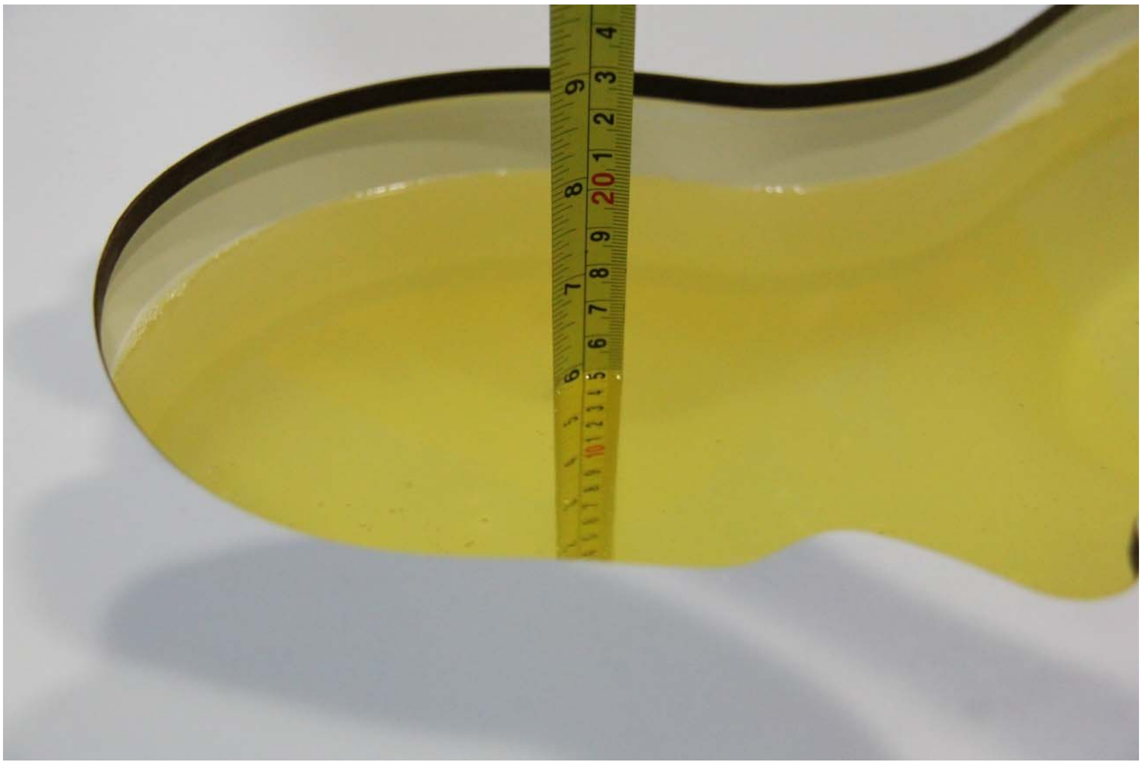
Picture 7-2 Liquid depth in the Flat Phantom (835MHz)



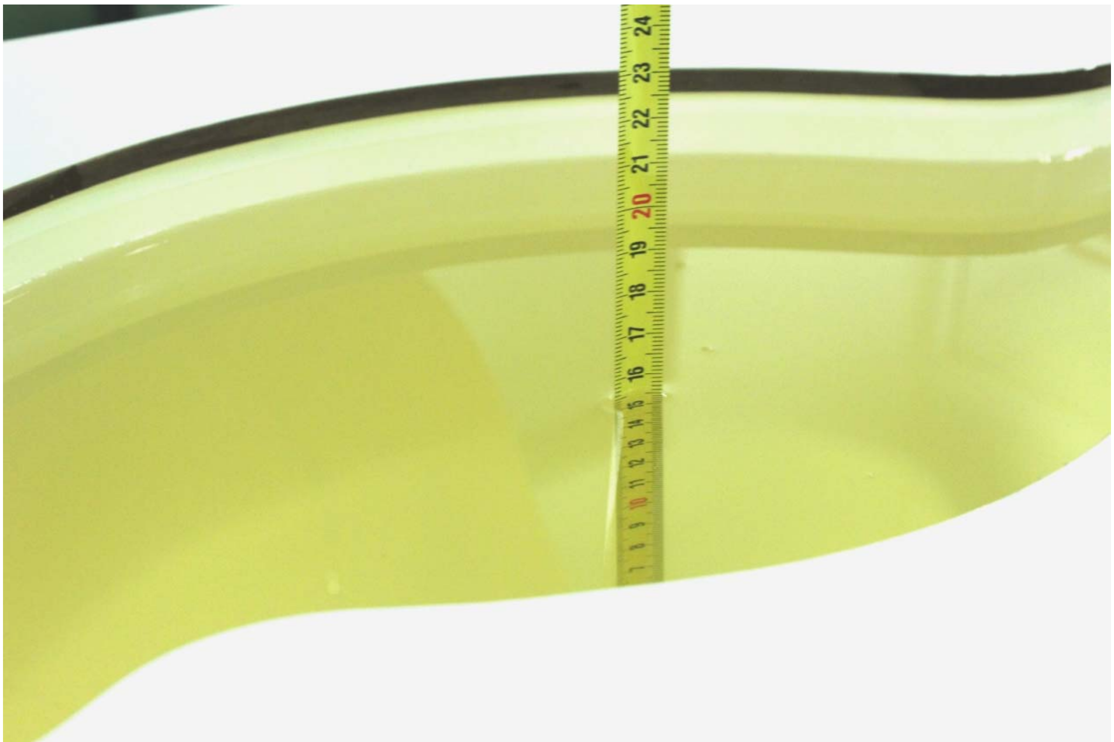
Picture 7-3 Liquid depth in the Head Phantom (1900 MHz)



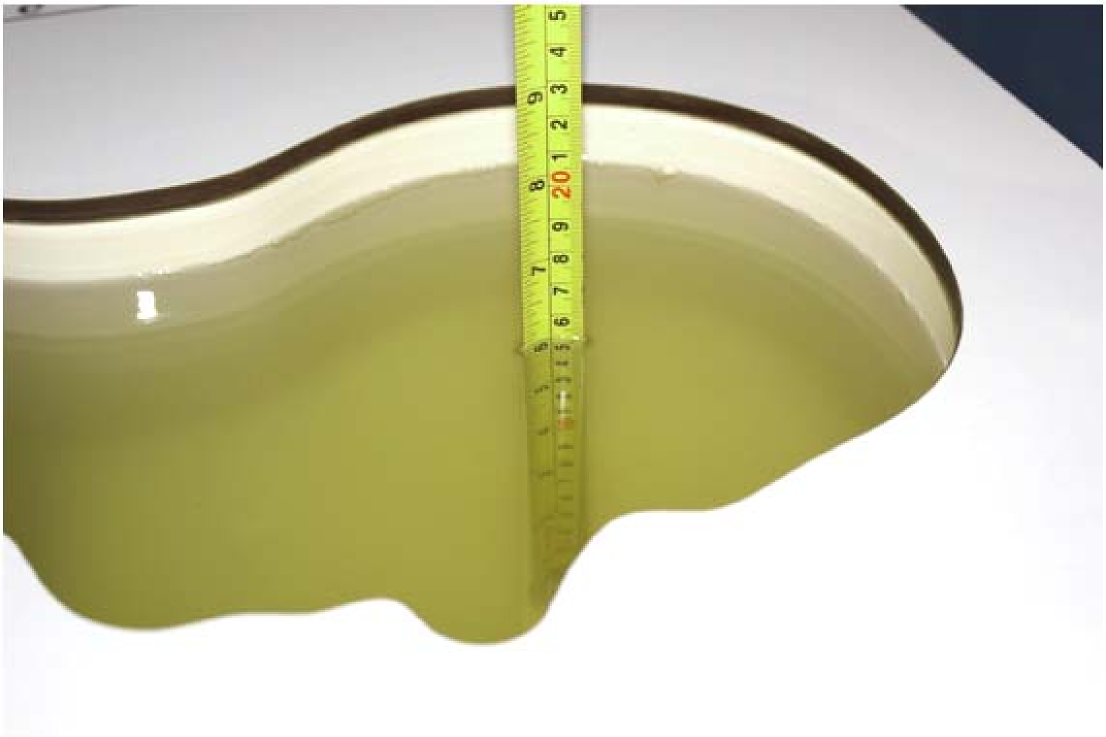
Picture 7-4 Liquid depth in the Flat Phantom (1900MHz)



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



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



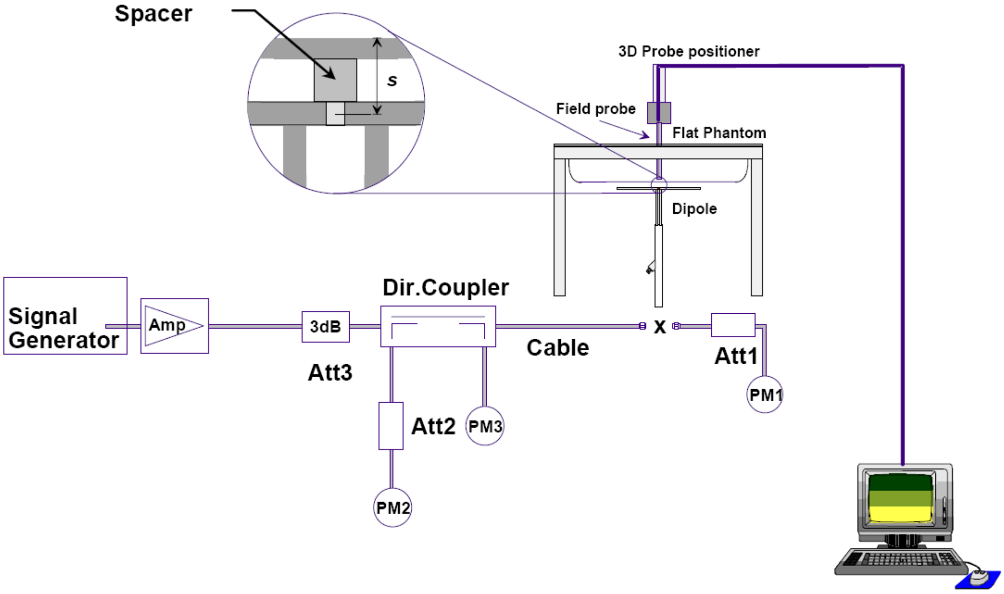
Picture 7-7 Liquid depth in the Head Phantom (2600 MHz Head)

Picture 7-8 Liquid depth in the Flat Phantom (2600MHz)

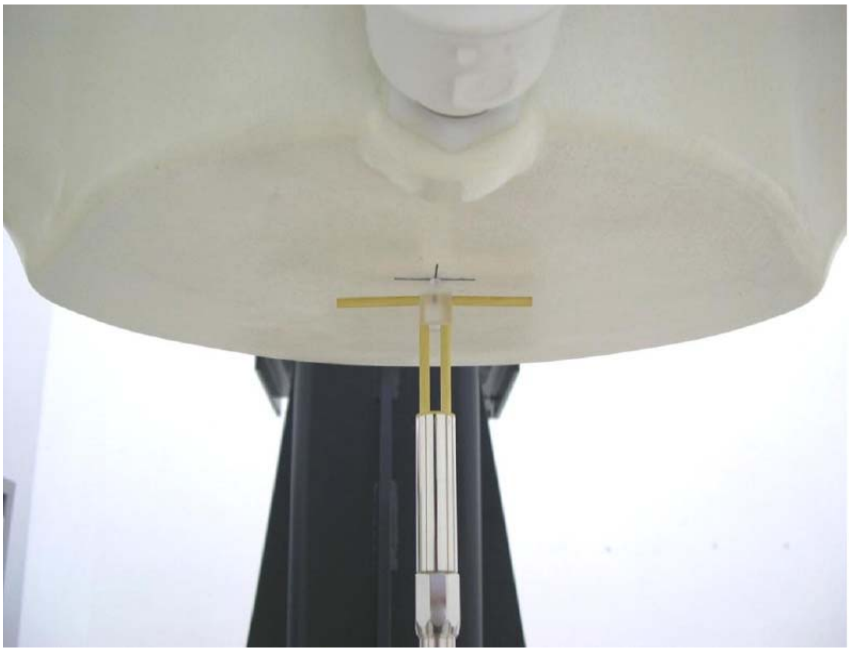
8 System verification

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
2017-2-15	835 MHz	6.18	9.44	6.04	9.52	-2.27%	0.85%
2017-2-17	1900 MHz	21.20	40.70	21.68	41.64	2.26%	2.31%
2017-2-18	2450 MHz	24.6	52.8	24.5	52.4	-0.49%	-0.76%
2017-2-14	2600 MHz	25.2	56.7	25.7	57.2	1.90%	0.88%

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
2017-2-15	835 MHz	6.36	9.69	6.20	9.68	-2.52%	-0.10%
2017-2-17	1900 MHz	21.30	40.10	21.04	40.44	-1.22%	0.85%
2017-2-18	2450 MHz	24.10	51.20	24.56	50.80	1.91%	-0.78%
2017-2-14	2600 MHz	24.80	55.30	24.84	55.20	0.16%	-0.18%

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.

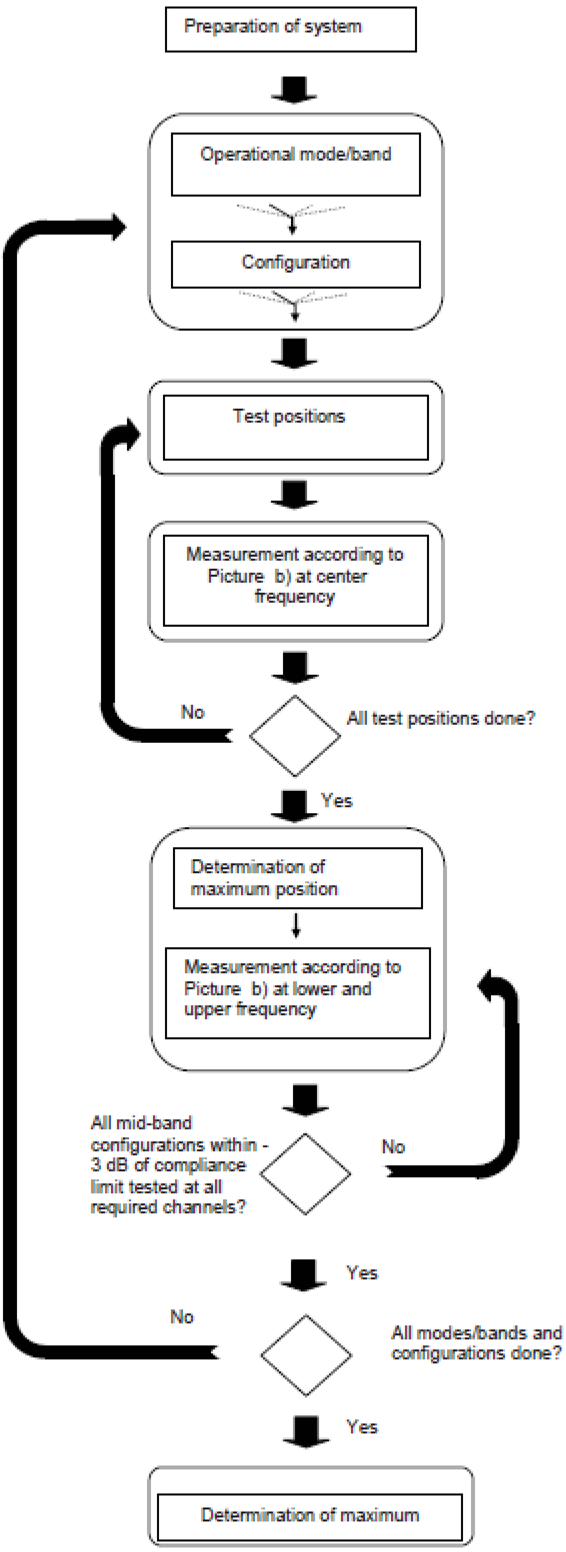
Step 1: The tests described in 9.2 shall be performed at the channel that is closest to the center of the transmit frequency band (f_c) for:

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.

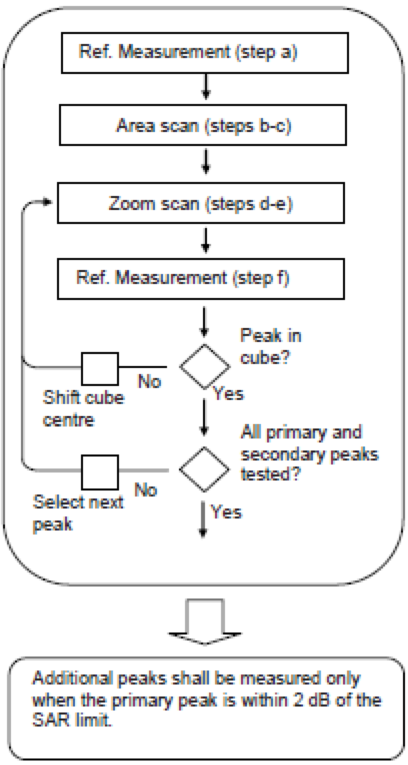
If more than three frequencies need to be tested according to 11.1 (i.e., N_c > 3), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

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 1528-2003. 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">≤ $1.5 \cdot \Delta z_{Zoom}(n-1)$</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 SAR Measurement for LTE

SAR tests for LTE are performed with a base station simulator, Rohde & Rchwarz CMW500. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. All powers were measured with the CMW 500.
It is performed for conducted power and SAR based on the KDB941225 D05.
SAR is evaluated separately according to the following procedures for the different test positions in each exposure condition – head, body, body-worn accessories and other use conditions. The procedures in the following subsections are applied separately to test each LTE frequency band.

1) QPSK with 1 RB allocation
   Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.
2) QPSK with 50% RB allocation
   The procedures required for 1 RB allocation in 1) are applied to measure the SAR for QPSK with 50% RB allocation.
3) QPSK with 100% RB allocation
   For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 1) and 2) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

9.5 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.

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

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

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

GSM850								
		Measured Power (dBm)				Average 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	33.30	32.59	32.70	32.69				
GPRS 1 Txslot	33.30	32.59	32.71	32.71	-9.03	23.56	23.68	23.68
GPRS 2 Txslots	30.50	29.60	29.69	29.71	-6.02	23.58	23.67	23.69
GPRS 3 Txslots	28.50	27.58	27.70	27.76	-4.26	23.32	23.44	23.50
GPRS 4 Txslots	27.50	26.66	26.81	26.89	-3.01	23.65	23.80	23.88
EGPRS GMSK 1 Txslot	33.30	32.58	32.69	32.69	-9.03	23.55	23.66	23.66
EGPRS GMSK 2 Txslots	30.50	29.58	29.67	29.71	-6.02	23.56	23.65	23.69
EGPRS GMSK 3 Txslots	28.50	27.58	27.70	27.76	-4.26	23.32	23.44	23.50
EGPRS GMSK 4 Txslots	27.50	26.78	26.83	26.90	-3.01	23.77	23.82	23.89
EGPRS 8PSK 1 Txslot	27.00	26.88	26.89	26.86	-9.03	17.85	17.86	17.83
EGPRS 8PSK 2 Txslots	25.50	25.02	25.16	25.11	-6.02	19.00	19.14	19.09
EGPRS 8PSK 3 Txslots	24.00	23.55	23.63	23.62	-4.26	19.29	19.37	19.36
EGPRS 8PSK 4 Txslots	22.50	22.34	22.50	22.38	-3.01	19.33	19.49	19.37

Table 11-2 PCS1900

PCS1900								
		Measured Power (dBm)				Average 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	30.30	29.66	29.89	30.06				
GPRS 1 Txslot	30.30	29.65	29.88	30.05	-9.03	20.62	20.85	21.02
GPRS 2 Txslots	28.00	27.20	27.22	27.37	-6.02	21.18	21.20	21.35
GPRS 3 Txslots	26.00	25.34	25.37	25.49	-4.26	21.08	21.11	21.23
GPRS 4 Txslots	25.00	24.27	24.32	24.44	-3.01	21.26	21.31	21.43
EGPRS GMSK 1 Txslot	30.30	29.66	29.88	30.05	-9.03	20.63	20.85	21.02
EGPRS GMSK 2 Txslots	28.00	27.20	27.24	27.38	-6.02	21.18	21.22	21.36
EGPRS GMSK 3 Txslots	26.00	25.34	25.36	25.48	-4.26	21.08	21.10	21.22
EGPRS GMSK 4 Txslots	25.00	24.27	24.32	24.44	-3.01	21.26	21.31	21.43
EGPRS 8PSK 1 Txslot	26.50	26.02	26.09	26.13	-9.03	16.99	17.06	17.10
EGPRS 8PSK 2 Txslots	24.50	23.65	23.67	23.68	-6.02	17.63	17.65	17.66
EGPRS 8PSK 3 Txslots	23.00	22.12	22.19	22.17	-4.26	17.86	17.93	17.91
EGPRS 8PSK 4 Txslots	21.50	20.78	20.79	20.75	-3.01	17.77	17.78	17.74

NOTES:

1) Division Factors

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

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

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

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

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

According to the conducted power as above, the body measurements are performed with 4Txslots for GSM850 and PCS1900.

11.2 WCDMA Measurement result

Table 11-3 WCDMA1900-BII

WCDMA1900-BII					
			Measured Power (dBm)		
Item		Tune-up	CH9538 1907.6 MHz	CH9400 1880 MHz	CH9262 1852.4 MHz
WCDMA	RMC	24.00	23.43	23.53	23.54
HSUPA	subtest1	21.00	20.57	20.00	19.76
	subtest2	21.00	19.95	19.98	19.67
	subtest3	21.00	20.95	20.96	20.66
	subtest4	21.00	19.52	19.46	19.22
	subtest5	22.00	21.91	21.93	21.66
HSPA+	\	22.50	22.22	22.24	22.02
DC-HSDPA	subtest1	23.00	22.17	22.12	21.92
	subtest2	23.00	22.18	22.11	21.91
	subtest3	23.00	22.15	22.09	21.88
	subtest4	23.00	22.17	22.11	21.86

Table 11-4 WCDMA850-BV

WCDMA850-BV					
			Measured Power (dBm)		
Item		Tune-up	CH4233 846.6 MHz	CH4715 835.4 MHz	CH4132 826.4 MHz
WCDMA	RMC	24.00	23.10	23.17	22.95
HSUPA	subtest1	21.00	20.13	19.72	19.63
	subtest2	21.00	19.60	19.73	19.60
	subtest3	21.00	20.61	20.75	20.62
	subtest4	21.00	19.07	19.20	19.08
	subtest5	22.00	21.58	21.70	21.56
HSPA+	\	22.00	21.53	21.64	21.56
DC-HSDPA	subtest1	23.00	21.56	21.63	21.87
	subtest2	23.00	21.53	21.61	21.82
	subtest3	23.00	21.55	21.59	21.88
	subtest4	23.00	21.52	21.58	21.84

11.3 LTE Measurement result

Table 11-5 LTE2500-FDD7

LTE2500-FDD7							
				Measured Power (dBm) & MPR			
BandWidth	RB Number/Sta	hannel/Frequen	Tune-up	QPSK		16QAM	
				Measured Power	MPR	Measured Power	MPR
5MHz	1H	21425	24.4	23.63	0	22.65	1
		21100	24.4	23.48	0	22.53	1
		20775	24.4	23.78	0	22.80	1
	1M	21425	24.4	23.25	0	22.66	1
		21100	24.4	23.57	0	22.35	1
		20775	24.4	23.90	0	22.90	1
	1L	21425	24.4	23.62	0	22.63	1
		21100	24.4	23.64	0	22.68	1
		20775	24.4	23.94	0	22.95	1
	12H	21425	24.4	22.63	1	21.74	2
		21100	24.4	22.49	1	21.61	2
		20775	24.4	22.81	1	21.93	2
	12M	21425	24.4	22.64	1	21.75	2
		21100	24.4	22.55	1	21.65	2
		20775	24.4	22.86	1	21.98	2
	12L	21425	24.4	22.52	1	21.70	2
		21100	24.4	22.39	1	21.71	2
		20775	24.4	22.91	1	21.99	2
	25	21425	24.4	22.60	1	21.61	2
		21100	24.4	22.54	1	21.58	2
		20775	24.4	22.86	1	21.86	2
10MHz	1H	21400	24.4	23.71	0	22.65	1
		21100	24.4	23.50	0	22.60	1
		20800	24.4	23.79	0	22.74	1
	1M	21400	24.4	23.65	0	22.60	1
		21100	24.4	23.59	0	22.76	1
		20800	24.4	23.80	0	22.89	1
	1L	21400	24.4	23.60	0	22.53	1
		21100	24.4	23.70	0	22.78	1
		20800	24.4	23.96	0	22.97	1
	25H	21400	24.4	22.56	1	21.57	2
		21100	24.4	22.46	1	21.48	2
		20800	24.4	22.76	1	21.75	2
	25M	21400	24.4	22.51	1	21.13	2
		21100	24.4	22.50	1	21.52	2
		20800	24.4	22.80	1	21.53	2
	25L	21400	24.4	22.48	1	21.46	2
		21100	24.4	22.60	1	21.58	2
		20800	24.4	22.85	1	21.83	2
	50	21400	24.4	22.53	1	21.52	2
		21100	24.4	22.55	1	21.54	2
		20800	24.4	22.85	1	21.81	2
15MHz	1H	21375	24.4	23.74	0	23.00	1
		21100	24.4	23.47	0	22.57	1
		20825	24.4	23.85	0	23.07	1
	1M	21375	24.4	23.54	0	22.78	1
		21100	24.4	23.64	0	22.68	1
		20825	24.4	24.04	0	23.28	1
	1L	21375	24.4	23.44	0	22.71	1
		21100	24.4	23.78	0	22.80	1
		20825	24.4	24.14	0	23.38	1
	36H	21375	24.4	22.65	1	21.64	2
		21100	24.4	22.56	1	21.55	2
		20825	24.4	22.88	1	21.88	2
	36M	21375	24.4	22.50	1	21.50	2
		21100	24.4	22.59	1	21.59	2
		20825	24.4	23.09	1	21.78	2
	36L	21375	24.4	22.51	1	21.42	2
		21100	24.4	22.70	1	21.70	2
		20825	24.4	23.12	1	22.06	2
	75	21375	24.4	22.51	1	21.48	2
		21100	24.4	22.68	1	21.64	2
		20825	24.4	23.11	1	22.03	2

20MHz	1H	21350	24.4	23.71	0	23.08	1
		21100	24.4	23.58	0	22.72	1
		20850	24.4	23.80	0	23.33	1
	1M	21350	24.4	23.48	0	22.93	1
		21100	24.4	23.51	0	22.82	1
		20850	24.4	23.96	0	23.40	1
	1L	21350	24.4	23.31	0	22.78	1
		21100	24.4	23.84	0	22.97	1
		20850	24.4	24.04	0	23.40	1
	50H	21350	24.4	22.55	1	21.52	2
		21100	24.4	22.49	1	21.49	2
		20850	24.4	22.76	1	21.73	2
	50M	21350	24.4	22.40	1	21.36	2
		21100	24.4	22.45	1	21.56	2
		20850	24.4	22.82	1	21.86	2
	50L	21350	24.4	22.33	1	21.31	2
		21100	24.4	22.65	1	21.64	2
		20850	24.4	22.96	1	21.91	2
	100	21350	24.4	22.38	1	21.34	2
		21100	24.4	22.60	1	21.57	2
		20850	24.4	22.94	1	21.89	2

11.4 Wi-Fi and BT Measurement result

The output power of BT antenna is as following:

Table 11-6 Bluetooth Power

Bluetooth Power				
Mode	Channel	Frequence	Tune-up	Measured
GFSK	78	2480 MHz	7.5	6.86
	39	2441 MHz	7	6.19
	0	2402 MHz	5	4.20
EDR2M-4_DQPSK	78	2480 MHz	6	5.53
	39	2441 MHz	6	4.93
	0	2402 MHz	4	3.15
EDR3M-8DPSK	78	2480 MHz	6	5.50
	39	2441 MHz	6	4.92
	0	2402 MHz	4	2.94

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

Table 11-7 WLAN 2450

	802.11b(dBm)					
Band	Channel\data rate		1Mbps	2Mbps	5.5Mbps	11Mbps
WLAN2450	11(2462MHz)	Measured	/	/	17.09	/
	6(2437(MHz)	Measured	19.27	19.29	19.76	19.22
	1(2412MHz)	Measured	/	/	17.42	/

	802.11g(dBm)									
Band	Channel\data rate		6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
WLAN2450	11(2462MHz)	Measured	12.81	/	/	/	/	/	/	/
	6(2437(MHz)	Measured	15.99	15.88	15.87	15.98	14.75	14.34	14.19	15.54
	1(2412MHz)	Measured	13.12	/	/	/	/	/	/	/

	802.11n(dBm)-20MHz									
Band	Channel\data rate		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
WLAN2450	11(2462MHz)	Measured	13.16	/	/	/	/	/	/	/
	6(2437(MHz)	Measured	15.19	14.71	14.67	14.99	14.48	13.58	13.10	14.65
	1(2412MHz)	Measured	12.83	/	/	/	/	/	/	/

	802.11n(dBm)-40MHz									
Band	Channel\data rate		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
WLAN2450	9(2452MHz)	Measured	11.00	/	/	/	/	/	/	/
	6(2437MHz)	Measured	14.04	13.74	13.67	13.55	13.40	13.42	13.38	13.34
	3(2422MHz)	Measured	11.38	/	/	/	/	/	/	/

802.11b

Channel\rate	1Mbps		2Mbps		5.5Mbps		11Mbps	
	dBm	±	dBm	±	dBm	±	dBm	±
1	17.0	1	17.0	1	17.0	1	17.0	1
6	19.0	1	19.0	1	19.0	1	19.0	1
11	17.0	1	17.0	1	17.0	1	17.0	1

802.11g

Channel\rate	6Mbps		9Mbps		12Mbps		18Mbps		24Mbps		36Mbps		48Mbps		54Mbps	
	dBm	±	dBm	±	dBm	±	dBm	±	dBm	±	dBm	±	dBm	±	dBm	±
1	13	1	13	1	13	1	13	1	12	1	12	1	12	1	12	1
6	15.5	1	15.5	1	15.5	1	15.5	1	15	1	15	1	15	1	15	1
11	13	1	13	1	13	1	13	1	12	1	12	1	12	1	12	1

802.11n-20M

Channel\rate	MCS0		MCS1		MCS2		MCS3		MCS4		MCS5		MCS6		MCS7	
	dBm	±	dBm	±	dBm	±	dBm	±	dBm	±	dBm	±	dBm	±	dBm	±
1	13	1	13	1	13	1	13	1	13	1	12	1	12	1	12	1
6	15	1	15	1	15	1	15	1	15	1	14	1	14	1	14	1
11	13	1	13	1	13	1	13	1	13	1	12	1	12	1	12	1

802.11n-40M

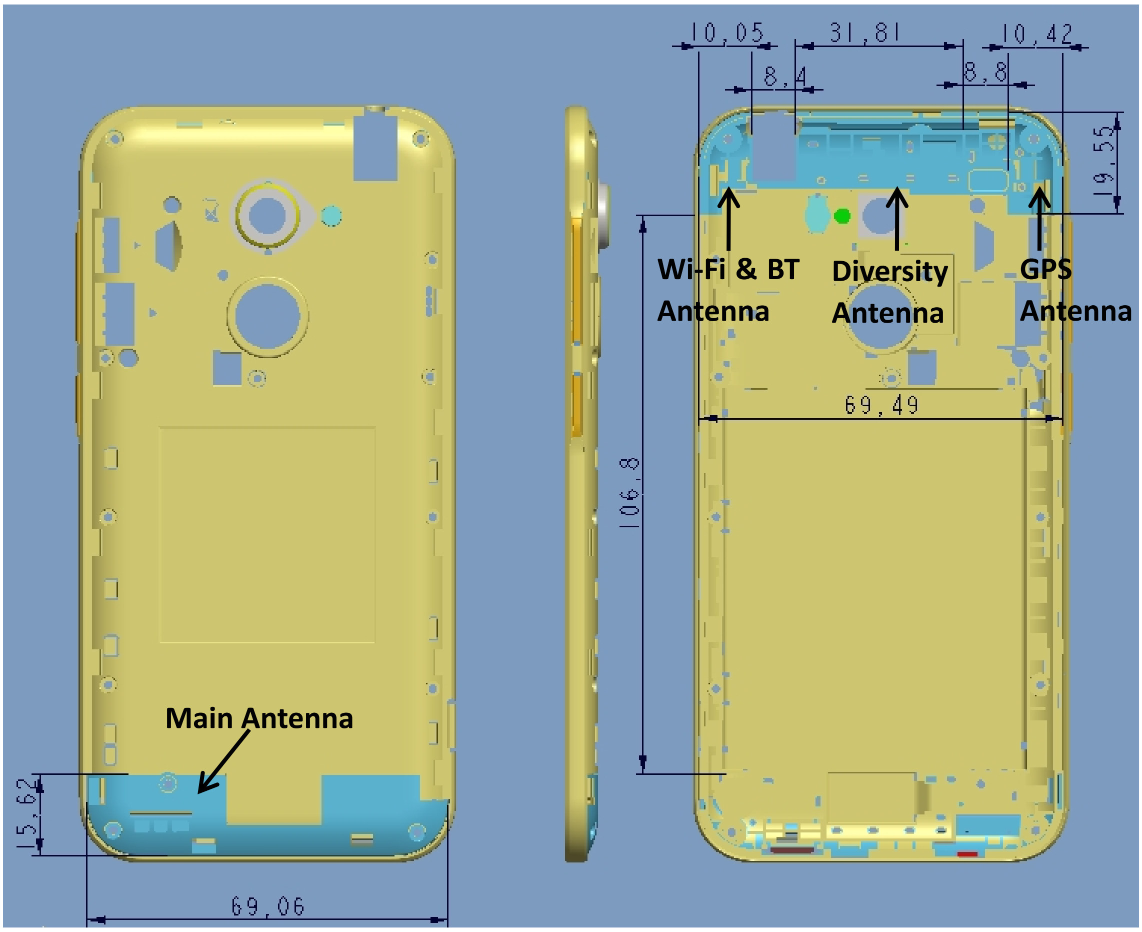
Channel\rate	MCS0		MCS1		MCS2		MCS3		MCS4		MCS5		MCS6		MCS7	
	dBm	±	dBm	±	dBm	±	dBm	±	dBm	±	dBm	±	dBm	±	dBm	±
1	11	1	11	11	11	11	11	11	11	1	11	1	11	1	11	1
6	14	1	14	1	14	1	14	1	14	1	14	1	14	1	14	1
11	11	1	11	1	11	1	11	1	11	1	11	1	11	1	11	1

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 v01, the edges with less than 2.5 cm distance to the antennas need to be tested for SAR.

SAR measurement positions						
Mode	Front	Rear	Left edge	Right edge	Top edge	Bottom edge
Main antenna	Yes	Yes	Yes	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

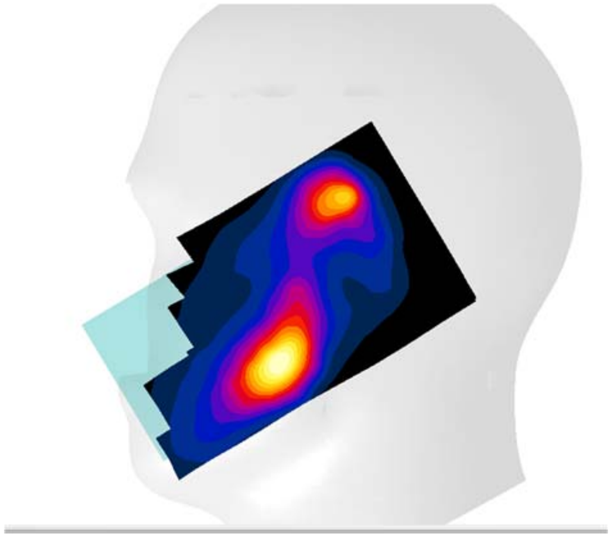
Table 12.1: Standalone SAR test exclusion considerations

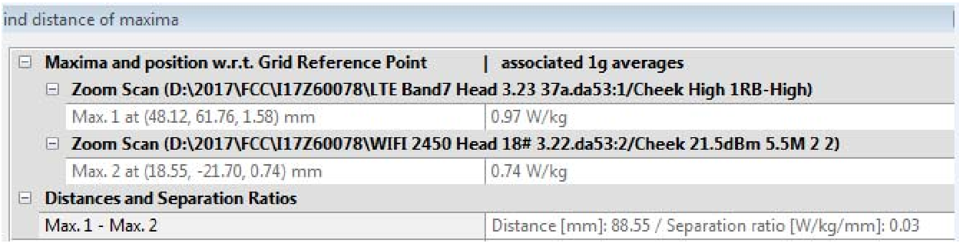
Band/Mode	F(GHz)	Position	SAR test exclusion threshold (mW)	RF output power		SAR test exclusion
				dBm	mW	
Bluetooth	2.441	Head	9.6	7.5	5.62	Yes
		Body	19.2	7.5	5.62	Yes
2.4GHz WLAN 802.11 b	2.45	Head	9.58	20	100.00	No
		Body	19.17	20	100.00	No

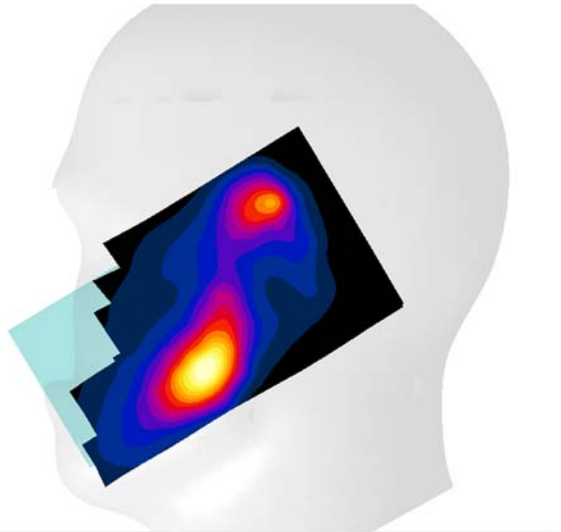
13 Evaluation of Simultaneous

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

	Position	Main antenna	WiFi	Sum	Distance (mm)	Ratio
Highest reported SAR value for Head	Right hand, Touch cheek	1.14	0.78	**1.92**	88.55	0.030
		1.29		**2.07**	88.56	0.034
		1.25		**2.03**	85.05	0.034
		0.92		**1.70**	87.99	0.025
		1.03		**1.81**	88.75	0.027
		1.06		**1.84**	88.75	0.028
		1.16		**1.94**	88.75	0.030
		1.21		**1.99**	88.75	0.032
Highest reported SAR value for Body	Rear	0.99	0.15	**1.14**	/	/

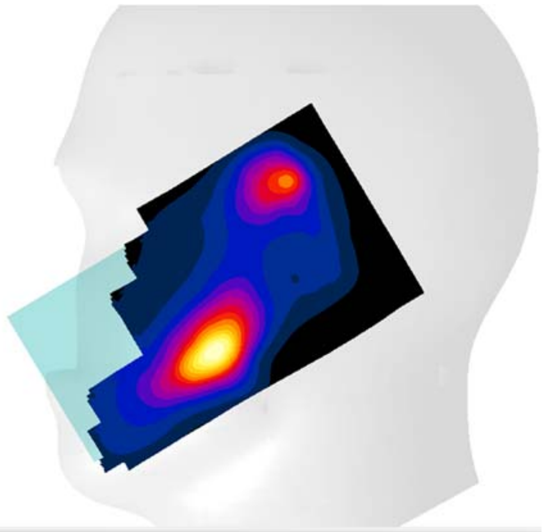






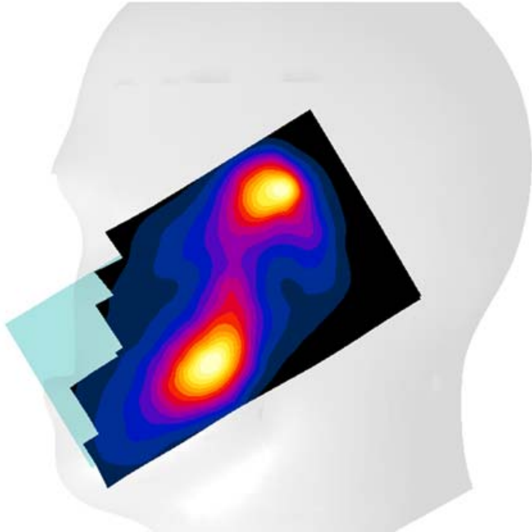
ind distance of maxima

Maxima and position w.r.t. Grid Reference Point	associated 1g averages
Zoom Scan (D:\2017\FCC\I17Z60078\WIFI 2450 Head 18# 3.22.da53:2/Cheek 21.5dBm 5.5M 2 2)	
Max. 1 at (18.55, -21.70, 0.74) mm	0.74 W/kg
Zoom Scan (D:\2017\FCC\I17Z60078\LTE Band7 Head 3.23 37a.da53:1/Cheek Middle 1RB-Low 2)	
Max. 2 at (48.12, 61.77, 1.57) mm	1.13 W/kg
Distances and Separation Ratios	
Max. 1 - Max. 2	Distance [mm]: 88.56 / Separation ratio [W/kg/mm]: 0.03

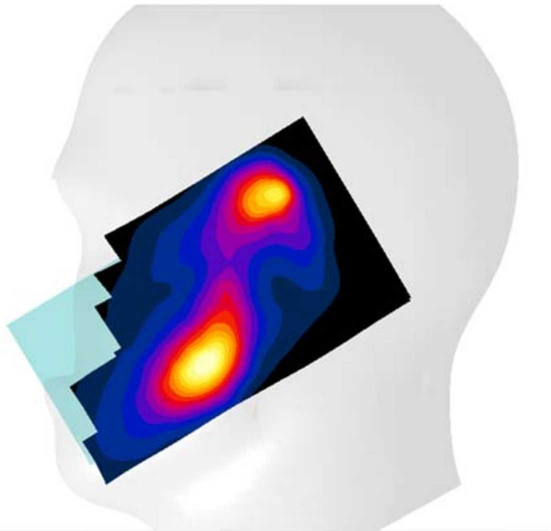


Find distance of maxima

Maxima and position w.r.t. Grid Reference Point	associated 1g averages
Zoom Scan (D:\2017\FCC\I17Z60078\WIFI 2450 Head 18# 3.22.da53:2/Cheek 21.5dBm 5.5M 2 2)	
Max. 1 at (18.55, -21.70, 0.74) mm	0.74 W/kg
Zoom Scan (G:\LTE Band7 Head 37a 2.13 .da53:0/Cheek Low 1RB-Low)	
Max. 2 at (48.49, 57.88, -1.45) mm	1.15 W/kg
Distances and Separation Ratios	
Max. 1 - Max. 2	Distance [mm]: 85.05 / Separation ratio [W/kg/mm]: 0.03

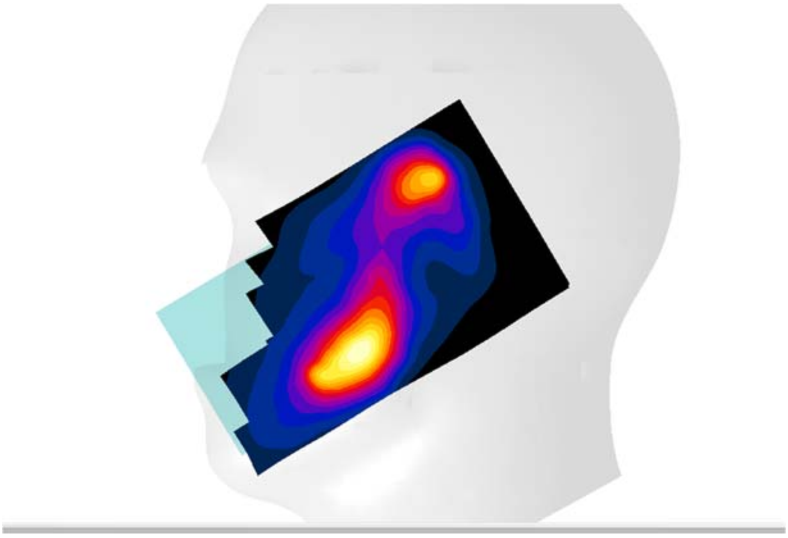


Maxima and position w.r.t. Grid Reference Point	associated 1g averages
Zoom Scan (D:\2017\FCC\I17Z60078\LTE Band7 Head 3.23 37a.da53:2/Cheek High 50RB-High)	
Max. 1 at (48.96, 60.86, 1.55) mm	0.76 W/kg
Zoom Scan (D:\2017\FCC\I17Z60078\WIFI 2450 Head 18# 3.22.da53:2/Cheek 21.5dBm 5.5M 2 2)	
Max. 2 at (18.55, -21.70, 0.74) mm	0.74 W/kg
Distances and Separation Ratios	
Max. 1 - Max. 2	Distance [mm]: 87.99 / Separation ratio [W/kg/mm]: 0.02



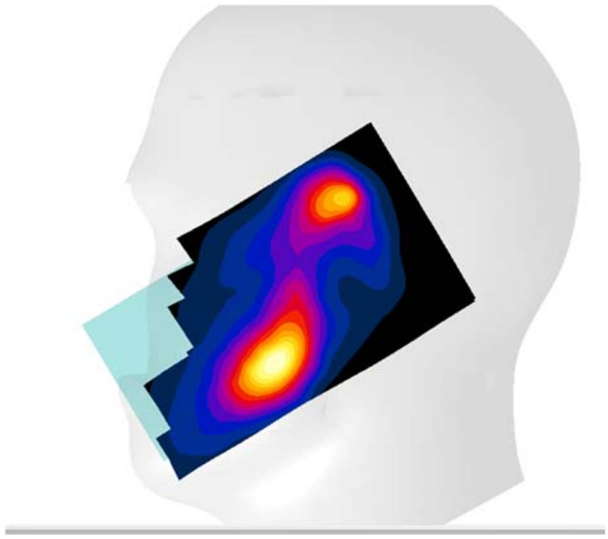
Find distance of maxima

Maxima and position w.r.t. Grid Reference Point	associated 1g averages
Zoom Scan (D:\2017\FCC\I17Z60078\LTE Band7 Head 3.23 37a.da53:2/Cheek Middle 50RB-Low)	
Max. 1 at (49.79, 61.36, 1.73) mm	0.87 W/kg
Zoom Scan (D:\2017\FCC\I17Z60078\WIFI 2450 Head 18# 3.22.da53:2/Cheek 21.5dBm 5.5M 2 2)	
Max. 2 at (18.55, -21.70, 0.74) mm	0.74 W/kg
Distances and Separation Ratios	
Max. 1 - Max. 2	Distance [mm]: 88.75 / Separation ratio [W/kg/mm]: 0.02



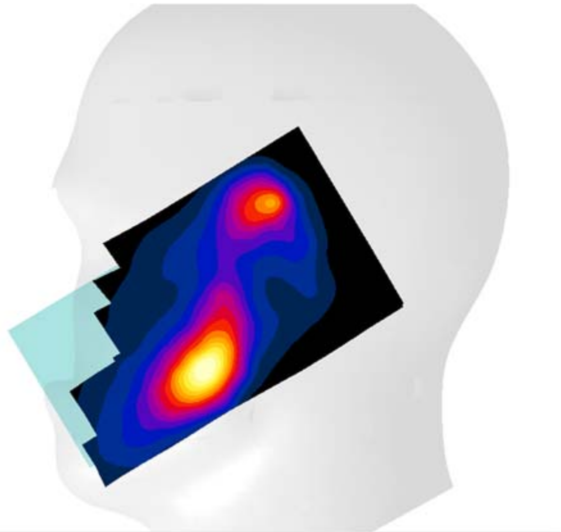
Find distance of maxima

Maxima and position w.r.t. Grid Reference Point	associated 1g averages
Zoom Scan (D:\2017\FCC\I17Z60078\LTE Band7 Head 3.23 37a.da53:2/Cheek Low 50RB-Low 2)	
Max. 1 at (49.78, 61.36, 1.77) mm	0.96 W/kg
Zoom Scan (D:\2017\FCC\I17Z60078\WIFI 2450 Head 18# 3.22.da53:2/Cheek 21.5dBm 5.5M 2 2)	
Max. 2 at (18.55, -21.70, 0.74) mm	0.74 W/kg
Distances and Separation Ratios	
Max. 1 - Max. 2	Distance [mm]: 88.75 / Separation ratio [W/kg/mm]: 0.02



nd distance of maxima

Maxima and position w.r.t. Grid Reference Point	associated 1g averages
Zoom Scan (D:\2017\FCC\I17Z60078\LTE Band7 Head 3.23 37a.da53:2/Cheek 100RB-Low)	
Max. 1 at (49.77, 61.37, 1.75) mm	0.96 W/kg
Zoom Scan (D:\2017\FCC\I17Z60078\WIFI 2450 Head 18# 3.22.da53:2/Cheek 21.5dBm 5.5M 2 2)	
Max. 2 at (18.55, -21.70, 0.74) mm	0.74 W/kg
Distances and Separation Ratios	
Max. 1 - Max. 2	Distance [mm]: 88.75 / Separation ratio [W/kg/mm]: 0.02



ind distance of maxima

Maxima and position w.r.t. Grid Reference Point	associated 1g averages
Zoom Scan (D:\2017\FCC\I17Z60078\WIFI 2450 Head 18# 3.22.da53:2/Cheek 21.5dBm 5.5M 2 2)	
Max. 1 at (18.55, -21.70, 0.74) mm	0.74 W/kg
Zoom Scan (D:\2017\FCC\I17Z60078\LTE Band7 Head 3.23 37a.da53:1/Cheek Middle 1RB-Low 2)	
Max. 2 at (48.12, 61.77, 1.57) mm	1.13 W/kg
Distances and Separation Ratios	
Max. 1 - Max. 2	Distance [mm]: 88.56 / Separation ratio [W/kg/mm]: 0.03

Note: There are two points in the picture. The top one is WiFi, and the bottom one is main antenna.

According to the KDB 447498 D01, when the sum of SAR is larger than the limit, SAR test exclusion is determined by the SAR to peak location separation ratio. The ratio is determined by $(SAR1 + SAR2)^{1.5}/Ri$, rounded to two decimal digits, and must be ≤ 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.

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	Right hand, Touch cheek	1.29	0.23	**1.52**
Maximum reported SAR value for Body	Front	1.02	0.12	**1.14**

[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	7.5	5.62	0.23
Bluetooth	2.441	Body	10	7.5	5.62	0.12

* - 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, but the SAR to peak location separation ratio < 0.04. 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:

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

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

Duty Cycle

Mode	**Duty Cycle**
Speech for GSM850/1900	1:8.3
GPRS&EGPRS for GSM850/1900	1:2
WCDMA&LTE	1:1

14.1 Evaluation of multi-batteries

We'll perform the head measurement in all bands with the primary battery depending on the evaluation of multi-batteries and retest on highest value point with other batteries. Then, repeat the measurement in the Body test.

frequency		**Mode/Band**	**Side**	**Position**	**BatteryType**	**1g SAR (W/kg)**	**PowerDrift**
MHz	**Channel**						
836.6	190	GSM850	Left	Cheek	CAC2400033CJ	0.28	0.12
836.6	190	GSM850	Left	Cheek	CAC2400035C2	0.246	0.04

Note: According to the values in the above table, the battery, CAC2400033CJ, is the primary battery. We'll perform the head measurement with this battery and retest on highest value point with others.

frequency		**Mode/Band**	**Position**	**BatteryType**	**1g SAR (W/kg)**	**PowerDrift**
MHz	**Channel**					
836.6	190	GSM850	Rear	CAC2400033CJ	0.397	-0.01
836.6	190	GSM850	Rear	CAC2400035C2	0.319	-0.01

Note: According to the values in the above table, the battery, CAC2400033CJ, is the primary battery. We'll perform the Body measurement with this battery and retest on highest value point with others.

Note： The battery of CAC2400033CJ is B1
The battery of CAC2400035C2 is B2

14.2 SAR results

Table 14-1 GSM850 Head

GSM850 Head								
Ambient Temperature:			22.5			Liquid Temperature:		22
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		33.30	33.30	33.30	Scaling factor*		
	Slot Average Power [dBm]		32.59	32.70	32.69	1.18	1.15	1.15
	Left Cheek	1g SAR	0.271	0.28	0.315	0.32	0.32	0.36
		10g SAR	0.207	0.19	0.239	0.24	0.22	0.27
		Deviation	-0.01	0.12	0.02	-0.01	0.12	0.02
	Left Tilt	1g SAR		0.188			0.22	
		10g SAR		0.146			0.17	
		Deviation		0.05			0.05	
	Right Cheek	1g SAR		0.197			0.23	
		10g SAR		0.155			0.18	
		Deviation		-0.02			-0.02	
	Right Tilt	1g SAR		0.177			0.20	
		10g SAR		0.136			0.16	
		Deviation		0.06			0.06	
GSM B2	*Left Cheek*	1g SAR			0.293			0.34
		10g SAR			0.228			0.26
		Deviation			0.01			0.01

Table 14-2 GSM850 Body

GSM850 Body								
Ambient Temperature:		22.5				Liquid Temperature:		22
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 4 Txslots	Tune-up		27.50	27.50	27.50	Scaling factor*		
	Slot Average Power [dBm]		26.66	26.81	26.89	1.21	1.17	1.15
	Front	1g SAR		0.292		0.00	0.34	0.00
		10g SAR		0.156		0.00	0.18	0.00
		Deviation		0.08		0.00	0.08	0.00
	Rear	1g SAR	0.43	0.397	0.458	0.52	0.46	0.53
		10g SAR	0.238	0.272	0.257	0.29	0.32	0.30
		Deviation	0.02	-0.01	-0.08	0.02	-0.01	-0.08
	Bottom edge	1g SAR		0.179		0.00	0.21	0.00
		10g SAR		0.068		0.00	0.08	0.00
		Deviation		0.04		0.00	0.04	0.00
	Left edge	1g SAR		0.145		0.00	0.17	0.00
		10g SAR		0.077		0.00	0.09	0.00
		Deviation		0.09		0.00	0.09	0.00
	Right edge	1g SAR		0.303		0.00	0.35	0.00
		10g SAR		0.166		0.00	0.19	0.00
		Deviation		0.11		0.00	0.11	0.00
EGPRS GMSK 4 Txslots	Tune-up		27.50	27.50	27.50	Scaling factor*		
	Slot Average Power [dBm]		26.78	26.83	26.90	1.18	1.17	1.15
	Rear	1g SAR			0.415	0.00	0.00	0.48
		10g SAR			0.254	0.00	0.00	0.29
		Deviation			-0.14	0.00	0.00	-0.14
GPRS 4 Txslots B2	*Rear*	1g SAR			0.418	0.00	0.00	0.48
		10g SAR			0.251	0.00	0.00	0.29
		Deviation			0.01	0.00	0.00	0.01

Table 14-3 PCS1900 Head

PCS1900 Head								
Ambient Temperature:			22.5			Liquid Temperature:		22
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH810 1909.8 MHz	CH661 1880 MHz	CH512 1850.2 MHz	CH810 1909.8 MHz	CH661 1880 MHz	CH512 1850.2 MHz
GSM	Tune-up		30.30	30.30	30.30	Scaling factor*		
	Slot Average Power [dBm]		29.66	29.89	30.06	1.16	1.10	1.06
	Left Cheek	1g SAR		0.134		0.00	0.15	0.00
		10g SAR		0.083		0.00	0.09	0.00
		Deviation		0.03		0.00	0.03	0.00
	Left Tilt	1g SAR		0.051		0.00	0.06	0.00
		10g SAR		0.031		0.00	0.03	0.00
		Deviation		-0.07		0.00	-0.07	0.00
	Right Cheek	1g SAR	0.241	0.203	0.17	0.28	0.22	0.18
		10g SAR	0.15	0.125	0.106	0.17	0.14	0.11
		Deviation	0.08	0.04	-0.09	0.08	0.04	-0.09
	Right Tilt	1g SAR		0.103		0.00	0.11	0.00
		10g SAR		0.06		0.00	0.07	0.00
		Deviation		0.11		0.00	0.11	0.00
GSM B2	*Right Cheek*	1g SAR	0.231			0.27	0.00	0.00
		10g SAR	0.142			0.16	0.00	0.00
		Deviation	0.09			0.09	0.00	0.00

Table 14-4 PCS1900 Body

PCS1900 Body								
Ambient Temperature:		22.5				Liquid Temperature:		22
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			CH810 1909.8 MHz	CH661 1880 MHz	CH512 1850.2 MHz	CH810 1909.8 MHz	CH661 1880 MHz	CH512 1850.2 MHz
GPRS 4 Txslots	Tune-up		25.00	25.00	25.00	Scaling factor*		
	Slot Average Power [dBm]		24.27	24.32	24.44	1.18	1.17	1.14
	Front	1g SAR		0.269		0.00	0.31	0.00
		10g SAR		0.164		0.00	0.19	0.00
		Deviation		-0.07		0.00	-0.07	0.00
	Rear	1g SAR		0.243		0.00	0.28	0.00
		10g SAR		0.156		0.00	0.18	0.00
		Deviation		0.01		0.00	0.01	0.00
	Bottom edge	1g SAR	0.429	0.341	0.328	0.51	0.40	0.37
		10g SAR	0.249	0.179	0.171	0.29	0.21	0.19
		Deviation	-0.11	0.08	-0.07	-0.11	0.08	-0.07
	Left edge	1g SAR		0.06		0.00	0.07	0.00
		10g SAR		0.035		0.00	0.04	0.00
		Deviation		0.12		0.00	0.12	0.00
	Right edge	1g SAR		0.148		0.00	0.17	0.00
		10g SAR		0.082		0.00	0.10	0.00
		Deviation		0.09		0.00	0.09	0.00
EGPRS GMSK 4 Txslots	Tune-up		25.00	25.00	25.00	Scaling factor*		
	Slot Average Power [dBm]		24.27	24.32	24.44	1.18	1.17	1.14
	Bottom edge	1g SAR	0.393			0.47	0.00	0.00
		10g SAR	0.212			0.25	0.00	0.00
		Deviation	-0.03			-0.03	0.00	0.00
GPRS 4 Txslots B2	*Bottom edge*	1g SAR	0.369			0.44	0.00	0.00
		10g SAR	0.205			0.24	0.00	0.00
		Deviation	0.02			0.02	0.00	0.00

Table 14-5 WCDMA1900-BII Head

WCDMA1900-BII Head								
Ambient Temperature: 22.5						Liquid Temperature: 22		
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		24.00	24.00	24.00	Scaling factor*		
	Slot Average Power [dBm]		23.43	23.53	23.54	1.14	1.12	1.11
	Left Cheek	1g SAR		0.45		0.00	0.50	0.00
		10g SAR		0.29		0.00	0.32	0.00
		Deviation		0.08		0.00	0.08	0.00
	Left Tilt	1g SAR		0.205		0.00	0.23	0.00
		10g SAR		0.131		0.00	0.15	0.00
		Deviation		-0.1		0.00	-0.10	0.00
	Right Cheek	1g SAR	0.616	0.598	0.512	0.70	0.67	0.57
		10g SAR	0.39	0.379	0.326	0.44	0.42	0.36
		Deviation	-0.1	0.02	0.09	-0.10	0.02	0.09
	Right Tilt	1g SAR		0.349		0.00	0.39	0.00
		10g SAR		0.214		0.00	0.24	0.00
		Deviation		0.01		0.00	0.01	0.00
RMC B2	*Right Cheek*	1g SAR	0.587			0.67	0.00	0.00
		10g SAR	0.367			0.42	0.00	0.00
		Deviation	-0.09			-0.09	0.00	0.00

Table 14-6 WCDMA1900-BII Body

WCDMA1900-BII Body								
Ambient Temperature: 22.5						Liquid Temperature: 22		
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		24.00	24.00	24.00	Scaling factor*		
	Slot Average Power [dBm]		23.43	23.53	23.54	1.14	1.12	1.11
	Front	1g SAR		0.7		0.00	0.78	0.00
		10g SAR		0.442		0.00	0.49	0.00
		Deviation		-0.05		0.00	-0.05	0.00
	Rear	1g SAR	0.852	0.891	0.839	0.97	0.99	0.93
		10g SAR	0.524	0.579	0.515	0.60	0.65	0.57
		Deviation	0.04	0.08	0.05	0.04	0.08	0.05
	Bottom edge	1g SAR	0.799	0.787	0.716	0.91	0.88	0.80
		10g SAR	0.433	0.437	0.398	0.49	0.49	0.44
		Deviation	0.03	-0.01	0.11	0.03	-0.01	0.11
	Left edge	1g SAR		0.258		0.00	0.29	0.00
		10g SAR		0.146		0.00	0.16	0.00
		Deviation		-0.13		0.00	-0.13	0.00
	Right edge	1g SAR		0.369		0.00	0.41	0.00
		10g SAR		0.203		0.00	0.23	0.00
		Deviation		0.17		0.00	0.17	0.00
RMC B2	*Rear*	1g SAR		0.878		0.00	0.98	0.00
		10g SAR		0.563		0.00	0.63	0.00
		Deviation		-0.04		0.00	-0.04	0.00

Table 14-7 WCDMA850-BV Head

WCDMA850-BV Head								
Ambient Temperature: 22.5						Liquid Temperature: 22		
Mode	Device orientation	SAR measurement	Measured SAR [W/kg] CH4233 846.6 MHz	Measured SAR [W/kg] CH4715 835.4 MHz	Measured SAR [W/kg] CH4132 826.4 MHz	Reported SAR [W/kg] CH4233 846.6 MHz	Reported SAR [W/kg] CH4715 835.4 MHz	Reported SAR [W/kg] CH4132 826.4 MHz
RMC	Tune-up		24.00	24.00	24.00	Scaling factor*		
	Slot Average Power [dBm]		23.10	23.17	22.95	1.23	1.21	1.27
	Left Cheek	1g SAR	0.532	0.425	0.324	0.65	0.51	0.41
		10g SAR	0.406	0.338	0.247	0.50	0.41	0.31
		Deviation	-0.18	0.04	-0.01	-0.18	0.04	-0.01
	Left Tilt	1g SAR		0.25			0.30	
		10g SAR		0.196			0.24	
		Deviation		-0.05			-0.05	
	Right Cheek	1g SAR		0.284			0.34	
		10g SAR		0.227			0.27	
		Deviation		0.02			0.02	
	Right Tilt	1g SAR		0.24			0.29	
		10g SAR		0.189			0.23	
		Deviation		0.01			0.01	
RMC B2	*Left Cheek*	1g SAR	0.497			0.61		
		10g SAR	0.382			0.47		
		Deviation	0.07			0.07		

Table 14-8 WCDMA850-BV Body

WCDMA850-BV Body								
Ambient Temperature: 22.5						Liquid Temperature: 22		
Mode	Device orientation	SAR measurement	Measured SAR [W/kg] CH4233 846.6 MHz	Measured SAR [W/kg] CH4715 835.4 MHz	Measured SAR [W/kg] CH4132 826.4 MHz	Reported SAR [W/kg] CH4233 846.6 MHz	Reported SAR [W/kg] CH4715 835.4 MHz	Reported SAR [W/kg] CH4132 826.4 MHz
RMC	Tune-up		24.00	24.00	24.00	Scaling factor*		
	Slot Average Power [dBm]		23.10	23.17	22.95	1.23	1.21	1.27
	Front	1g SAR		0.332		0.00	0.40	0.00
		10g SAR		0.27		0.00	0.33	0.00
		Deviation		0.07		0.00	0.07	0.00
	Rear	1g SAR	0.632	0.467	0.386	0.78	0.57	0.49
		10g SAR	0.354	0.375	0.312	0.44	0.45	0.40
		Deviation	-0.01	0.03	-0.08	-0.01	0.03	-0.08
	Bottom edge	1g SAR		0.228		0.00	0.28	0.00
		10g SAR		0.123		0.00	0.15	0.00
		Deviation		0.01		0.00	0.01	0.00
	Left edge	1g SAR		0.29		0.00	0.35	0.00
		10g SAR		0.22		0.00	0.27	0.00
		Deviation		0.06		0.00	0.06	0.00
	Right edge	1g SAR		0.187		0.00	0.23	0.00
		10g SAR		0.14		0.00	0.17	0.00
		Deviation		0.09		0.00	0.09	0.00
RMC B2	*Rear*	1g SAR	0.56			0.69	0.00	0.00
		10g SAR	0.338			0.42	0.00	0.00
		Deviation	0.04			0.04	0.00	0.00

Table 14-9 LTE2500-FDD7 Head

LTE2500-FDD7 Head								
Ambient Temperature:		22.5				Liquid Temperature:		22
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			21350	21100	20850	21350	21100	20850
			H	L	L	H	L	L
20MHz QPSK1RB	Tune-up		24.40	24.40	24.40	Scaling factor*		
	Measured Power [dBm]		23.71	23.84	24.04	1.17	1.14	1.09
	Left Cheek	1g SAR			0.516	0.00	0.00	0.56
		10g SAR			0.297	0.00	0.00	0.32
		Deviation			0.11	0.00	0.00	0.11
	Left Tilt	1g SAR			0.494	0.00	0.00	0.54
		10g SAR			0.243	0.00	0.00	0.26
		Deviation			-0.09	0.00	0.00	-0.09
	Right Cheek	1g SAR	0.972	1.13	1.15	1.14	1.29	1.25
		10g SAR	0.5	0.588	0.592	0.59	0.67	0.64
		Deviation	0.01	0.03	-0.04	0.01	0.03	-0.04
	Right Tilt	1g SAR			0.284	0.00	0.00	0.31
		10g SAR			0.151	0.00	0.00	0.16
		Deviation			0.08	0.00	0.00	0.08
TRUE	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			21350	21100	20850	21350	21100	20850
			H	L	L	H	L	L
20MHz QPSK50%RB	Tune-up		23.40	23.40	23.40	Scaling factor*		
	Measured Power [dBm]		22.55	22.65	22.96	1.22	1.19	1.11
	Left Cheek	1g SAR			0.401	0.00	0.00	0.44
		10g SAR			0.23	0.00	0.00	0.25
		Deviation			-0.05	0.00	0.00	-0.05
	Left Tilt	1g SAR			0.377	0.00	0.00	0.42
		10g SAR			0.185	0.00	0.00	0.20
		Deviation			0.07	0.00	0.00	0.07
	Right Cheek	1g SAR	0.757	0.87	0.957	0.92	1.03	1.06
		10g SAR	0.393	0.457	0.509	0.48	0.54	0.56
		Deviation	0.03	0.01	0.05	0.03	0.01	0.05
	Right Tilt	1g SAR			0.22	0.00	0.00	0.24
		10g SAR			0.117	0.00	0.00	0.13
		Deviation			0.01	0.00	0.00	0.01
Mode	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			21350	21100	20850	21350	21100	20850
20MHz QPSK100%RB	Tune-up		23.40	23.40	23.40	Scaling factor*		
	Measured Power [dBm]		22.38	22.60	22.94	1.26	1.20	1.11
	Right Cheek	1g SAR			0.961	0.00	0.00	1.07
		10g SAR			0.509	0.00	0.00	0.57
		Deviation			0.05	0.00	0.00	0.05
20MHz QPSK1RB B2	Right Cheek	1g SAR		1.06		0.00	1.21	0.00
		10g SAR		0.559		0.00	0.64	0.00
		Deviation		0.09		0.00	0.09	0.00

Table 14-10 LTE2500-FDD7 Body

LTE2500-FDD7 Body								
Ambient Temperature: 22.5						Liquid Temperature: 22		
Mode	**Device orientation**	**SAR measurement**	**Measured SAR [W/kg]**			**Reported SAR [W/kg]**		
			21350	**21100**	**20850**	**21350**	**21100**	**20850**
			H	**L**	**L**	**H**	**L**	**L**
20MHz QPSK1RB	**Tune-up**		**24.40**	**24.40**	**24.40**	**Scaling factor***		
	Measured Power [dBm]		**23.71**	**23.84**	**24.04**	**1.17**	**1.14**	**1.09**
	Front	1g SAR	0.699	0.829	0.939	0.82	0.94	1.02
		10g SAR	0.382	0.45	0.516	0.45	0.51	0.56
		Deviation	0.09	0.12	-0.01	0.09	0.12	-0.01
	Rear	1g SAR	0.71	0.786	0.806	0.83	0.89	0.88
		10g SAR	0.394	0.407	0.424	0.46	0.46	0.46
		Deviation	0.03	0.07	0.02	0.03	0.07	0.02
	Bottom edge	1g SAR			0.437			0.47
		10g SAR			0.232			0.25
		Deviation			0.02			0.02
	Left edge	1g SAR			0.116			0.13
		10g SAR			0.064			0.07
		Deviation			-0.11			-0.11
	Right edge	1g SAR			0.585			0.64
		10g SAR			0.316			0.34
		Deviation			0.05			0.05
Mode	**Device orientation**	**SAR measurement**	**Measured SAR [W/kg]**			**Reported SAR [W/kg]**		
			21350	**21100**	**20850**	**21350**	**21100**	**20850**
			H	**L**	**L**			
20MHz QPSK50%RB	**Tune-up**		**23.40**	**23.40**	**23.40**	**Scaling factor***		
	Measured Power [dBm]		**22.55**	**22.65**	**22.96**	**1.22**	**1.19**	**1.11**
	Front	1g SAR			0.697	0.00	0.00	0.77
		10g SAR			0.386	0.00	0.00	0.43
		Deviation			-0.04	0.00	0.00	-0.04
	Rear	1g SAR			0.613	0.00	0.00	0.68
		10g SAR			0.321	0.00	0.00	0.36
		Deviation			0.14	0.00	0.00	0.14
	Bottom edge	1g SAR			0.329	0.00	0.00	0.36
		10g SAR			0.175	0.00	0.00	0.19
		Deviation			0.18	0.00	0.00	0.18
	Left edge	1g SAR			0.087	0.00	0.00	0.10
		10g SAR			0.049	0.00	0.00	0.05
		Deviation			0.04	0.00	0.00	0.04
	Right edge	1g SAR			0.446	0.00	0.00	0.49
		10g SAR			0.24	0.00	0.00	0.27
		Deviation			0.02	0.00	0.00	0.02
Mode	**Device orientation**	**SAR measurement**	**Measured SAR [W/kg]**			**Reported SAR [W/kg]**		
			21350	**21100**	**20850**	**21350**	**21100**	**20850**
20MHz QPSK100%RB	**Tune-up**		**23.40**	**23.40**	**23.40**	**Scaling factor***		
	Measured Power [dBm]		**22.38**	**22.60**	**22.94**	**1.26**	**1.20**	**1.11**
	Front	1g SAR			0.789	0.00	0.00	0.88
		10g SAR			0.411	0.00	0.00	0.46
		Deviation			0.14	0.00	0.00	0.14
20MHz QPSK1RB B2	*Front*	1g SAR			0.901	0.00	0.00	0.98
		10g SAR			0.495	0.00	0.00	0.54
		Deviation			0.1	0.00	0.00	0.10
20MHz QPSK100%RB	*Rear*	1g SAR			0.764	0.00	0.00	0.83
		10g SAR			0.402	0.00	0.00	0.44
		Deviation			0.09	0.00	0.00	0.09

14.3 Full SAR

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	25	824.2 MHz	33.3	32.69	Left Cheek	0.239	0.315	0.27	0.36	0.02	Fig A.1
GSM850	128	824.2 MHz	27.5	26.89	Rear	0.257	0.458	0.30	0.53	-0.08	Fig A.2
PCS1900	810	1909.8 MHz	30.3	29.66	Right Cheek	0.15	0.241	0.17	0.28	0.08	Fig A.3
PCS1900	810	1909.8 MHz	25	24.27	Bottom edge	0.249	0.429	0.29	0.51	-0.11	Fig A.4
WCDMA1900-BII	9538	1907.6 MHz	24	23.43	Right Cheek	0.39	0.616	0.44	0.70	-0.1	Fig A.5
WCDMA1900-BII	9400	1880 MHz	24	23.53	Rear	0.579	0.891	0.65	0.99	0.08	Fig A.6
WCDMA850-BV	4233	846.6 MHz	24	23.10	Left Cheek	0.406	0.532	0.50	0.65	-0.18	Fig A.7
WCDMA850-BV	4233	846.6 MHz	24	23.10	Rear	0.354	0.632	0.44	0.78	-0.01	Fig A.8
LTE2500-FDD7	20850	2510 MHz	24.4	23.84	Right Cheek	0.588	1.13	0.67	1.29	0.03	Fig A.9
LTE2500-FDD7	20850	2510 MHz	24.4	24.04	Front	0.516	0.939	0.56	1.02	-0.01	Fig A.10

14.4 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 14-11 WLAN 2450 Head

WLAN Head Area scan								
Ambient Temperature:		22.5			Liquid Temperature:			22
Rate	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			1	6	11	1	6	11
			2462 MHz	2437 MHz	2412 MHz	2462 MHz	2437 MHz	2412 MHz
802.11b 5.5Mbps	Tune-up		18.00	20.00	18.00	Scaling factor*		
	Slot Average Power [dBm]		17.42	19.76	17.09	1.14	1.06	1.23
	Left Cheek	1g Fast SAR		0.158		0.00	0.17	0.00
		10g SAR		0.0802		0.00	0.08	0.00
		Deviation		0.13		0.00	0.13	0.00
	Left Tilt	1g Fast SAR		0.161		0.00	0.17	0.00
		10g SAR		0.076		0.00	0.08	0.00
		Deviation		0.13		0.00	0.13	0.00
	Right Cheek	1g Fast SAR		0.691		0.00	0.73	0.00
		10g SAR		0.331		0.00	0.35	0.00
		Deviation		0.01		0.00	0.01	0.00
	Right Tilt	1g Fast SAR		0.304		0.00	0.32	0.00
		10g SAR		0.152		0.00	0.16	0.00
		Deviation		0.17		0.00	0.17	0.00
802.11b 5.5Mbps B2	*Right Cheek*	1g Fast SAR		0.656		0.00	0.69	0.00
		10g SAR		0.288		0.00	0.30	0.00
		Deviation		0.05		0.00	0.05	0.00

WLAN Head Zoom scan								
Ambient Temperature:		22.5			Liquid Temperature:			22
Rate	Device orientation	SAR measurement	Measured SAR [W/kg]			Reported SAR [W/kg]		
			1	6	11	1	6	11
			2462 MHz	2437 MHz	2412 MHz	2462 MHz	2437 MHz	2412 MHz
802.11b 5.5Mbps	Tune-up		18.00	20.00	18.00	Scaling factor*		
	Slot Average Power [dBm]		17.42	19.76	17.09	1.14	1.06	1.23
	Right Cheek	1g Full SAR		0.74		0.00	0.78	0.00
		10g SAR		0.327		0.00	0.35	0.00
		Deviation		0.01		0.00	0.01	0.00
	Right Tilt	1g Full SAR		0.359		0.00	0.38	0.00
		10g SAR		0.158		0.00	0.17	0.00
		Deviation		0.17		0.00	0.17	0.00

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.								
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C								
Frequency		Side	Test Position	Actual duty factor	maximum duty factor	Reported SAR	Scaled reported SAR (1g) (W/kg)	Figure
MHz	Ch.					(1g) (W/kg)		
2437	6	Right	Cheek	99.52%	100%	**0.78**	**0.78**	Fig.A.11

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

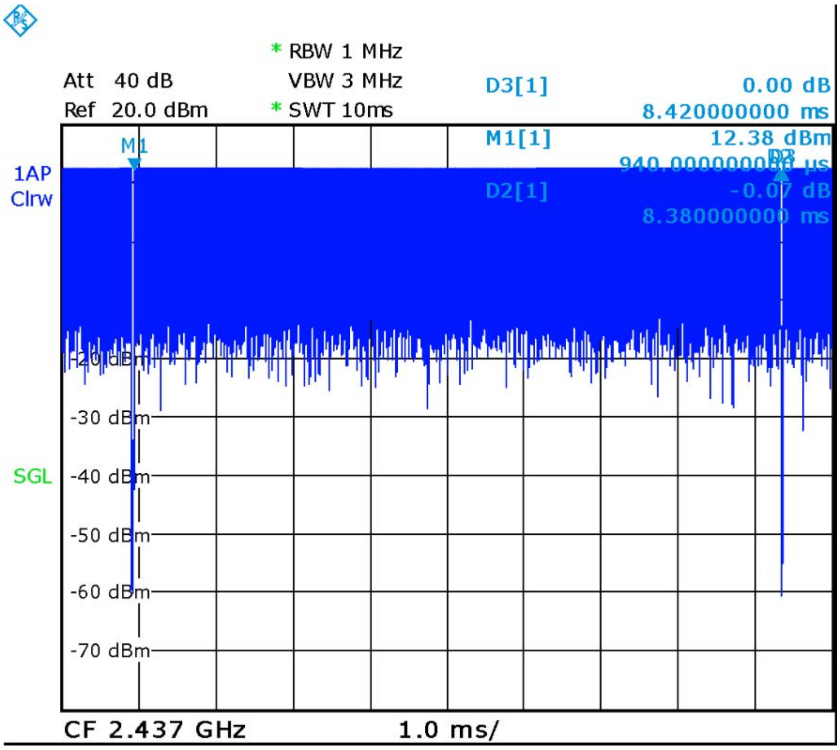
Table 14-12 WLAN 2450 Body

WLAN Body Area scan								
Ambient Temperature: 22.5					Liquid Temperature: 22			
Mode	**Device orientation**	**SAR measurement**	**Measured SAR [W/kg]**			**Reported SAR [W/kg]**		
			1	**6**	**11**	**1**	**6**	**11**
			2462 MHz	**2437 MHz**	**2412 MHz**	**2462 MHz**	**2437 MHz**	**2412 MHz**
802.11b 5.5Mbps	**Tune-up**		**18.00**	**20.00**	**18.00**	**Scaling factor***		
	Slot Average Power [dBm]		**17.42**	**19.76**	**17.09**	**1.14**	**1.06**	**1.23**
	Front	1g Fast SAR		0.09			0.10	
		10g SAR		0.048			0.05	
		Deviation		0.08			0.08	
	Rear	1g Fast SAR		0.132			0.14	
		10g SAR		0.065			0.07	
		Deviation		-0.03			-0.03	
	Top edge	1g Fast SAR		0.075			0.08	
		10g SAR		0.039			0.04	
		Deviation		0.12			0.12	
	Left edge	1g Fast SAR		0.088			0.09	
		10g SAR		0.043			0.05	
		Deviation		-0.12			-0.12	
802.11b 5.5Mbps B2	*Rear*	1g Fast SAR		0.1			0.11	
		10g SAR		0.053			0.06	
		Deviation		0.09			0.09	

WLAN Body Zoom scan								
Ambient Temperature: 22.5					Liquid Temperature: 22			
Mode	**Device orientation**	**SAR measurement**	**Measured SAR [W/kg]**			**Reported SAR [W/kg]**		
			1	**6**	**11**	**1**	**6**	**11**
			2462 MHz	**2437 MHz**	**2412 MHz**	**2462 MHz**	**2437 MHz**	**2412 MHz**
802.11b 5.5Mbps	**Tune-up**		**18.00**	**20.00**	**18.00**	**Scaling factor***		
	Slot Average Power [dBm]		**17.42**	**19.76**	**17.09**	**1.14**	**1.06**	**1.23**
	Rear	1g Full SAR		0.143			0.15	
		10g SAR		0.07			0.07	
		Deviation		-0.03			-0.03	

Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C							
Frequency		Test Position	Actual duty factor	maximum duty factor	Reported SAR	Scaled reported SAR (1g) (W/kg)	Figure
MHz	Ch.				(1g) (W/kg)		
2437	6	Rear	99.52%	100%	**0.15**	**0.15**	Fig.A.12

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	Channel	Frequency	Test Position	Original SAR (W/kg)	First Repeated SAR(W/kg)	The Ratio
WCDMA1900-BII	9400	1880 MHz	Rear	0.891	0.886	1.01
LTE2500-FDD7	20850	2510 MHz	Right Cheek	1.15	1.14	1.01
LTE2500-FDD7	20850	2510 MHz	Front	0.939	0.928	1.01

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 13, 2017	One year
02	Power meter	NRVD	102196	March 03, 2016	One year
03	Power sensor	NRV-Z5	100596		
04	Signal Generator	E4438C	MY49071430	January 13, 2017	One Year
05	Amplifier	60S1G4	0331848	No Calibration Requested	
06	BTS	E5515C	MY50263375	January 16, 2017	One year
07	BTS	CMW500	129942	March 03, 2016	One year
08	E-field Probe	SPEAG EX3DV4	7307	February 19, 2016	One year
09	DAE	SPEAG DAE4	1331	January 19, 2017	One year
10	Dipole Validation Kit	SPEAG D835V2	4d069	July 20, 2016	One year
11	Dipole Validation Kit	SPEAG D1900V2	5d101	July 28, 2016	One year
12	Dipole Validation Kit	SPEAG D2450V2	853	July 25, 2016	One year
13	Dipole Validation Kit	SPEAG D2600V2	1012	July 25, 2016	One year

END OF REPORT BODY

ANNEX A Graph Results

GSM850_CH25 Left Cheek

Date: 2/15/2017

Electronics: DAE4 Sn1331

Medium: Head 835 MHz

Medium parameters used: f = 824.2 MHz; σ = 41.54 mho/m; εr = 0.864; ρ = 1000 kg/m^3

Ambient Temperature: 22.5^{o}C, Liquid Temperature: 22.0^{o}C

Communication System: GSM850 824.2 MHz Duty Cycle: 1:8.3

Probe: EX3DV4 – SN7307 ConvF(10.01,10.01,10.01)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.348 W/kg

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

Reference Value = 4.627 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.403 W/kg

SAR(1 g) = 0.315 W/kg; SAR(10 g) = 0.239 W/kg

Maximum value of SAR (measured) = 0.339 W/kg

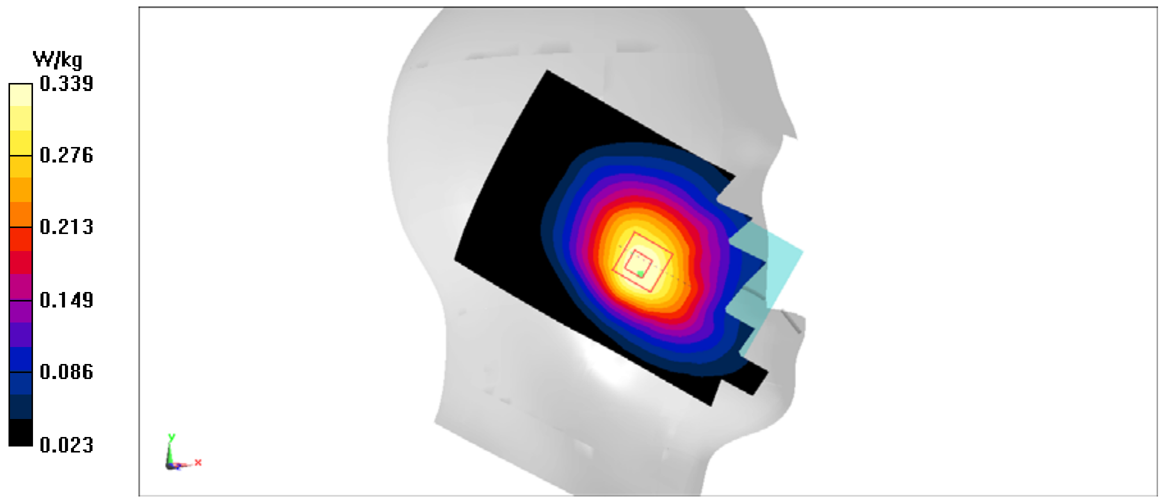


Figure A.1

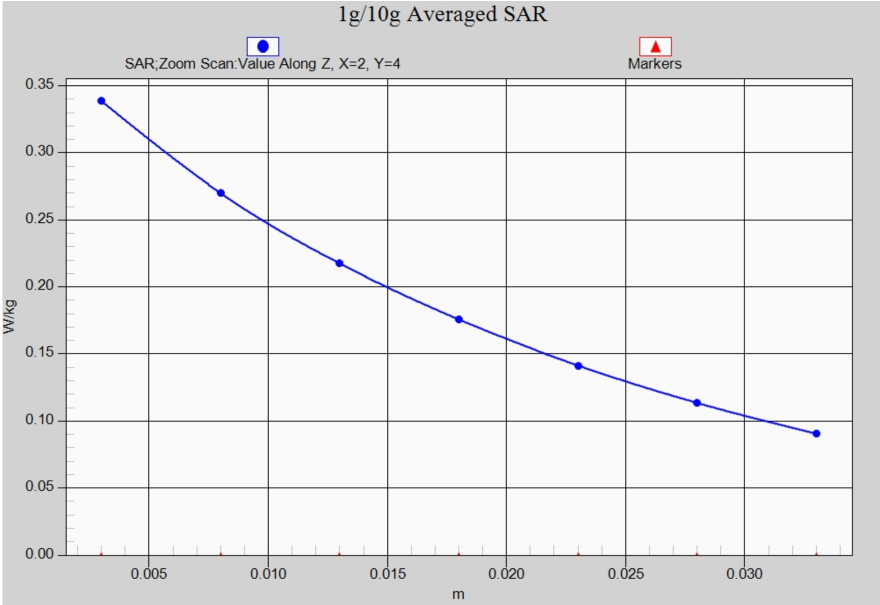


Fig. 1-1 Z-Scan at power reference point (GSM 850)

GSM850_CH128 Rear
Date: 2/15/2017
Electronics: DAE4 Sn1331
Medium: Body 835 MHz
Medium parameters used: f = 824.2 MHz; σ = 56.42 mho/m; εr = 0.948; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.0°C
Communication System: GSM850 824.2 MHz Duty Cycle: 1:2
Probe: EX3DV4 – SN7307 ConvF(9.83,9.83,9.83)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.56 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.95 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.827 W/kg
SAR(1 g) = 0.458 W/kg; SAR(10 g) = 0.257 W/kg
Maximum value of SAR (measured) = 0.572 W/kg

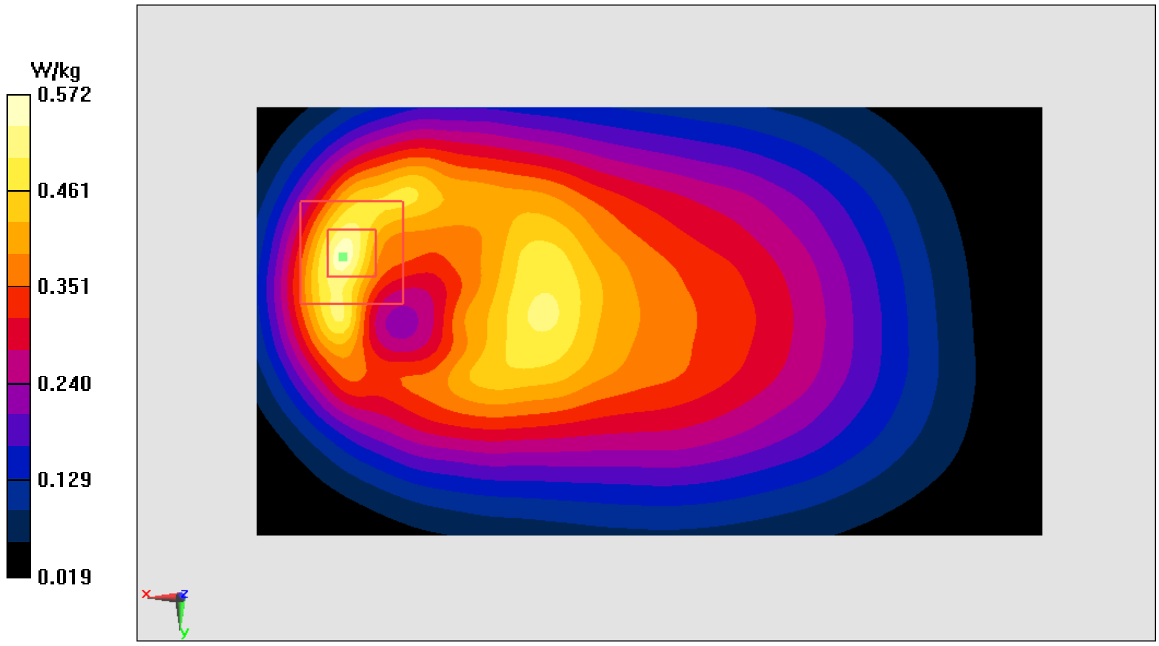


Figure A.2

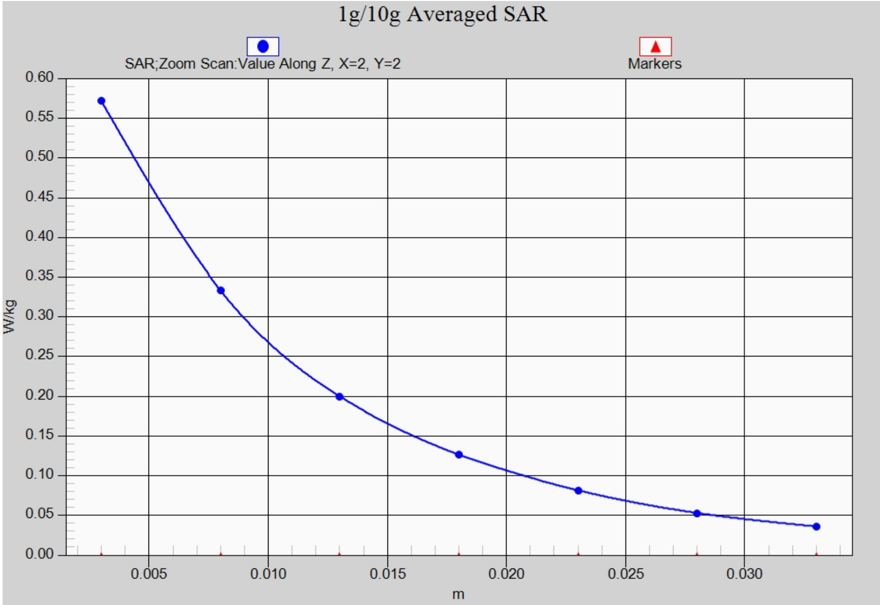


Fig. 2-1 Z-Scan at power reference point (GSM 850)

PCS1900_CH810 Right Cheek

Date: 2/17/2017

Electronics: DAE4 Sn1331

Medium: Head 1900 MHz

Medium parameters used: f = 1909.8 MHz; σ = 39.84 mho/m; εr = 1.415; ρ = 1000 kg/m^3

Ambient Temperature: 22.5°C, Liquid Temperature: 22.0°C

Communication System: PCS1900 1909.8 MHz Duty Cycle: 1:8.3

Probe: EX3DV4 – SN7307 ConvF(8.1,8.1,8.1)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.311 W/kg

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

Reference Value = 3.598 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.379 W/kg

SAR(1 g) = 0.241 W/kg; SAR(10 g) = 0.15 W/kg

Maximum value of SAR (measured) = 0.286 W/kg

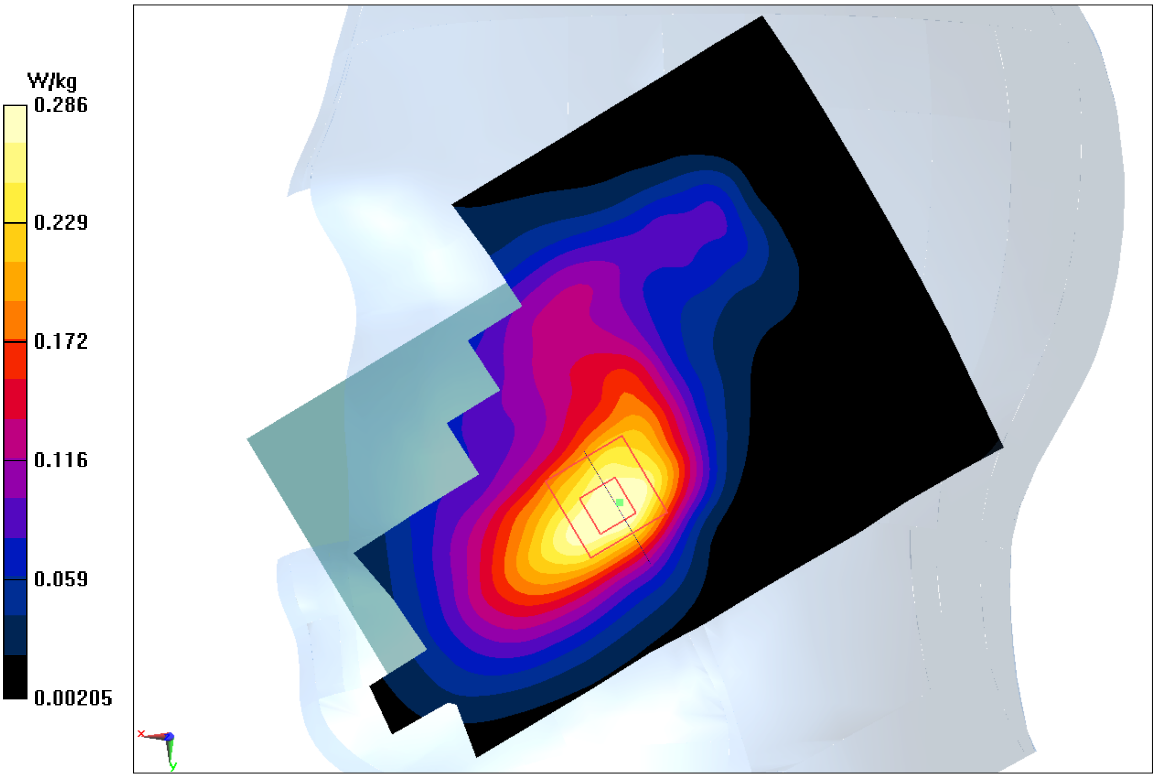


Figure A.3

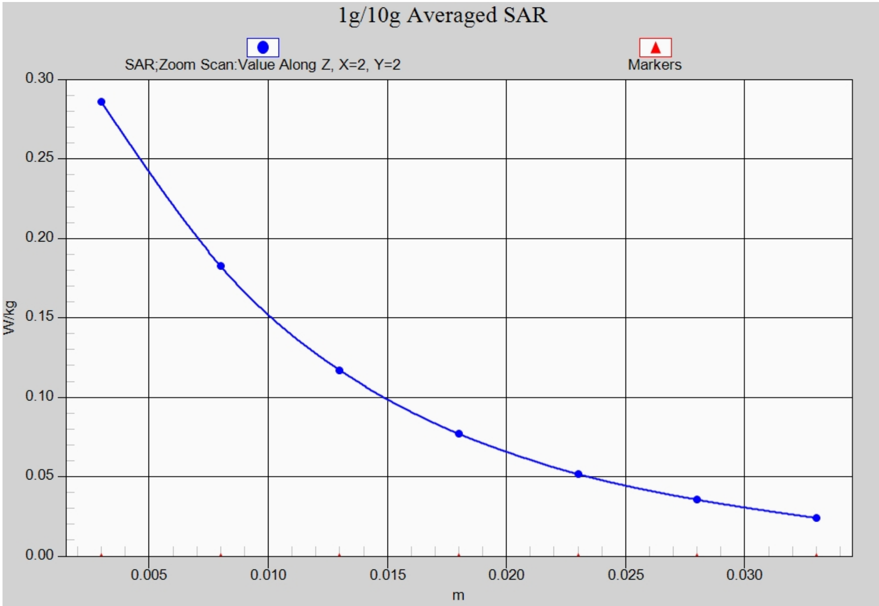


Fig. 3-1 Z-Scan at power reference point (PCS 1900)

PCS1900_CH810 Bottom edge
Date: 2/17/2017
Electronics: DAE4 Sn1331
Medium: Body 1900 MHz
Medium parameters used: f = 1909.8 MHz; σ = 53.01 mho/m; εr = 1.527; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.0°C
Communication System: PCS1900 1909.8 MHz Duty Cycle: 1:2
Probe: EX3DV4 – SN7307 ConvF(7.67,7.67,7.67)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.518 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.97 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 0.697 W/kg
SAR(1 g) = 0.429 W/kg; SAR(10 g) = 0.249 W/kg
Maximum value of SAR (measured) = 0.52 W/kg

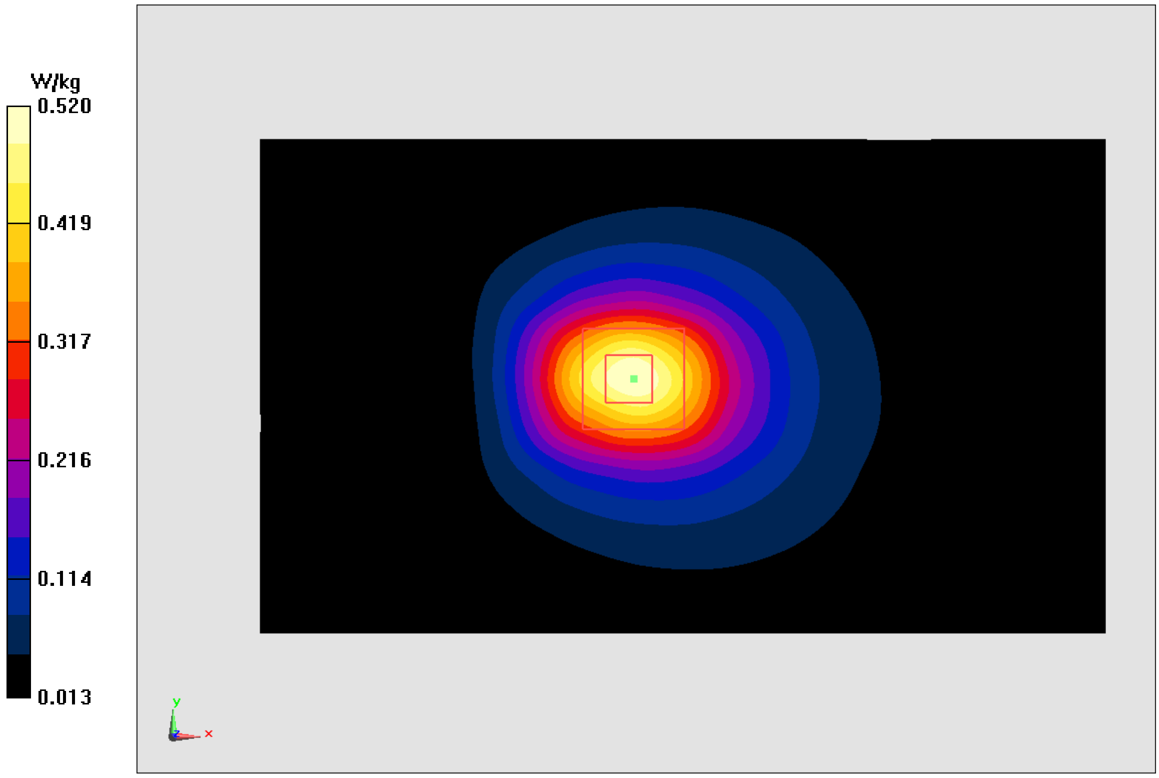


Figure A.4

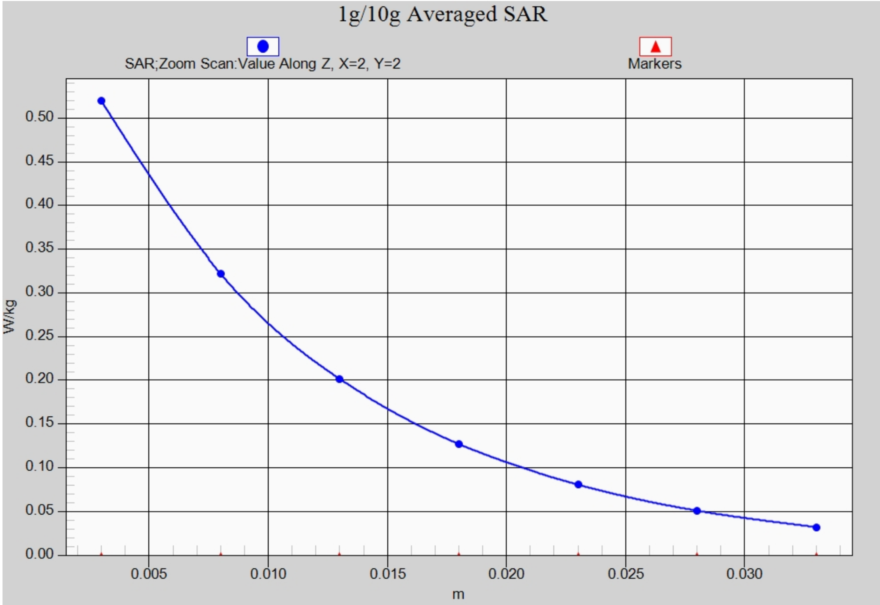


Fig. 4-1 Z-Scan at power reference point (PCS 1900)

WCDMA1900-BII_CH9538 Right Cheek
Date: 2/17/2017
Electronics: DAE4 Sn1331
Medium: Head 1900 MHz
Medium parameters used: f = 1907.6 MHz; σ = 39.92 mho/m; εr = 1.411; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.0°C
Communication System: WCDMA1900-BII 1907.6 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(8.1,8.1,8.1)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.785 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.715 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 0.949 W/kg
SAR(1 g) = 0.616 W/kg; SAR(10 g) = 0.39 W/kg
Maximum value of SAR (measured) = 0.729 W/kg

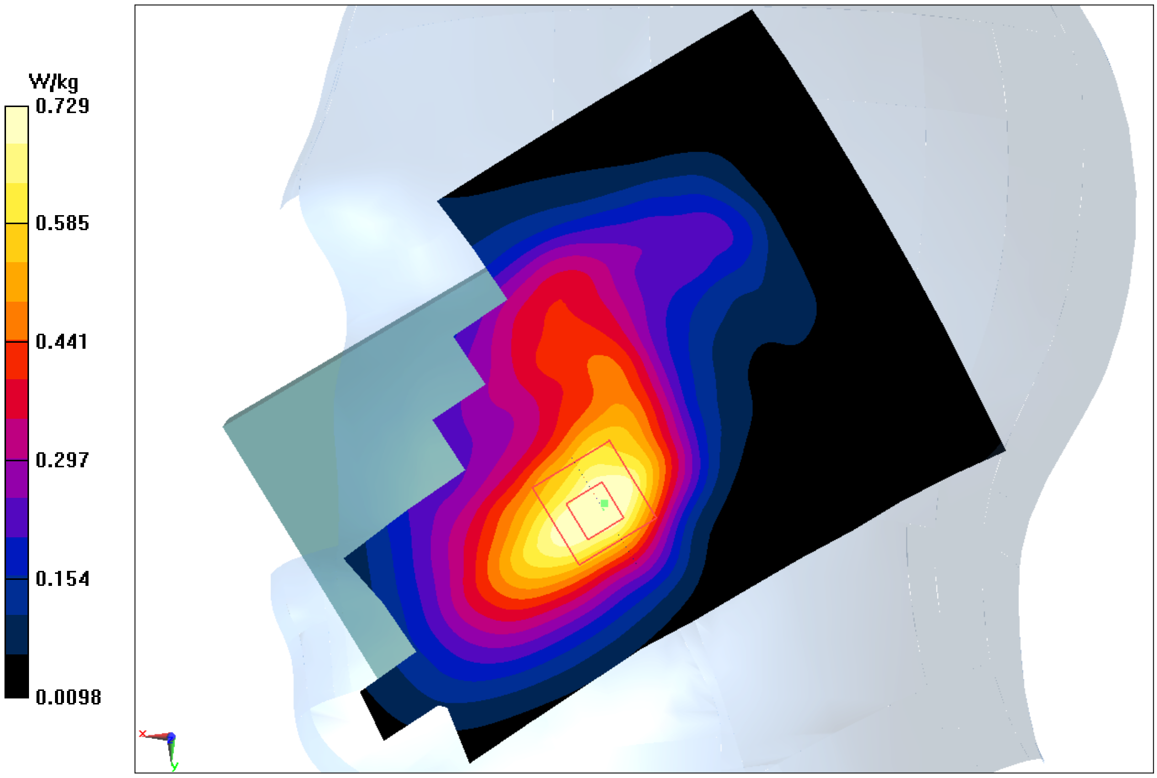


Figure A.5

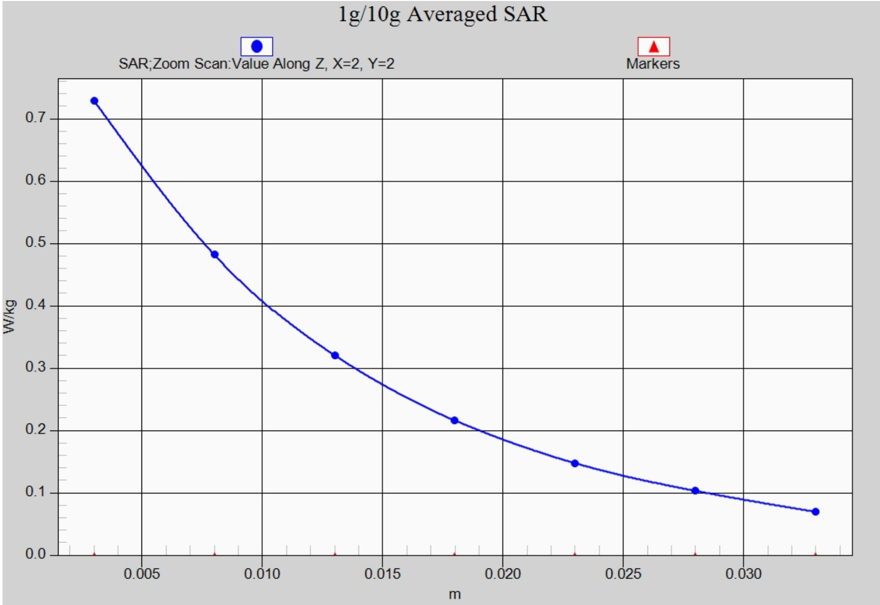


Fig. 5-1 Z-Scan at power reference point (WCDMA 1900)

WCDMA1900-BII_CH9400 Rear
Date: 2/17/2017
Electronics: DAE4 Sn1331
Medium: Body 1900 MHz
Medium parameters used: f = 1880 MHz; σ = 53.28 mho/m; εr = 1.498; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.0°C
Communication System: WCDMA1900-BII 1880 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.67,7.67,7.67)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.05 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.15 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 1.34 W/kg
SAR(1 g) = 0.891 W/kg; SAR(10 g) = 0.579 W/kg
Maximum value of SAR (measured) = 1.02 W/kg

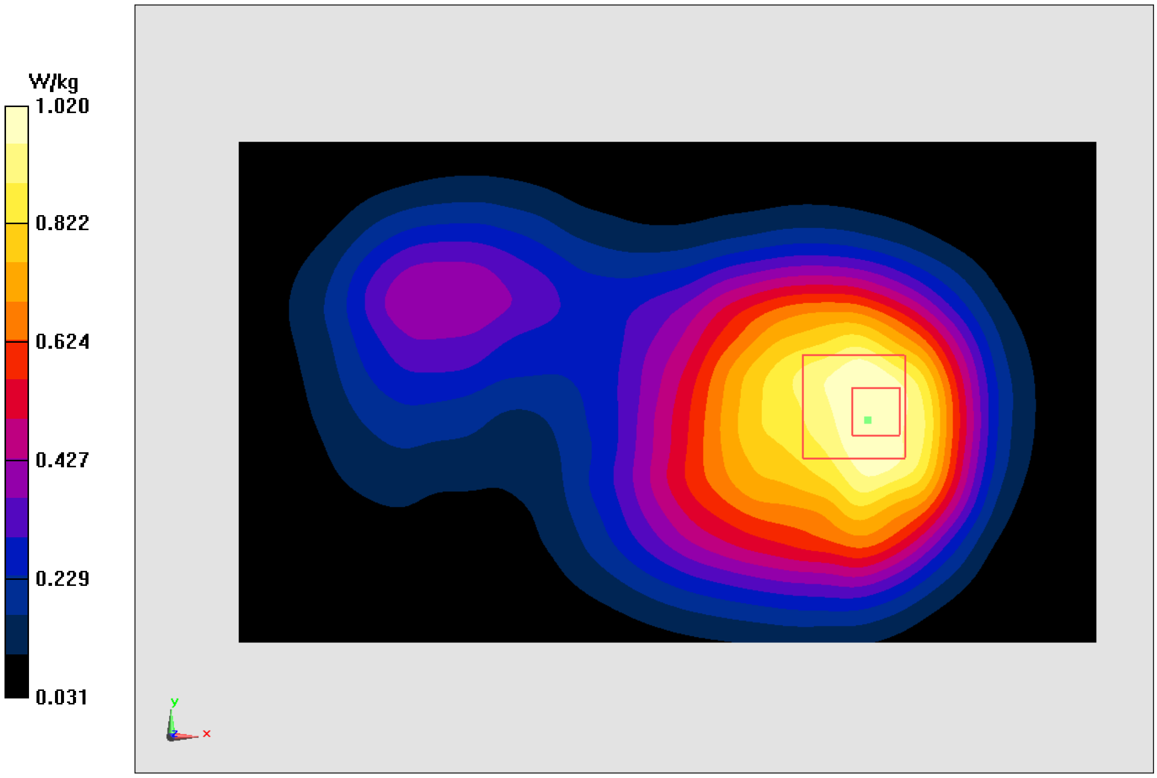


Figure A.6

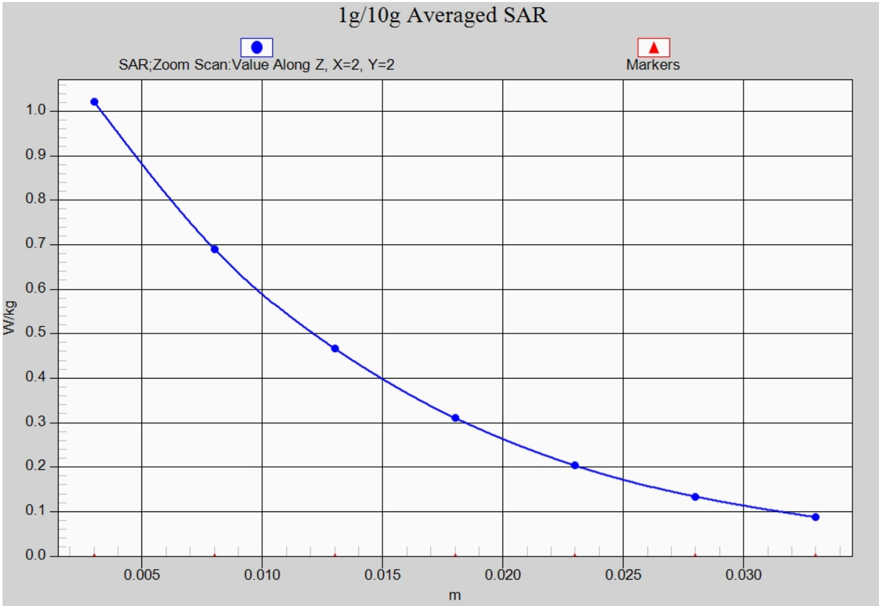


Fig. 6-1 Z-Scan at power reference point (WCDMA 1900)

WCDMA850-BV_CH4233 Left Cheek
Date: 2/15/2017
Electronics: DAE4 Sn1331
Medium: Head 835 MHz
Medium parameters used: f = 846.6 MHz; σ = 41.05 mho/m; εr = 0.916; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.0°C
Communication System: WCDMA850-BV 846.6 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(10.01,10.01,10.01)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.598 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.585 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.677 W/kg
SAR(1 g) = 0.532 W/kg; SAR(10 g) = 0.406 W/kg
Maximum value of SAR (measured) = 0.577 W/kg

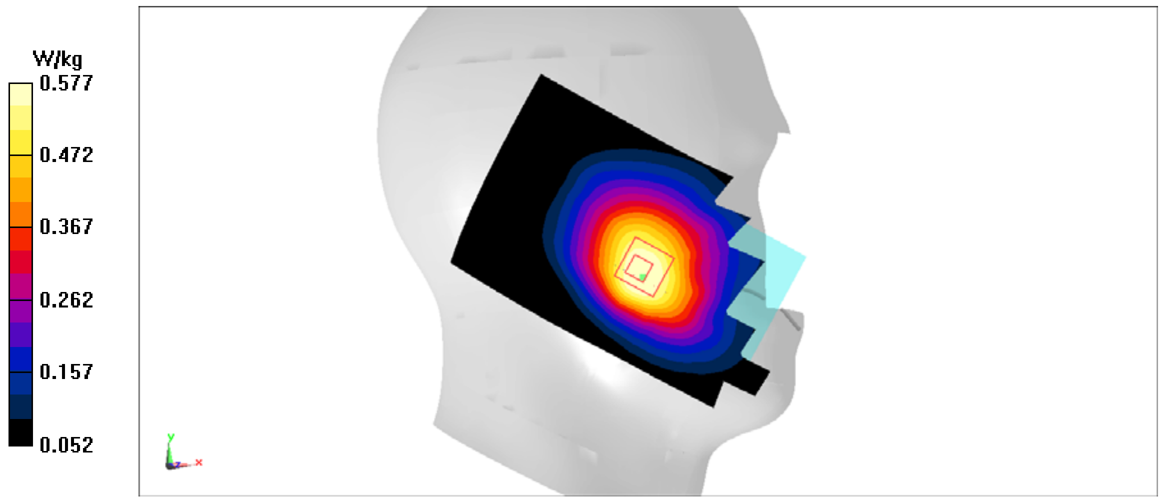


Figure A.7

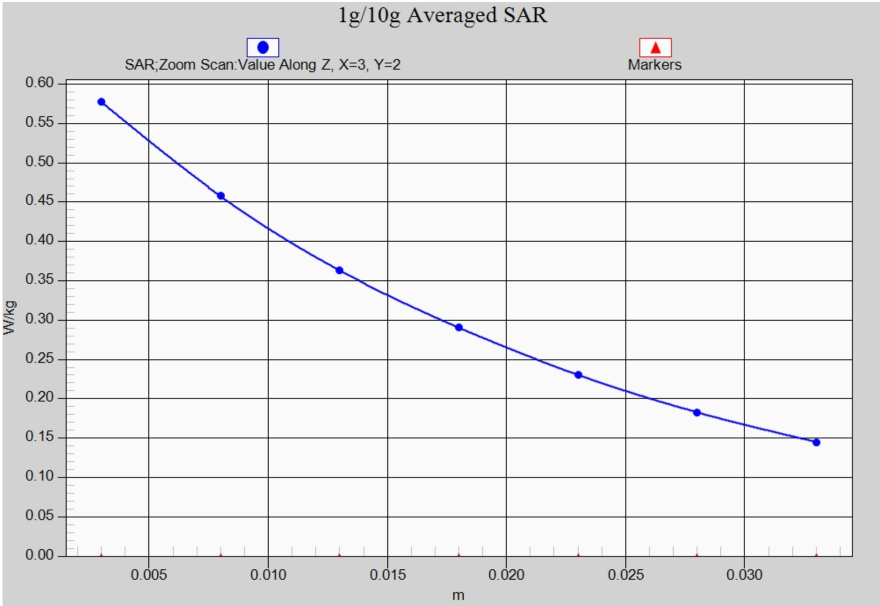


Fig. 7-1 Z-Scan at power reference point (WCDMA 850)

WCDMA850-BV_CH4233 Rear
Date: 2/15/2017
Electronics: DAE4 Sn1331
Medium: Body 835 MHz
Medium parameters used: f = 846.6 MHz; σ = 56.09 mho/m; εr = 0.987; ρ = 1000 kg/m^3
Ambient Temperature: 22.5^{o}C, Liquid Temperature: 22.0^{o}C
Communication System: WCDMA850-BV 846.6 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(9.83,9.83,9.83)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.714 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.89 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.11 W/kg
SAR(1 g) = 0.632 W/kg; SAR(10 g) = 0.354 W/kg
Maximum value of SAR (measured) = 0.774 W/kg

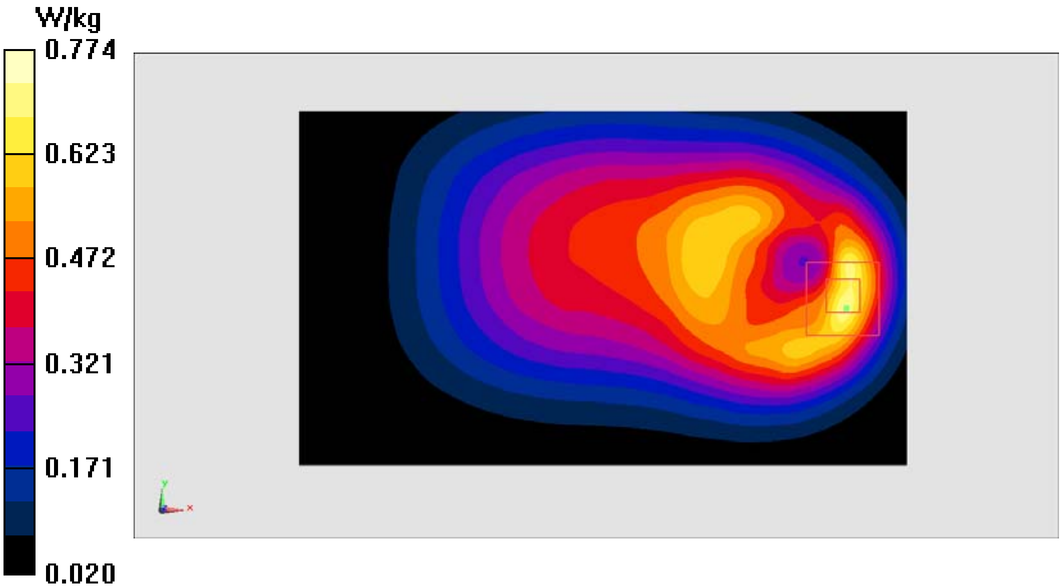


Figure A.8

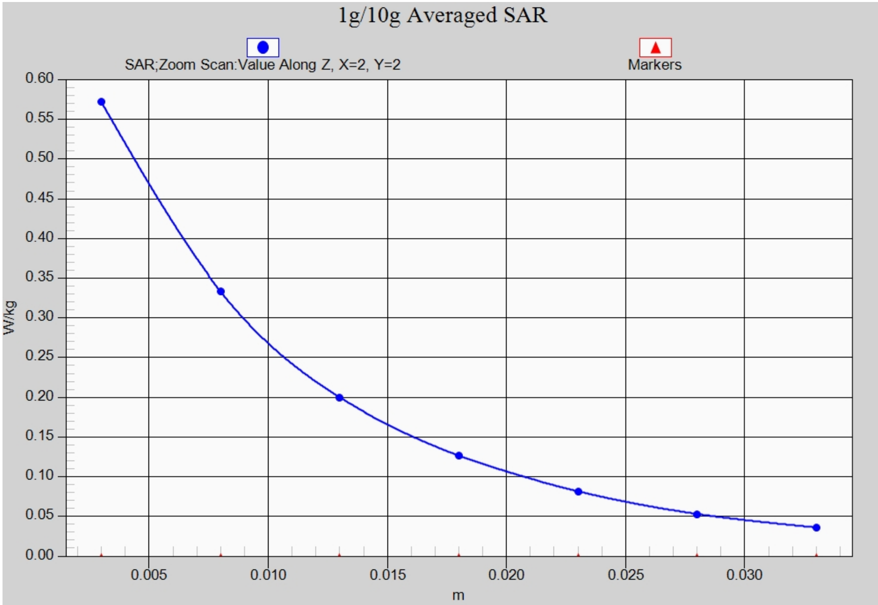


Fig. 8-1 Z-Scan at power reference point (WCDMA 850)

LTE2500-FDD7_CH20850 Right Cheek

Date: 2/14/2017

Electronics: DAE4 Sn1331

Medium: Head 2600 MHz

Medium parameters used: f = 2510 MHz; σ = 39.58 mho/m; εr = 1.924; ρ = 1000 kg/m^3

Ambient Temperature: 22.5°C, Liquid Temperature: 22.0°C

Communication System: LTE2500-FDD7 2510 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(7.21,7.21,7.21)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.58 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.805 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 2.2 W/kg
SAR(1 g) = 1.13 W/kg; SAR(10 g) = 0.588 W/kg
Maximum value of SAR (measured) = 1.43 W/kg

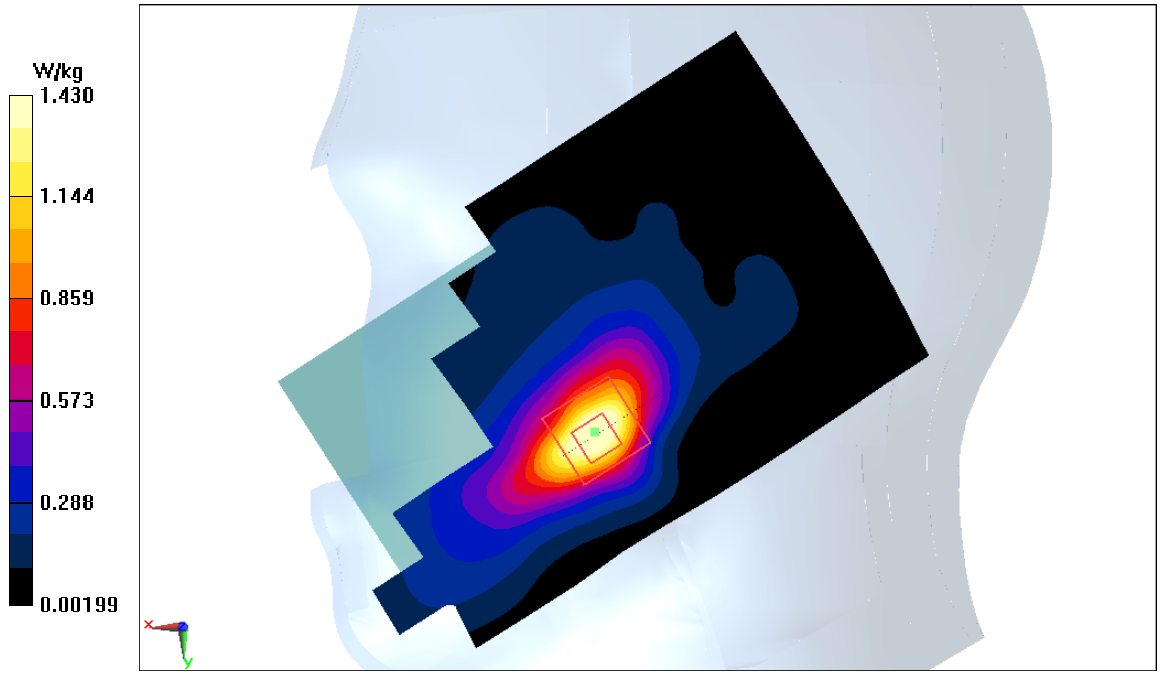


Figure A.9

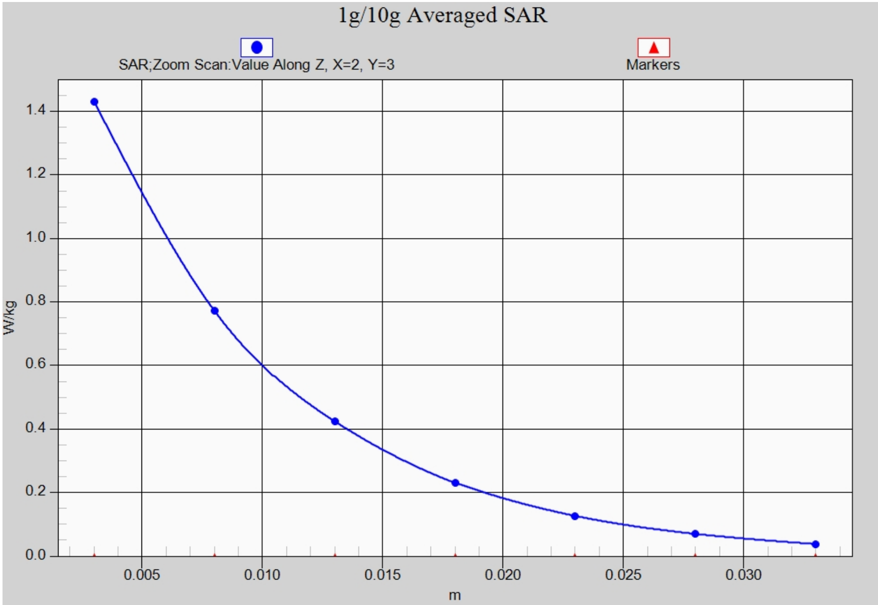


Fig. 9-1 Z-Scan at power reference point (LTE2500-FDD7)

LTE2500-FDD7_CH20850 Front
Date: 2/14/2017
Electronics: DAE4 Sn1331
Medium: Body 2600 MHz
Medium parameters used: f = 2510 MHz; σ = 51.74 mho/m; εr = 2.145; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22.0°C
Communication System: LTE2500-FDD7 2510 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.03,7.03,7.03)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.27 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.49 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.79 W/kg
SAR(1 g) = 0.939 W/kg; SAR(10 g) = 0.516 W/kg
Maximum value of SAR (measured) = 1.14 W/kg

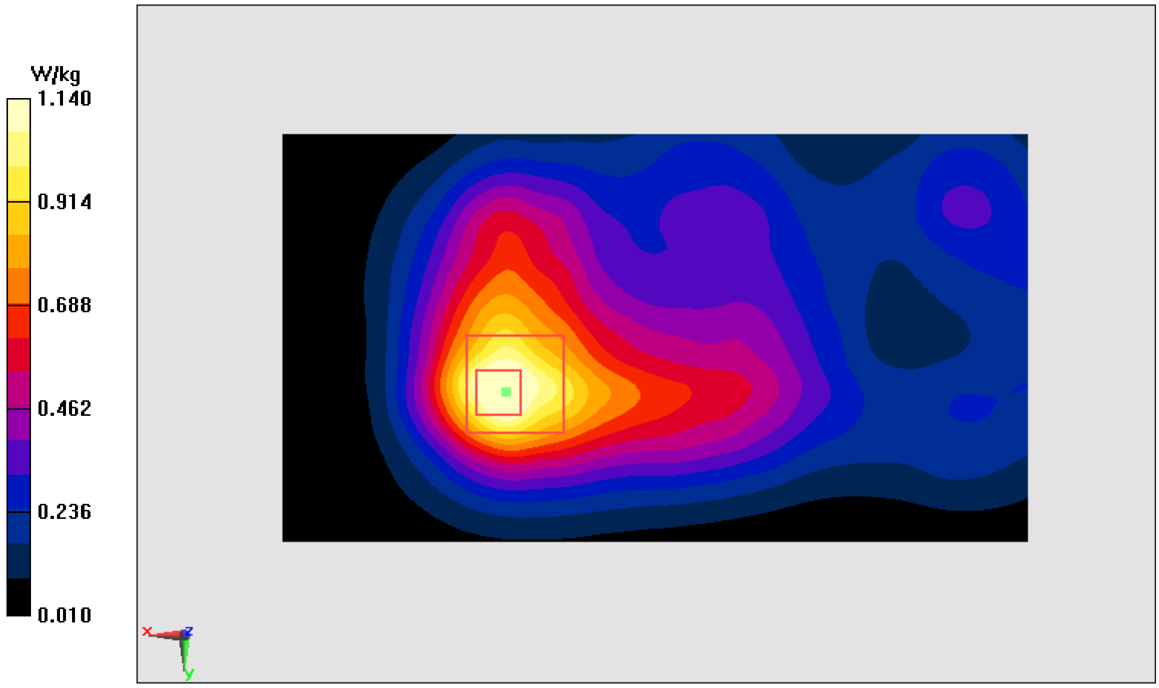


Figure A.10

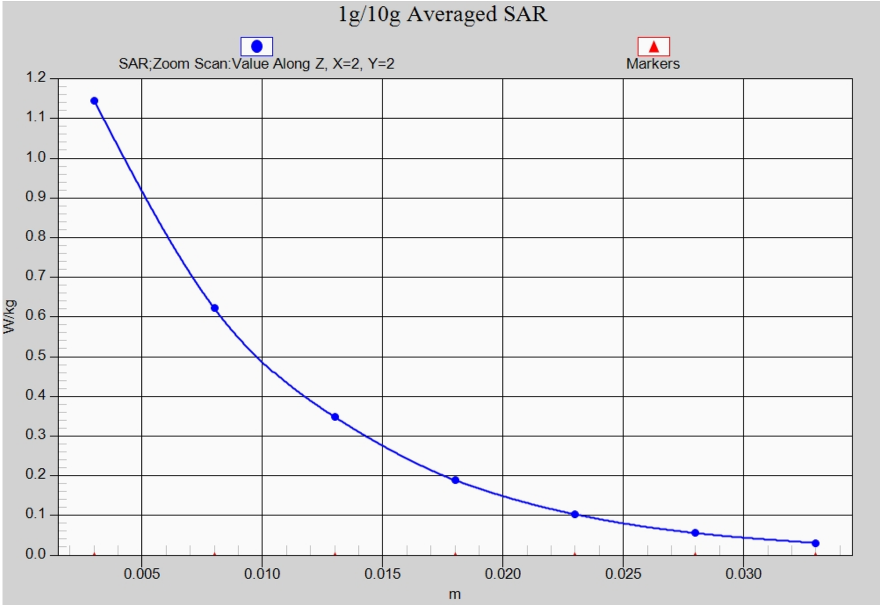


Fig. 10-1 Z-Scan at power reference point (LTE2500-FDD7)

WLAN2450_CH6 Right Cheek
Date: 2/18/2017
Electronics: DAE4 Sn1331
Medium: Head 2450 MHz
Medium parameters used: f = 2437; σ = 1.801 mho/m; εr = 39.34; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C,   Liquid Temperature: 22°C
Communication System: WLAN2450 2437 Duty Cycle: 1：1
Probe: EX3DV4 – SN7307 ConvF(7.36,7.36,7.36)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.06 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.13 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.62 W/kg
SAR(1 g) = 0.74 W/kg; SAR(10 g) = 0.327 W/kg
Maximum value of SAR (measured) = 0.988 W/kg

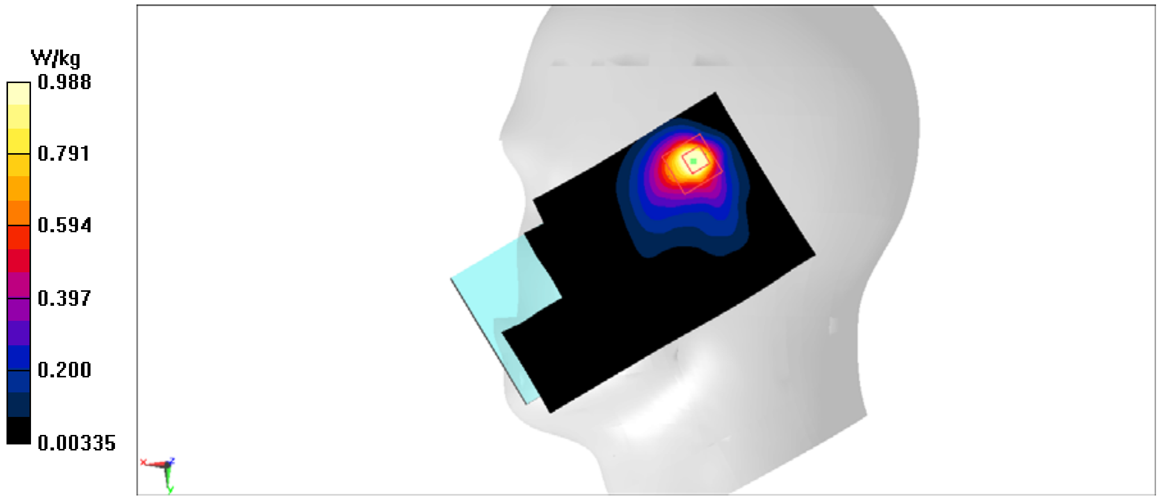


Figure A.11

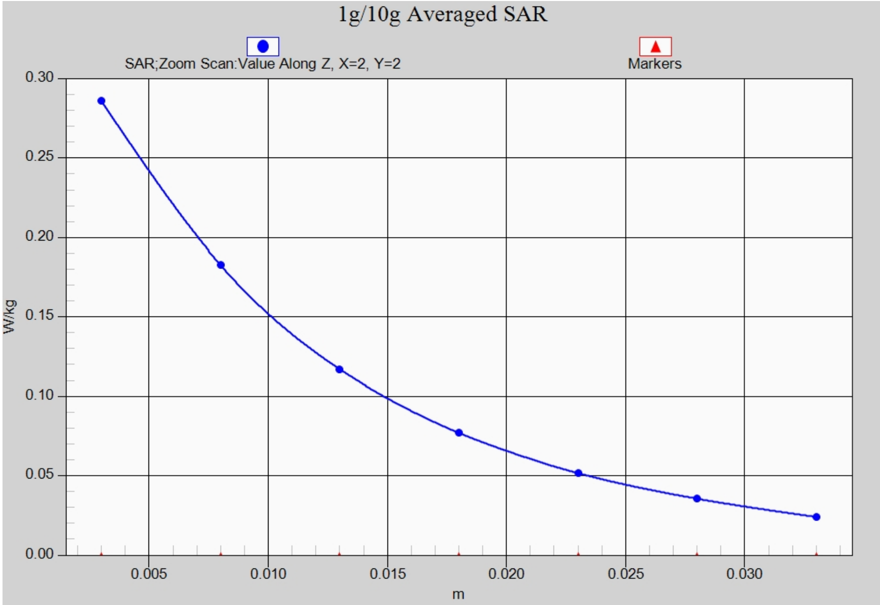


Fig. 11-1 Z-Scan at power reference point (WLAN2450)

WLAN2450_CH6 Rear
Date: 2/18/2017
Electronics: DAE4 Sn1331
Medium: Body 2450 MHz
Medium parameters used: f = 2437; σ = 1.942 mho/m; εr = 52.63; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C, Liquid Temperature: 22°C
Communication System: WLAN2450 2437 Duty Cycle: 1：1
Probe: EX3DV4 – SN7307 ConvF(7.22,7.22,7.22)

Area Scan (71x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.179 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.270 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.284 W/kg
SAR(1 g) = 0.143 W/kg; SAR(10 g) = 0.07 W/kg
Maximum value of SAR (measured) = 0.176 W/kg

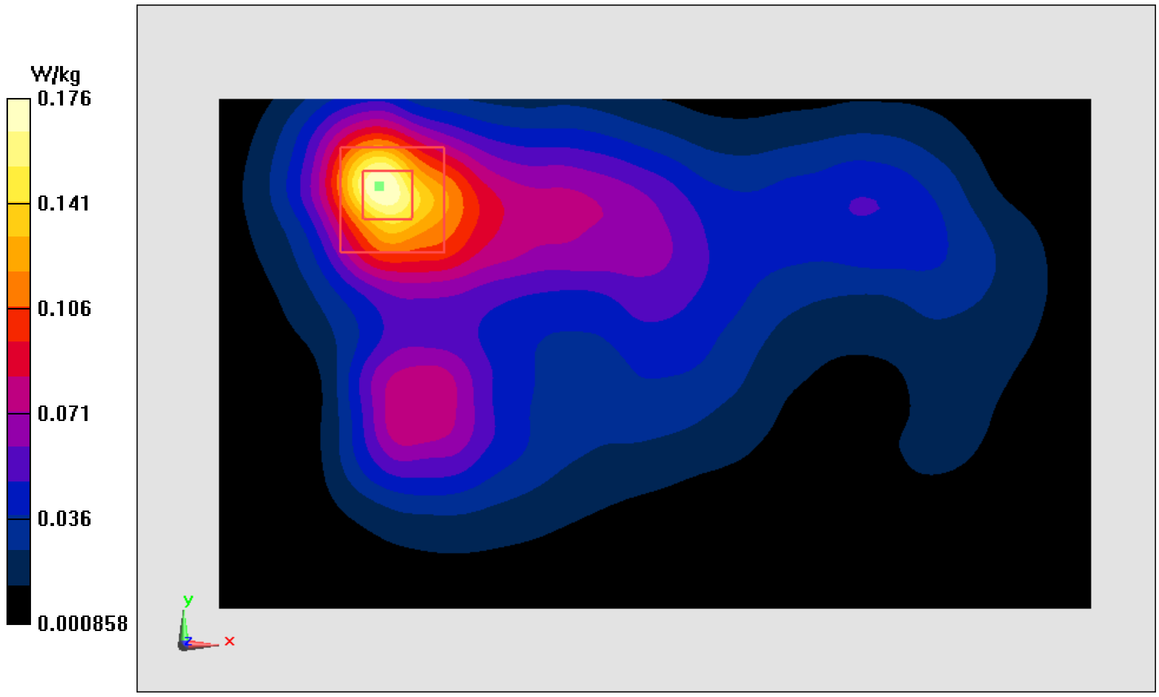


Figure A.12

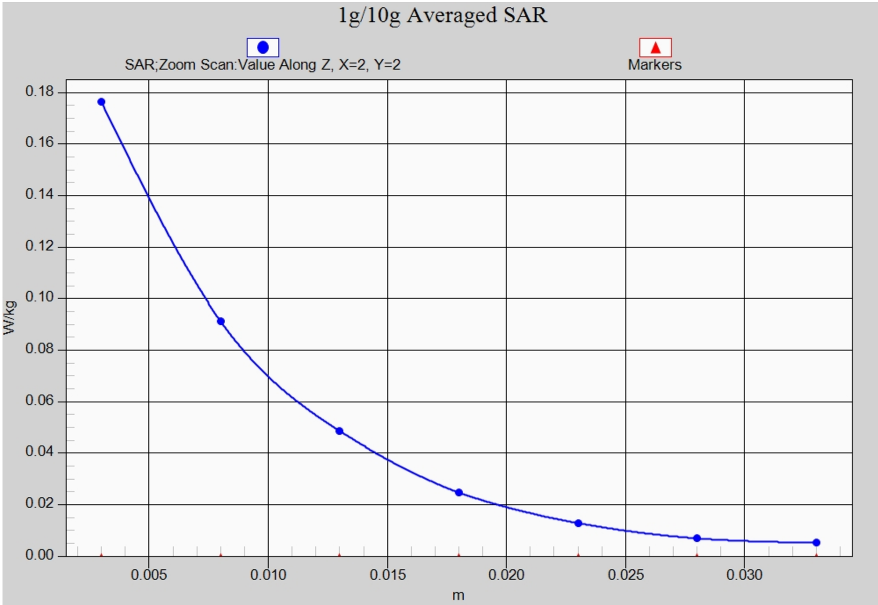


Fig. 12-1 Z-Scan at power reference point (WLAN2450)

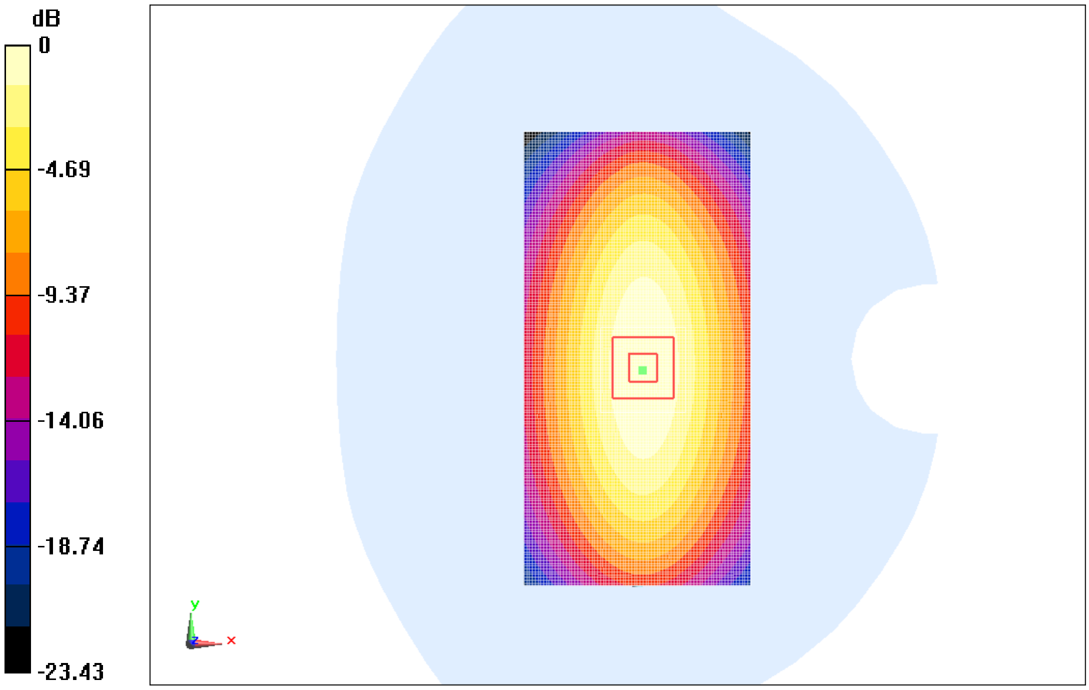
ANNEX B System Verification Results

835MHz

Date: 2017-2-15
Electronics: DAE4 Sn1331
Medium: Head 850 MHz
Medium parameters used: f = 835 MHz; σ = 0.896 S/m; ε_r = 41.26; ρ = 1000 kg/m^3
Ambient Temperature: 22.5ºC Liquid Temperature: 22.0ºC
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(10.01, 10.01, 10.01)

System Validation /Area Scan (81x161x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 53.33 V/m; Power Drift = 0.08 dB
Fast SAR: SAR(1 g) = 2.33W/kg; SAR(10 g) = 1.54 W/kg
Maximum value of SAR (interpolated) = 2.60 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.33 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 3.68 W/kg
SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.51 W/kg
Maximum value of SAR (measured) = 2.61 W/kg



0 dB = 2.61 W/kg = 4.17 dBW/kg

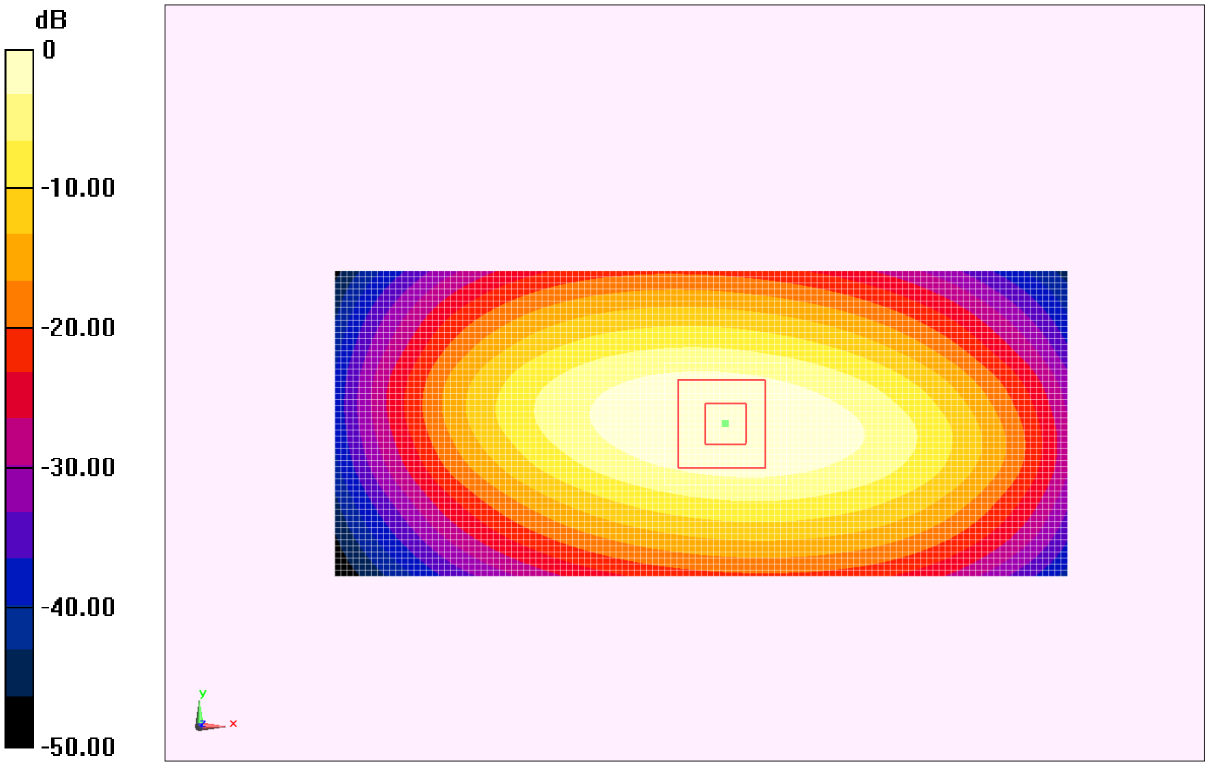
Fig.B.1 validation 835MHz 250mW

835MHz

Date: 2017-2-15
Electronics: DAE4 Sn1331
Medium: Body 850 MHz
Medium parameters used: f = 835 MHz; σ =0.961 S/m; ε_r = 56.21; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C   Liquid Temperature: 22.0°C
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(9.83, 9.83, 9.83)

System Validation /Area Scan (81x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 51.81 V/m; Power Drift = -0.01 dB
Fast SAR: SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.51 W/kg
Maximum value of SAR (interpolated) = 2.54 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.81 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.55 W/kg
SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 2.58 W/kg



0 dB = 2.58 W/kg = 4.12 dBW/kg

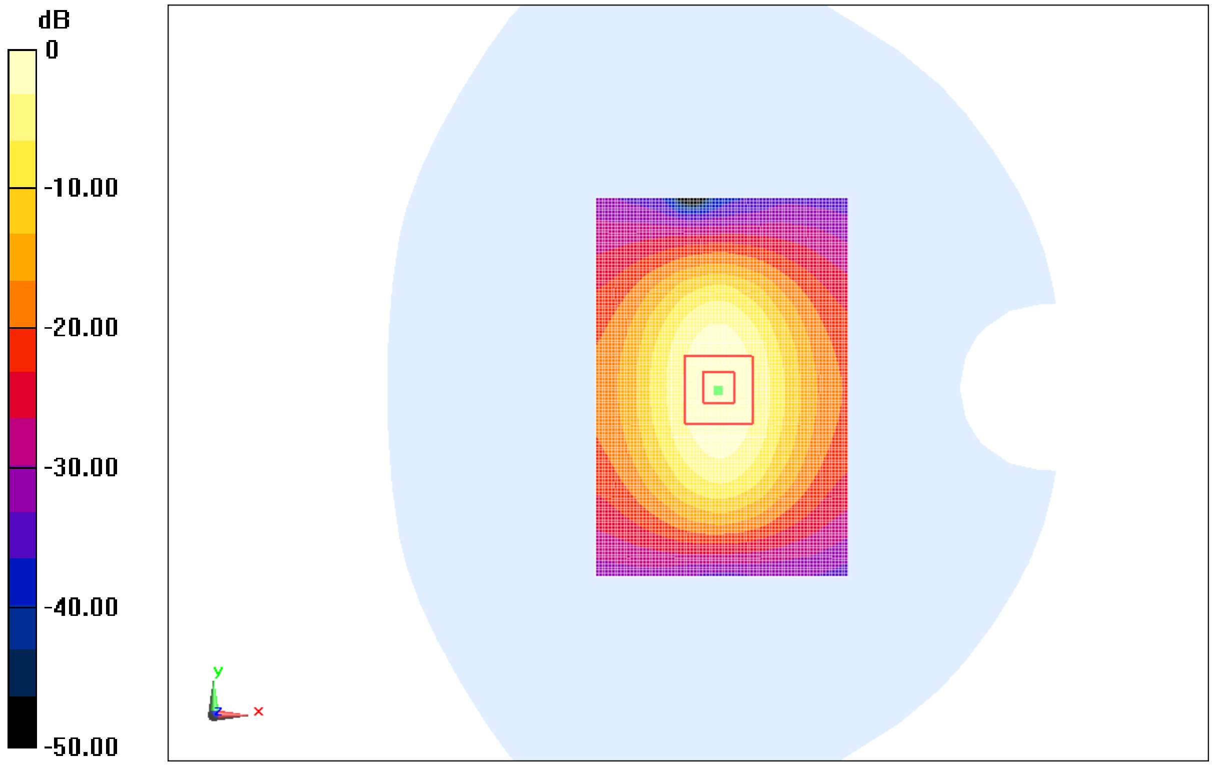
Fig.B.2 validation 835MHz 250mW

1900MHz

Date: 2017-2-17
Electronics: DAE4 Sn1331
Medium: Head 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.405 S/m; ε_r = 39.95; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN7307 ConvF(8.10, 8.10, 8.10)

System Validation /Area Scan (81x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 93.723 V/m; Power Drift = 0.05 dB
Fast SAR: SAR(1 g) = 10.43 W/kg; SAR(10 g) = 5.51 W/kg
Maximum value of SAR (interpolated) = 12.0 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.723 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 18.91 W/kg
SAR(1 g) = 10.41 W/kg; SAR(10 g) = 5.41 W/kg
Maximum value of SAR (measured) = 11.82 W/kg



0 dB = 11.82 W/kg = 10.73 dBW/kg

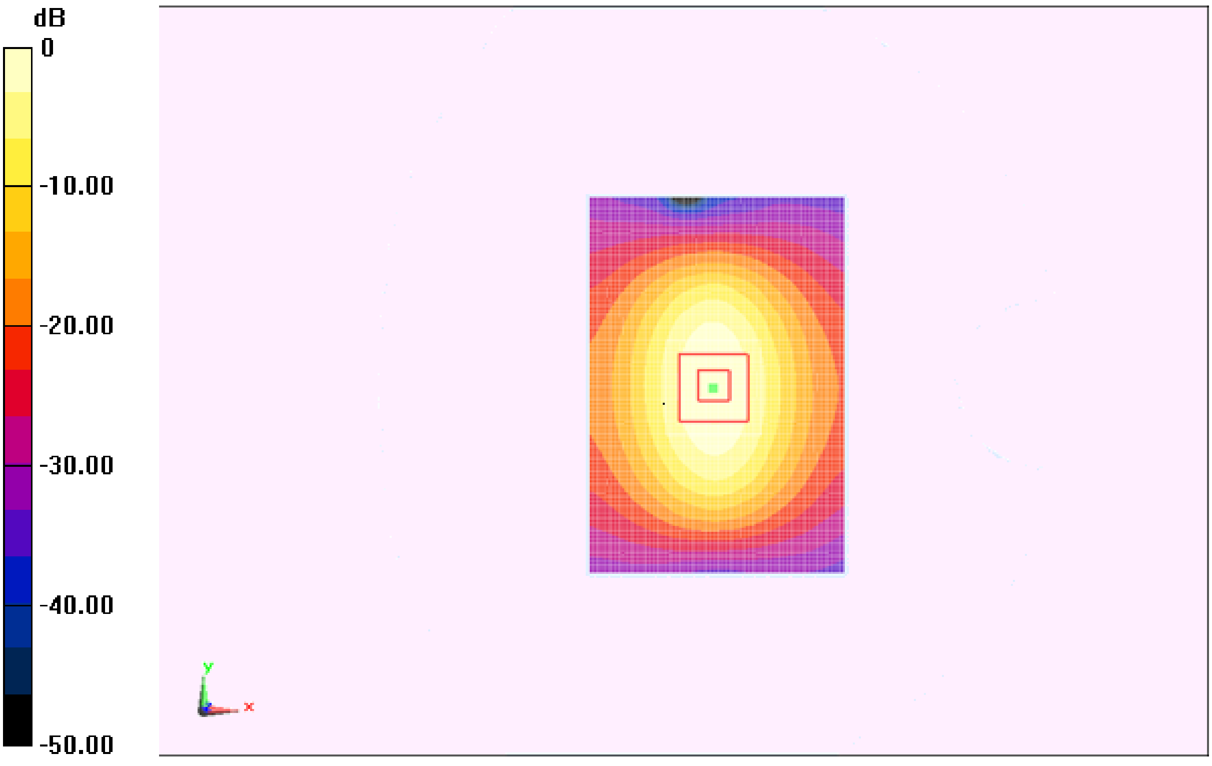
Fig.B.3 validation 1900MHz 250mW

1900MHz

Date: 2017-2-17
Electronics: DAE4 Sn1331
Medium: Body 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.511 S/m; ε_r = 53.11; ρ = 1000 kg/m^3
Ambient Temperature: 22.5ºC Liquid Temperature: 22.0ºC
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.67, 7.67, 7.67)

System validation /Area Scan (81x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 57.81 V/m; Power Drift = -0.02 dB
Fast SAR: SAR(1 g) = 10.13 W/kg; SAR(10 g) = 5.31 W/kg
Maximum value of SAR (interpolated) = 12.4 W/kg

System validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.81 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 19.01 W/kg
SAR(1 g) = 10.11 W/kg; SAR(10 g) = 5.26 W/kg
Maximum value of SAR (measured) = 12.22 W/kg



0 dB = 12.22 W/kg = 10.87 dBW/kg

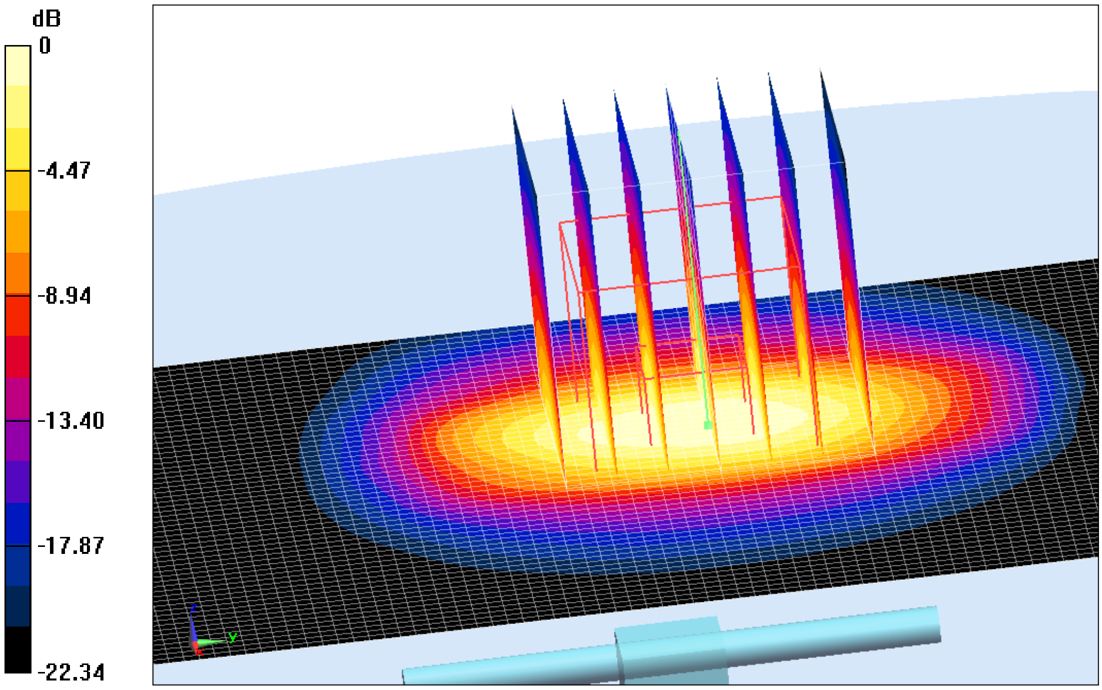
Fig.B.4 validation 1900MHz 250mW

2450MHz

Date: 2017-2-18
Electronics: DAE4 Sn1331
Medium: Head 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.835 mho/m; ε_r = 38.86; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(8.37, 8.37, 8.37)

System Validation /Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 90.13 V/m; Power Drift = -0.02 dB
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.10 W/kg
Maximum value of SAR (interpolated) = 17.1 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.13 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 27.37 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.12 W/kg
Maximum value of SAR (measured) = 16.39 W/kg



0 dB = 16.39 W/kg = 12.15 dBW/kg

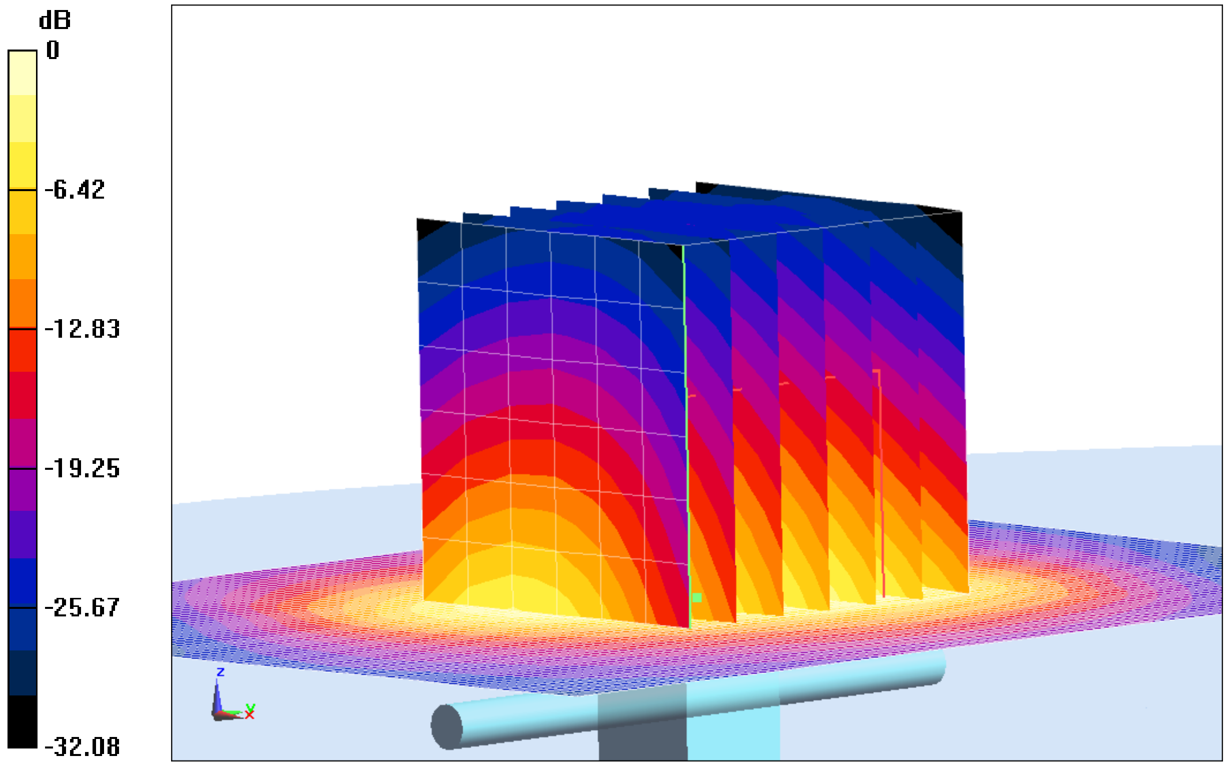
Fig.B.5 validation 2450MHz 250mW

2450MHz

Date: 2017-2-18
Electronics: DAE4 Sn1331
Medium: Body 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.989 S/m; ε_r = 51.98; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.36, 7.36, 7.36)

System Validation/Area Scan (81x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 88.921 V/m; Power Drift = 0.07 dB
SAR(1 g) = 12.6 W/kg; SAR(10 g) = 6.08 W/kg
Maximum value of SAR (interpolated) = 14.2 W/kg

System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 88.921 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 24.62 W/kg
SAR(1 g) = 12.7 W/kg; SAR(10 g) = 6.14 W/kg
Maximum value of SAR (measured) = 14.39 W/kg



0 dB = 14.39 W/kg = 11.58 dB W/kg

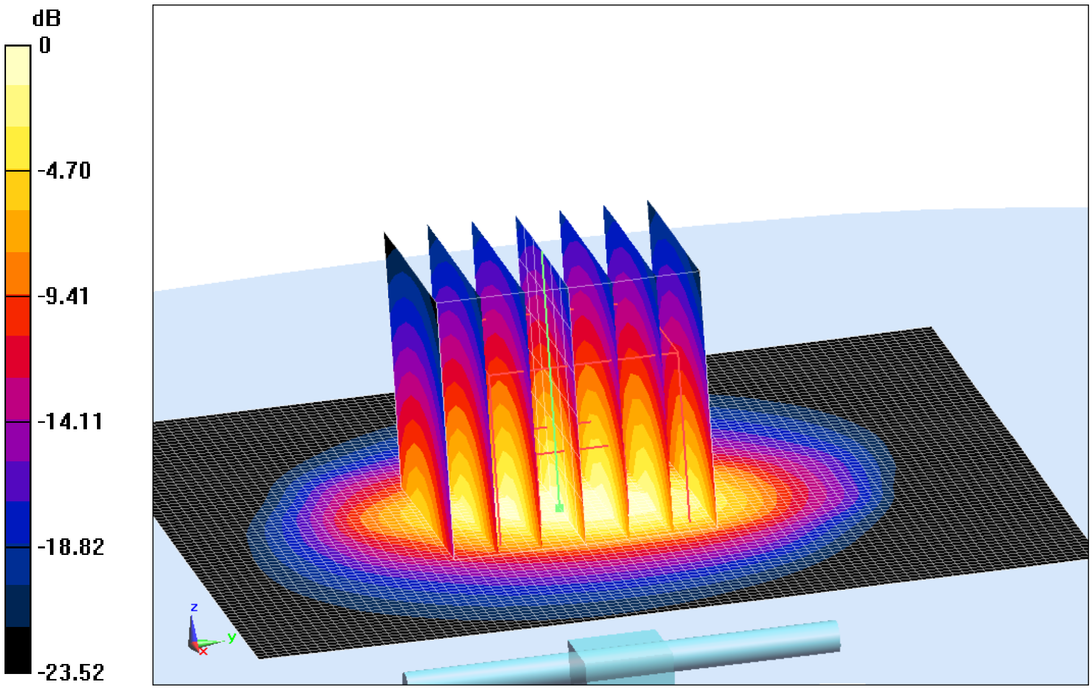
Fig.B.6 validation 2450MHz 250mW

2600MHz

Date: 2017-2-14
Electronics: DAE4 Sn1331
Medium: Head 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 1.954 mho/m; ε_r = 39.38; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 2600 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.21, 7.21, 7.21)

System Validation/Area Scan(81x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 80.404 V/m; Power Drift = 0.03 dB
SAR(1 g) = 14.2W/kg; SAR(10 g) = 6.42 W/kg
Maximum value of SAR (interpolated) = 22.6 W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 80.404 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 31.03 W/kg
SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.42 W/kg
Maximum value of SAR (measured) = 22.1 W/kg



0 dB = 22.1 W/kg = 13.44dBW/kg

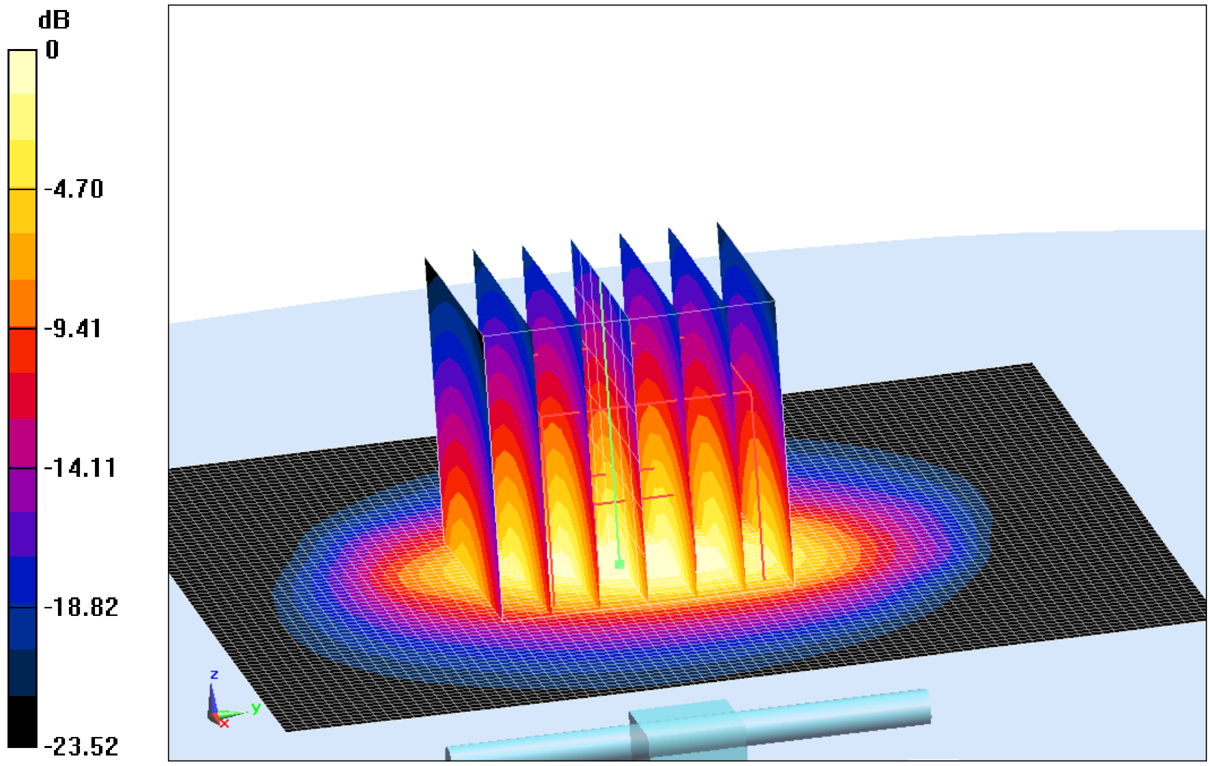
Fig.B.7 validation 2600MHz 250mW

2600MHz

Date: 2017-2-14
Electronics: DAE4 Sn1331
Medium: Body 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.185 mho/m; ε_r = 51.58; ρ = 1000 kg/m^3
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 2600 MHz Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.03, 7.03, 7.03)

System Validation /Area Scan(81x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 83.31 V/m; Power Drift = 0.05 dB
Fast SAR: SAR(1 g) = 13.6W/kg; SAR(10 g) = 6.19 W/kg
Maximum value of SAR (interpolated) = 22.5W/kg

System Validation /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 83.31 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 31.29W/kg
SAR(1 g) = 13.8W/kg; SAR(10 g) = 6.21W/kg
Maximum value of SAR (measured) = 22.5W/kg



0 dB = 22.5W/kg = 13.52 dB W/kg

Fig.B.8 validation 2600MHz 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.

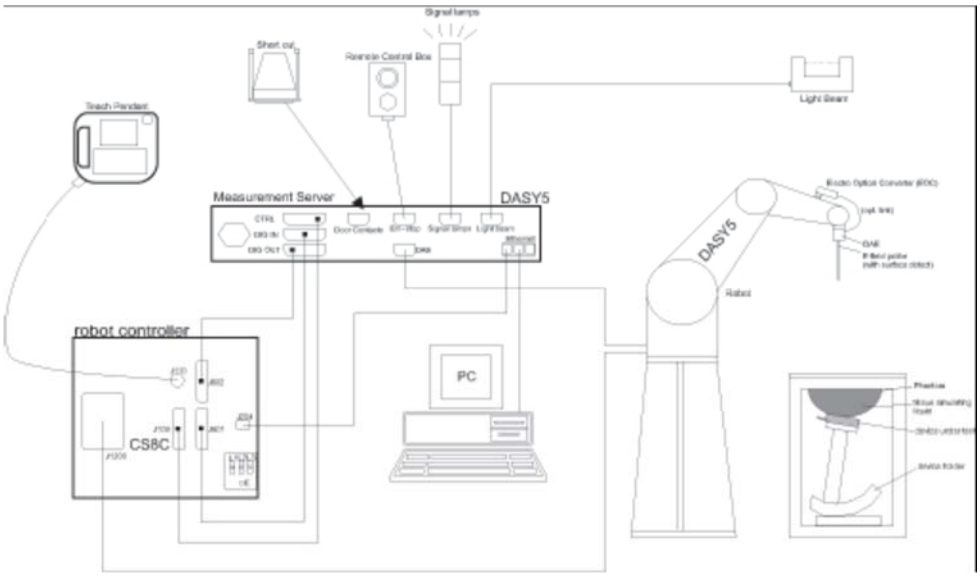
Table B.1 Comparison between area scan and zoom scan for system verification

Date	Band	Position	Area scan (1g)	Zoom scan (1g)	Drift (%)
2017-2-15	835	Head	2.33	2.38	-2.10
	835	Body	2.37	2.42	-2.07
2017-2-17	1900	Head	10.43	10.41	0.19
	1900	Body	10.13	10.11	0.20
2017-2-18	2450	Head	13.2	13.1	0.76
	2450	Body	12.6	12.7	-0.79
2017-2-14	2600	Head	14.2	14.3	-0.70
	2600	Body	13.6	13.8	-1.45

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.

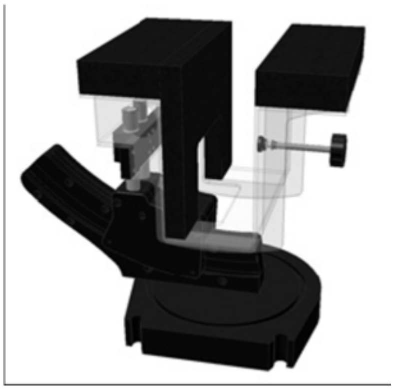
The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference 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)

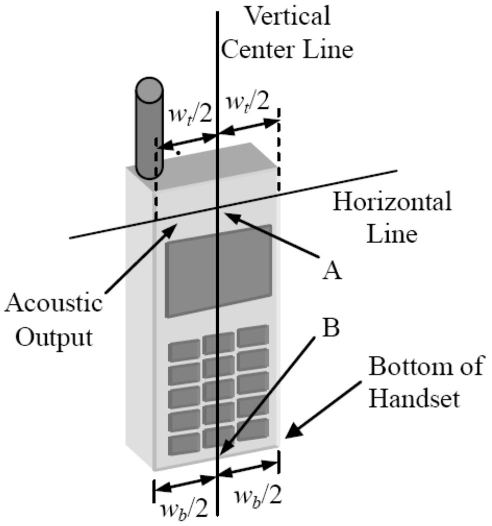
Available: Special

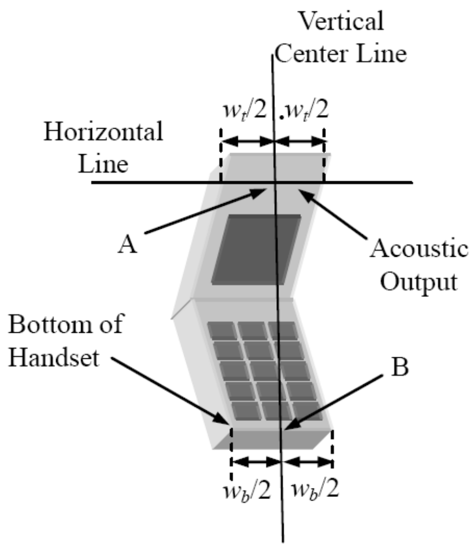
Picture C.10: SAM Twin Phantom

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

D.1 General considerations

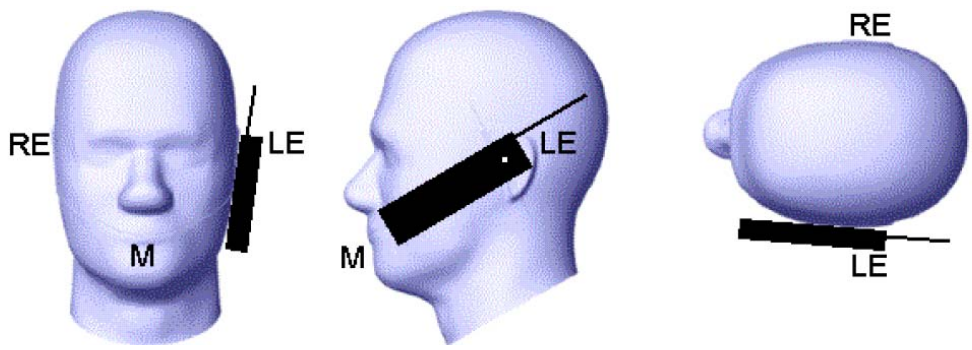
This standard specifies two handset test positions against the head phantom – the "cheek" position and the "tilt" position.





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