SAR TEST REPORT

No. I15Z41437-SEM01

For

ZTE CORPORATION

LTE/WCDMA/GSM（GPRS）Multi-Mode Digital Mobile Phone

Model Name: Blade S6 Lite、Blade S6、ZTE Blade S6、ZTE Blade S6 Lite

Marketing Name: ZTE

With

Hardware Version: wrbA

Software Version: BLADE_S_EIYV1.0.0B01

FCC ID: SRQ-BLADES6

Issued Date: 2015-7-15

TESTING
CNAS L0570

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.

Test Laboratory:

CTTL, Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT

No.52, HuayuanNorth Road, Haidian District, Beijing, P. R. China 100191.

Tel:+86(0)10-62304633-2512,Fax:+86(0)10-62304633-2504

Email:cttl_terminals@catr.cn, website:www.chinattl.com

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REPORT HISTORY

Report Number	Revision	Issue Date	Description
I15N00530-SAR	Rev.0	2015-7-15	Initial creation of test report

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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

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 10

5 TEST METHODOLOGY 11

5.1 APPLICABLE LIMIT REGULATIONS 11
5.2 APPLICABLE MEASUREMENT STANDARDS 11

6 SPECIFIC ABSORPTION RATE (SAR) 12

6.1 INTRODUCTION 12
6.2 SAR DEFINITION 12

7 TISSUE SIMULATING LIQUIDS 13

7.1 TARGETS FOR TISSUE SIMULATING LIQUID 13
7.2 DIELECTRIC PERFORMANCE 13

8 SYSTEM VERIFICATION 17

8.1 SYSTEM SETUP 17
8.2 SYSTEM VERIFICATION 18
8.3 JUSTIFICATION FOR EXTENDED SAR DIPOLE CALIBRATIONS 19

9 MEASUREMENT PROCEDURES 20

9.1 TESTS TO BE PERFORMED 20
9.2 GENERAL MEASUREMENT PROCEDURE 21
9.3 WCDMA MEASUREMENT PROCEDURES FOR SAR 22
9.4 BLUETOOTH & WI-FI MEASUREMENT PROCEDURES FOR SAR 23
9.5 SAR MEASUREMENT FOR LTE 23
9.6 POWER DRIFT 24

10 AREA SCAN BASED 1-G SAR 25

10.1 REQUIREMENT OF KDB 25

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10.2 FAST SAR ALGORITHMS 25

11 CONDUCTED OUTPUT POWER 26

11.1 MANUFACTURING TOLERANCE 26
11.2 GSM MEASUREMENT RESULT 30
11.3 WCDMA MEASUREMENT RESULT 31
11.4 LTE_FDD MEASUREMENT RESULT 32
11.5 WI-FI AND BT MEASUREMENT RESULT 42

12 SIMULTANEOUS TX SAR CONSIDERATIONS 43

12.1 INTRODUCTION 43
12.2 TRANSMIT ANTENNA SEPARATION DISTANCES 43
12.3 SAR MEASUREMENT POSITIONS 44
12.4 STANDALONE SAR TEST EXCLUSION CONSIDERATIONS 44

13 EVALUATION OF SIMULTANEOUS 45

14 SAR TEST RESULT 46

14.1 SAR RESULTS FOR FAST SAR 47
14.2 SAR RESULTS FOR STANDARD PROCEDURE 59
14.3 WLAN EVALUATION 63

15 SAR MEASUREMENT VARIABILITY 65

16 MEASUREMENT UNCERTAINTY 67

16.1 MEASUREMENT UNCERTAINTY FOR NORMAL SAR TESTS (300MHZ~3GHZ) 67
16.2 MEASUREMENT UNCERTAINTY FOR FAST SAR TESTS (300MHZ~3GHZ) 68

17 MAIN TEST INSTRUMENTS 69

ANNEX A GRAPH RESULTS 70

ANNEX B SYSTEM VERIFICATION RESULTS 106

ANNEX C SAR MEASUREMENT SETUP 117

ANNEX D POSITION OF THE WIRELESS DEVICE IN RELATION TO THE PHANTOM 123

ANNEX E EQUIVALENT MEDIA RECIPES 125

ANNEX F SYSTEM VALIDATION 127

ANNEX G PROBE CALIBRATION CERTIFICATE 128

ANNEX H DIPOLE CALIBRATION CERTIFICATE 139

ANNEX I ACCREDITATION CERTIFICATE 179

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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

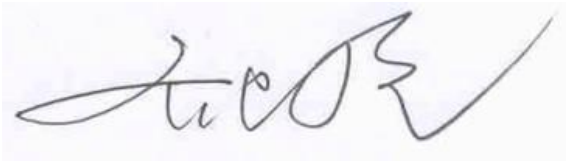
1.3 Project Data

Project Leader:	Qi Dianyuan
Test Engineer:	Lin Xiaojun
Testing Start Date:	June 10, 2015
Testing End Date:	June 26, 2015

1.4 Signature

Lin Xiaojun

(Prepared this test report)



Qi Dianyuan

(Reviewed this test report)

Xiao Li

Deputy Director of the laboratory

(Approved this test report)

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2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for ZTE CORPORATION LTE/WCDMA/GSM（GPRS）Multi-Mode Digital Mobile Phone Blade S6 Lite、Blade S6、ZTE Blade S6、ZTE Blade S6 Lite are 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	0.33	PCE
	PCS 1900	0.14	
	UMTS FDD 5	0.35	
	UMTS FDD 2	0.28	
	LTE Band 2	0.35	
	LTE Band 4	0.56	
	LTE Band 5	0.67	
	LTE Band 7	0.23	
	WLAN 2.4 GHz	0.40	DTS
Body-worn (Separation Distance 10mm)	GSM 850	0.45	PCE
	PCS 1900	0.37	
	UMTS FDD 5	0.49	
	UMTS FDD 2	**1.07**	
	LTE Band 2	0.73	
	LTE Band 4	1.00	
	LTE Band 5	0.96	
	LTE Band 7	1.06	
	WLAN 2.4 GHz	0.08	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 C95.1-1999.

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**: 1.07W/kg (1g).**

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

	Position	Main antenna	WiFi	Sum
Highest reported SAR value for Head	Left hand, Touch cheek	0.67	0.25	0.92
	Right hand, Touch cheek	0.61	0.40	1.01
Highest reported SAR value for Body	Rear	1.07	0.08	**1.15**

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	Left hand, Touch cheek	0.67	0.21	0.88
	Right hand, Touch cheek	0.61	0.21	0.82
Highest reported SAR value for Body	Rear	1.07	0.10	**1.17**

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

According to the above tables, the highest sum of reported SAR values is **1.17 W/kg (1g)**. The detail for simultaneous transmission consideration is described in chapter 13.

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3 Client Information

3.1 Applicant Information

Company Name:	ZTE CORPORATION
Address /Post:	ZTE Plaza, Keji Road South, Shenzhen, China
Contact:	Min Zhang
Email:	zhang.min13@zte.com.cn
Telephone:	+86 18616587757
Fax:	+86 021 50801070

3.2 Manufacturer Information

Company Name:	ZTE CORPORATION
Address /Post:	ZTE Plaza, Keji Road South, Shenzhen, China
Contact:	Min Zhang
Email:	zhang.min13@zte.com.cn
Telephone:	+86 18616587757
Fax:	+86 021 50801070

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

4.1 About EUT

Description:	LTE/WCDMA/GSM（GPRS）Multi-Mode Digital Mobile Phone
Model Name:	Blade S6 Lite、Blade S6、ZTE Blade S6、ZTE Blade S6 Lite
Operating mode(s):	GSM 850/900/1800/1900, WCDMA 850/1900, LTE_FDD Band 2/4/5/7, BT, Wi-Fi
Tested Tx Frequency:	825 – 848.8 MHz (GSM 850)
	1850.2 – 1910 MHz (GSM 1900)
	826.4–846.6 MHz (WCDMA850 Band V)
	1852.4–1907.6 MHz (WCDMA1900 Band II)
	1860–1900(LTE_FDD Band II)
	1720–1745(LTE_FDD Band IV)
	829–844(LTE_FDD Band V)
	2510–2560(LTE_FDD Band VII)
	2412 – 2462 MHz (Wi-Fi 2.4G)
GPRS&EGPRS Multislot Class:	33；
GPRS capability Class:	B
WCDMA Category:	HSDPA: 11
	HSUPA: 6
	DC-HSDPA: 42
Release Version:	GSM: R99
	GPRS: R99
	UMTS: R8
Test device Production information:	Production unit
Device type:	Portable device
Antenna type:	Integrated antenna
Accessories/Body-worn configurations:	Headset
Hotspot mode:	Support simultaneous transmission of hotspot and voice(or data)
Form factor:	143mm × 72 mm

4.2 Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	IMEI:866504022491694	wrbA	BLADE_S_EIYV1.0.0B01
EUT2	IMEI:866504022491603	wrbA	BLADE_S_EIYV1.0.0B01

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

Note: It is performed to test SAR with the EUT1 and conducted power with the EUT 2

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4.3 Internal Identification of AE used during the test

AE ID*	Description	Model	SN	Manufacturer
AE1	Battery	Li3824T43P6hA542 36-H	/	/
AE2	Headset	HMZ17-CTIA-3.5	/	/

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

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5 TEST METHODOLOGY

5.1 Applicable Limit Regulations

ANSI C95.1–1999: 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: Experimental Techniques.

KDB447498 D01: General RF Exposure Guidance v05r02: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

KDB648474 D04 Handset SAR v01r02: SAR Evaluation Considerations for Wireless Handsets.

KDB941225 D06 Hotspot Mode SAR v01r01: SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

KDB248227 D01 802.11 Wi-Fi SAR v02r01 : SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters.

KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03: SAR Measurement Requirements for 100 MHz to 6 GHz.

KDB 865664 D02 RF Exposure Reporting v01r01: RF Exposure Compliance Reporting and Documentation Considerations

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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.

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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
900	Head	41.50	39.4～43.6	0.97	0.92～1.02
900	Body	55.00	52.4～58.0	1.05	0.92～1.02
1800	Head	40.00	38.0～42.0	1.4	1.33～1.47
1800	Body	53.50	50.8～56.2	1.52	1.40～1.60
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	37.1～41.0
2600	Body	2.16	2.05～2.27	52.5	49.8～55.1

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 (%)
2015-6-10	Head	835 MHz	41.32	-0.43	0.93	3.33
2015-6-11	Body	835 MHz	53.49	-3.10	0.97	0.00
2015-6-15	Head	1800 MHz	40.82	2.05	1.36	-2.86
2015-6-22	Body	1800 MHz	53.32	0.04	1.52	0.00
2015-6-18	Head	1900 MHz	40.44	1.10	1.44	2.86
2015-6-19	Body	1900 MHz	50.79	-4.71	1.54	1.32
2015-6-26	Head	2450 MHz	39.33	0.33	1.88	4.44
2015-6-26	Body	2450 MHz	51.28	-2.69	1.98	1.54
2015-6-25	Head	2600 MHz	38.06	-2.41	2.00	2.04
2015-6-26	Body	2600 MHz	50.83	-3.18	2.16	0.00

Note: The liquid temperature is 22.0 ^{o}C

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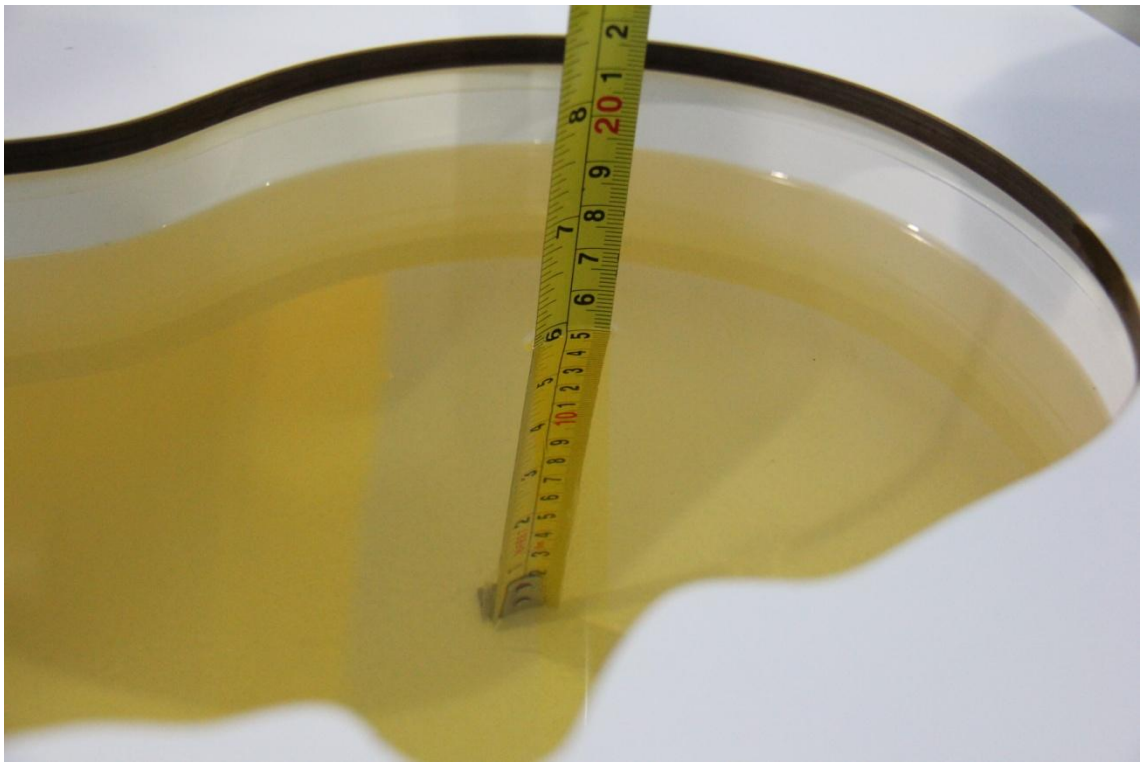
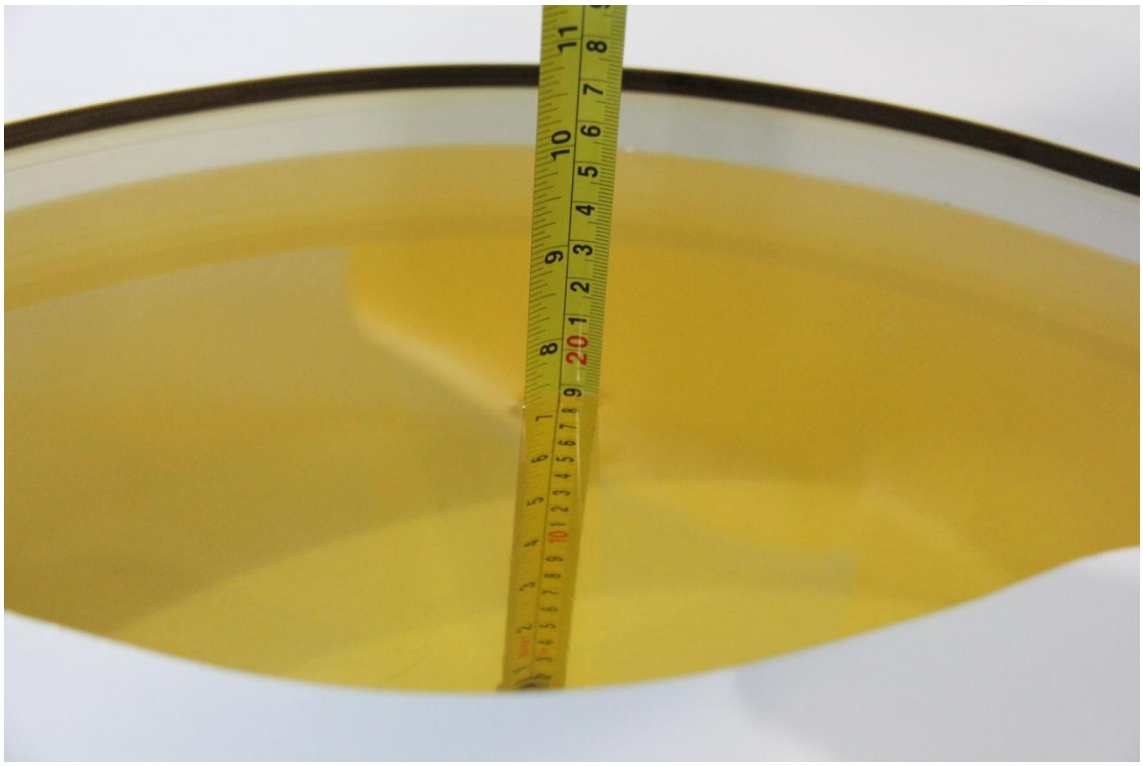


Picture 7-1: Liquid depth in the Head Phantom (835 MHz)



Picture 7-2: Liquid depth in the Flat Phantom (900 MHz)

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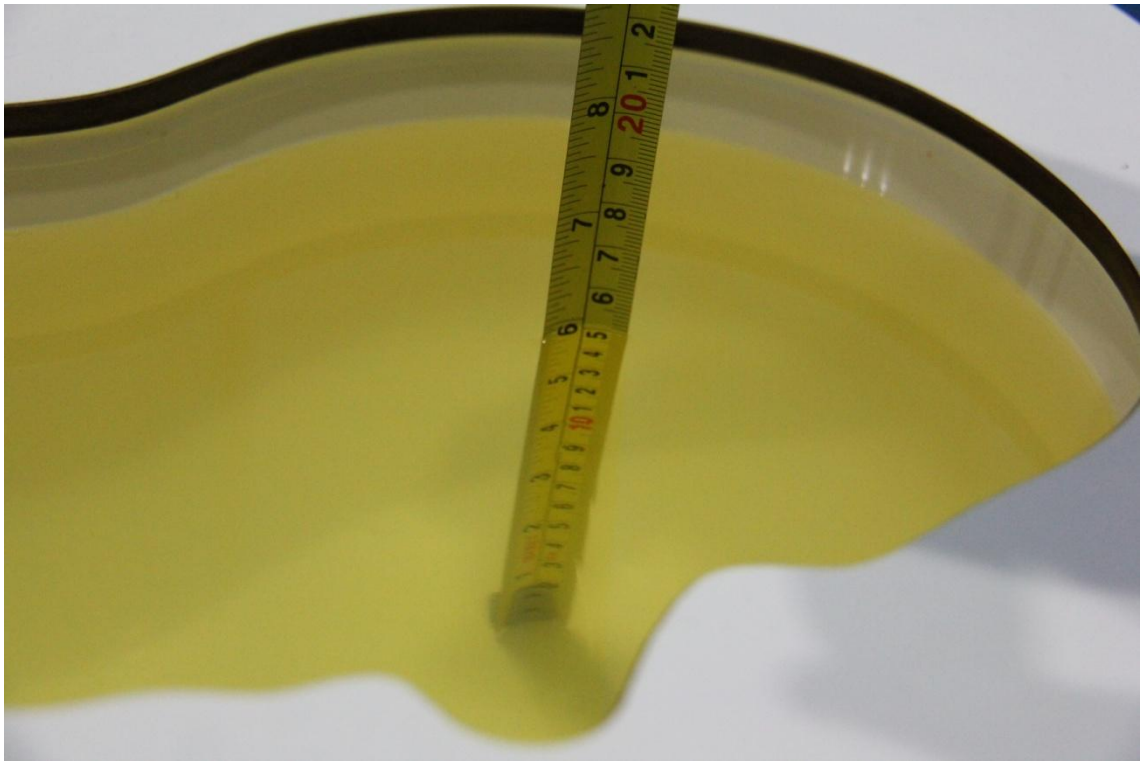
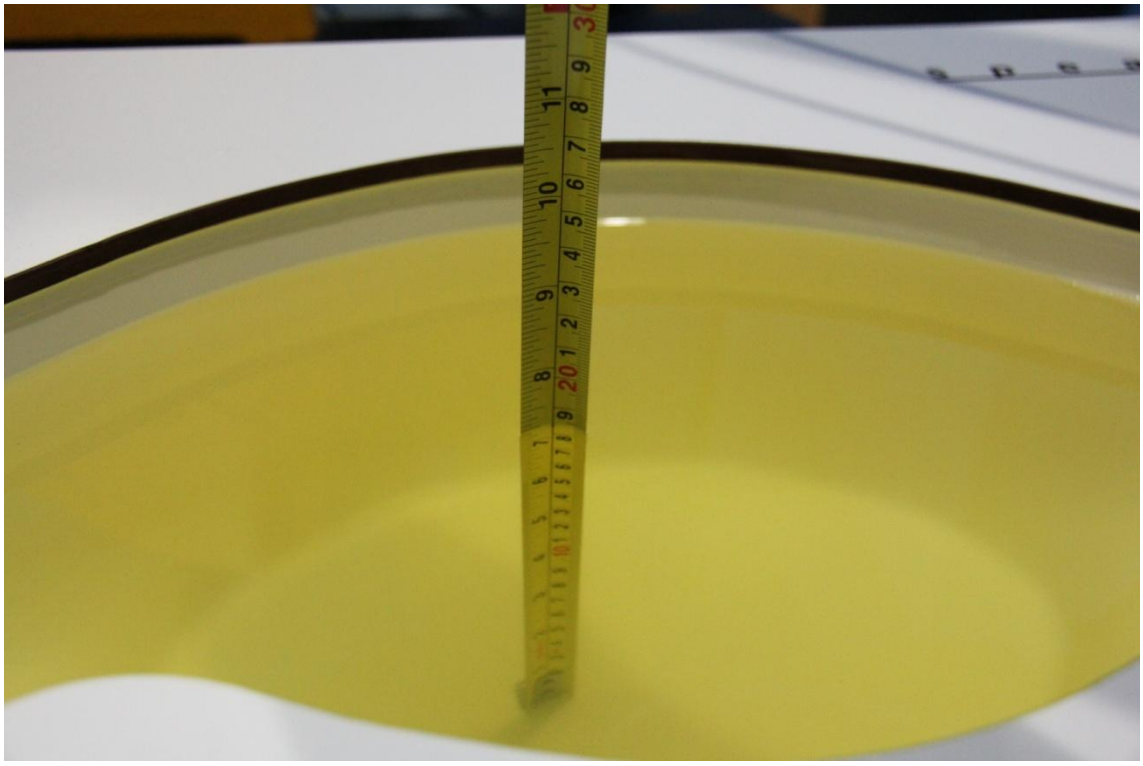


Picture 7-3: Liquid depth in the Head Phantom (1800 MHz)



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

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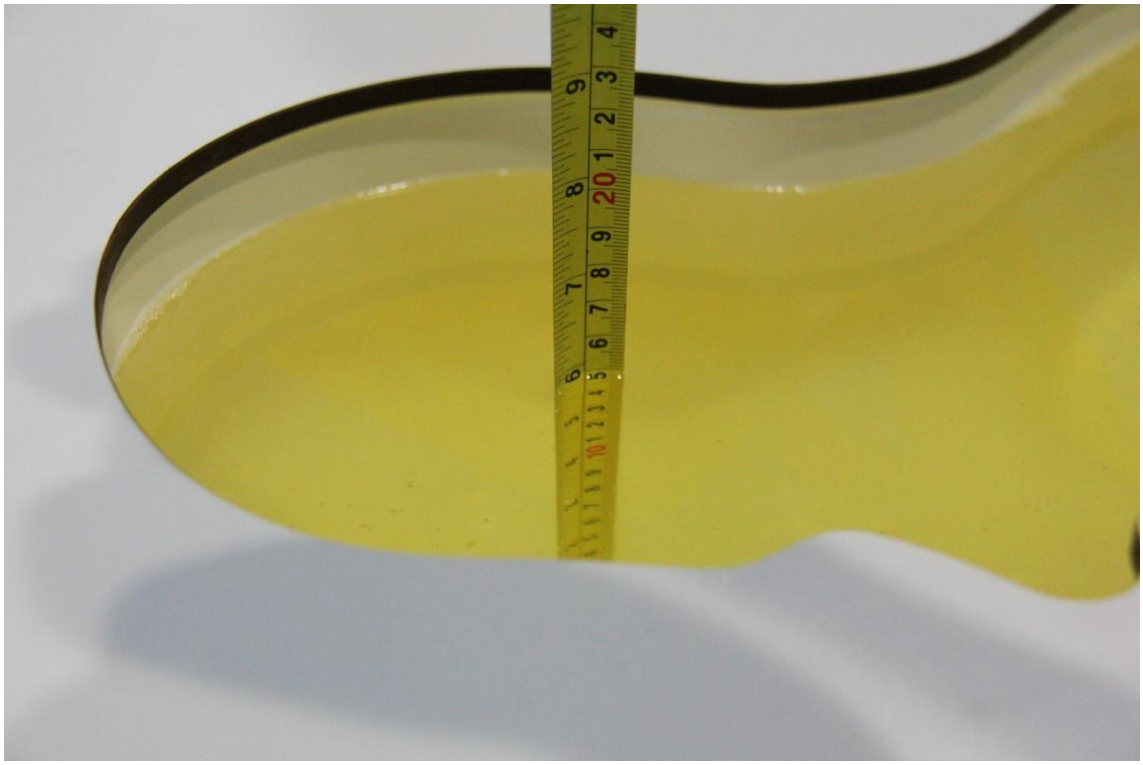
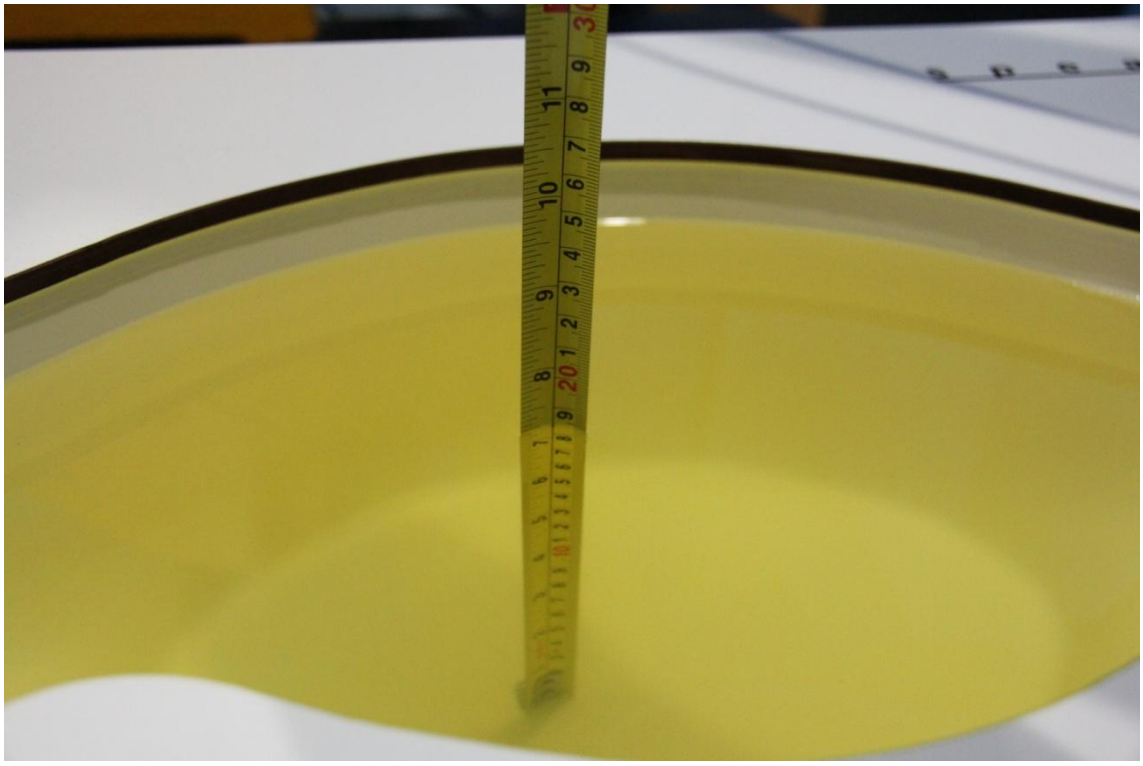


Picture 7-5: Liquid depth in the Head Phantom (2450MHz)



Picture 7-6: Liquid depth in the Flat Phantom (2550MHz)

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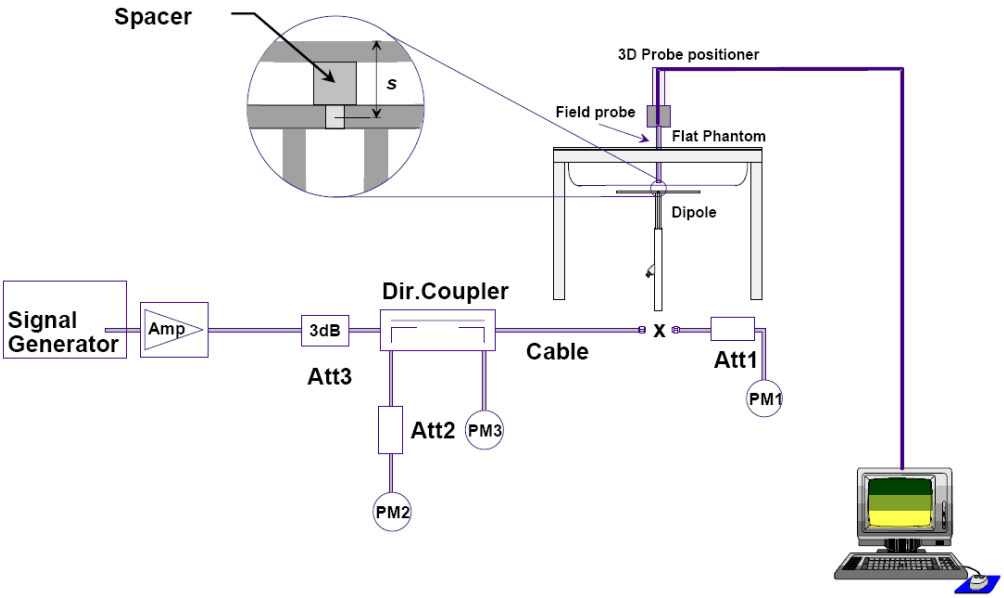
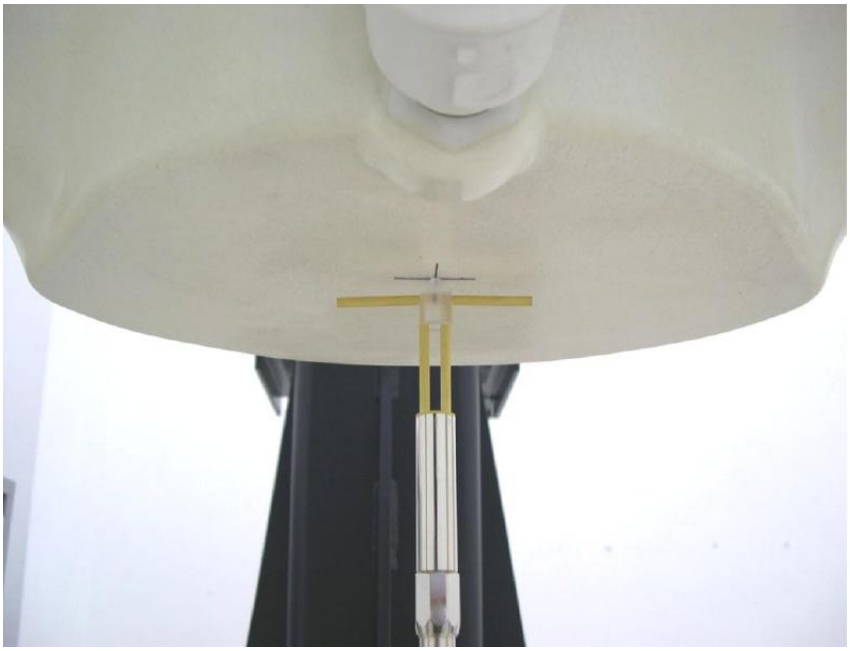
8 System verification

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

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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
2015-6-10	835 MHz	6.2	9.5	6.28	9.76	1.29%	2.74%
2015-6-15	1800 MHz	20.4	38.4	20.36	37.8	-0.20%	-1.56%
2015-6-18	1900 MHz	20.9	40.5	20.52	39.72	-1.82%	-1.93%
2015-6-26	2450 MHz	25.3	53.7	25.24	55.2	-0.24%	2.79%
2015-6-25	2550 MHz	26.0	57.2	26.08	59.2	0.31%	3.50%

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
2015-6-11	835 MHz	6.4	9.5	6.4	9.8	0.00%	3.16%
2015-6-22	1800 MHz	21.1	40.3	20.6	39.6	-2.37%	-1.74%
2015-6-19	1900 MHz	21.5	41.1	22.24	41.28	3.44%	0.44%
2015-6-26	2450 MHz	24.5	52.0	25.32	53.92	3.35%	3.69%
2015-6-26	2550 MHz	24.4	54.1	24.08	54.4	-1.31%	0.55%

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8.3 Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 2 years ago but more than 1 year ago were confirmed in maintaining return loss (< - 20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB 865664 D01:

Dipole D2550V2 SN: 1010				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
4/29/2014	-29.3	/	53.2	/
1/23/2015	-28.2	3.7	51.5	1.7
Body Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
4/29/2014	-29.1	/	49.9	/
2/5/2015	-28.6	1.7	48.5	1.3

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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 centre 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.

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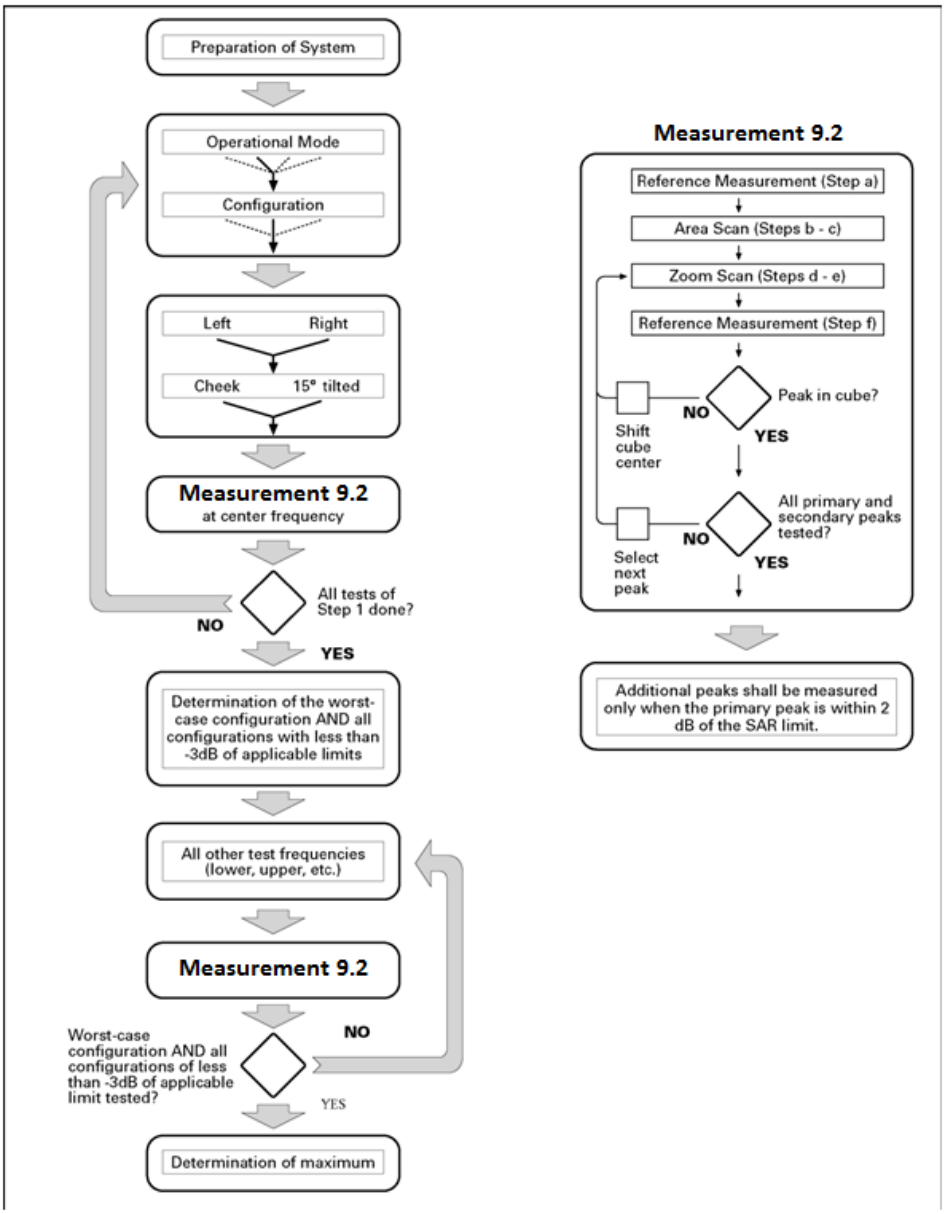

Picture 9.1 Block diagram of the tests to be performed

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

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when all the measurement parameters in the following table are not satisfied.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

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 *reported* 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.

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.

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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	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	12/15	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 β_{ed2}:47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	4/15	56/75	4	1	3.0	2.0	17	71
5	15/15	15/15	64	15/15	24/15	30/15	134/15	4	1	1.0	0.0	21	81

9.4 Bluetooth & Wi-Fi Measurement Procedures for SAR

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

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

9.5 SAR Measurement for LTE

SAR tests for LTE are performed with a base station simulator, Anristu MT8820C. Closed loop power control was used so the UE transmits with maximum output power during SAR testing.All powers were measured with the Anristu MT8820C.It is performed for conducted power and SAR based on the KDB941225 D05.

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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 Table 14.2 to Table 14.25 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

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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.

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11 Conducted Output Power

11.1 Manufacturing tolerance

Table 11.1: GSM Speech

GSM 850			
Channel	Channel 251	Channel 190	Channel 128
Target (dBm)	32	32	32
Tolerance ±(dB)	1	1	1
GSM 1900			
Channel	Channel 810	Channel 661	Channel 512
Target (dBm)	30	30	30
Tolerance ±(dB)	1	1	1

Table 11.2: GPRS and EGPRS

GSM 850 GPRS&EGPRS (GMSK)				
Channel		**251**	**190**	**128**
1 Txslot	Target (dBm)	32	32	32
	Tolerance ±(dB)	1	1	1
2 Txslots	Target (dBm)	30	30	30
	Tolerance ±(dB)	1	1	1
3Txslots	Target (dBm)	27	27	27
	Tolerance ±(dB)	1	1	1
4 Txslots	Target (dBm)	26	26	26
	Tolerance ±(dB)	1	1	1
GSM 1900 GPRS&EGPRS (GMSK)				
Channel		**810**	**661**	**512**
1 Txslot	Target (dBm)	30	30	30
	Tolerance ±(dB)	1	1	1
2 Txslots	Target (dBm)	27	27	27
	Tolerance ±(dB)	1	1	1
3Txslots	Target (dBm)	25	25	25
	Tolerance ±(dB)	1	1	1
4 Txslots	Target (dBm)	24	24	24
	Tolerance ±(dB)	1	1	1
	Tolerance ±(dB)	1	1	1

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Table 11.3: WCDMA

UMTS Band V		Conducted Power (dBm)		
		Channel 4233	Channel 4183	Channel 4132
CS	Target (dBm)	21	21	21
	Tolerance ±(dB)	1	1	1
HSUPA sub-test 1	Target (dBm)	20	20	20
	Tolerance ±(dB)	1	1	1
HSUPA sub-test 2	Target (dBm)	20	20	20
	Tolerance ±(dB)	1	1	1
HSUPA sub-test 3	Target (dBm)	20	20	20
	Tolerance ±(dB)	1	1	1
HSUPA sub-test 4	Target (dBm)	20	20	20
	Tolerance ±(dB)	1	1	1
HSUPA sub-test 5	Target (dBm)	20	20	20
	Tolerance ±(dB)	1	1	1
HSDPA sub-test 1-4	Target (dBm)	20	20	20
	Tolerance ±(dB)	1	1	1
UMTS Band II		Conducted Power (dBm)		
		Channel 9538	Channel 9400	Channel 9262
CS	Target (dBm)	21	21	21
	Tolerance ±(dB)	1	1	1
HSUPA sub-test 1	Target (dBm)	20	20	20
	Tolerance ±(dB)	1	1	1
HSUPA sub-test 2	Target (dBm)	20	20	20
	Tolerance ±(dB)	1	1	1
HSUPA sub-test 3	Target (dBm)	20	20	20
	Tolerance ±(dB)	1	1	1
HSUPA sub-test 4	Target (dBm)	20	20	20
	Tolerance ±(dB)	1	1	1
HSUPA sub-test 5	Target (dBm)	20	20	20
	Tolerance ±(dB)	1	1	1
HSDPA sub-test 1-4	Target (dBm)	20	20	20
	Tolerance ±(dB)	1	1	1

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Table 11.4: LTE

LTE Band 2			
Channel	Channel 19100	Channel 18900	Channel 18700
Target (dBm)	21.5	21.5	21.5
Tolerance ±(dB)	2	2	2
LTE Band 4			
Channel	Channel 20300	Channel 20175	Channel 20050
Target (dBm)	22	22	22
Tolerance ±(dB)	2	2	2
LTE Band 5			
Channel	Channel 20600	Channel 20525	Channel 20450
Target (dBm)	22	22	22
Tolerance ±(dB)	2	2	2
LTE Band 7			
Channel	Channel 21350	Channel 21100	Channel 20850
Target (dBm)	21.5	21.5	21.5
Tolerance ±(dB)	2	2	2

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Table 11.5: Bluetooth

Mode		Channel 1	Channel39	Channel 78
GFSK	Target (dBm)	6	6	6
	Tolerance ±(dB)	1	1	1
EDR2M-4DQPSK	Target (dBm)	6	6	6
	Tolerance ±(dB)	1	1	1
EDR3M-8DPSK	Target (dBm)	6	6	6
	Tolerance ±(dB)	1	1	1

Table 11.6: WiFi

Mode	Channel/Data rate	Target (dBm)	Tolerance ±(dB)
802.11 b (2.4GHz)	1Mbps	14	1
	2Mbps	13	1
	5.5Mbps	12	1
	11Mbps	11	1
802.11 g (2.4GHz)	6-18Mbps	14	1
	24-36Mbps	14	1
	48-54Mbps	14	1
802.11 n (2.4GHz HT20)	MCS0-4	14	1
	MCS5-7	14	1

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11.2 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 11.6: The conducted power measurement results for GSM850/1900

GSM 850MHz	Conducted Power (dBm)		
	Channel 251(848.8MHz)	Channel 190(836.6MHz)	Channel 128(824.2MHz)
	32.15	32.13	31.92
GSM 1900MHz	Conducted Power (dBm)		
	Channel 810(1909.8MHz)	Channel 661(1880MHz)	Channel 512(1850.2MHz)
	30.43	30.32	30.24

Table 11.7: The conducted power measurement results for GPRS and EGPRS

GSM 850		Measured Power (dBm)			calculation	Average Power (dBm)		
		251	**190**	**128**		**251**	**190**	**128**
GPRS	1Txslots	32.15	32.13	31.92	-9.03dB	23.12	23.1	22.89
	2Txslots	29.92	29.92	29.74	-6.02dB	23.90	23.90	23.72
	3Txslots	27.83	27.83	27.62	-4.26dB	23.57	23.57	23.36
	4Txslots	**26.94**	**26.93**	**26.75**	-3.01dB	**23.93**	**23.92**	**23.74**
EGPRS (GMSK)	1Txslots	32.13	32.12	31.89	-9.03dB	23.10	23.09	22.86
	2Txslots	29.9	29.91	29.71	-6.02dB	23.88	23.89	23.69
	3Txslots	27.81	27.82	27.59	-4.26dB	23.55	23.56	23.33
	4Txslots	**26.92**	**26.92**	**26.72**	-3.01dB	**23.91**	**23.91**	**23.71**
GSM 1900		Measured Power (dBm)			calculation	Average Power (dBm)		
		810	**661**	**512**		**810**	**661**	**512**
GPRS	1Txslots	30.43	30.32	30.24	-9.03dB	21.40	21.29	21.21
	2Txslots	27.52	27.42	27.23	-6.02dB	21.50	21.40	21.21
	3Txslots	25.43	25.33	25.22	-4.26dB	21.17	21.07	20.96
	4Txslots	**24.54**	**24.42**	**24.33**	-3.01dB	**21.53**	**21.41**	**21.32**
EGPRS (GMSK)	1Txslots	30.41	30.29	30.23	-9.03dB	21.38	21.26	21.2
	2Txslots	27.5	27.39	27.22	-6.02dB	21.48	21.37	21.2
	3Txslots	25.41	25.3	25.21	-4.26dB	21.15	21.04	20.95
	4Txslots	**24.52**	**24.39**	**24.32**	-3.01dB	**21.51**	**21.38**	**21.31**

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 GSM 850 and GSM 1900.

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11.3 WCDMA Measurement result

Table 11.8: The conducted Power for WCDMA850/1900

UMTS Band V		Conducted Power (dBm)		
		Ch 2863 (912.6MHz)	Ch 2788 (897.4MHz)	Ch 2712 (882.4MHz)
RMC	12.2kbps RMC	21.8	21.8	21.8
HSUPA	Sub Test - 1	20.9	20.8	20.8
	Sub Test - 2	19.9	19.9	19.9
	Sub Test - 3	19.8	20.0	20.0
	Sub Test - 4	20.4	20.5	20.5
	Sub Test - 5	20.9	21.0	20.9
HSDPA	Sub Test - 1	20.8	20.9	20.9
	Sub Test - 2	20.8	20.9	20.8
	Sub Test - 3	20.3	20.5	20.3
	Sub Test - 4	20.3	20.5	20.4
UMTS Band II		**Conducted Power (dBm)**		
		Ch 9888 (1977.6MHz)	**Ch 9750 (1950MHz)**	**Ch 9612 (1922.4MHz)**
RMC	12.2kbps RMC	21.7	21.8	21.8
HSUPA	Sub - Test 1	20.1	20.8	20.2
	Sub - Test 2	19.9	19.8	19.8
	Sub - Test 3	19.5	19.9	19.3
	Sub - Test 4	20.8	20.3	20.2
	Sub - Test 5	20.9	20.7	20.8
HSDPA	Sub - Test 1	20.8	20.7	20.7
	Sub - Test 2	20.8	20.8	20.9
	Sub - Test 3	20.3	20.3	20.4
	Sub - Test 4	20.3	20.2	20.4

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11.4 LTE_FDD Measurement result

Table 11.9: The conducted Power for LTE-FDD

LTE-FDD Band 2				Actual output Power (dBm)		
Band-width	**RBallocation**	**RBoffset**	**Modulation**	**High**	**Middle**	**Low**
1.4 MHz				**1909.3MHz**	**1880MHz**	**1850.7MHz**
	1RB	**High**	**QPSK**	23.15	23.12	23.13
			16QAM	22.38	22.34	22.34
		Middle	**QPSK**	23.17	23.15	23.11
			16QAM	22.38	22.36	22.37
		Low	**QPSK**	23.15	23.14	23.13
			16QAM	22.35	22.32	22.34
	3RB	**High**	**QPSK**	23.15	23.13	23.15
			16QAM	22.16	22.18	22.19
		Middle	**QPSK**	23.21	23.20	23.18
			16QAM	22.18	22.21	22.17
		Low	**QPSK**	23.18	23.14	23.17
			16QAM	22.25	22.16	22.26
	6RB	**/**	**QPSK**	22.26	22.24	22.25
			16QAM	21.27	21.22	21.23
3 MHz				**1908.5MHz**	**1880MHz**	**1851.5MHz**
	1RB	**High**	**QPSK**	23.11	23.12	23.13
			16QAM	22.36	22.37	22.36
		Middle	**QPSK**	23.18	23.14	23.13
			16QAM	22.37	22.36	22.35
		Low	**QPSK**	23.14	23.13	23.14
			16QAM	22.39	22.36	22.33
	8RB	**High**	**QPSK**	22.25	22.26	22.27
			16QAM	21.30	21.28	21.28
		Middle	**QPSK**	22.25	22.23	22.20
			16QAM	21.23	21.22	21.22
		Low	**QPSK**	22.21	22.29	22.26
			16QAM	21.31	21.30	21.28
	15RB	**/**	**QPSK**	22.27	22.27	22.20
			16QAM	21.28	21.28	21.25

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				1907.5MHz	1880MHz	1852.5MHz
5 MHz	1RB	**High**	**QPSK**	23.16	23.17	23.13
			16QAM	22.36	22.35	22.38
		Middle	**QPSK**	23.16	23.14	23.13
			16QAM	22.38	22.39	22.36
		Low	**QPSK**	23.19	23.12	23.15
			16QAM	22.39	22.34	22.35
	12RB	**High**	**QPSK**	22.25	22.24	22.26
			16QAM	21.24	21.26	21.27
		Middle	**QPSK**	22.23	22.20	22.25
			16QAM	21.27	21.25	21.23
		Low	**QPSK**	22.21	22.25	22.23
			16QAM	21.33	21.32	21.22
	25RB		**QPSK**	22.23	22.22	22.20
			16QAM	21.21	21.23	21.22
10 MHz				**1905MHz**	**1880MHz**	**1855MHz**
	1RB	**High**	**QPSK**	23.19	23.16	23.15
			16QAM	22.38	22.36	22.37
		Middle	**QPSK**	23.18	23.17	23.13
			16QAM	22.35	22.32	22.34
		Low	**QPSK**	23.15	23.13	23.14
			16QAM	22.36	22.30	22.33
	25RB	**High**	**QPSK**	22.26	22.25	22.24
			16QAM	21.28	21.25	21.26
		Middle	**QPSK**	22.26	22.25	22.24
			16QAM	21.28	21.32	21.28
		Low	**QPSK**	22.25	22.24	22.24
			16QAM	21.32	21.33	21.28
	50RB	**/**	**QPSK**	22.28	22.26	22.25
			16QAM	21.28	21.25	21.24

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				1902.5MHz	1880MHz	1857.5MHz
15 MHz	1RB	High	QPSK	23.17	23.12	23.15
			16QAM	22.37	22.35	22.34
		Middle	QPSK	23.15	23.16	23.16
			16QAM	22.39	22.34	22.33
		Low	QPSK	23.13	23.19	23.17
			16QAM	22.37	22.36	22.36
	36RB	High	QPSK	22.25	22.27	22.24
			16QAM	21.28	21.25	21.25
		Middle	QPSK	22.25	22.26	22.25
			16QAM	21.32	21.28	21.25
		Low	QPSK	22.25	22.29	22.27
			16QAM	21.23	21.22	21.28
	75RB	/	QPSK	22.23	22.22	22.20
			16QAM	21.27	21.26	21.23
20 MHz				1900MHz	1880MHz	1860MHz
	1RB	High	QPSK	23.21	23.20	23.18
			16QAM	22.37	22.36	22.36
		Middle	QPSK	23.19	23.22	23.13
			16QAM	22.35	22.32	22.32
		Low	QPSK	23.25	23.21	23.22
			16QAM	22.38	22.36	22.33
	50RB	High	QPSK	22.27	22.27	22.26
			16QAM	21.28	21.26	21.28
		Middle	QPSK	22.24	22.25	22.27
			16QAM	21.26	21.23	21.28
		Low	QPSK	22.24	22.29	22.23
			16QAM	21.28	21.26	21.22
	100RB	/	QPSK	22.20	22.24	22.21
			16QAM	21.27	21.21	21.22

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LTE-FDD Band 4				Actual output Power (dBm)		
Band-width	**RBallocation**	**RBoffset**	**Modulation**	**High**	**Middle**	**Low**
1.4 MHz				**1754.3MHz**	**1732.5MHz**	**1710.7MHz**
	1RB	**High**	**QPSK**	23.39	23.34	23.41
			16QAM	22.55	22.53	22.47
		Middle	**QPSK**	23.40	23.36	23.36
			16QAM	22.62	22.57	22.49
		Low	**QPSK**	23.38	23.36	23.41
			16QAM	22.62	22.58	22.53
	3RB	**High**	**QPSK**	23.35	23.35	23.37
			16QAM	22.39	22.36	22.31
		Middle	**QPSK**	23.35	23.38	23.39
			16QAM	22.37	22.45	22.38
		Low	**QPSK**	23.42	23.38	23.42
			16QAM	22.39	22.37	22.34
	6RB	**/**	**QPSK**	22.37	22.36	22.39
			16QAM	21.55	21.54	21.50
3 MHz				**1753.5MHz**	**1732.5MHz**	**1711.5MHz**
	1RB	**High**	**QPSK**	23.42	23.37	23.42
			16QAM	22.61	22.59	22.59
		Middle	**QPSK**	23.35	23.35	23.37
			16QAM	22.60	22.60	22.60
		Low	**QPSK**	23.38	23.34	23.42
			16QAM	22.62	22.59	22.63
	8RB	**High**	**QPSK**	22.45	22.43	22.47
			16QAM	21.57	21.58	21.58
		Middle	**QPSK**	22.48	22.39	22.46
			16QAM	21.53	21.55	21.52
		Low	**QPSK**	22.42	22.43	22.40
			16QAM	21.51	21.51	21.52
	15RB	**/**	**QPSK**	22.36	22.32	22.40
			16QAM	21.58	21.57	21.61

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				1752.5MHz	1732.5MHz	1712.5MHz
5 MHz	1RB	**High**	**QPSK**	23.37	23.37	23.40
			16QAM	22.60	22.59	22.60
		Middle	**QPSK**	23.37	23.40	23.40
			16QAM	22.62	22.58	22.60
		Low	**QPSK**	23.39	23.35	23.43
			16QAM	22.62	22.61	22.63
	12RB	**High**	**QPSK**	22.44	22.42	22.46
			16QAM	21.53	21.54	21.57
		Middle	**QPSK**	22.42	22.43	22.41
			16QAM	21.51	21.60	21.60
		Low	**QPSK**	22.42	22.38	22.45
			16QAM	21.52	21.53	21.55
	25RB	**/**	**QPSK**	22.34	22.32	22.36
			16QAM	21.55	21.54	21.54
10 MHz				**1750MHz**	**1732.5MHz**	**1715MHz**
	1RB	**High**	**QPSK**	23.37	23.41	23.41
			16QAM	22.58	22.58	22.56
		Middle	**QPSK**	23.39	23.42	23.40
			16QAM	22.61	22.61	22.60
		Low	**QPSK**	23.40	23.37	23.43
			16QAM	22.61	22.60	22.62
	25RB	**High**	**QPSK**	22.44	22.42	22.46
			16QAM	21.54	21.54	21.58
		Middle	**QPSK**	22.43	22.42	22.45
			16QAM	21.62	21.56	21.62
		Low	**QPSK**	22.44	22.42	22.46
			16QAM	21.61	21.56	21.58
	50RB	**/**	**QPSK**	22.36	22.34	22.38
			16QAM	21.53	21.54	21.57

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				1747.5MHz	1732.5MHz	1717.5MHz
15 MHz	1RB	**High**	**QPSK**	23.40	23.38	23.40
			16QAM	22.57	22.62	22.58
		Middle	**QPSK**	23.41	23.38	23.36
			16QAM	22.58	22.60	22.59
		Low	**QPSK**	23.41	23.36	23.44
			16QAM	22.61	22.59	22.63
	36RB	**High**	**QPSK**	22.44	22.42	22.47
			16QAM	21.57	21.53	21.55
		Middle	**QPSK**	22.44	22.45	22.49
			16QAM	21.52	21.56	21.52
		Low	**QPSK**	22.44	22.43	22.46
			16QAM	21.61	21.53	21.58
	75RB	**/**	**QPSK**	22.34	22.32	22.36
			16QAM	21.58	21.55	21.60
20 MHz				**1745MHz**	**1732.5MHz**	**1720MHz**
	1RB	**High**	**QPSK**	23.43	23.41	23.43
			16QAM	22.60	22.62	22.62
		Middle	**QPSK**	23.42	23.41	23.44
			16QAM	22.59	22.59	22.60
		Low	**QPSK**	23.45	23.40	23.46
			16QAM	22.63	22.61	22.65
	50RB	**High**	**QPSK**	22.46	22.44	22.47
			16QAM	21.55	21.56	21.58
		Middle	**QPSK**	22.48	22.42	22.43
			16QAM	21.55	21.53	21.58
		Low	**QPSK**	22.44	22.42	22.47
			16QAM	21.53	21.54	21.58
	100RB	**/**	**QPSK**	22.38	22.37	22.41
			16QAM	21.57	21.56	21.60

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LTE-FDD Band 5				Actual output Power (dBm)		
Band-width	**RBallocation**	**RBoffset**	**Modulation**	**High**	**Middle**	**Low**
1.4 MHz				**848.3MHz**	**836.5MHz**	**824.7MHz**
	1RB	**High**	**QPSK**	23.42	23.42	23.40
			16QAM	22.63	22.62	22.58
		Middle	**QPSK**	23.44	23.43	23.43
			16QAM	22.63	22.64	22.62
		Low	**QPSK**	23.41	23.43	23.44
			16QAM	22.62	22.60	22.61
	3RB	**High**	**QPSK**	23.25	23.21	23.22
			16QAM	22.32	22.31	22.35
		Middle	**QPSK**	23.25	23.21	23.22
			16QAM	22.32	22.31	22.35
		Low	**QPSK**	23.22	23.21	23.23
			16QAM	22.38	22.36	22.34
	6RB	**/**	**QPSK**	22.24	22.25	22.24
			16QAM	21.37	21.39	21.35
3 MHz				**847.5MHz**	**836.5MHz**	**825.5MHz**
	1RB	**High**	**QPSK**	23.41	23.42	23.40
			16QAM	22.63	22.60	22.62
		Middle	**QPSK**	23.44	23.45	23.43
			16QAM	22.62	22.61	22.63
		Low	**QPSK**	23.40	23.44	23.43
			16QAM	22.62	22.63	22.60
	8RB	**High**	**QPSK**	22.27	22.23	22.25
			16QAM	21.35	21.33	21.39
		Middle	**QPSK**	22.25	22.24	22.25
			16QAM	21.39	21.35	21.38
		Low	**QPSK**	22.24	22.26	22.23
			16QAM	21.33	21.37	21.32
	15RB	**/**	**QPSK**	22.26	22.22	22.23
			16QAM	21.35	21.34	21.33
5 MHz				**846.5MHz**	**836.5MHz**	**826.5MHz**
	1RB	**High**	**QPSK**	23.37	23.36	23.39
			16QAM	22.61	22.58	22.60
		Middle	**QPSK**	23.43	23.42	23.40
			16QAM	22.61	22.60	22.64
		Low	**QPSK**	23.43	23.43	23.44
			16QAM	22.64	22.60	22.63
	12RB	**High**	**QPSK**	22.31	22.26	22.30
			16QAM	21.41	21.35	21.42
		Middle	**QPSK**	22.32	22.31	22.29
			16QAM	21.36	21.37	21.41

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		Low	**QPSK**	22.35	22.34	22.32
			16QAM	21.40	21.38	21.35
	25RB	**/**	**QPSK**	22.31	22.27	22.25
			16QAM	21.41	21.39	21.38
10 MHz				**844MHz**	**836.5MHz**	**829MHz**
	1RB	**High**	**QPSK**	23.47	23.43	23.41
			16QAM	22.66	22.64	22.64
		Middle	**QPSK**	23.45	23.46	23.45
			16QAM	22.63	22.62	22.61
		Low	**QPSK**	23.44	23.43	23.43
			16QAM	22.63	22.64	22.62
	25RB	**High**	**QPSK**	22.34	22.32	22.30
			16QAM	21.35	21.34	21.33
		Middle	**QPSK**	22.32	22.31	22.30
			16QAM	21.39	21.41	21.39
		Low	**QPSK**	22.31	22.32	22.31
			16QAM	21.42	21.36	21.37
	50RB	**/**	**QPSK**	22.36	22.29	22.25
			16QAM	21.42	21.41	21.39

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LTE-FDD Band 7				Actual output Power (dBm)		
				2567.5MHz	**2535MHz**	**2502.5MHz**
5 MHz	1RB	**High**	**QPSK**	22.98	22.89	22.93
			16QAM	22.07	22.14	22.13
		Middle	**QPSK**	22.96	22.97	22.98
			16QAM	22.08	22.07	22.09
		Low	**QPSK**	22.94	22.94	22.96
			16QAM	22.15	22.16	22.17
	12RB	**High**	**QPSK**	21.86	21.86	21.87
			16QAM	21.06	21.05	21.08
		Middle	**QPSK**	21.88	21.85	21.89
			16QAM	21.04	21.01	21.05
		Low	**QPSK**	21.83	21.82	21.87
			16QAM	21.05	21.06	21.11
	25RB	**/**	**QPSK**	21.82	21.83	21.86
			16QAM	21.03	21.06	21.08
10 MHz				**2565MHz**	**2535MHz**	**2505MHz**
	1RB	**High**	**QPSK**	22.86	22.88	22.86
			16QAM	22.09	22.13	22.14
		Middle	**QPSK**	22.89	22.89	22.90
			16QAM	22.09	22.08	22.10
		Low	**QPSK**	22.95	22.94	22.99
			16QAM	22.13	22.16	22.12
	25RB	**High**	**QPSK**	21.85	21.83	21.88
			16QAM	21.07	21.10	21.13
		Middle	**QPSK**	21.87	21.88	21.91
			16QAM	21.06	21.05	21.08
		Low	**QPSK**	21.81	21.83	21.86
			16QAM	21.03	21.07	21.09
	50RB	**/**	**QPSK**	21.83	21.81	21.86
			16QAM	21.03	21.08	21.07

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				2562.5MHz	2535MHz	2507.5MHz
15 MHz	1RB	High	QPSK	22.88	22.87	22.89
			16QAM	22.12	22.11	22.15
		Middle	QPSK	22.85	22.83	22.89
			16QAM	22.03	22.06	22.08
		Low	QPSK	22.90	22.91	22.92
			16QAM	22.12	22.11	22.13
	36RB	High	QPSK	21.85	21.89	21.88
			16QAM	21.06	21.09	21.12
		Middle	QPSK	21.87	21.88	21.90
			16QAM	21.06	21.08	21.11
		Low	QPSK	21.83	21.86	21.87
			16QAM	21.10	21.13	21.14
	75RB	/	QPSK	21.82	21.84	21.85
			16QAM	21.05	21.04	21.07
20 MHz				2560MHz	2535MHz	2510MHz
	1RB	High	QPSK	22.99	22.95	22.96
			16QAM	22.10	22.14	22.15
		Middle	QPSK	22.89	22.88	22.93
			16QAM	22.11	22.11	22.13
		Low	QPSK	23.00	23.01	23.01
			16QAM	22.15	22.18	22.19
	50RB	High	QPSK	21.88	21.88	21.90
			16QAM	21.07	21.05	21.14
		Middle	QPSK	21.88	21.89	21.90
			16QAM	21.07	21.10	21.13
		Low	QPSK	21.89	21.87	21.92
			16QAM	21.12	21.15	21.17
	100RB	/	QPSK	21.84	21.87	21.89
			16QAM	21.05	21.08	21.11

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11.5 Wi-Fi and BT Measurement result

The output power of BT antenna is as following:

Mode	Conducted Power (dBm)		
	Channel 0 (2402MHz)	Channel 39 (2441MHz)	Channel 78 (2480MHz)
GFSK	5.33	6.21	6.03
EDR2M-4_DQPSK	5.36	6.10	5.85
EDR3M-8DPSK	5.48	6.19	6.02

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

802.11b（dBm）

Channel\data rate	1Mbps	2Mbps	5.5Mbps	11Mbps
1(2412MHz)	14.05	13.78	12.95	11.65
6(2437MHz)	13.74	/	/	/
11(2462MHz)	13.73	/	/	/

802.11g（dBm）

Channel\data rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
1(2412MHz)	14.72	14.72	14.73	14.75	14.61	14.78	14.8	14.65
6(2437MHz)	14.51	/	/	/	/	/	/	/
11(2462MHz)	14.42	/	/	/	/	/	/	/

802.11n（dBm）- HT20 (2.4G)

Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
1(2412MHz)	14.66	14.71	14.71	14.66	14.67	14.71	14.55	14.5
6(2437MHz)	14.60	/	/	/	/	/	/	/
11(2462MHz)	14.55	/	/	/	/	/	/	/

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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

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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	9.60	7	5.01	Yes
		Body	19.20	7	5.01	Yes
2.4GHz WLAN 802.11 b	2.45	Head	9.58	15	31.62	No
		Body	19.17	15	31.62	No

Note: As the power of WLAN Body is merely below the test exclusion threshold, we still perform the SAR test for WLAN Body positions.

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13 Evaluation of Simultaneous

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

	Position	Main antenna	WiFi	Sum
Highest reported SAR value for Head	Left hand, Touch cheek	0.67	0.25	0.92
	Right hand, Touch cheek	0.61	0.40	1.01
Highest reported SAR value for Body	Rear	1.07	0.08	**1.15**

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

	Position	Main antenna	BT*	Sum
Highest reported SAR value for Head	Left hand, Touch cheek	0.67	0.21	0.88
	Right hand, Touch cheek	0.61	0.21	0.82
Highest reported SAR value for Body	Rear	1.07	0.10	**1.17**

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

Table 13.3: Estimated SAR for Bluetooth

Position	F (GHz)	Distance (mm)	Upper limit of power *		Estimated$_{1g}$ (W/kg)
			dBm	mW	
Head	2.441	5	7	5.01	0.21
Body	2.441	10	7	5.01	0.10

* - Maximum possible output power declared by manufacturer

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

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

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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 > 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.

Table 14.1: Duty Cycle

Mode	Duty Cycle
Speech for GSM850/1900	1:8.3
GPRS&EGPRS for GSM850	1:2
GPRS&EGPRS for GSM1900	1:2
WCDMA850/1900 &WiFi	1:1

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14.1 SAR results for Fast SAR

Table 14.2: SAR Values (GSM 850 MHz Band - Head)

Ambient Temperature: 23.7 °C Liquid Temperature: 23.2 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
848.8	251	Left	Touch	Fig.1	32.15	33	0.237	**0.24**	0.325	**0.33**	0.12
836.6	190	Left	Touch	/	32.13	33	0.196	**0.20**	0.290	**0.30**	0.09
824.2	128	Left	Touch	/	31.92	33	0.173	**0.18**	0.254	**0.26**	0.10
836.6	190	Left	Tilt	/	32.13	33	0.146	**0.15**	0.211	**0.22**	0.18
836.6	190	Right	Touch	/	32.13	33	0.173	**0.18**	0.250	**0.26**	0.06
836.6	190	Right	Tilt	/	32.13	33	0.161	**0.17**	0.233	**0.24**	0.11

Table 14.3: SAR Values (GSM 850 MHz Band - Body) –Hotspot off

Ambient Temperature: 23.0 °C Liquid Temperature: 22.5 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
836.6	190	Front	/	26.93	27	0.230	**0.23**	0.328	**0.33**	0.12
848.8	251	Rear	/	26.94	27	0.346	**0.35**	0.45	**0.45**	0.04
836.6	190	Rear	/	26.93	27	0.302	**0.30**	0.429	**0.43**	0.02
824.2	128	Rear	/	26.75	27	0.301	**0.30**	0.427	**0.43**	0.08

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.4: SAR Values (GSM 850 MHz Band - Body)- Hotspot on

Ambient Temperature: 23.0 °C Liquid Temperature: 22.5 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
836.6	190	Front	/	26.93	27	0.230	**0.23**	0.328	**0.33**	0.12
848.8	251	Rear	Fig.2	26.94	27	0.346	**0.35**	0.45	**0.45**	0.04
836.6	190	Rear	/	26.93	27	0.302	**0.30**	0.429	**0.43**	0.02
824.2	128	Rear	/	26.75	27	0.301	**0.30**	0.427	**0.43**	0.08
836.6	190	Left	/	26.93	27	0.154	**0.15**	0.235	**0.24**	0.12
836.6	190	Right	/	26.93	27	0.199	**0.20**	0.295	**0.30**	0.15
836.6	190	Bottom	/	26.93	27	0.041	**0.04**	0.065	**0.07**	0.10
848.8	251	Rear EGPRS	/	26.94	27	0.320	**0.32**	0.438	**0.44**	0.08

Note1: The distance between the EUT and the phantom bottom is 10mm.

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Table 14.5: SAR Values (GSM 1900 MHz Band - Head)

Ambient Temperature: 23.3°C Liquid Temperature: 22.8 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1880	661	Left	Touch	/	30.32	31	0.073	**0.08**	0.131	**0.13**	0.08
1880	661	Left	Tilt	/	30.32	31	0.031	**0.03**	0.056	**0.06**	0.17
1909.8	810	Right	Touch	/	30.43	31	0.079	**0.08**	0.133	**0.14**	0.13
1880	661	Right	Touch	Fig.3	30.32	31	0.087	**0.09**	0.140	**0.14**	0.10
1850.2	512	Right	Touch	/	30.24	31	0.072	**0.07**	0.121	**0.12**	0.09
1880	661	Right	Tilt	/	30.32	31	0.046	**0.05**	0.079	**0.08**	0.15

Table 14.6: SAR Values (GSM 1900 MHz Band - Body)- Hotspot off

Ambient Temperature: 22.5 °C Liquid Temperature: 22.0 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1880	661	Front	/	24.42	25	0.112	**0.12**	0.187	**0.19**	0.13
1909.8	810	Rear	/	24.54	25	0.154	**0.16**	0.310	**0.32**	0.05
1880	661	Rear	/	24.42	25	0.165	**0.17**	0.321	**0.33**	0.15
1850.2	512	Rear	/	24.33	25	0.183	**0.19**	0.358	**0.37**	0.11

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.7: SAR Values (GSM 1900 MHz Band - Body) - Hotspot on

Ambient Temperature: 22.5 °C Liquid Temperature: 22.0 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1880	661	Front	/	24.42	25	0.112	**0.12**	0.187	**0.19**	0.13
1909.8	810	Rear	/	24.54	25	0.154	**0.16**	0.310	**0.32**	0.05
1880	661	Rear	/	24.42	25	0.165	**0.17**	0.321	**0.33**	0.15
1850.2	512	Rear	Fig.4	24.33	25	0.183	**0.19**	0.358	**0.37**	0.11
1880	661	Left	/	24.42	25	0.031	**0.03**	0.054	**0.06**	-0.14
1880	661	Right	/	24.42	25	0.022	**0.02**	0.047	**0.05**	-0.15
1880	661	Bottom	/	24.42	25	0.151	**0.16**	0.284	**0.29**	0.05
1850.2	512	RearEGPRS	/	24.42	25	0.176	**0.18**	0.335	**0.34**	0.16

Note1: The distance between the EUT and the phantom bottom is 10mm.

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Table 14.8: SAR Values (WCDMA 850 MHz Band - Head)

Ambient Temperature: 23.7 °C Liquid Temperature: 23.2 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
836.4	4183	Left	Touch	/	21.8	22	0.222	**0.22**	0.331	**0.33**	0.11
836.4	4183	Left	Tilt	/	21.8	22	0.198	**0.20**	0.286	**0.29**	0.14
846.6	4233	Left	Touch	Fig.5	21.8	22	0.254	**0.26**	0.351	**0.35**	0.08
836.4	4132	Left	Touch	/	21.8	22	0.224	**0.23**	0.333	**0.34**	0.10
836.4	4183	Right	Touch	/	21.8	22	0.214	**0.22**	0.311	**0.31**	0.15
836.4	4183	Right	Tilt	/	21.8	22	0.170	**0.17**	0.247	**0.25**	0.12

Table 14.9: SAR Values (WCDMA 850 MHz Band - Body) - Hotspot off

Ambient Temperature: 23.0 °C Liquid Temperature: 22.5 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
836.4	4183	Front	/	21.8	22	0.116	**0.12**	0.168	**0.17**	0.13
846.6	4233	Rear	/	21.8	22	0.266	**0.27**	0.481	**0.49**	0.02
836.4	4183	Rear	/	21.8	22	0.261	**0.26**	0.442	**0.45**	0.06
826.4	4132	Rear	/	21.8	22	0.258	**0.26**	0.416	**0.42**	0.08

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.10: SAR Values (WCDMA 850 MHz Band - Body) - Hotspot on

Ambient Temperature: 23.0 °C Liquid Temperature: 22.5 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
836.4	4183	Front	/	21.8	22	0.116	**0.12**	0.168	**0.17**	0.13
846.6	4233	Rear	Fig.6	21.8	22	0.266	**0.27**	0.481	**0.49**	0.02
836.4	4183	Rear	/	21.8	22	0.261	**0.26**	0.442	**0.45**	0.06
826.4	4132	Rear	/	21.8	22	0.258	**0.26**	0.416	**0.42**	0.08
836.4	4183	Left	/	21.8	22	0.113	**0.11**	0.165	**0.17**	0.13
836.4	4182	Right	/	21.8	22	0.117	**0.12**	0.171	**0.17**	0.15
836.4	4183	Bottom	/	21.8	22	0.082	**0.08**	0.132	**0.13**	0.14

Note1: The distance between the EUT and the phantom bottom is 10mm.

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Table 14.11: SAR Values (WCDMA 1900 MHz Band - Head)

Ambient Temperature: 23.3°C Liquid Temperature: 22.8°C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1880	9400	Left	Touch	/	21.8	22	0.096	**0.10**	0.163	**0.16**	0.08
1880	9400	Left	Tilt	/	21.8	22	0.049	**0.05**	0.091	**0.09**	0.13
1852.4	9262	Right	Touch	/	21.8	22	0.145	**0.15**	0.245	**0.25**	0.09
1880	9400	Right	Touch	Fig.7	21.8	22	0.153	**0.15**	0.277	**0.28**	0.17
1907.6	9538	Right	Touch	/	21.7	22	0.150	**0.15**	0.260	**0.26**	0.12
1880	9400	Right	Tilt	/	21.8	22	0.081	**0.08**	0.142	**0.14**	0.17

Table 14.12: SAR Values (WCDMA 1900 MHz Band - Body) - Hotspot off

Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1880	9400	Front	/	21.8	22	0.215	**0.22**	0.378	**0.38**	0.11
1907.6	9538	Rear	/	21.7	22	0.554	**0.56**	1.05	**1.07**	-0.05
1880	9400	Rear	/	21.8	22	0.480	**0.48**	0.934	**0.94**	-0.02
1852.4	9262	Rear	/	21.8	22	0.487	**0.49**	0.941	**0.95**	-0.05

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.13: SAR Values (WCDMA 1900 MHz Band - Body) - Hotspot on

Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1880	9400	Front	/	21.8	22	0.215	**0.22**	0.378	**0.38**	0.11
1907.6	9538	Rear	Fig.8	21.7	22	0.554	**0.56**	1.05	**1.07**	-0.05
1880	9400	Rear	/	21.8	22	0.480	**0.48**	0.934	**0.94**	-0.02
1852.4	9262	Rear	/	21.8	22	0.487	**0.49**	0.941	**0.95**	-0.05
1880	9400	Left	/	21.8	22	0.087	**0.09**	0.146	**0.15**	0.10
1880	9400	Right	/	21.8	22	0.072	**0.07**	0.123	**0.12**	0.13
1880	9400	Bottom	/	21.8	22	0.345	**0.35**	0.649	**0.66**	0.08

Note1: The distance between the EUT and the phantom bottom is 10mm.

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Table 14.14: SAR Values (LTE Band 2-Head)

Ambient Temperature: 23.3°C Liquid Temperature: 22.8°C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1900	19100	QPSK_20MHz_1RB_Low	Left Touch	23.25	23.5	Fig.9	0.211	**0.21**	0.343	**0.35**	0.14
1900	19100	QPSK_20MHz_1RB_Low	Left Tilt	23.25	23.5	/	0.049	**0.05**	0.088	**0.09**	0.11
1900	19100	QPSK_20MHz_50RB_Low	Left Touch	22.24	22.5	/	0.127	**0.13**	0.208	**0.22**	0.10
1900	19100	QPSK_20MHz_50RB_Low	Left Tilt	22.24	22.5	/	0.026	**0.03**	0.051	**0.05**	-0.07
1900	19100	QPSK_20MHz_1RB_Low	Right Touch	23.25	23.5	/	0.173	**0.18**	0.282	**0.29**	0.13
1900	19100	QPSK_20MHz_1RB_Low	Right Tilt	23.25	23.5	/	0.090	**0.09**	0.151	**0.15**	0.18
1900	19100	QPSK_20MHz_50RB_Low	Right Touch	22.24	22.5	/	0.117	**0.12**	0.195	**0.21**	0.08
1900	19100	QPSK_20MHz_50RB_Low	Right Tilt	22.24	22.5	/	0.068	**0.07**	0.113	**0.12**	0.17

Table 14.15: SAR Values (LTE Band 2-Body) - Hotspot off

Ambient Temperature: 23.4°C Liquid Temperature: 22.9°C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1900	19100	QPSK_20MHz_1RB_Low	Front	23.25	23.5	/	0.142	**0.15**	0.254	**0.26**	0.05
1900	19100	QPSK_20MHz_50RB_Low	Front	22.24	22.5	/	0.195	**0.21**	0.337	**0.36**	0.10
1900	19100	QPSK_20MHz_1RB_Low	Rear	23.25	23.5	/	0.331	**0.35**	0.721	**0.73**	-0.18
1900	19100	QPSK_20MHz_50RB_Low	Rear	22.24	22.5	/	0.239	**0.25**	0.460	**0.49**	0.14

Note1: The distance between the EUT and the phantom bottom is 10mm.

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Table 14.16: SAR Values (LTE Band 2-Body) - Hotspot on

Ambient Temperature: 23.4 °C Liquid Temperature: 22.9 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1900	19100	QPSK_20MHz_1RB_Low	Front	23.25	23.5	/	0.142	**0.15**	0.254	**0.26**	0.05
1900	19100	QPSK_20MHz_50RB_Low	Front	22.24	22.5	/	0.195	**0.21**	0.337	**0.36**	0.10
1900	19100	QPSK_20MHz_1RB_Low	Rear	23.25	23.5	Fig.10	0.331	**0.35**	0.721	**0.73**	-0.18
1900	19100	QPSK_20MHz_50RB_Low	Rear	22.24	22.5	/	0.239	**0.25**	0.460	**0.49**	0.14
1900	19100	QPSK_20MHz_1RB_Low	Right	23.25	23.5	/	0.075	**0.08**	0.129	**0.14**	0.15
1900	19100	QPSK_20MHz_50RB_Low	Right	22.24	22.5	/	0.055	**0.06**	0.095	**0.10**	0.19
1900	19100	QPSK_20MHz_1RB_Low	Left	23.25	23.5	/	0.092	**0.10**	0.163	**0.17**	-0.12
1900	19100	QPSK_20MHz_50RB_Low	Left	22.24	22.5	/	0.070	**0.07**	0.141	**0.15**	-0.08
1900	19100	QPSK_20MHz_1RB_Low	Bottom	23.25	23.5	/	0.339	**0.36**	0.618	**0.65**	-0.12
1900	19100	QPSK_20MHz_50RB_Low	Bottom	22.24	22.5	/	0.242	**0.26**	0.445	**0.47**	-0.06

Note: The distance between the EUT and the phantom bottom is 10mm.

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Table 14.17: SAR Values (LTE Band 4-Head)

Ambient Temperature: 23.3 °C Liquid Temperature: 22.8°C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1720	20050	QPSK_20MHz _1RB_Low	Left Touch	23.46	24	Fig.11	0.312	**0.35**	0.493	**0.56**	0.19
1720	20050	QPSK_20MHz _1RB_ Low	Left Tilt	23.46	24	/	0.083	**0.09**	0.134	**0.15**	0.12
1720	20050	QPSK_20MHz _1RB_ Low	Right Touch	23.46	24	/	0.199	**0.23**	0.317	**0.36**	0.07
1720	20050	QPSK_20MHz _1RB_ Low	Right Tilt	23.46	24	/	0.107	**0.12**	0.174	**0.20**	0.13
1720	20050	QPSK_20MHz _50RB_ Low	Left Touch	22.47	23	/	0.261	**0.30**	0.425	**0.48**	0.08
1720	20050	QPSK_20MHz _50RB_ Low	Left Tilt	22.47	23	/	0.084	**0.10**	0.135	**0.15**	0.15
1720	20050	QPSK_20MHz _50RB_ Low	Right Touch	22.47	23	/	0.202	**0.23**	0.3211	**0.36**	0.09
1720	20050	QPSK_20MHz _50RB_ Low	Right Tilt	22.47	23	/	0.105	**0.12**	0.171	**0.19**	0.18

Table 14.18: SAR Values (LTE Band 4-Body) - Hotspot off

Ambient Temperature: 23.4 °C Liquid Temperature: 22.9 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1720	20050	QPSK_20MHz _1RB_LOW	Front	23.46	24	/	0.311	**0.35**	0.526	**0.60**	0.06
1720	20050	QPSK_20MHz _50RB_ LOW	Front	22.47	23	/	0.251	**0.28**	0.426	**0.48**	0.10
1720	20050	QPSK_20MHz _1RB_LOW	Rear	23.46	24	/	0.518	**0.59**	0.887	**1.00**	0.05
1745	20300	QPSK_20MHz _1RB_LOW	Rear	23.45	24	/	0.503	**0.57**	0.852	**0.97**	0.07
1732.5	20175	QPSK_20MHz _1RB_LOW	Rear	23.40	24	/	0.496	**0.57**	0.833	**0.96**	-0.04

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1720	20050	QPSK_20MHz_50RB_ LOW	Rear	22.47	23	/	0.427	**0.48**	0.725	**0.82**	-0.09
1720	20050	QPSK_20MHz_100RB	Rear	22.41	23	/	0.415	**0.48**	0.703	**0.81**	-0.02

Note: The distance between the EUT and the phantom bottom is 10mm.

Table 14.19: SAR Values (LTE Band 4-Body) - Hotspot on

Ambient Temperature: 23.4 °C Liquid Temperature: 22.9 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1720	20050	QPSK_20MHz_1RB_LOW	Front	23.46	24	/	0.311	**0.35**	0.526	**0.60**	0.06
1720	20050	QPSK_20MHz_50RB_ LOW	Front	22.47	23	/	0.251	**0.28**	0.426	**0.48**	0.10
1720	20050	QPSK_20MHz_1RB_LOW	Rear	23.46	24	Fig.12	0.518	**0.59**	0.887	**1.00**	0.05
1745	20300	QPSK_20MHz_1RB_LOW	Rear	23.45	24	/	0.503	**0.57**	0.852	**0.97**	0.07
1732.5	20175	QPSK_20MHz_1RB_LOW	Rear	23.40	24	/	0.496	**0.57**	0.833	**0.96**	-0.04
1720	20050	QPSK_20MHz_50RB_ LOW	Rear	22.47	23	/	0.427	**0.48**	0.725	**0.82**	-0.09
1720	20050	QPSK_20MHz_100RB	Rear	22.41	23	/	0.415	**0.48**	0.703	**0.81**	-0.02
1720	20050	QPSK_20MHz_1RB_ LOW	Bottom	23.46	24	/	0.410	**0.46**	0.747	**0.85**	0.10
1720	20050	QPSK_20MHz_50RB_ LOW	Bottom	22.47	23	/	0.327	**0.37**	0.675	**0.76**	0.13
1720	20050	QPSK_20MHz_1RB_ LOW	Right	23.46	24	/	0.079	**0.09**	0.135	**0.15**	-0.16
1720	20050	QPSK_20MHz_50RB_ LOW	Right	22.47	23	/	0.065	**0.07**	0.112	**0.13**	-0.18
1720	20050	QPSK_20MHz_1RB_ LOW	Left	23.46	24	/	0.119	**0.14**	0.200	**0.23**	0.19
1720	20050	QPSK_20MHz_50RB_ LOW	Left	22.47	23	/	0.102	**0.12**	0.183	**0.21**	0.12

Note: The distance between the EUT and the phantom bottom is 10mm.

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Table 14.20: SAR Values (LTE Band 5-Head)

Ambient Temperature: 23.7 °C Liquid Temperature: 23.2 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
844	20600	QPSK_10MHz _1RB_ high	Left Touch	23.47	24	Fig.13	0.444	**0.50**	0.597	**0.67**	0.19
844	20600	QPSK_10MHz _25RB_high	Left Touch	22.34	23	/	0.300	**0.35**	0.432	0.50	0.13
844	20600	QPSK_10MHz _1RB_ high	Left Tilt	23.47	24	/	0.263	**0.30**	0.395	0.45	0.11
844	20600	QPSK_10MHz _25RB_high	Left Tilt	22.34	23	/	0.223	**0.26**	0.302	0.35	0.18
844	20600	QPSK_10MHz _1RB_ high	Right Touch	23.47	24	/	0.376	**0.43**	0.541	0.61	0.02
844	20600	QPSK_10MHz _25RB_high	Right Touch	22.34	23	/	0.284	**0.33**	0.407	0.47	0.08
844	20600	QPSK_10MHz _1RB_ high	Right Tilt	23.47	24	/	0.245	**0.28**	0.350	0.40	0.12
844	20600	QPSK_10MHz _25RB_high	Right Tilt	22.34	23	/	0.186	**0.22**	0.266	0.31	0.16

Table 14.21: SAR Values (LTE Band 5-Body) - Hotspot off

Ambient Temperature: 24.8 °C Liquid Temperature: 24.3 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
844	20600	QPSK_10MHz _1RB_ high	Front	23.47	24	/	0.437	**0.49**	0.617	**0.70**	0.08
844	20600	QPSK_10MHz _25RB_high	Front	22.34	23	/	0.243	**0.28**	0.401	**0.47**	0.05
844	20600	QPSK_10MHz _1RB_ high	Rear	23.47	24	/	0.651	**0.74**	0.853	**0.96**	0.01
836.5	20525	QPSK_10MHz _1RB_ high	Rear	23.43	24	/	0.624	**0.71**	0.836	**0.95**	0.00
829	20450	QPSK_10MHz _1RB_ high	Rear	23.41	24	/	0.578	**0.66**	0.819	**0.94**	-0.01

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844	20600	QPSK_10MHz _25RB_high	Rear	22.34	23	/	0.441	**0.51**	0.624	**0.73**	0.05
844	20600	QPSK_10MHz _50RB_ high	Rear	22.36	23	/	0.428	**0.50**	0.576	**0.67**	0.02

Note: The distance between the EUT and the phantom bottom is 10mm.

Table 14.22: SAR Values (LTE Band 5-Body) - Hotspot on

Ambient Temperature: 24.8 °C Liquid Temperature: 24.3 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
844	20600	QPSK_10MHz _1RB_ high	Front	23.47	24	/	0.437	**0.49**	0.617	**0.70**	0.08
844	20600	QPSK_10MHz _25RB_high	Front	22.34	23	/	0.243	**0.28**	0.401	**0.47**	0.05
844	20600	QPSK_10MHz _1RB_ high	Rear	23.47	24	Fig.14	0.651	**0.74**	0.853	**0.96**	0.01
836.5	20525	QPSK_10MHz _1RB_ high	Rear	23.43	24	/	0.624	**0.71**	0.836	**0.95**	0.00
829	20450	QPSK_10MHz _1RB_ high	Rear	23.41	24	/	0.578	**0.66**	0.819	**0.94**	-0.01
844	20600	QPSK_10MHz _25RB_high	Rear	22.34	23	/	0.441	**0.51**	0.624	**0.73**	0.05
844	20600	QPSK_10MHz _50RB_ high	Rear	22.36	23	/	0.428	**0.50**	0.576	**0.67**	0.02
844	20600	QPSK_10MHz _1RB_ high	Bottom	23.47	24	/	0.122	**0.14**	0.196	**0.22**	0.12
844	20600	QPSK_10MHz _25RB_high	Bottom	22.34	23	/	0.113	**0.13**	0.180	**0.21**	0.18
844	20600	QPSK_10MHz _1RB_ high	Right	23.47	24	/	0.318	**0.36**	0.470	**0.53**	0.14
844	20600	QPSK_10MHz _25RB_hight	Right	22.34	23	/	0.248	**0.29**	0.366	**0.43**	0.13
844	20600	QPSK_10MHz _1RB_ high	Left	23.47	24	/	0.327	**0.37**	0.481	**0.54**	0.18
844	20600	QPSK_10MHz _25RB_high	Left	22.34	23	/	0.256	**0.30**	0.382	**0.45**	0.12

Note: The distance between the EUT and the phantom bottom is 10mm.

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Table 14.23: SAR Values (LTE Band 7-Head)

Ambient Temperature: 23.7 °C Liquid Temperature: 23.2 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
2510	20850	QPSK_20MHz _1RB_ Low	Left Touch	23.01	23.5	/	0.092	**0.10**	0.180	**0.21**	0.02
2510	20850	QPSK_20MHz _50RB_Low	Left Touch	21.92	22.5	/	0.064	**0.07**	0.117	**0.13**	0.07
2510	20850	QPSK_20MHz _1RB_ Low	Left Tilt	23.01	23.5	/	0.020	**0.02**	0.041	**0.05**	0.12
2510	20850	QPSK_20MHz _50RB_Low	Left Tilt	21.92	22.5	/	0.019	**0.02**	0.033	**0.04**	0.10
2510	20850	QPSK_20MHz _1RB_ LOW	Right Touch	23.01	23.5	Fig.15	0.105	**0.12**	0.204	**0.23**	0.11
2510	20850	QPSK_20MHz _50RB Low	Right Touch	21.92	22.5	/	0.075	**0.09**	0.148	**0.17**	0.10
2510	20850	QPSK_20MHz _1RB_Low	Right Tilt	23.01	23.5	/	0.023	**0.03**	0.046	**0.05**	0.17
2510	20850	QPSK_20MHz _50RB_Low	Right Tilt	21.92	22.5	/	0.018	**0.02**	0.036	**0.04**	0.13

Table 14.24: SAR Values (LTE Band 7-Body) - Hotspot off

Ambient Temperature: 24.8 °C Liquid Temperature: 24.3 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
2510	20850	QPSK_20MHz _1RB_ LOW	Front	23.01	23.5	/	0.143	**0.16**	0.344	**0.40**	0.17
2510	20850	QPSK_20MHz _50RB_ LOW	Front	21.92	22.5	/	0.104	**0.12**	0.252	**0.29**	0.13
2510	20850	QPSK_20MHz _1RB_ LOW	Rear	23.01	23.5	/	0.408	**0.46**	0.942	**1.06**	0.15
2560	21350	QPSK_20MHz _1RB_ LOW	Rear	23.00	23.5	/	0.397	**0.45**	0.923	**1.04**	0.10
2535	21100	QPSK_20MHz _1RB_ LOW	Rear	23.01	23.5	/	0.404	**0.45**	0.936	**1.05**	0.11

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2510	20850	QPSK_20MHz _50RB_ LOW	Rear	21.92	22.5	/	0.310	**0.35**	0.601	**0.69**	0.08
2510	20850	QPSK_20MHz _100RB_ Low	Rear	21.89	22.5	/	0.302	**0.35**	0.589	**0.68**	0.13

Note: The distance between the EUT and the phantom bottom is 10mm.

Table 14.25: SAR Values (LTE Band 7-Body) - Hotspot on

Ambient Temperature: 24.8 °C Liquid Temperature: 24.3 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
2510	20850	QPSK_20MHz _1RB_ LOW	Front	23.01	23.5	/	0.143	**0.16**	0.344	**0.40**	0.17
2510	20850	QPSK_20MHz _50RB_ LOW	Front	21.92	22.5	/	0.104	**0.12**	0.252	**0.29**	0.13
2510	20850	QPSK_20MHz _1RB_ LOW	Rear	23.01	23.5	Fig.16	0.408	**0.46**	0.942	**1.06**	0.15
2560	21350	QPSK_20MHz _1RB_ LOW	Rear	23.00	23.5	/	0.397	**0.45**	0.923	**1.04**	0.10
2535	21100	QPSK_20MHz _1RB_ LOW	Rear	23.01	23.5	/	0.404	**0.45**	0.936	**1.05**	0.11
2510	20850	QPSK_20MHz _50RB_ LOW	Rear	21.92	22.5	/	0.310	**0.35**	0.601	**0.69**	0.08
2510	20850	QPSK_20MHz _100RB_ Low	Rear	21.89	22.5	/	0.302	**0.35**	0.589	**0.68**	0.13
2510	20850	QPSK_20MHz _1RB_ LOW	Bottom	23.01	23.5	/	0.373	**0.42**	0.713	**0.80**	0.04
2510	20850	QPSK_20MHz _50RB_ LOW	Bottom	21.92	22.5	/	0.286	**0.33**	0.535	**0.61**	0.02
2510	20850	QPSK_20MHz _1RB_ LOW	Right	23.01	23.5	/	0.025	**0.03**	0.058	**0.07**	0.11
2510	20850	QPSK_20MHz _50RB_ LOW	Right	21.92	22.5	/	0.013	**0.02**	0.036	**0.04**	0.15
2510	20850	QPSK_20MHz _1RB_ LOW	Left	23.01	23.5	/	0.019	**0.02**	0.047	**0.05**	0.10
2510	20850	QPSK_20MHz _50RB_ LOW	Left	21.92	22.5	/	0.008	**0.01**	0.021	**0.02**	0.18

Note: The distance between the EUT and the phantom bottom is 10mm.

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14.2 SAR results for Standard procedure

There is zoom scan measurement to be added for the highest measured SAR in each exposure configuration/band.

Table 14.26: SAR Values (GSM 850 MHz Band - Head)

Ambient Temperature: 23.7 °C Liquid Temperature: 23.2 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
848.8	251	Left	Touch	Fig.1	32.15	33	0.237	**0.24**	0.325	**0.33**	0.12

Table 14.27: SAR Values (GSM 850 MHz Band - Body)

Ambient Temperature: 23.0 °C Liquid Temperature: 22.5 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
848.8	251	Rear	Fig.2	26.94	27	0.346	**0.35**	0.45	**0.45**	0.04

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.28: SAR Values (GSM 1900 MHz Band - Head)

Ambient Temperature: 23.3°C Liquid Temperature: 22.8 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1880	661	Right	Touch	Fig.3	30.32	31	0.087	**0.09**	0.140	**0.14**	0.10

Table 14.29: SAR Values (GSM 1900 MHz Band - Body)

Ambient Temperature: 22.5 °C Liquid Temperature: 22.0 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1850.2	512	Rear	Fig.4	24.33	25	0.183	**0.19**	0.358	**0.37**	0.11

Note1: The distance between the EUT and the phantom bottom is 10mm.

Table 14.30: SAR Values (WCDMA 850 MHz Band - Head)

Ambient Temperature: 23.7 °C Liquid Temperature: 23.2 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
846.6	4233	Left	Touch	Fig.5	21.8	22	0.254	**0.26**	0.351	**0.35**	0.08

Table 14.31: SAR Values (WCDMA 850 MHz Band - Body)

Ambient Temperature: 23.0 °C Liquid Temperature: 22.5 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
846.6	4233	Rear	Fig.6	21.8	22	0.266	**0.27**	0.481	**0.49**	0.02

Note1: The distance between the EUT and the phantom bottom is 10mm.

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Table 14.32: SAR Values (WCDMA 1900 MHz Band - Head)

Ambient Temperature: 23.3°C Liquid Temperature: 22.8°C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1880	9400	Right	Touch	Fig.7	21.8	22	0.153	**0.15**	0.277	**0.28**	0.17

Table 14.33: SAR Values (WCDMA 1900 MHz Band - Body)

Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1907.6	9538	Rear	Fig.8	21.7	22	0.554	**0.56**	1.05	**1.07**	-0.05

Note1: The distance between the EUT and the phantom bottom is 10mm.

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Table 14.34: SAR Values (LTE Band 2-Head)

Ambient Temperature: 23.3°C Liquid Temperature: 22.8°C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1900	19100	QPSK_20MHz _1RB_Low	Left Touch	23.25	23.5	Fig.9	0.211	**0.21**	0.343	**0.35**	0.14

Table 14.35: SAR Values (LTE Band 2-Body)

Ambient Temperature: 23.4°C Liquid Temperature: 22.9°C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1900	19100	QPSK_20MHz _1RB_Low	Rear	23.46	24	Fig.10	0.331	**0.35**	0.493	**0.56**	-0.18

Note: The distance between the EUT and the phantom bottom is 10mm.

Table 14.36: SAR Values (LTE Band 4-Head)

Ambient Temperature: 23.3°C Liquid Temperature: 22.8°C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1720	20050	QPSK_20MHz _1RB_Low	Left Touch	23.46	23.5	Fig.11	0.312	**0.353**	0.493	**0.558**	0.19

Table 14.37: SAR Values (LTE Band 4-Body)

Ambient Temperature: 23.4°C Liquid Temperature: 22.9°C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1720	20050	QPSK_20MHz _1RB_LOW	Rear	23.46	24	Fig.12	0.518	**0.59**	0.887	**1.00**	0.05

Note: The distance between the EUT and the phantom bottom is 10mm.

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Table 14.30: SAR Values (LTE Band 5-Head)

Ambient Temperature: 23.7 °C Liquid Temperature: 23.2 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
844	20600	QPSK_10MHz _1RB_ hight	Left Touch	23.47	24	Fig.13	0.444	**0.50**	0.597	**0.67**	0.19

Table 14.31: SAR Values (LTE Band 5-Body)

Ambient Temperature: 24.8 °C Liquid Temperature: 24.3 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
844	20600	QPSK_10MHz _1RB_ hight	Rear	23.47	24	Fig.14	0.651	**0.74**	0.853	**0.96**	0.01

Note: The distance between the EUT and the phantom bottom is 10mm

Table 14.32: SAR Values (LTE Band 7-Head)

Ambient Temperature: 23.7 °C Liquid Temperature: 23.2 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
2510	20850	QPSK_20MHz _1RB_ LOW	Right Touch	23.01	23.5	Fig.15	0.105	**0.12**	0.204	**0.23**	0.11

Table 14.33: SAR Values (LTE Band 7-Body)

Ambient Temperature: 24.8 °C Liquid Temperature: 24.3 °C											
Frequency		Configuration	Test Position	Conducted Power (dBm)	Max. tune-up Power (dBm)	Figure No.	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
2510	20850	QPSK_20MHz _1RB_ LOW	Rear	23.01	23.5	Fig.16	0.408	**0.46**	0.942	**1.06**	0.15

Note: The distance between the EUT and the phantom bottom is 10mm.

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14.3 WLAN Evaluation

According to the KDB248227 D01, SAR is measured for 2.4GHz 802.11b DSSS using the initial test position procedure.

Head Evaluation

Table 14.34: SAR Values (Wi-Fi 802.11b - Head)

Ambient Temperature: 23.0 °C Liquid Temperature: 22.5 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
2412	1	Left	Touch	/	14.05	15	0.115	**0.14**	0.227	**0.28**	0.03
2412	1	Left	Tilt	/	14.05	15	0.101	**0.13**	0.183	**0.23**	0.12
2412	1	Right	Touch	Fig.17	14.05	15	0.151	**0.19**	0.303	**0.38**	0.10
2412	1	Right	Tilt	/	14.05	15	0.090	**0.11**	0.168	**0.21**	0.18

As shown above table, the initial test position for head is “Right Touch”. So the head SAR of WLAN is presented as below:

Table 14.35: SAR Values (WLAN - Head) – 802.11b 1Mbps (Full SAR)

Ambient Temperature: 22.5 °C Liquid Temperature: 22.0 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
2412	1	Right	Touch	Fig.17	14.05	15	0.160	**0.20**	0.321	**0.40**	0.10

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. A maximum transmission duty factor of 98.9% is achievable for WLAN in this project and the scaled reported SAR is presented as below.

Table 14.36: SAR Values (WLAN - Head) – 802.11b 1Mbps (Scaled Reported SAR)

Ambient Temperature: 22.5 °C Liquid Temperature: 22.0 °C							
Frequency		Side	Test Position	Actual duty factor	maximum duty factor	Reported SAR (1g) (W/kg)	Scaled reported SAR (1g) (W/kg)
MHz	Ch.						
2412	1	Right	Touch	98.9%	100%	**0.40**	**0.40**

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

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Body Evaluation

Table 14.37: SAR Values (WLAN - Body & Hotspot with 10 mm) – 802.11b 1Mbps (Fast SAR)

Ambient Temperature: 23.0 °C Liquid Temperature: 22.5 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
2412	1	Front	/	14.05	15	0.011	**0.01**	0.020	**0.03**	0.07
2412	1	Rear	Fig.18	14.05	15	0.030	**0.04**	0.056	**0.07**	0.12
2412	1	Left	/	14.05	15	0.015	**0.02**	0.029	**0.04**	0.12
2412	1	Top	/	14.05	15	0.023	**0.03**	0.042	**0.05**	0.15

Note1: The distance between the EUT and the phantom bottom is 10mm.

As shown above table, the initial test position for body is "Rear". So the body SAR of WLAN is presented as below:

Table 14.38: SAR Values (WLAN - Body) – 802.11b 1Mbps (Full SAR)

Ambient Temperature: 23.0 °C Liquid Temperature: 22.5 °C										
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
2412	1	Rear	Fig.18	14.05	15	0.033	**0.04**	0.067	**0.08**	0.12

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. A maximum transmission duty factor of 98.9% is achievable for WLAN in this project and the scaled reported SAR is presented as below.

Table 14.39: SAR Values (WLAN - Body) – 802.11b 1Mbps (Scaled Reported SAR)

Ambient Temperature: 22.5 °C Liquid Temperature: 22.0 °C						
Frequency		Test Position	Actual duty factor	maximum duty factor	Reported SAR (1g) (W/kg)	Scaled reported SAR (1g) (W/kg)
MHz	Ch.					
2412	1	Rear	98.9%	100%	**0.08**	**0.08**

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

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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.

Table 15.1: SAR Measurement Variability for Body WCDMA 1900 (1g)

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.						
1907.6	9538	Rear	10	1.05	1.03	1.02	/

Table 15.2: SAR Measurement Variability for Body LTE Band 4 (1g)

Frequency		Configuration	Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.							
1720	20050	QPSK_20MHz _1RB_Middle	Rear	10	0.887	0.869	1.02	/

Table 15.3:SAR Measurement Variability for Body LTE Band 5 (1g)

Frequency		Configuration	Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.							
836.5	20525	QPSK_10MHz _1RB_ hight	Rear	10	0.853	0.846	1.01	/

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Table 15.3:SAR Measurement Variability for Body LTE Band 7 (1g)

Frequency		Configuration	Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.							
2510	20850	QPSK_20MHz _1RB_ LOW	Rear	10	0.942	0.933	1.01	/

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16 Measurement Uncertainty

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

2No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	5.5	N	1	1	1	5.4	5.4	∞
2	Isotropy	B	4.7	R	$\sqrt{3}$	1	1	1.6	1.6	∞
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	6.4	6.4	∞
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	0.5	0.5	∞
5	Detection limit	B	1.0	N	1	1	1	1	1	∞
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.6	0.6	∞
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.0	0.0	∞
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.0	1.0	∞
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
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	1.2	1.2	∞
Test sample related										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	5
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	0.28	9
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	0.31	0.25	9
Combined standard uncertainty		$u_c^{'} = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$						11.1	11.0	95.5
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						22.3	22.1	

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16.2 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	10.8	N	1	1	5.4	5.4	1	∞
2	Isotropy	B	2.8	R	1	1	1.6	1.6	1	∞
3	Boundary effect	B	1.0	R	1	1	0.6	0.6	1	∞
4	Linearity	B	4.7	R	1	1	2.7	2.7	1	∞
5	Detection limit	B	1.0	R	1	1	0.6	0.6	1	∞
6	Readout electronics	B	0.3	R	1	1	0.3	0.3	1	∞
7	Response time	B	0.8	R	1	1	0.5	0.5	1	∞
8	Integration time	B	2.6	R	1	1	1.5	1.5	1	∞
9	RF ambient conditions-noise	B	0	R	1	1	0	0	1	∞
10	RF ambient conditions-reflection	B	0	R	1	1	0	0	1	∞
11	Probe positioned mech. Restrictions	B	0.4	R	1	1	0.2	0.2	1	∞
12	Probe positioning with respect to phantom shell	B	2.9	R	1	1	1.7	1.7	1	∞
13	Post-processing	B	1.0	R	1	1	0.6	0.6	1	∞
14	Fast SAR z-Approximation	B	7.0	R	1	1	4.0	4.0	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		$u_c^{'} = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						13.1	12.45	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						26.2	25.9	

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17 MAIN TEST INSTRUMENTS

Table 17.1: List of Main Instruments

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	Agilent E5071C	MY46103759	December 17,2014	One year
02	Power meter	NRVD	101253	March 5,2015	One year
03	Power sensor	NRV-Z5	100333		
04	Signal Generator	E4438C	MY45095825	January 13, 2015	One year
05	Amplifier	VTL5400	0404	No Calibration Requested	
06	BTS	E5515C	GB47460133	September 4, 2014	One year
07	E-field Probe	SPEAG ES3DV3	3151	September 1, 2014	One year
08	DAE	SPEAG DAE4	786	November 20, 2014	One year
09	Dipole Validation Kit	SPEAG D900V2	1d054	November 5, 2014	One year
10	Dipole Validation Kit	SPEAG D1800V2	2d147	November 6, 2014	One year
11	Dipole Validation Kit	SPEAG D1900V2	5d088	November 5, 2014	One year
12	Dipole Validation Kit	SPEAG D2450V2	5d088	November 3, 2014	One year
13	Dipole Validation Kit	SPEAG D2550V2	1010	June 7, 2013	Three year
14	Radio Communication Analyzer	Anristu MT8820C	6201341853	March 27, 2015	One year

END OF REPORT BODY

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ANNEX A Graph Results

GSM 850 Left Cheek High

Date/Time: 2015-6-10
Electronics: DAE4 Sn786
Medium: Head 850 MHz
Medium parameters used (interpolated): f = 848.8 MHz; σ = 0.94 S/m; ε_r = 41.17; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: GSM Frequency: 848.8 MHz Duty Cycle: 1:8.30042
Probe: ES3DV3 - SN3151 ConvF(6.04, 6.04, 6.04); Calibrated: 2014-9-1
Left Cheek High/Area Scan (51x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.349 W/kg

Left Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.917 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.432 W/kg
SAR(1 g) = 0.325 W/kg; SAR(10 g) = 0.237 W/kg
Maximum value of SAR (measured) = 0.344 W/kg

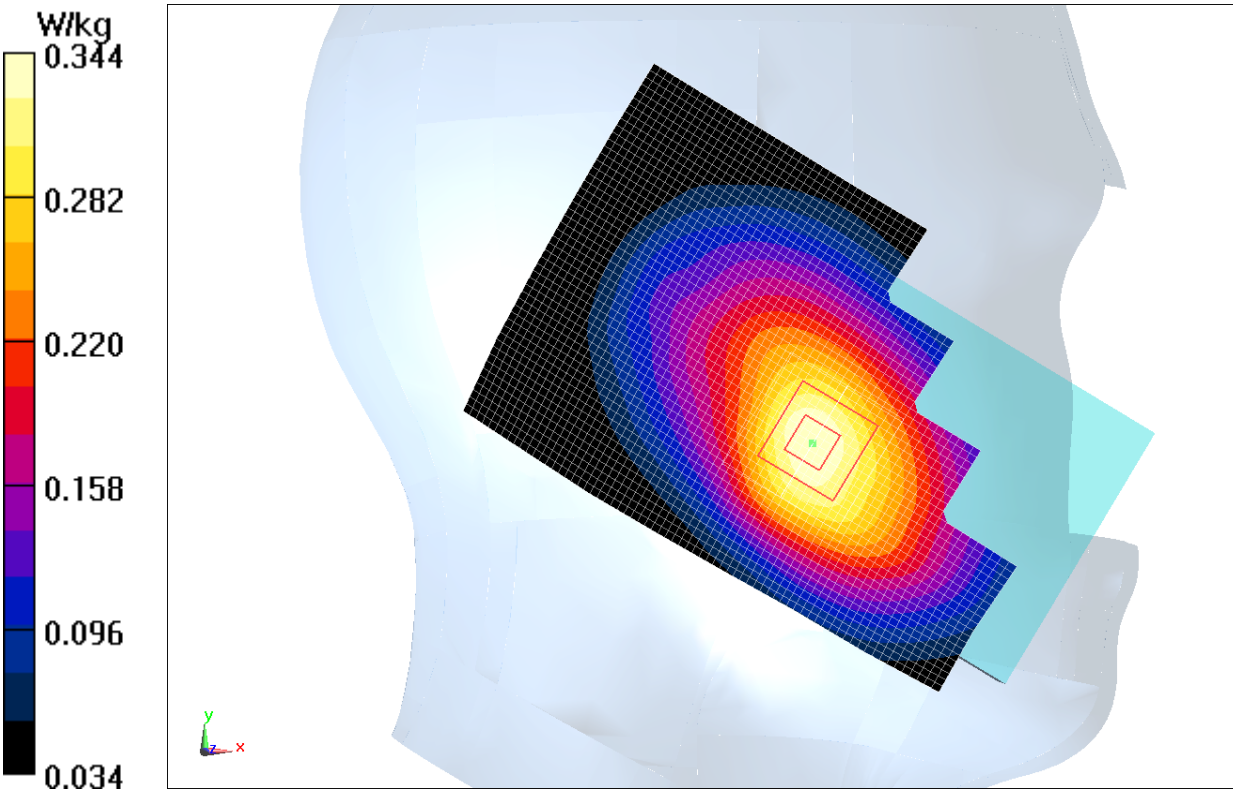

Fig.1 GSM 850MHz CH251

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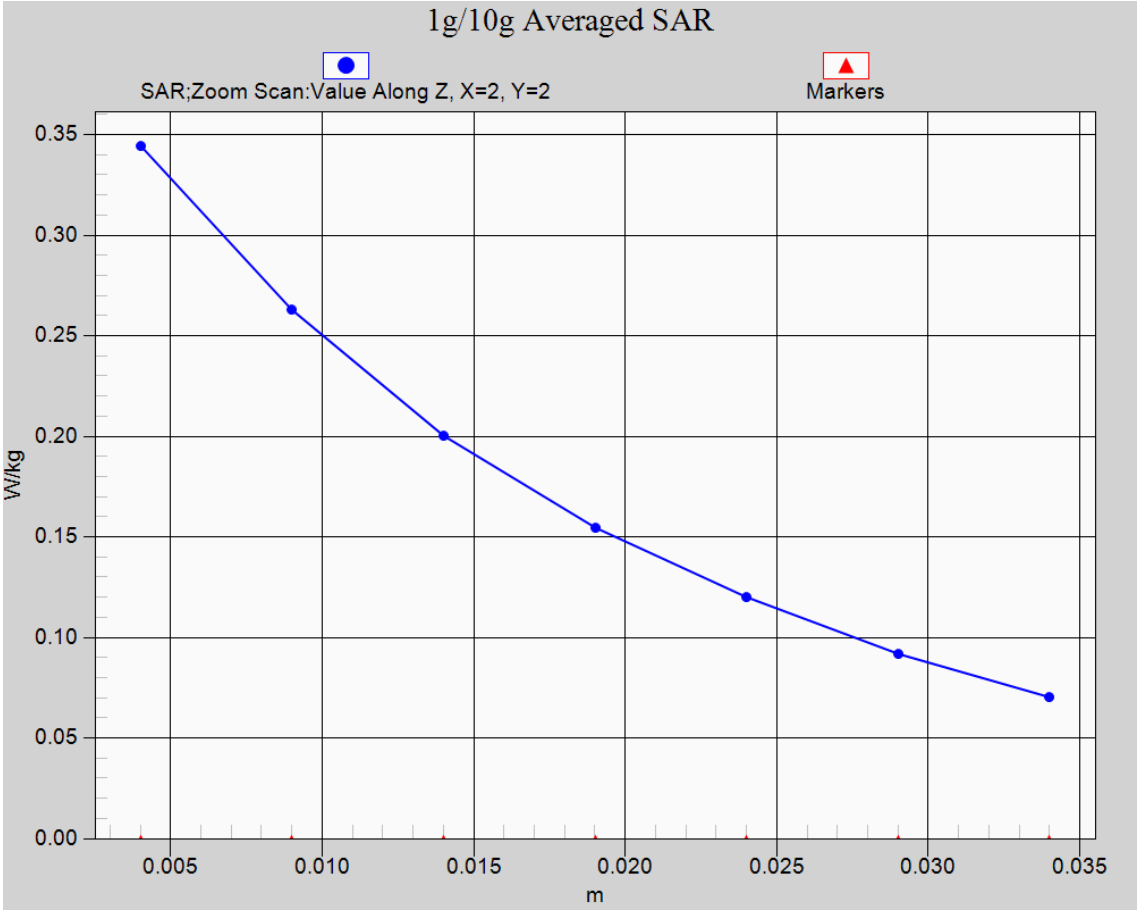

Fig.1-1 Z-Scan at power reference point (GSM 850 MHz CH251)

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850 Body Rear High

Date/Time: 2015-6-11
Electronics: DAE4 Sn786
Medium: Body850 MHz
Medium parameters used (interpolated): f = 848.8 MHz; σ = 0.984 S/m; ε_r = 53.419; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: 4 slot GPRS Frequency: 848.8 MHz Duty Cycle: 1:2.08018
Probe: ES3DV3 - SN3151 ConvF(6.14, 6.14, 6.14); Calibrated: 2014-9-1

Rear side High/Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.470 W/kg

Rear side High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 22.084 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.551 W/kg
SAR(1 g) = 0.450 W/kg; SAR(10 g) = 0.346 W/kg
Maximum value of SAR (measured) = 0.469 W/kg

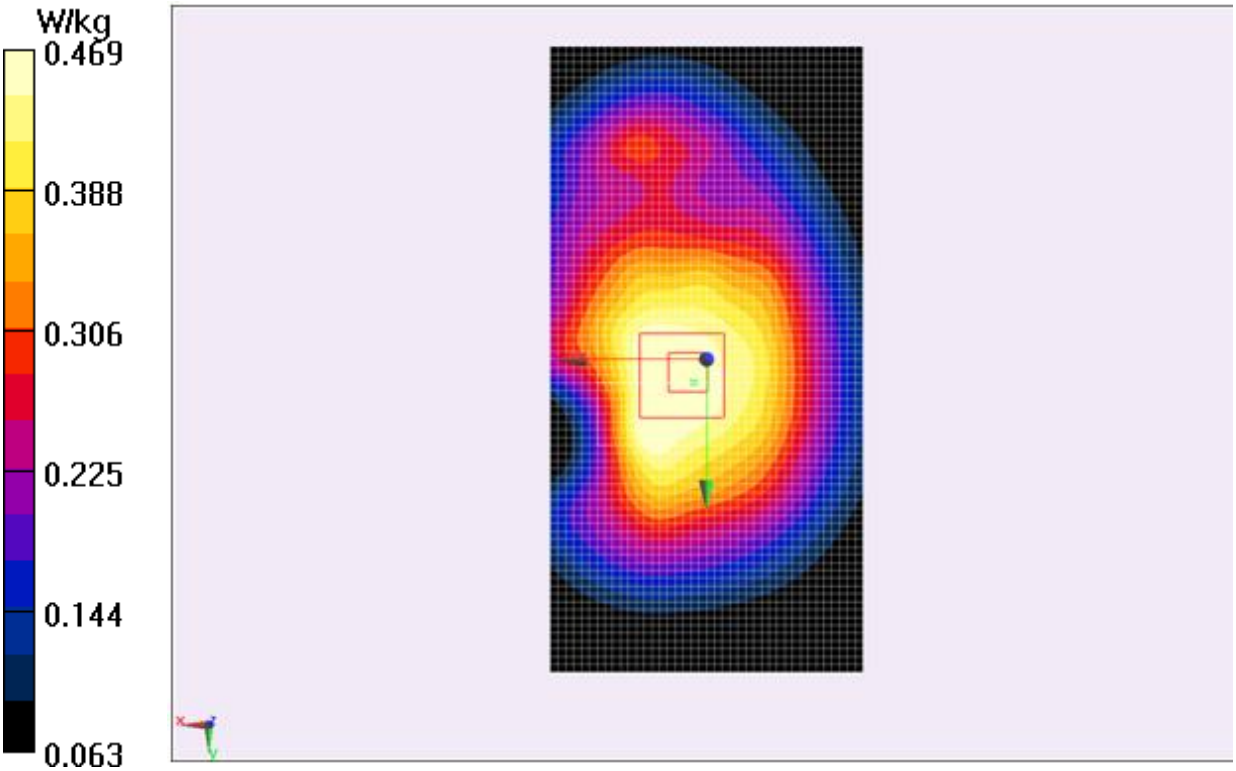

Fig.2 GSM 850 MHz CH190

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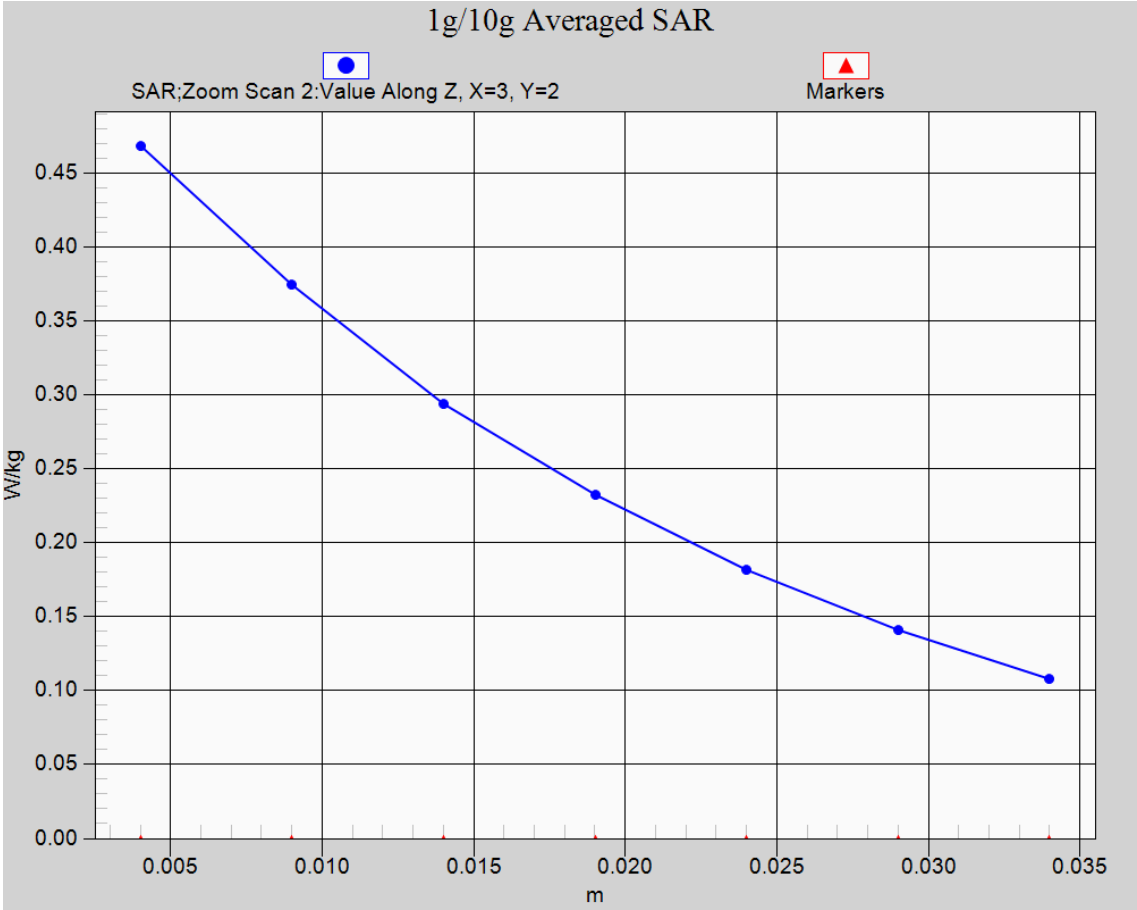

Fig.2-1 Z-Scan at power reference point (GSM 850 MHz CH251)

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GSM1900 Right Cheek Middle

Date/Time: 2015-6-18
Electronics: DAE4 Sn786
Medium: 1900 Head
Medium parameters used: f = 1880 MHz; σ = 1.427 S/m; ε_r = 40.499; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: GSM Frequency: 1880 MHz Duty Cycle: 1:8.30042
Probe: ES3DV3 - SN3151 ConvF(5.16, 5.16, 5.16); Calibrated: 2014-9-1

Right Cheek Middle/Area Scan (51x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.153 W/kg

Right Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.828 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.224 W/kg
SAR(1 g) = 0.140 W/kg; SAR(10 g) = 0.087 W/kg
Maximum value of SAR (measured) = 0.151 W/kg

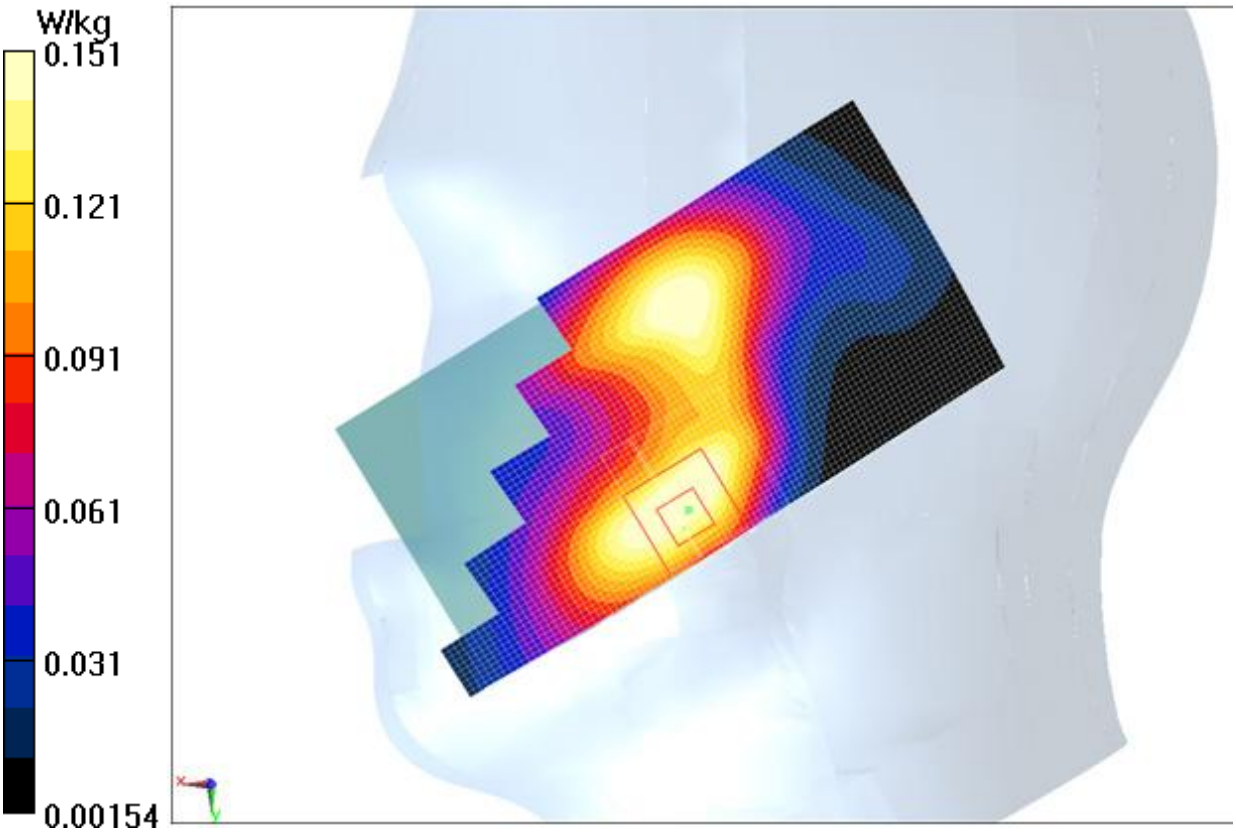

Fig.3 GSM 1900 MHz CH661

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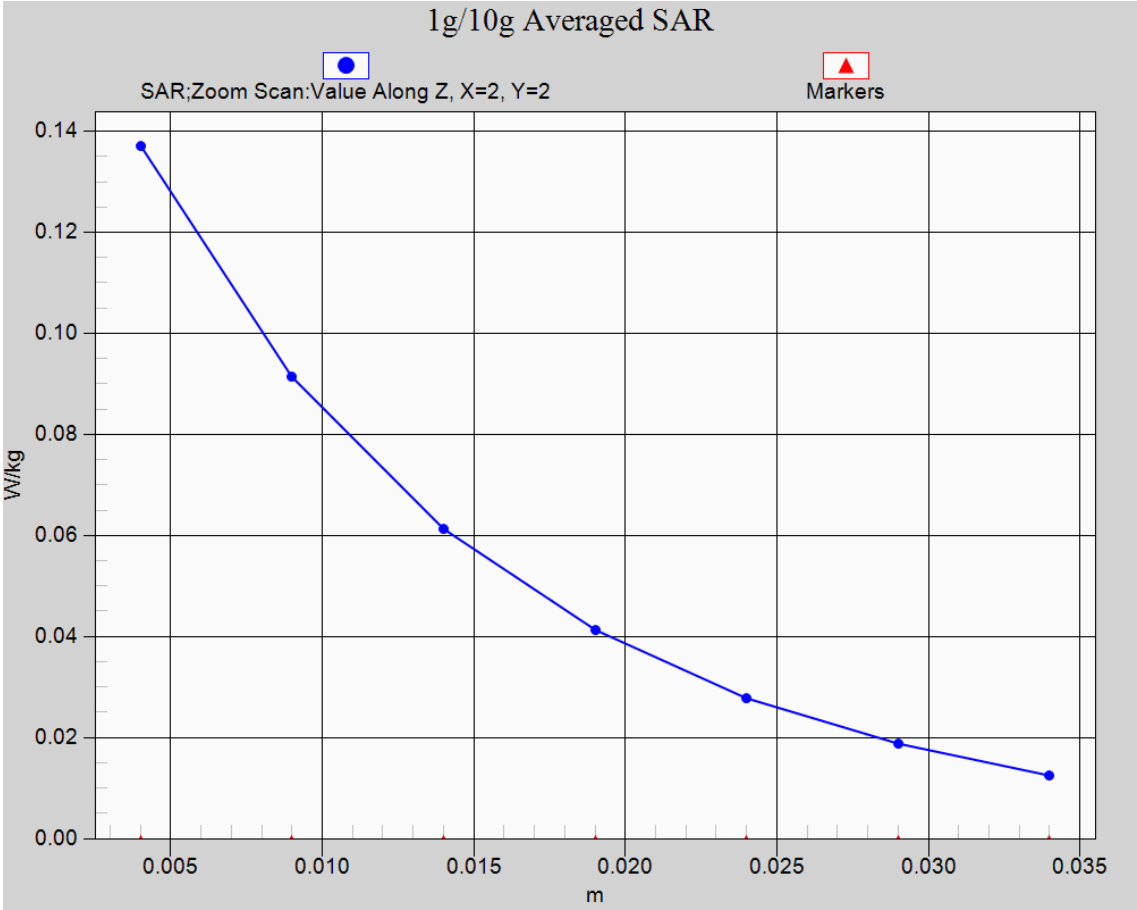

Fig.3-1 Z-Scan at power reference point (GSM 1900 MHz CH661)

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GSM1900 Body Rear Low

Date/Time: 2015-6-19

Electronics: DAE4 Sn786

Medium: 1900 Body

Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.492 S/m; ε_r = 50.913; ρ = 1000 kg/m^3

Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C

Communication System: 4 slot GPRS Frequency: 1850.2 MHz Duty Cycle: 1:2.08018

Probe: ES3DV3 - SN3151 ConvF(4.77, 4.77, 4.77); Calibrated: 2014-9-1

Rear side Low/Area Scan (51x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.397 W/kg

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

Reference Value = 7.579 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.636 W/kg

SAR(1 g) = 0.358 W/kg; SAR(10 g) = 0.183 W/kg

Maximum value of SAR (measured) = 0.400 W/kg

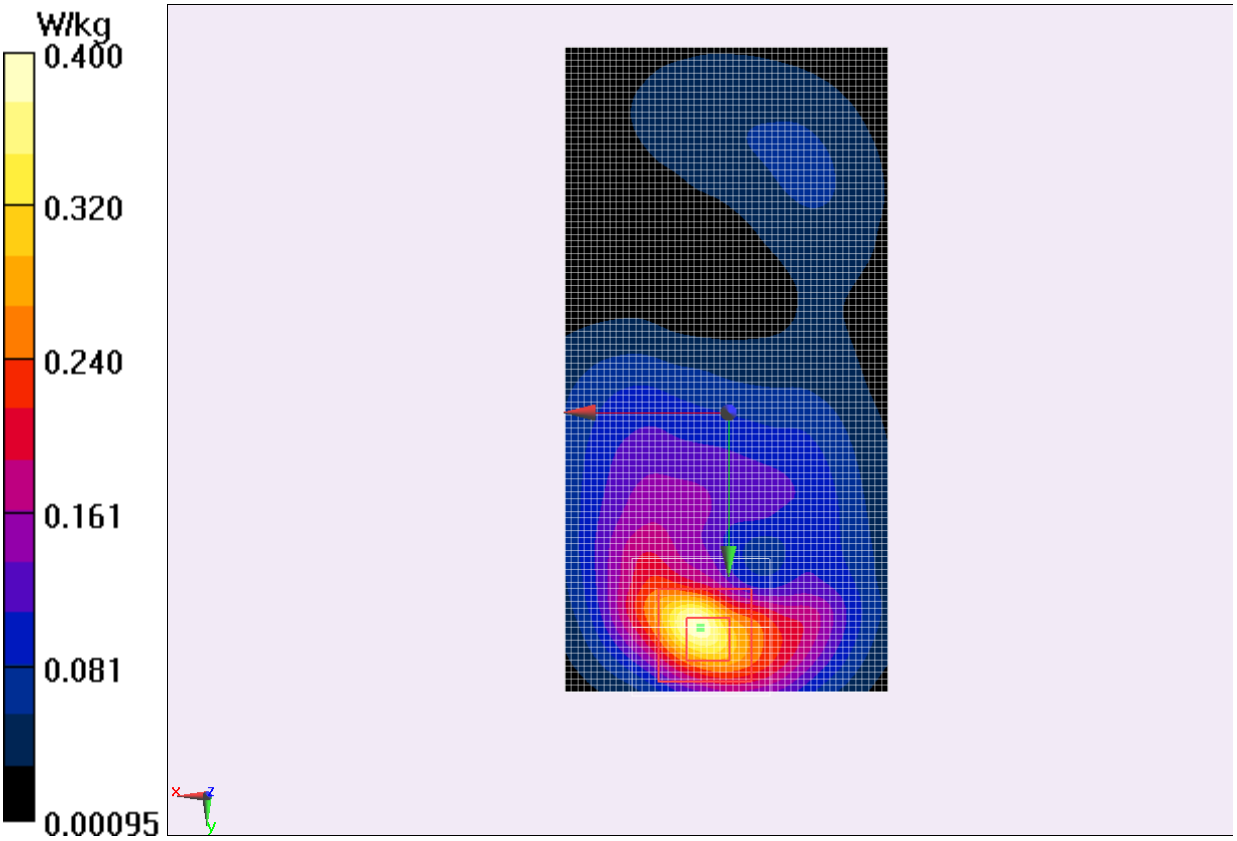

Fig.4 GSM 1900 MHz CH512

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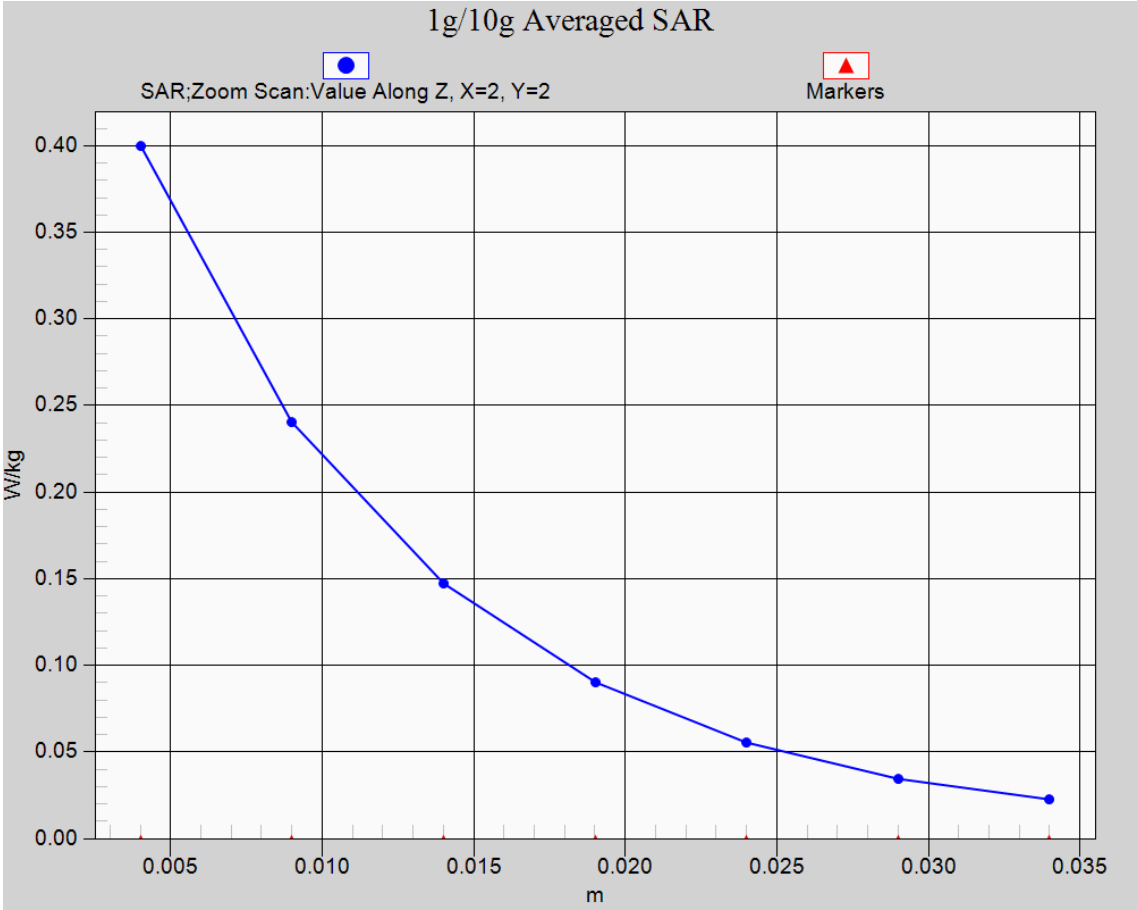

Fig.4-1 Z-Scan at power reference point (GSM 1900 MHz CH512)

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WCDMA 850 Left Cheek High

Date/Time: 2015-6-10
Electronics: DAE4 Sn786
Medium: Head 850 MHz
Medium parameters used (interpolated): f = 846.6 MHz; σ = 0.938 S/m; ε_r = 41.195; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: WCDMA Frequency: 846.6 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(6.04, 6.04, 6.04); Calibrated: 2014-9-1

Left Cheek High/Area Scan (51x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.366 W/kg

Left Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.729 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.473 W/kg
SAR(1 g) = 0.351 W/kg; SAR(10 g) = 0.254 W/kg
Maximum value of SAR (measured) = 0.368 W/kg

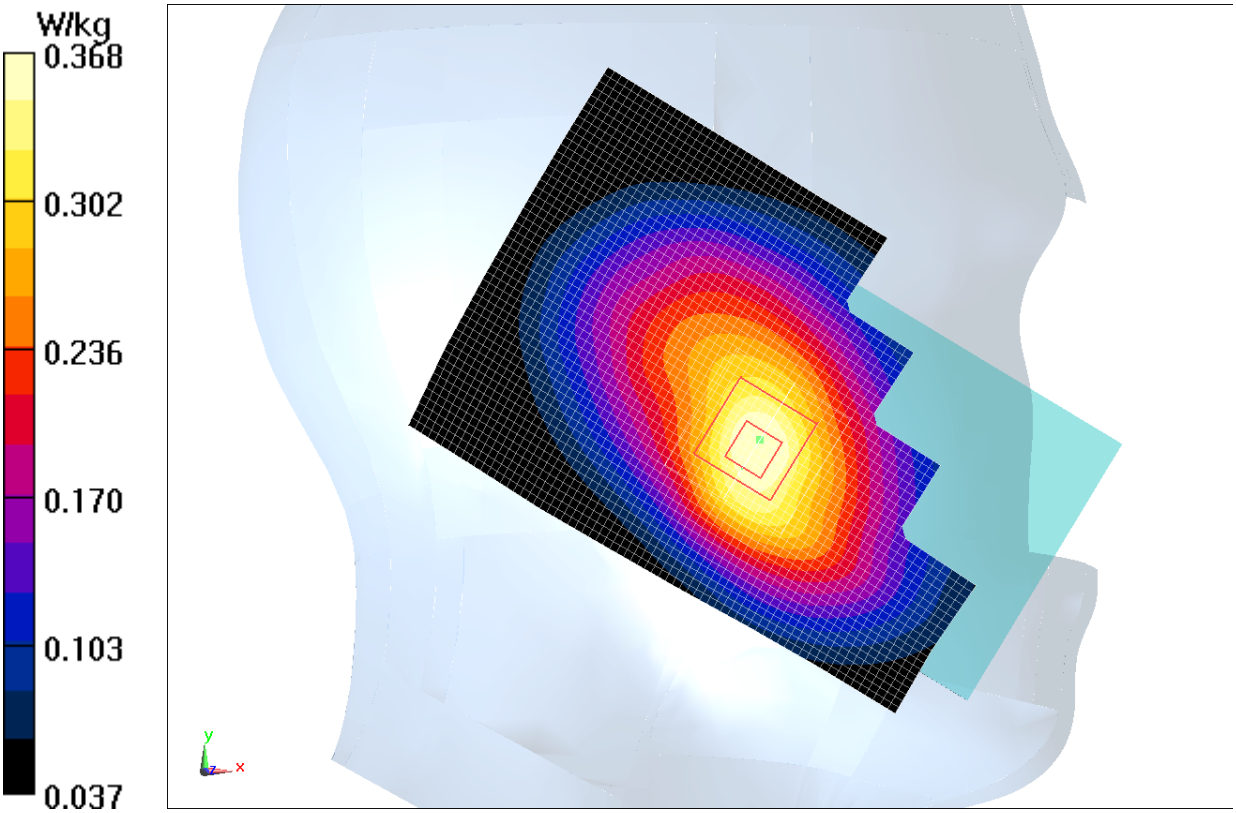

Fig.5 WCDMA 850 CH4233

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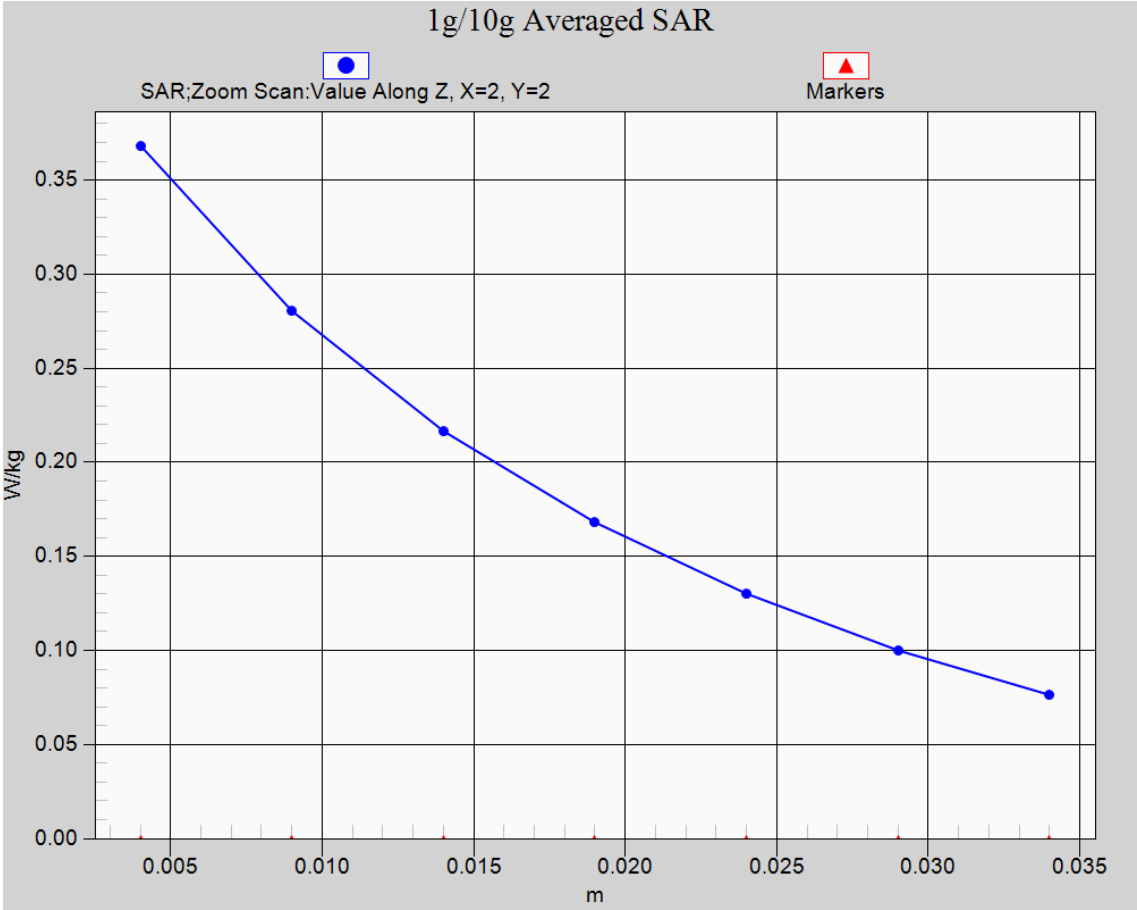

Fig.5-1 Z-Scan at power reference point (WCDMA 850 CH4233)

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WCDMA 850 Body Rear High

Date/Time: 2015-6-11
Electronics: DAE4 Sn786
Medium: Body850 MHz
Medium parameters used (interpolated): f = 846.6 MHz; σ = 0.982 S/m; ε_r = 53.433; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: WCDMA Frequency: 846.6 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(6.14, 6.14, 6.14); Calibrated: 2014-9-1

Rear side High/Area Scan (41x81x1): Interpolated grid: dx=2.000 mm, dy=2.000 mm

Maximum value of SAR (interpolated) = 0.524 W/kg

Rear side High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.442 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.848 W/kg
SAR(1 g) = 0.481 W/kg; SAR(10 g) = 0.266 W/kg
Maximum value of SAR (measured) = 0.521 W/kg

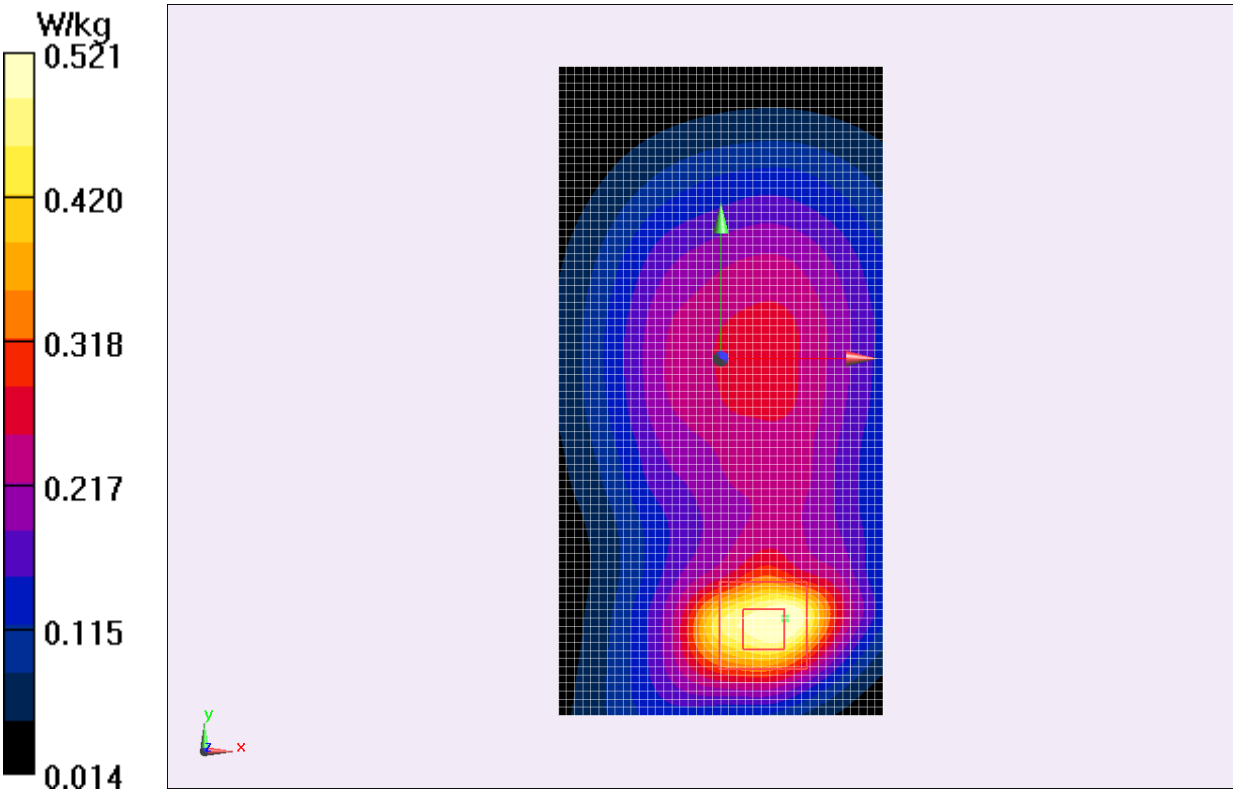

Fig.6 WCDMA 850 CH4233

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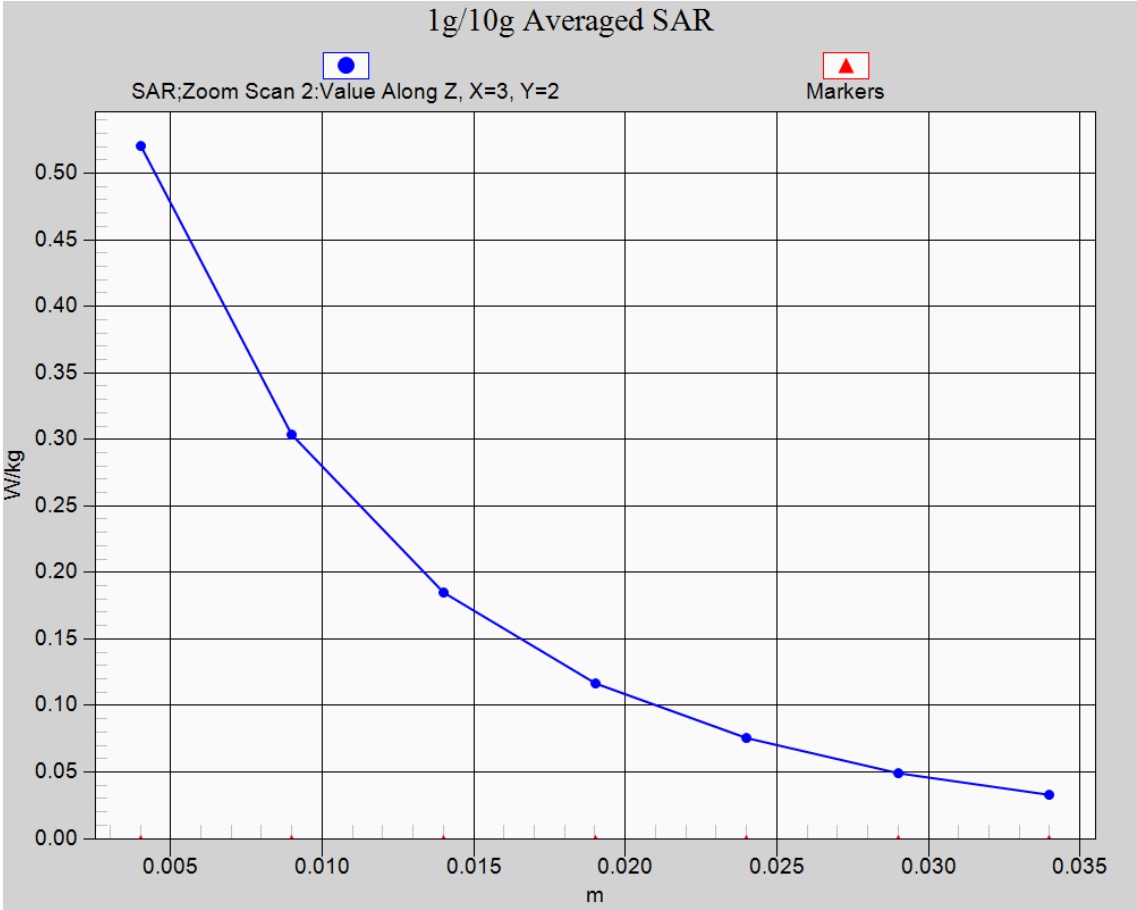

Fig.6-1 Z-Scan at power reference point (WCDMA850 CH4233)

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WCDMA 1900 Right Cheek Middle

Date/Time: 2015-6-18
Electronics: DAE4 Sn786
Medium: 1900 Head
Medium parameters used: f = 1880 MHz; σ = 1.427 S/m; ε_r = 40.499; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: WCDMA Frequency: 1880 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(5.16, 5.16, 5.16); Calibrated: 2014-9-1

Right Cheek Middle/Area Scan (51x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.288 W/kg

Right Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.176 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.398 W/kg
SAR(1 g) = 0.277 W/kg; SAR(10 g) = 0.153 W/kg
Maximum value of SAR (measured) = 0.286 W/kg

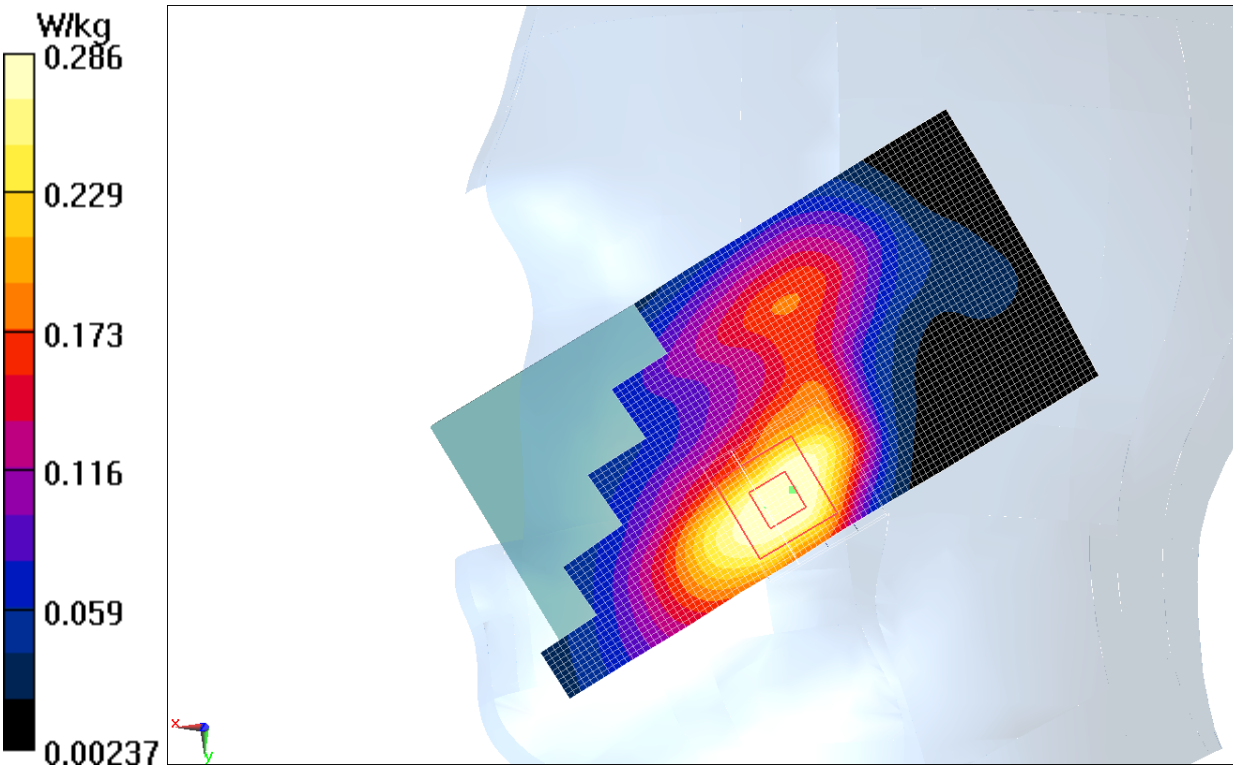

Fig.7 WCDMA1900 CH9400

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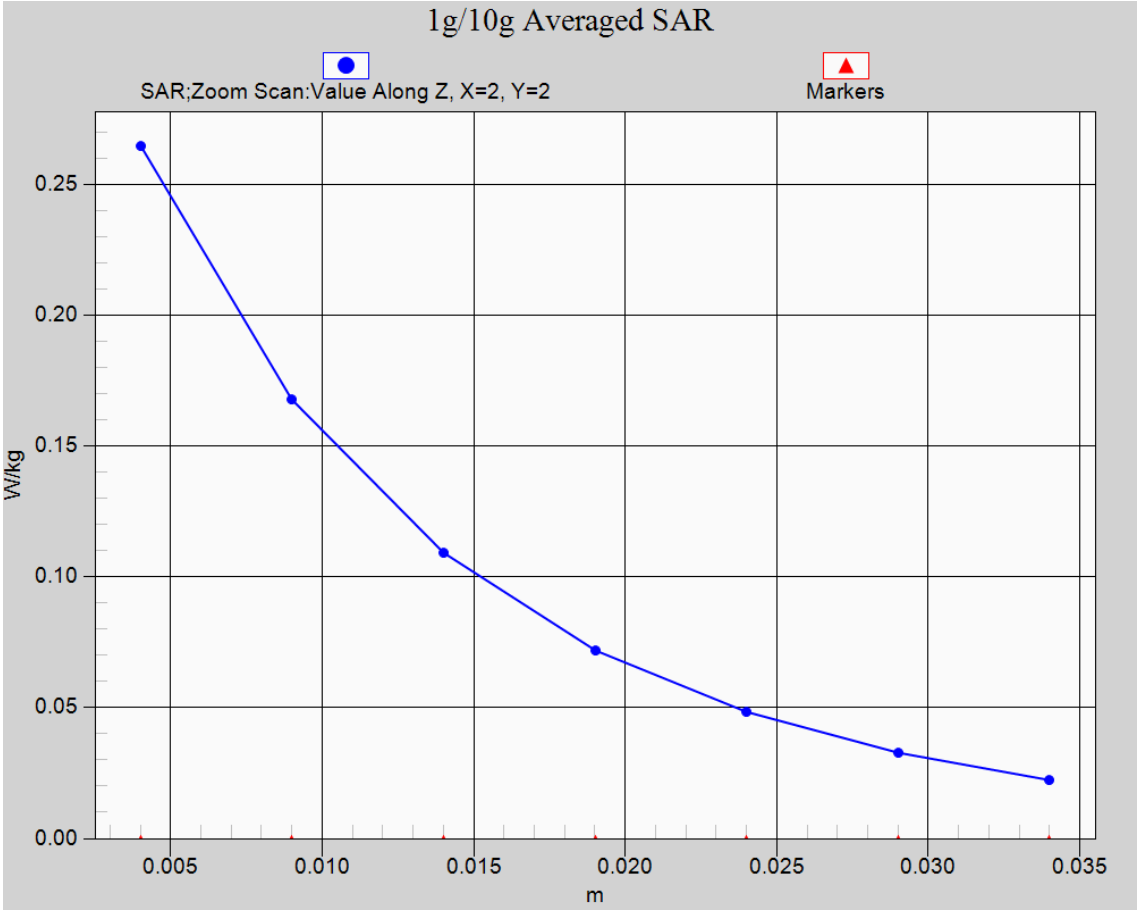

Fig.7-1 Z-Scan at power reference point (WCDMA1900 CH9400)

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WCDMA 1900 Body Rear High

Date/Time: 2015-6-19

Medium: Body 1900

Medium parameters used: f = 1908 MHz; σ = 1.548 S/m; ε_r = 50.782; ρ = 1000 kg/m^3

Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C

Communication System: WCDMA Frequency: 1908 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3151 ConvF(4.77, 4.77, 4.77); Calibrated: 2014-9-1

Rear side High/Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

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

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

Reference Value = 7.463 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 1.85 W/kg

SAR(1 g) = 1.05 W/kg; SAR(10 g) = 0.554 W/kg

Maximum value of SAR (measured) = 1.17 W/kg

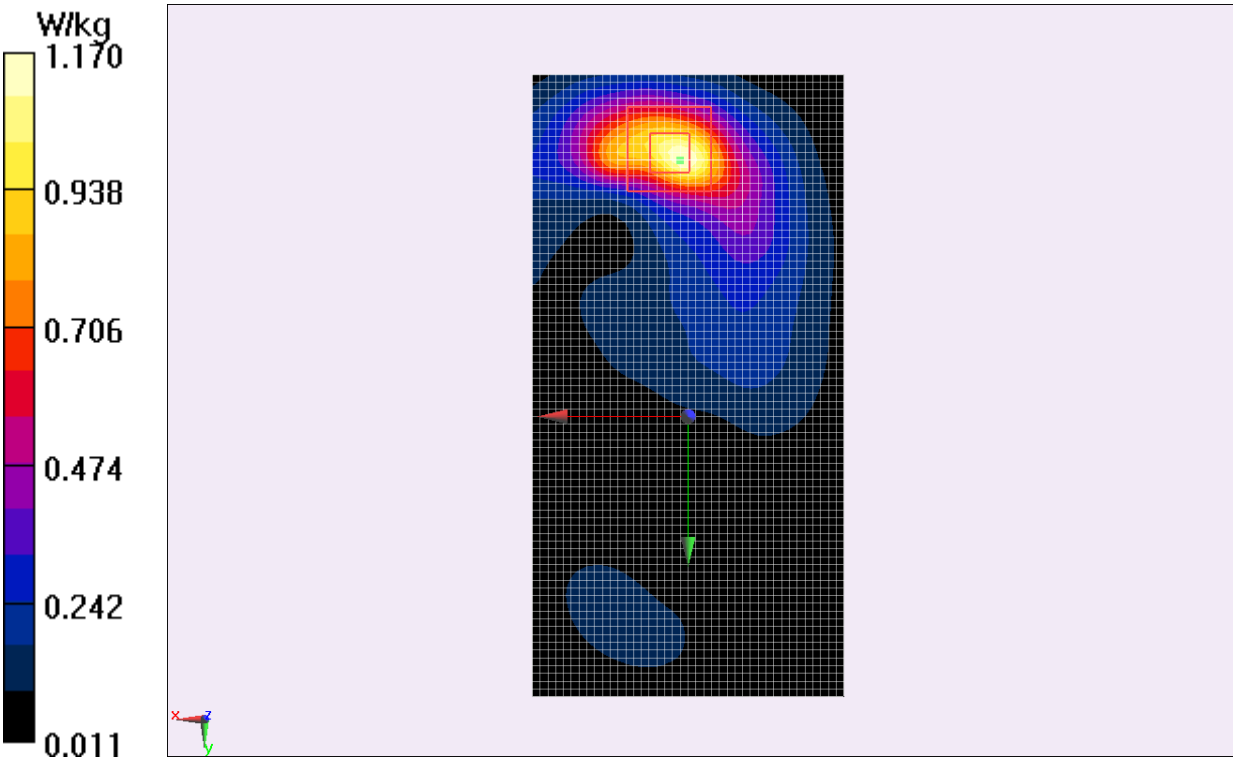

Fig.8 WCDMA1900 CH9538

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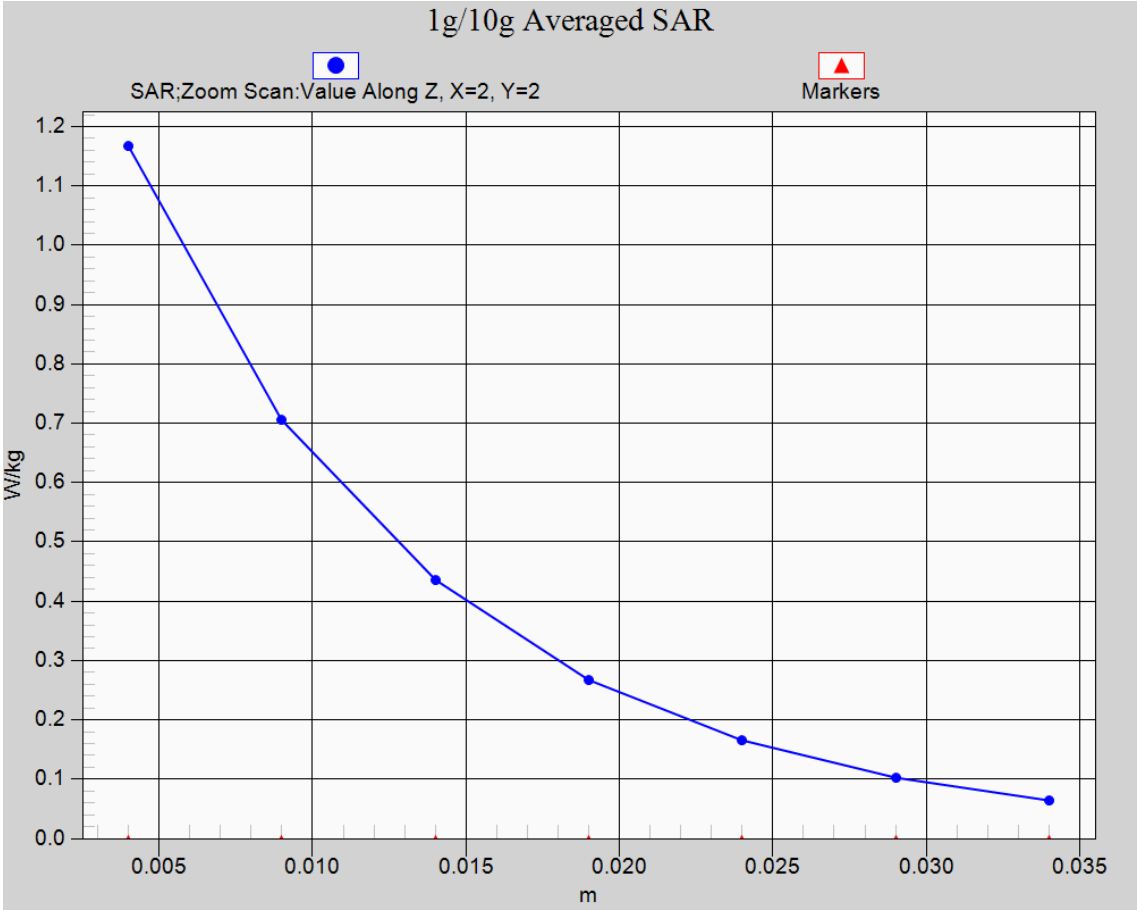

Fig.8-1 Z-Scan at power reference point (WCDMA1900 CH9538)

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LTE Band 2 Left Cheek High with QPSK_20MHz_1RB_ Low

Date/Time: 2015-6-18
Electronics: DAE4 Sn786
Medium: 1900 Head
Medium parameters used: f = 1880 MHz; σ = 1.427 S/m; ε_r = 40.499; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: LTE_FDD Frequency: 1880 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(5.16, 5.16, 5.16); Calibrated: 2014-9-1

LTE/Left Cheek High_1RB_ Low /Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.349 W/kg

LTE/Left Cheek High_1RB_ Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.701 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.528 W/kg
SAR(1 g) = 0.343 W/kg; SAR(10 g) = 0.211 W/kg
Maximum value of SAR (measured) = 0.359 W/kg

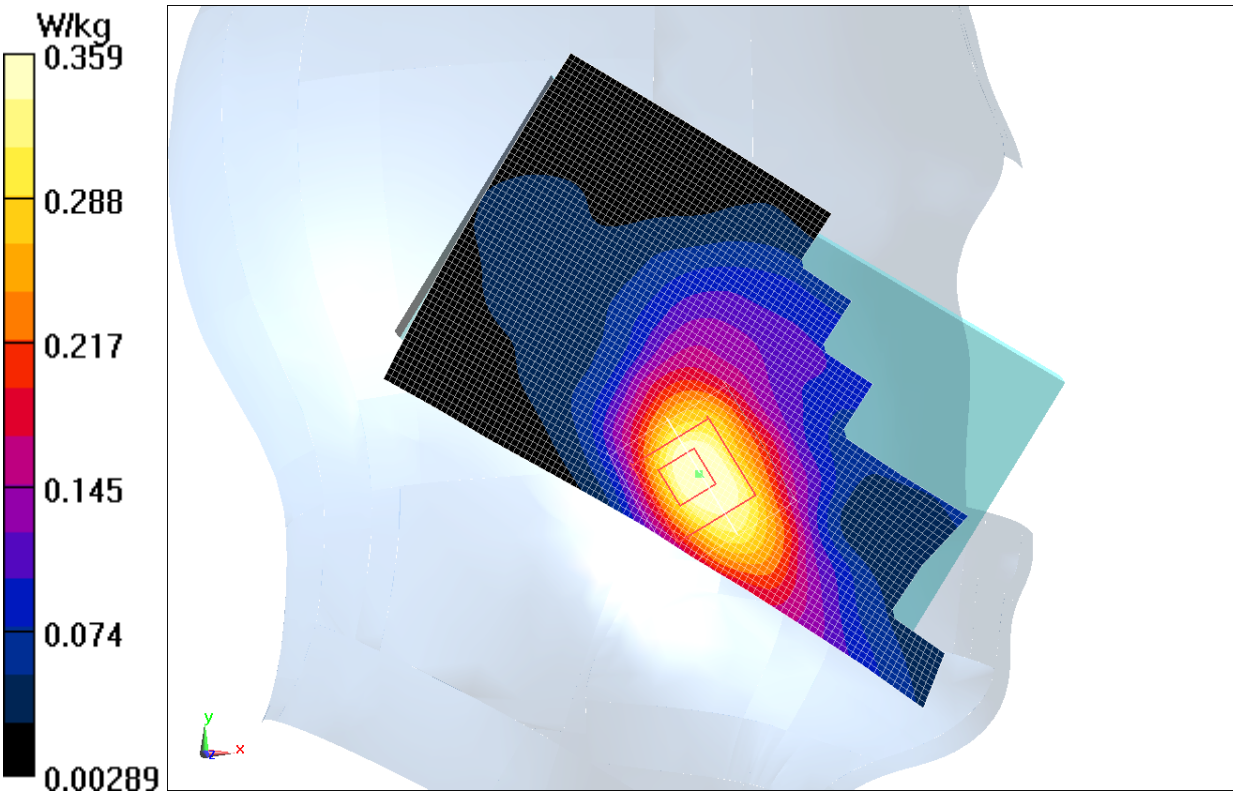

Fig.9 LTE Band 2 CH19100

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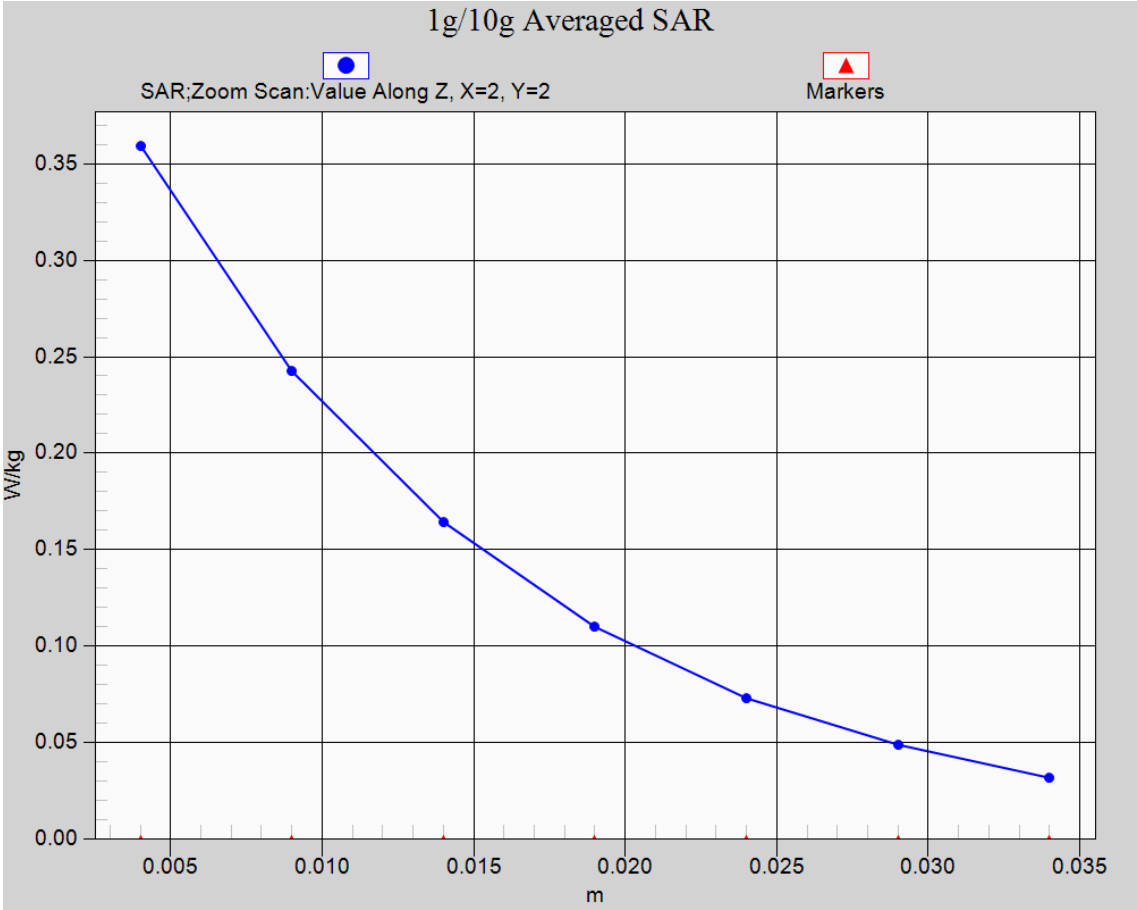

Fig.9-1 Z-Scan at power reference point (Band 2 CH19100)

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LTE Band 2 Body Rear High with QPSK_20MHz_1RB_ Low

Date/Time: 2015-6-19
Electronics: DAE4 Sn786
Medium: Body 1900
Medium parameters used: f = 1860 MHz; σ = 1.575 S/m; ε_r = 53.137; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: LTE_FDD Frequency: 1860 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(4.77, 4.77, 4.77); Calibrated: 2014-9-1

Rear side High_1RB_ Low/Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.763 W/kg

Rear side High_1RB_ Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.472 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.721 W/kg; SAR(10 g) = 0.331 W/kg
Maximum value of SAR (measured) = 0.781 W/kg

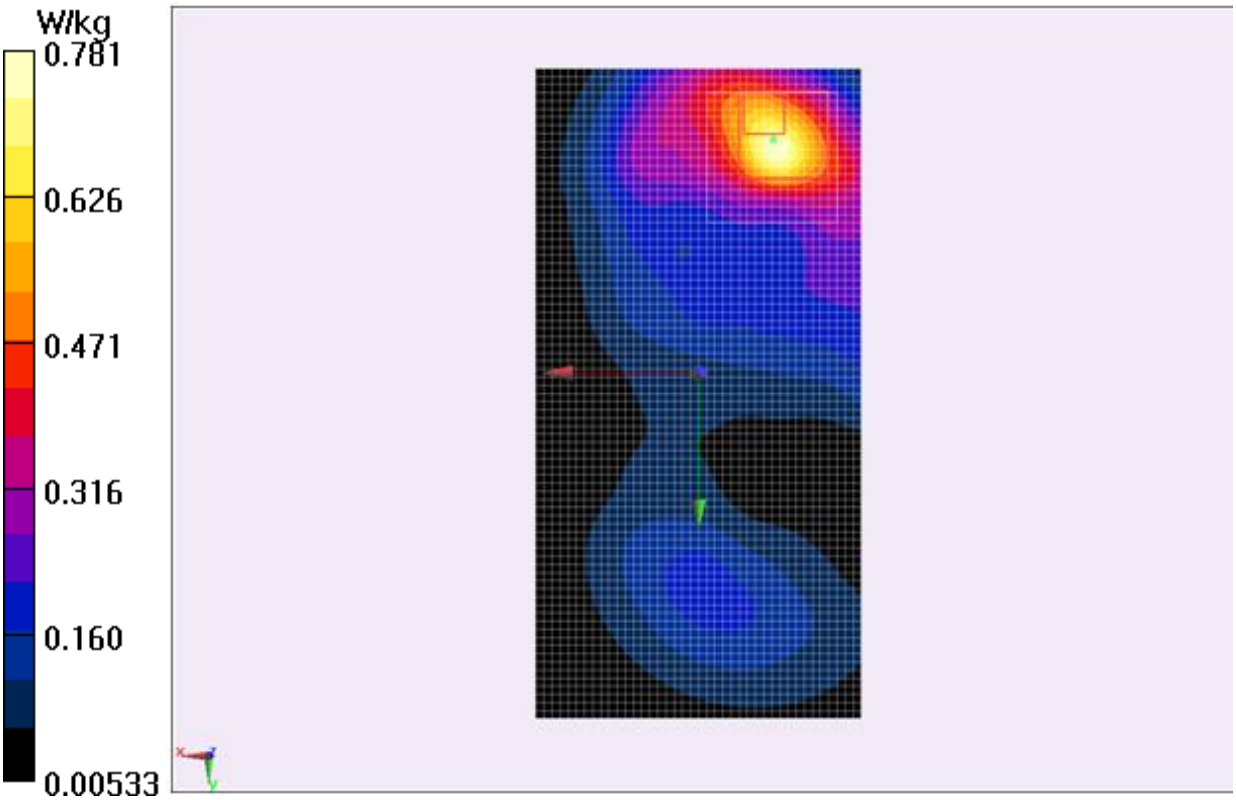

Fig.10 LTE Band 2 CH19100

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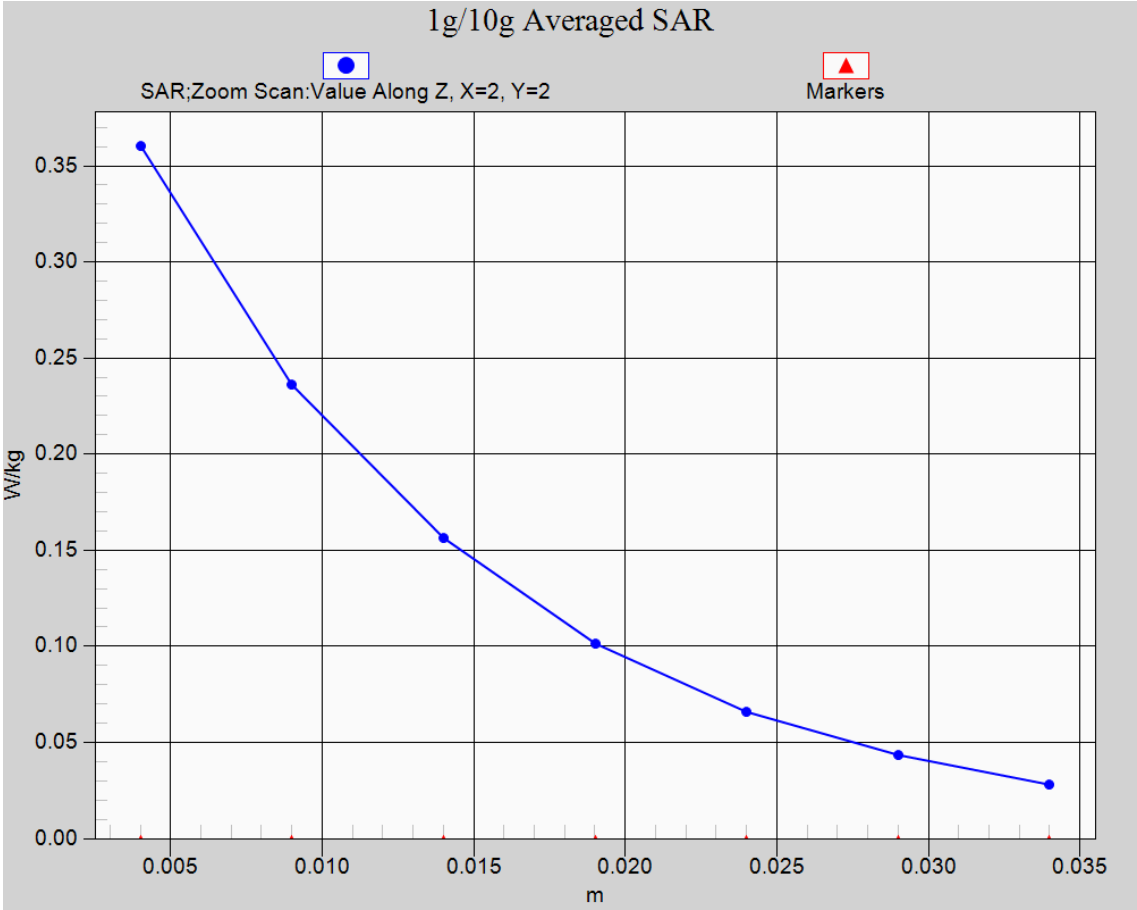

Fig.10-1 Z-Scan at power reference point (Band 2 CH19100)

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LTE Band 4 Left Cheek Low with QPSK_20MHz_1RB_Low

Date/Time: 2015-6-15
Electronics: DAE4 Sn786
Medium: 1800 Head
Medium parameters used: f = 1720 MHz; σ = 1.277 S/m; ε_r = 41.149; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: LTE_FDD Frequency: 1720 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(5.44, 5.44, 5.44); Calibrated: 2014-9-1

Left Cheek Low_1RB_Low/Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.514 W/kg

Left Cheek Low_1RB_Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.987 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 0.713 W/kg
SAR(1 g) = 0.493 W/kg; SAR(10 g) = 0.312 W/kg
Maximum value of SAR (measured) = 0.530 W/kg

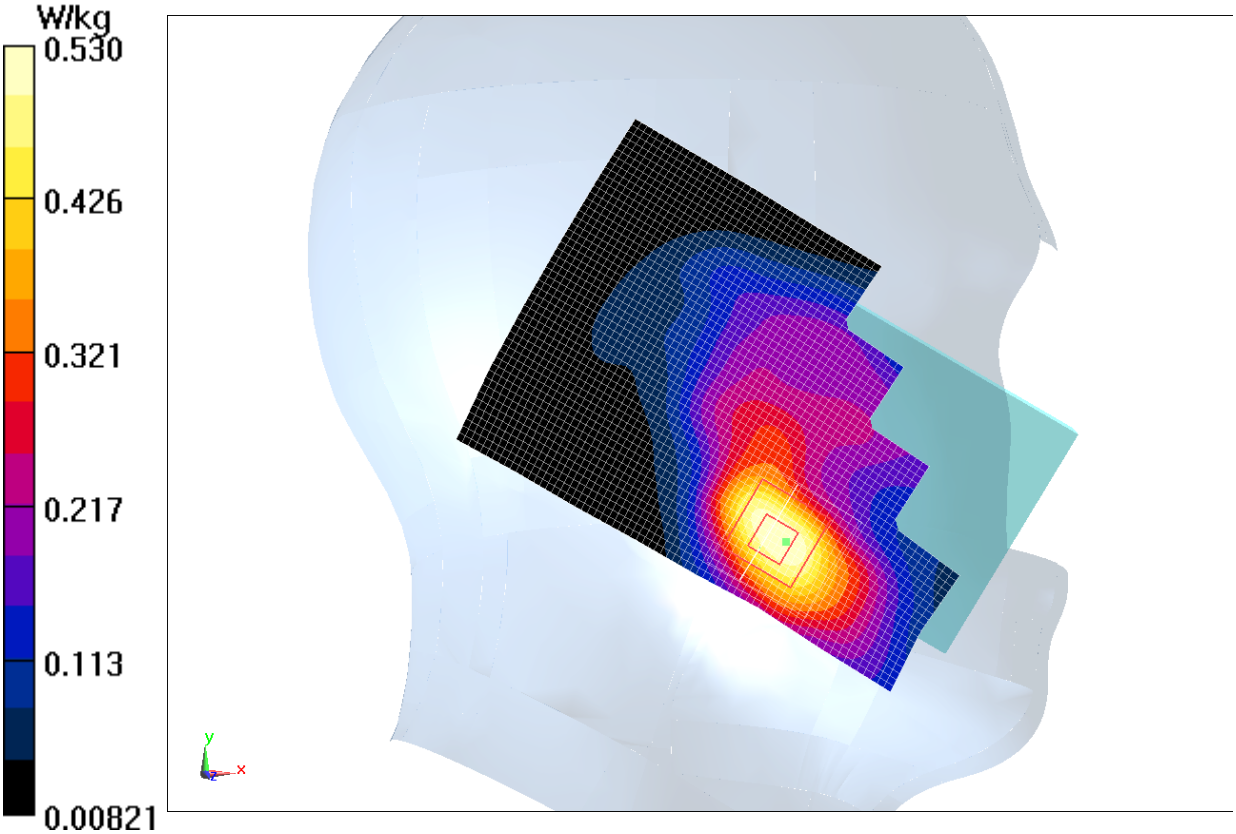

Fig.11 LTE Band4 CH20050

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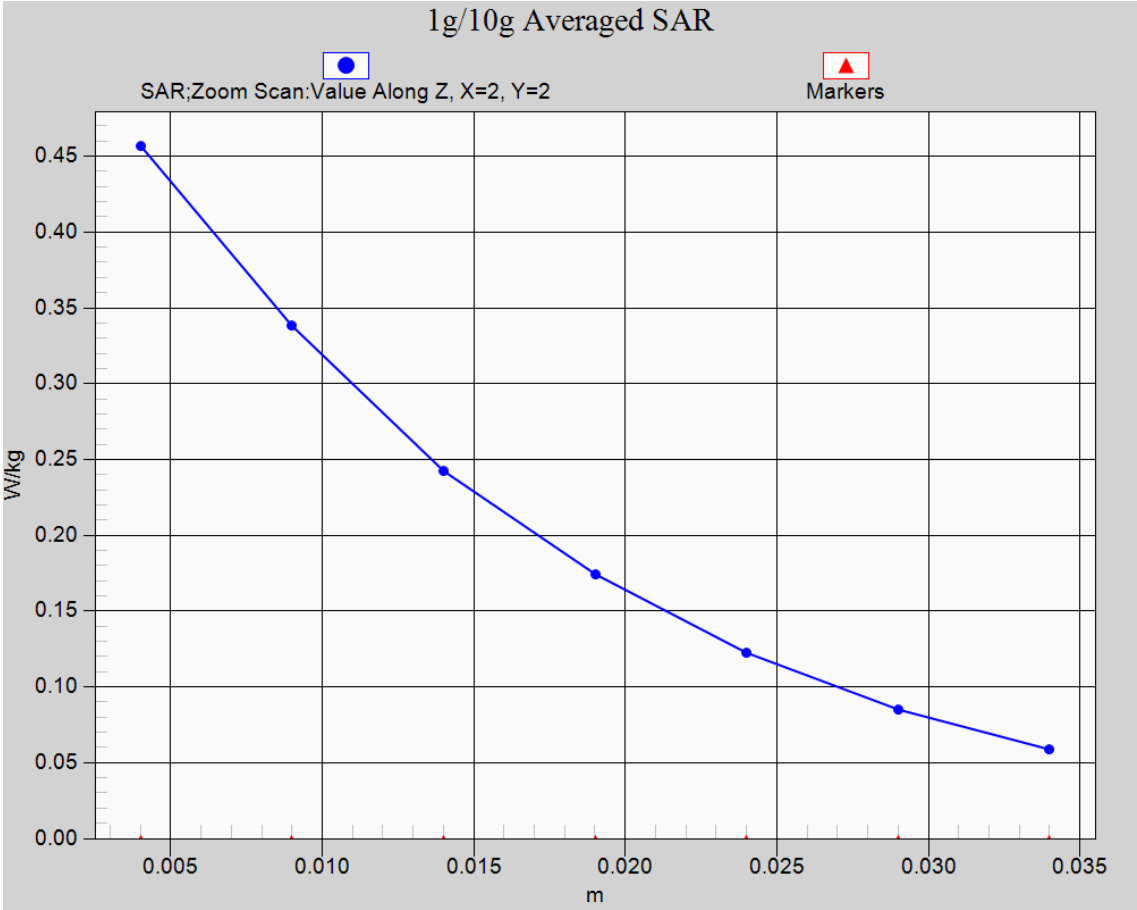

Fig.11-1 Z-Scan at power reference point (Band 4 CH20050)

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LTE Band 4 Body Rear Low with QPSK_20MHz_1RB_Low

Date/Time: 2015-6-22
Electronics: DAE4 Sn786
Medium: 1900 Body
Medium parameters used: f = 1720 MHz; σ = 1.375 S/m; ε_r = 51.22; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: LTE_FDD Frequency: 1720 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(5.03, 5.03, 5.03); Calibrated: 2014-9-1

Rear side Low_1RB_Low/Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.00 W/kg

Rear side Low_1RB_Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.696 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.52 W/kg
SAR(1 g) = 0.887 W/kg; SAR(10 g) = 0.518 W/kg
Maximum value of SAR (measured) = 0.991 W/kg

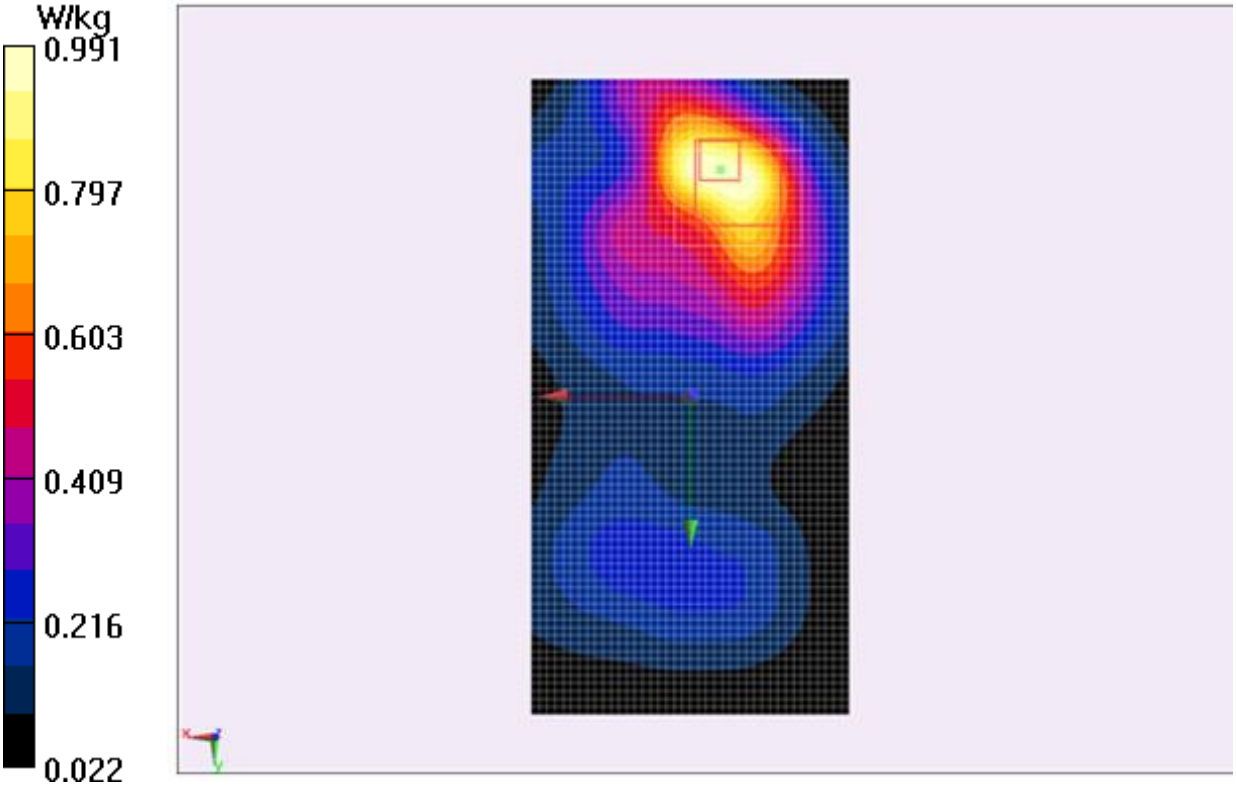

Fig.12 LTE Band 4 CH20050

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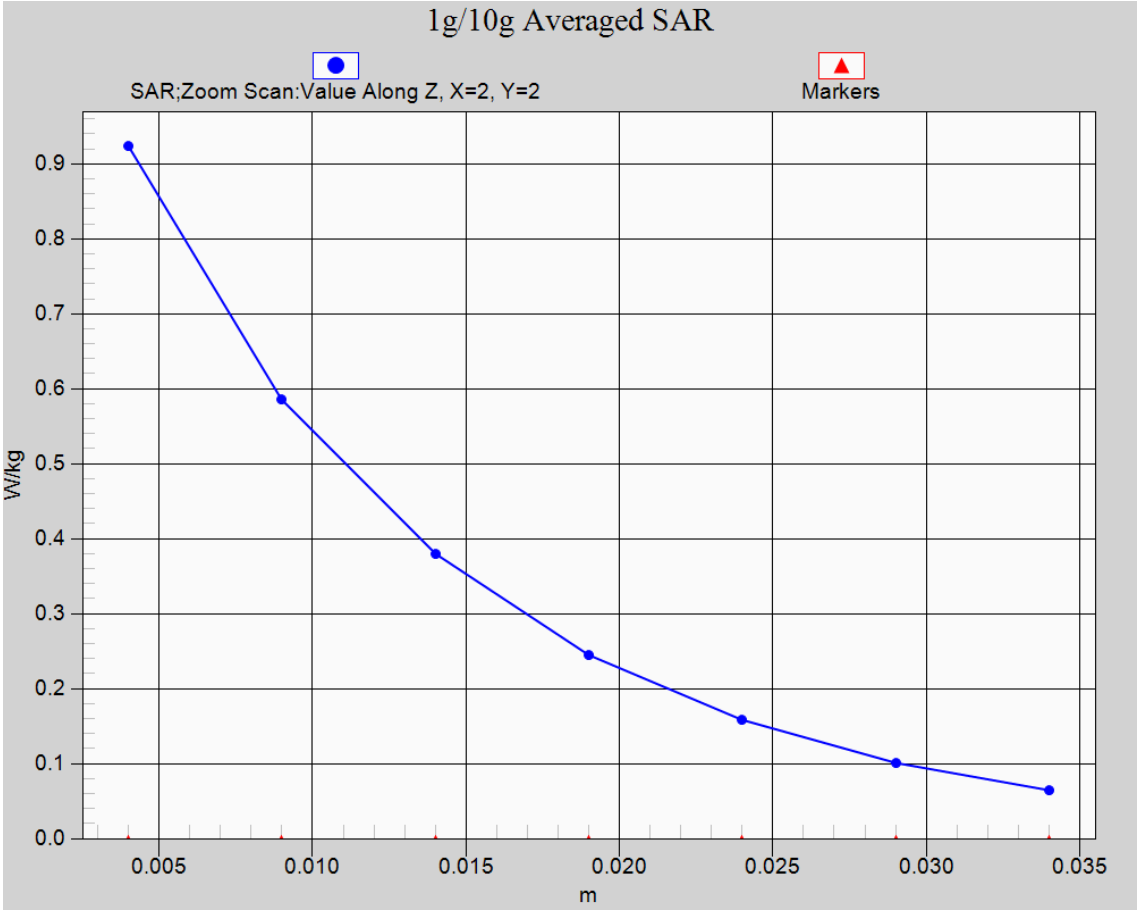

Fig.12-1 Z-Scan at power reference point (Band 4 CH20050)

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LTE Band 5 Right Cheek High with QPSK_10MHz_1RB_ High

Date/Time: 2015-6-10
Electronics: DAE4 Sn786
Medium: Head 835 MHz
Medium parameters used: f = 844 MHz; σ = 0.936 S/m; ε_r = 41.227; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: LTE_FDD Frequency: 844 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(6.04, 6.04, 6.04); Calibrated: 2014-9-1

Left Cheek High_1RB_High/Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.667 W/kg

Left Cheek High_1RB_High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.411 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 0.760 W/kg
SAR(1 g) = 0.597 W/kg; SAR(10 g) = 0.444 W/kg
Maximum value of SAR (measured) = 0.622 W/kg

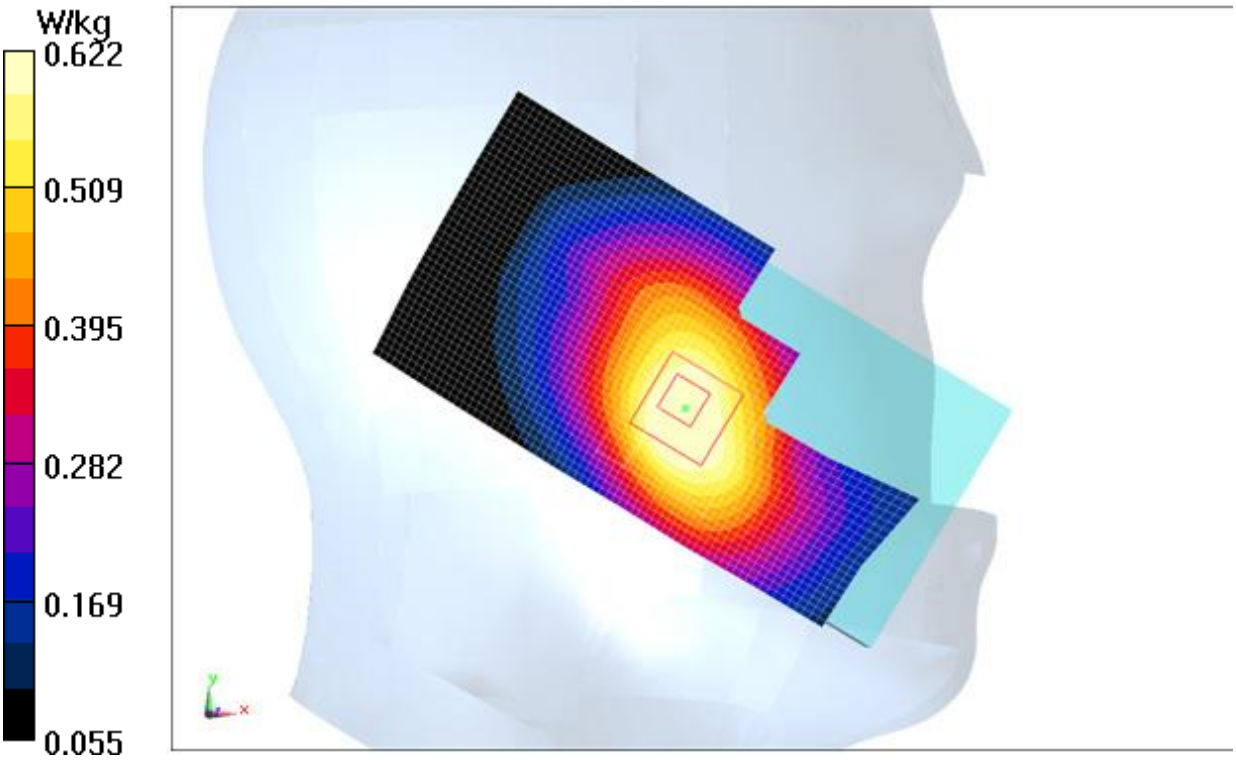

Fig.13 LTE Band 5 CH20600

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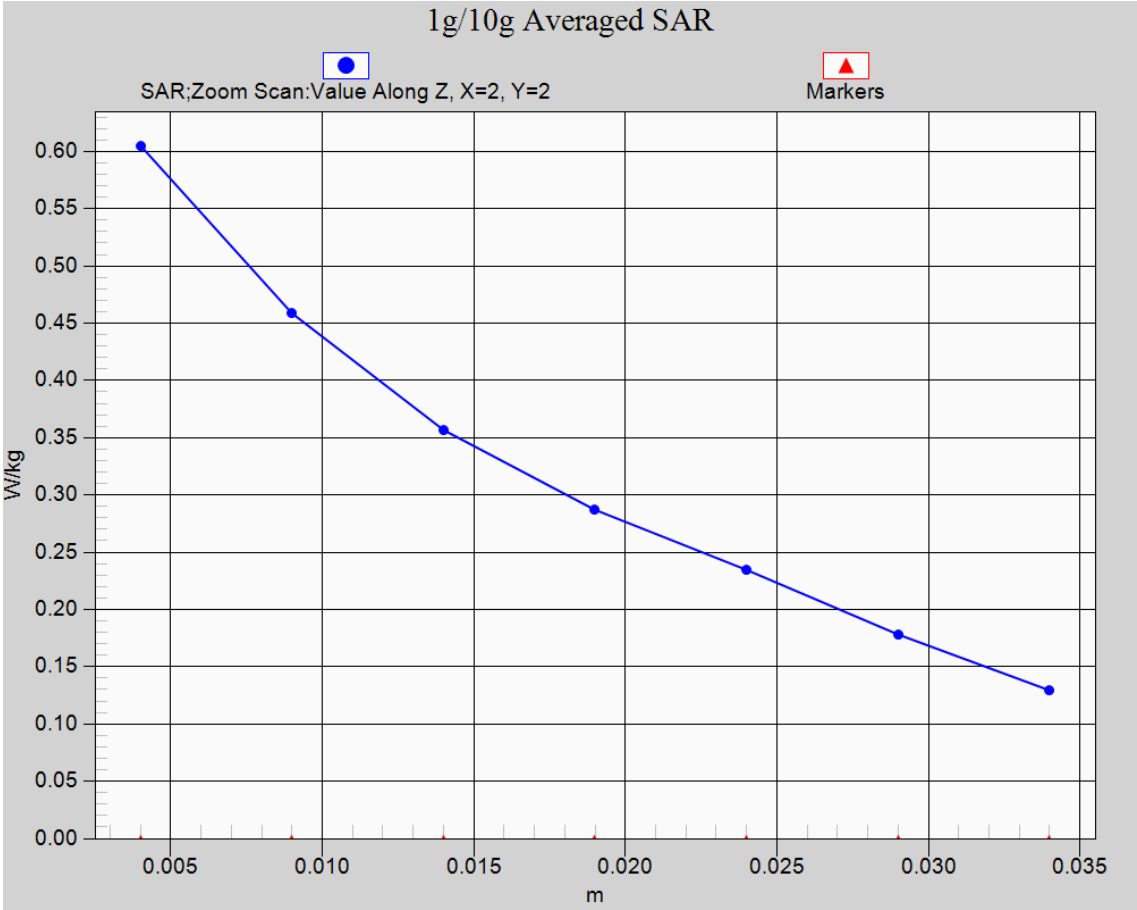

Fig.13-1 Z-Scan at power reference point (Band 5 CH20600)

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LTE Band 5 Body Rear High with QPSK_10MHz_1RB_ High

Date/Time: 2015-6-11
Medium: Body850 MHz
Medium parameters used: f = 844 MHz; σ = 0.979 S/m; ε_r = 53.445; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: LTE_FDD Frequency: 844 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(6.14, 6.14, 6.14); Calibrated: 2014-9-1

Rear side High_1RB_ High /Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.888 W/kg

Rear side High_1RB_ High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.450 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.07 W/kg
SAR(1 g) = 0.853 W/kg; SAR(10 g) = 0.651 W/kg
Maximum value of SAR (measured) = 0.894 W/kg

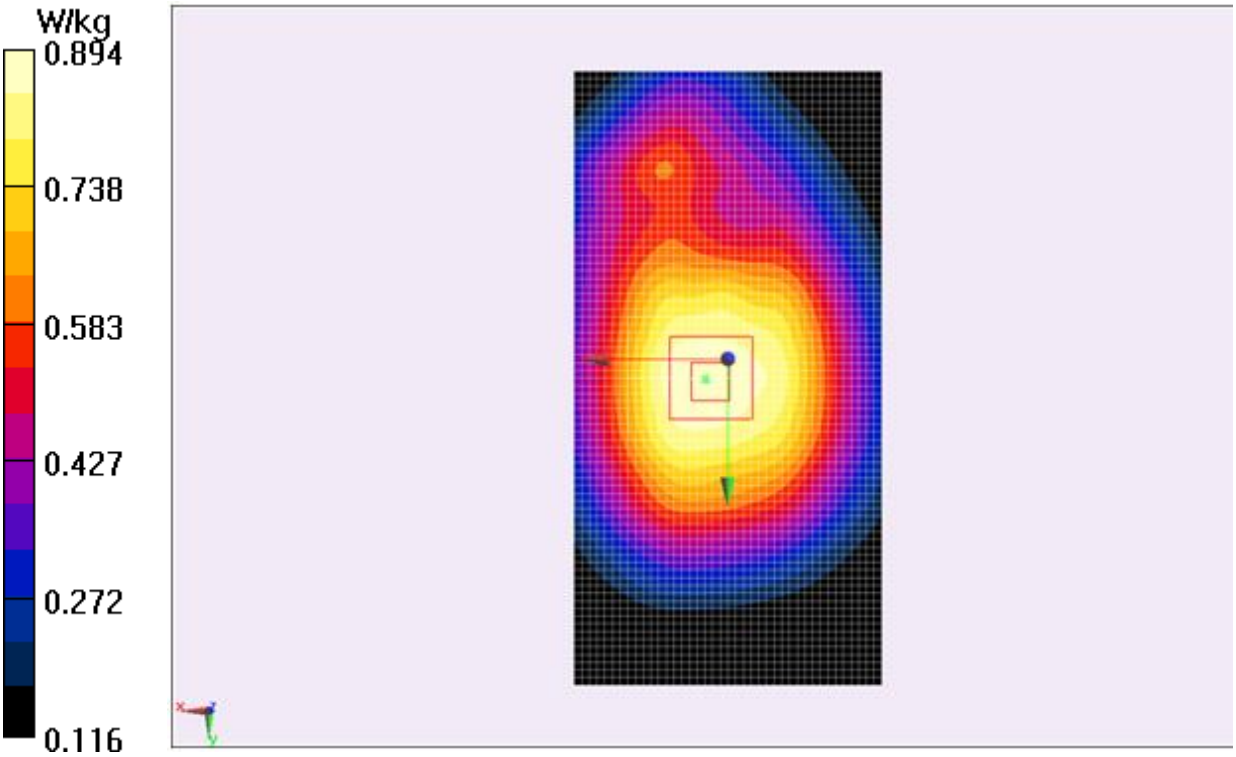

Fig.14 LTE Band 5 CH20600

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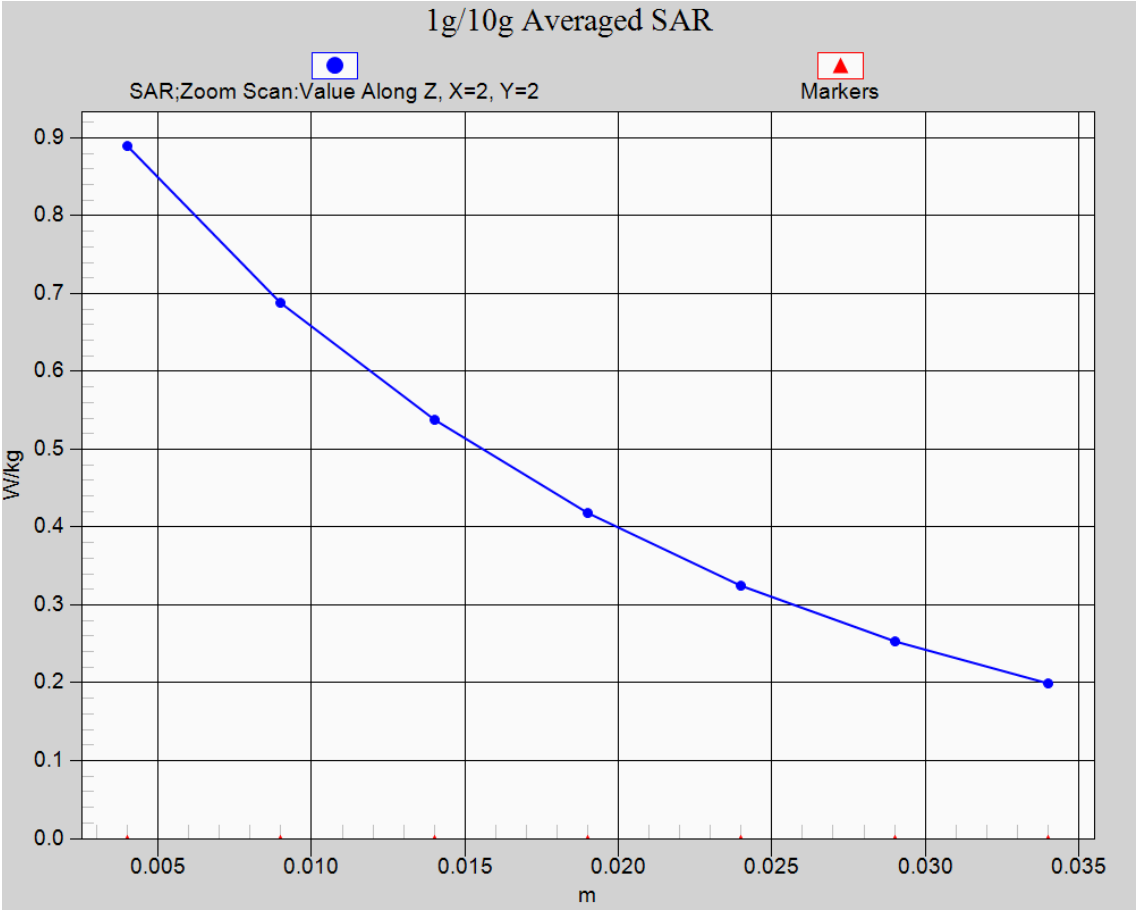

Fig.14-1 Z-Scan at power reference point (Band 5 CH20600)

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LTE Band 7 Right Cheek Low with QPSK_20MHz_1RB_Low

Date/Time: 2015-6-25
Electronics: DAE4 Sn786
Medium: Head 2600 MHz
Medium parameters used: f = 2560 MHz; σ = 1.996 S/m; ε_r = 38.17; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: LTE_FDD Frequency: 2560 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(4.57, 4.57, 4.57); Calibrated: 2014-9-1

Right Cheek Low _1RB_ Low/Area Scan (51x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.267 W/kg

Right Cheek Low_1RB_ Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.042 V/m; Power Drift = 0.11dB
Peak SAR (extrapolated) = 0.388 W/kg
SAR(1 g) = 0.204 W/kg; SAR(10 g) = 0.105 W/kg
Maximum value of SAR (measured) = 0.274 W/kg

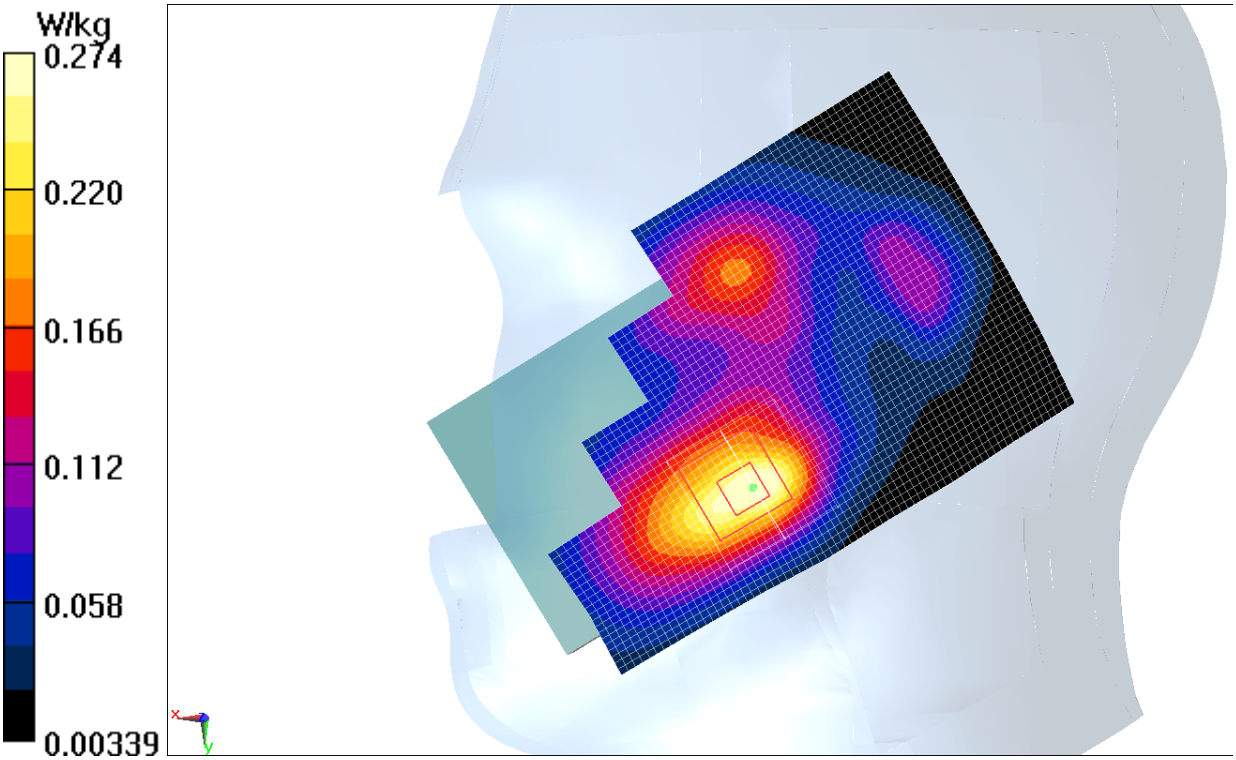

Fig.15 LTE Band 7 CH20850

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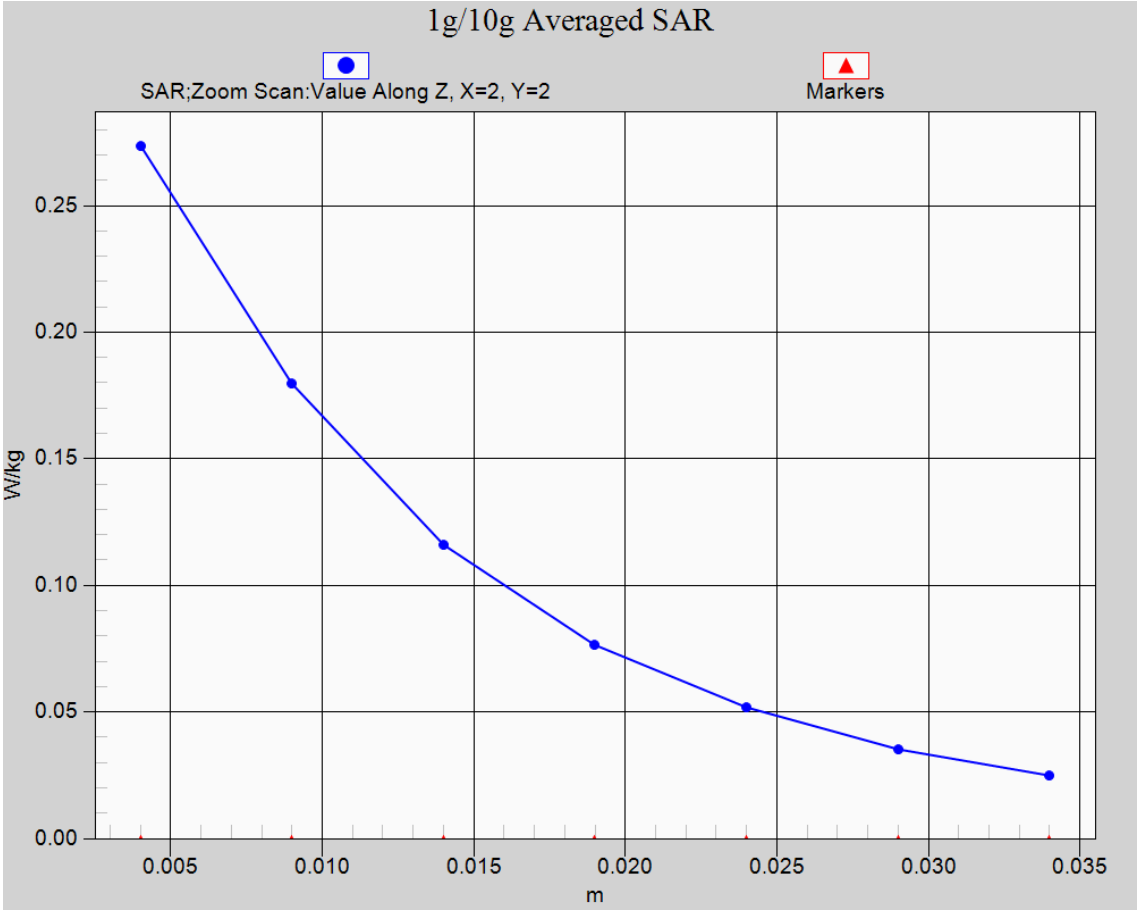

Fig.15-1 Z-Scan at power reference point (Band 7 CH20850)

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LTE Band 7 Body Rear Low with QPSK_20MHz_1RB_Low

Date/Time: 2015-6-26
Electronics: DAE4 Sn786
Medium: body 2600 MHz
Medium parameters used: f = 2560 MHz; σ = 2.116 S/m; ε_r = 50.95; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: LTE_FDD Frequency: 2560 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(4.57, 4.57, 4.57); Calibrated: 2014-9-1

Rear side Low_1RB_ Low /Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.06 W/kg

Rear side Low_1RB_ Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.409 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 1.74 W/kg
SAR(1 g) = 0.942 W/kg; SAR(10 g) = 0.408 W/kg
Maximum value of SAR (measured) = 1.01 W/kg

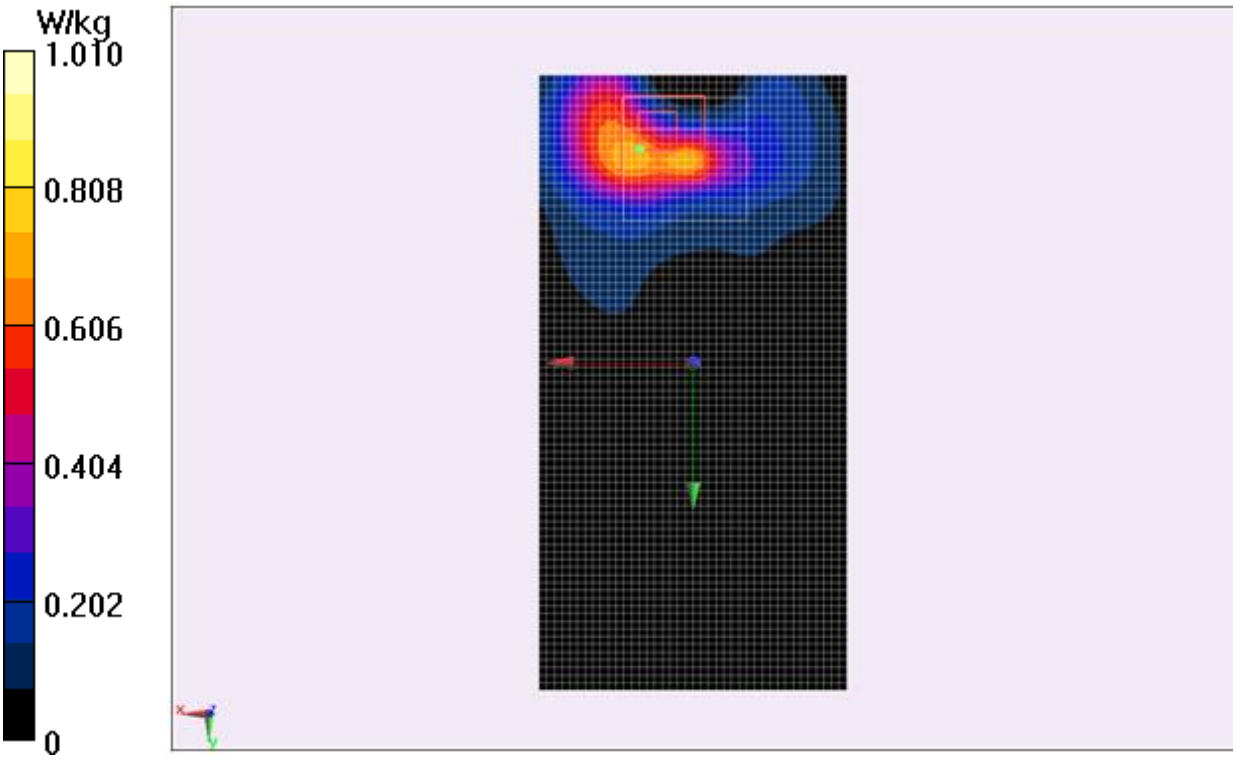

Fig.16 LTE Band 7 CH20850

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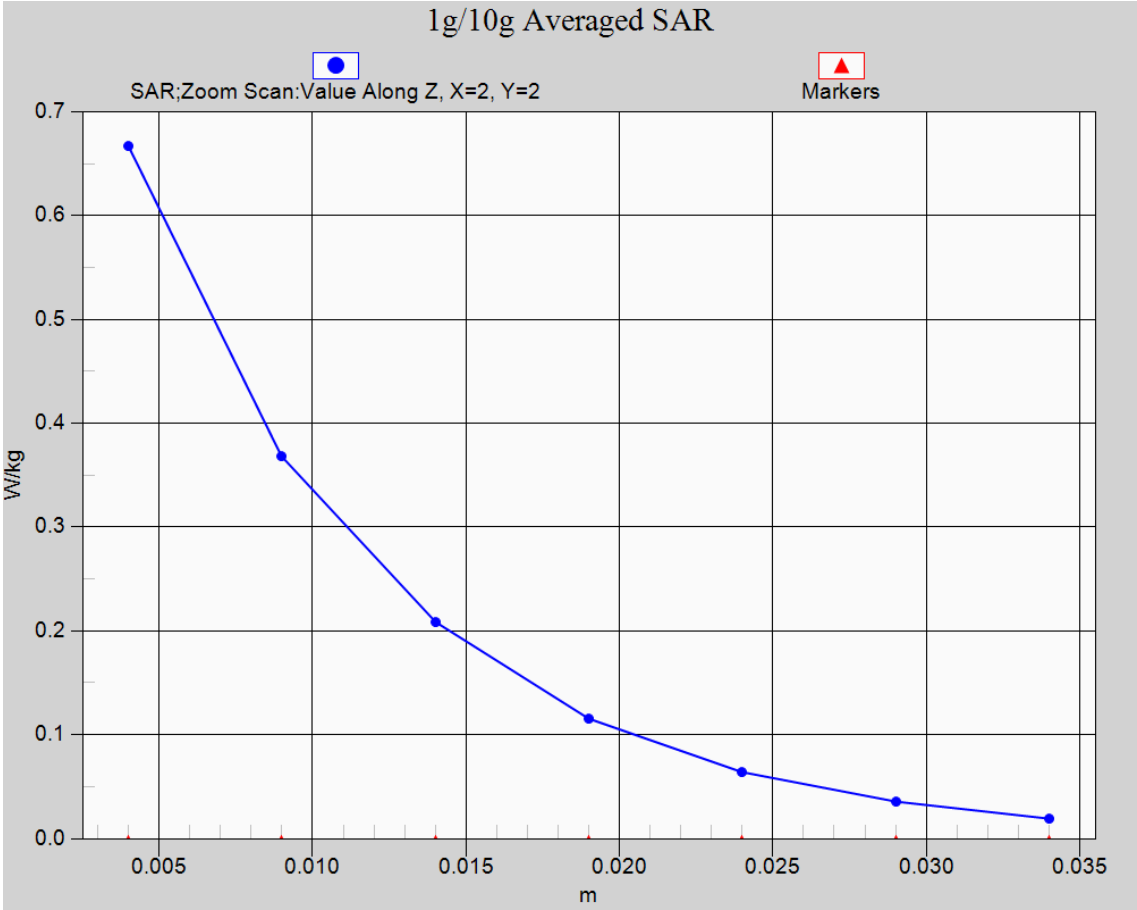

Fig.16-1 Z-Scan at power reference point (Band 7 CH20850)

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Wi-Fi 802.11b Right Cheek Channel 1

Date/Time: 2015-6-26
Electronics: DAE4 Sn786
Medium: Head 2450
Medium parameters used: f = 2462 MHz; σ = 1.893 S/m; ε_r = 39.297; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: WiFi Frequency: 2462 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(4.71, 4.71, 4.71); Calibrated: 2014-9-1

Right Cheek Low /Area Scan (51x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.376 W/kg

Right Cheek Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.699 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.960 W/kg
SAR(1 g) = 0.321 W/kg; SAR(10 g) = 0.160 W/kg
Maximum value of SAR (measured) = 0.389 W/kg

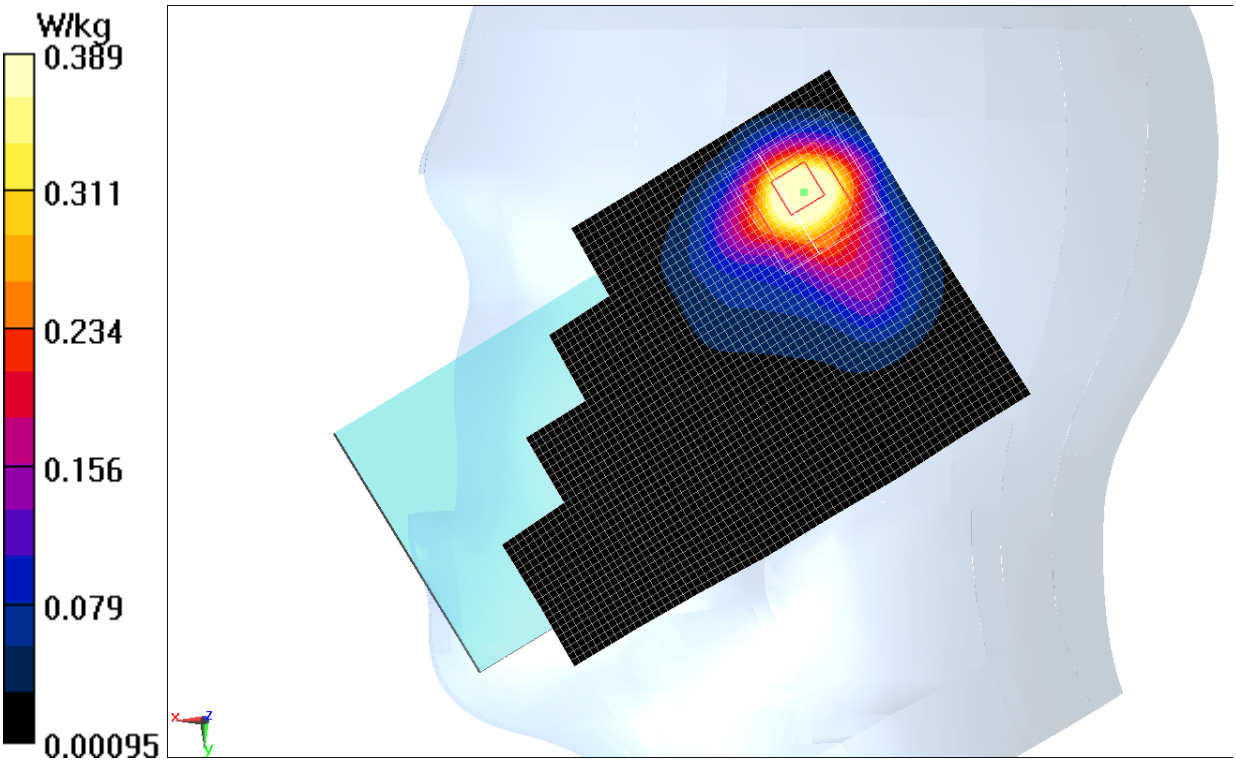

Fig.17 Wi-Fi 2450 MHz CH1

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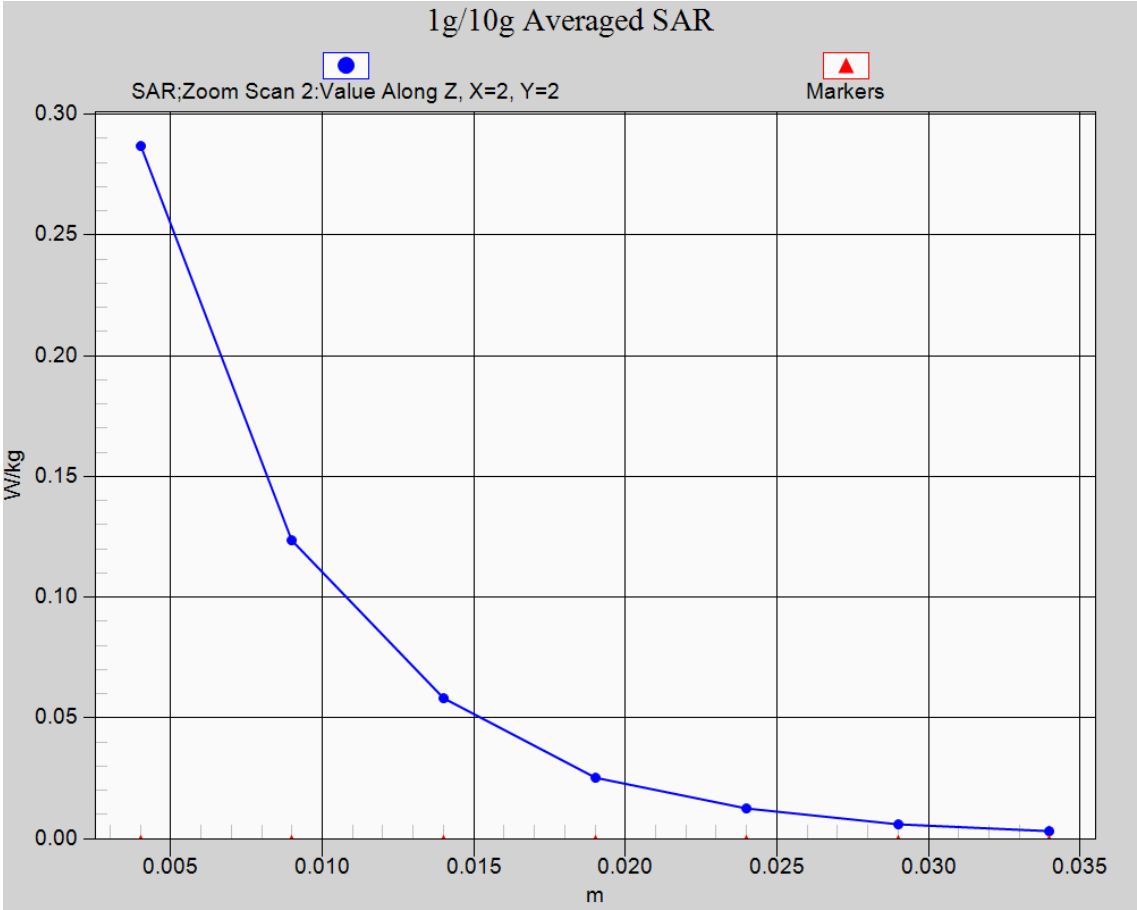

Fig.17-1 Z-Scan at power reference point (Wi-Fi 2450 MHz CH1)

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Wi-Fi 802.11b Body Rear Channel 1

Date/Time: 2015-6-26
Electronics: DAE4 Sn786
Medium: body 2450 MHz
Medium parameters used: f = 2412 MHz; σ = 1.818 S/m; εr = 38.756; ρ = 1000 kg/m3
Ambient Temperature:22.0oC Liquid Temperature:21.5oC
Communication System: WiFi Frequency: 2412 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(4.71, 4.71, 4.71); Calibrated: 2014-9-1

Rear Low/Area Scan (41x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.0952 W/kg

Rear Low /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.736 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.218 W/kg
SAR(1 g) = 0.067 W/kg; SAR(10 g) = 0.033 W/kg
Maximum value of SAR (measured) = 0.0955 W/kg

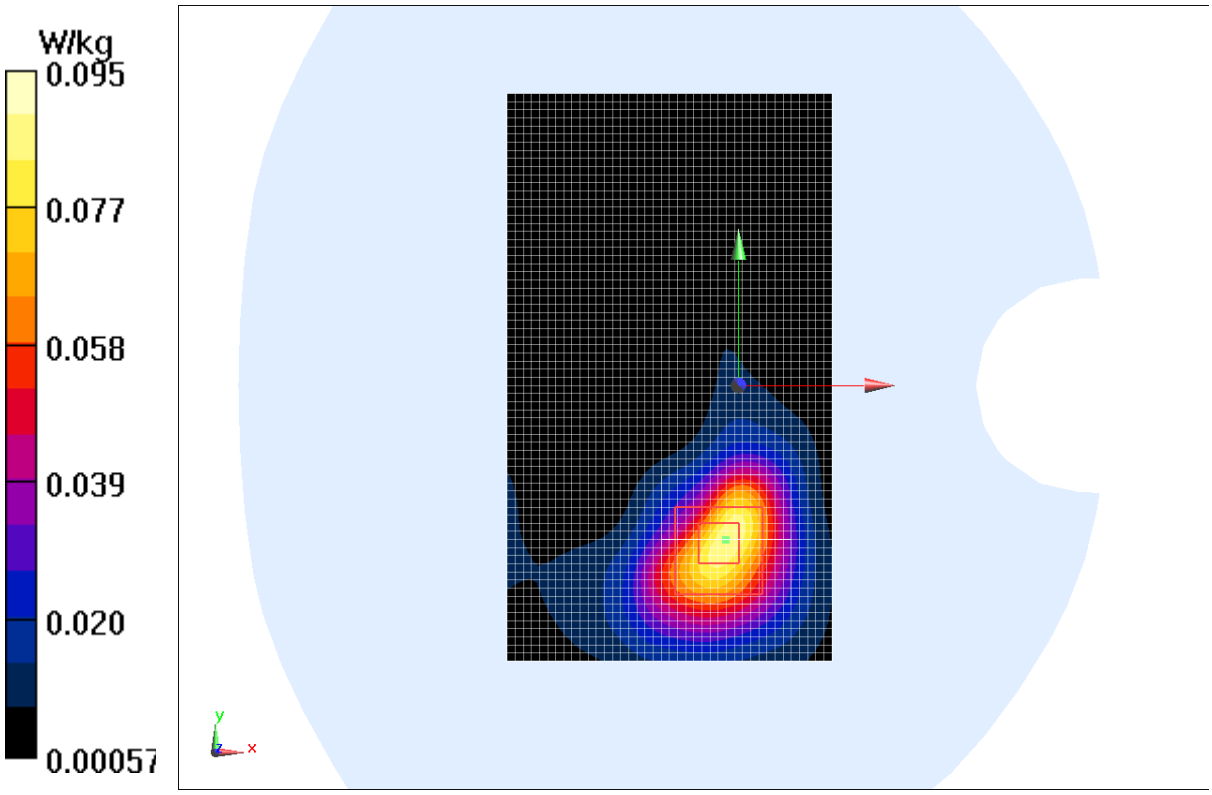

Fig.18 Wi-Fi 2450 MHz CH1

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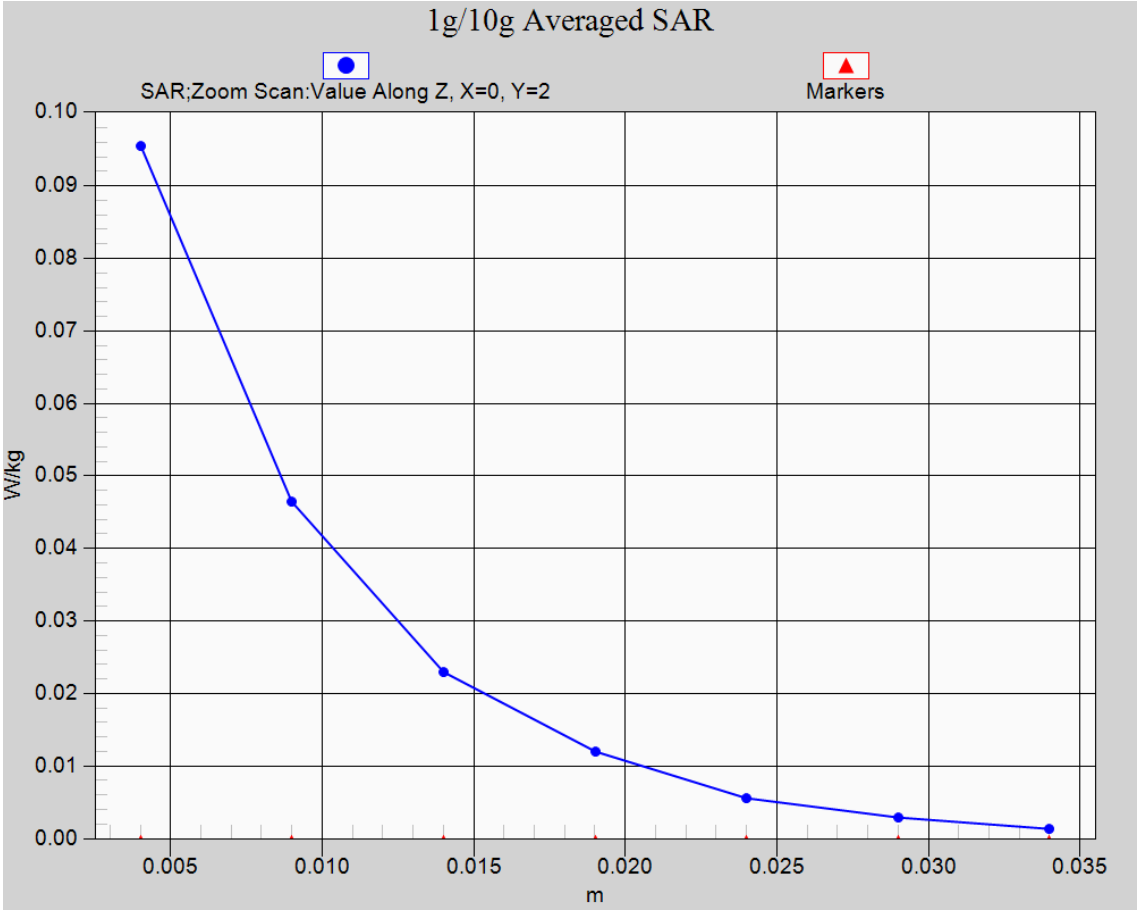

Fig.18-1 Z-Scan at power reference point (Wi-Fi 2450 MHz CH1)

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ANNEX B System Verification Results

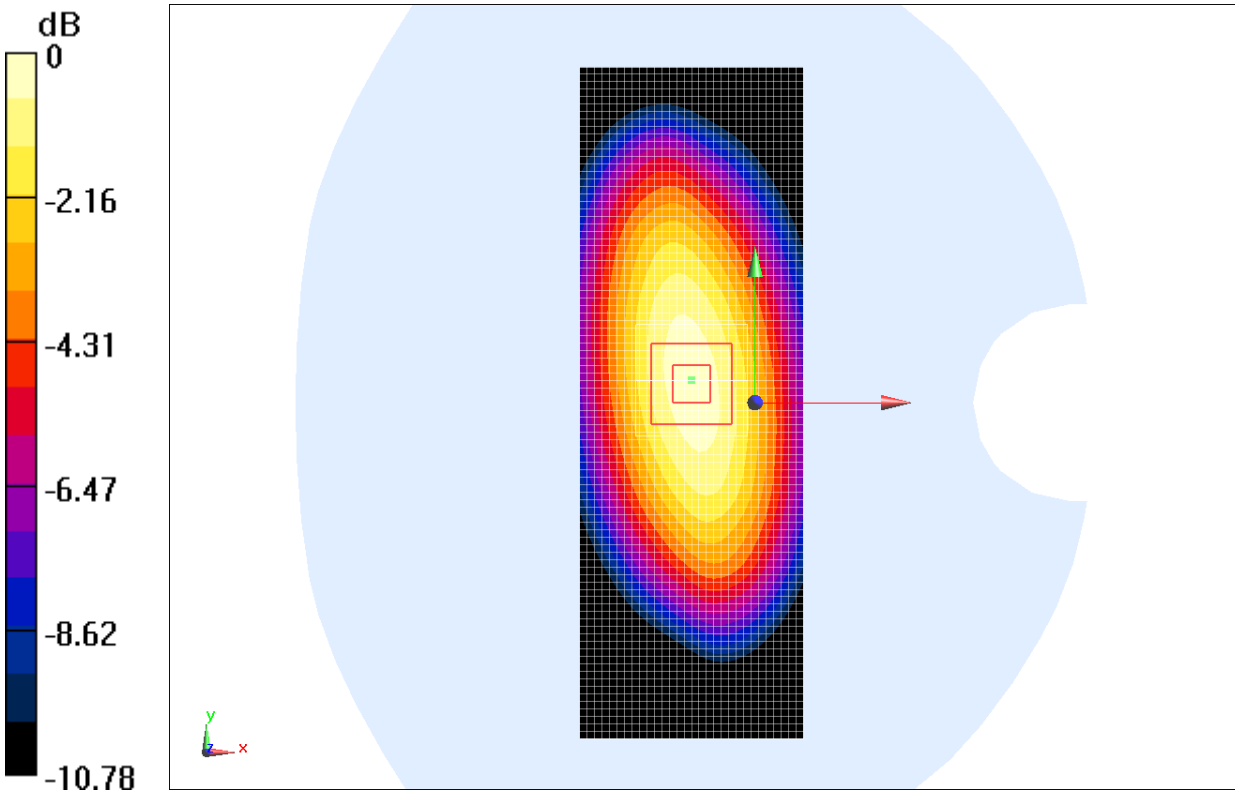
835MHz

Date/Time: 2015-6-10
Electronics: DAE4 Sn786
Medium: Head 850 MHz
Medium parameters used (interpolated): f = 835 MHz; σ = 0.929 S/m; ε_r = 41.315; ρ = 1000 kg/m^3
Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C
Communication System: CW_TMC Frequency: 835 MHz Duty Cycle: 1:1
Probe: ES3DV3 - SN3151 ConvF(6.04, 6.04, 6.04); Calibrated: 2014-9-1

Configuration /Area Scan (31x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
SAR(1 g) = 2.40 W/kg; SAR(10 g) = 1.48 W/kg
Maximum value of SAR (interpolated) = 2.48 W/kg

Configuration /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.349 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.75 W/kg
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.57 W/kg

Maximum value of SAR (measured) = 2.64 W/kg



0 dB = 2.64 W/kg = 4.22 dBW/kg

Fig.B.1 validation 835MHz 250mW

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835MHz

Date/Time: 2015-6-11

Electronics: DAE4 Sn786

Medium: Body850 MHz

Medium parameters used (interpolated): f = 835 MHz; σ = 0.97 S/m; ε_r = 53.498; ρ = 1000 kg/m^3

Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C

Communication System: CW_TMC Frequency: 835 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3151 ConvF(6.14, 6.14, 6.14); Calibrated: 2014-9-1

Configuration/Area Scan (61x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.51 W/kg

Maximum value of SAR (interpolated) = 2.64 W/kg

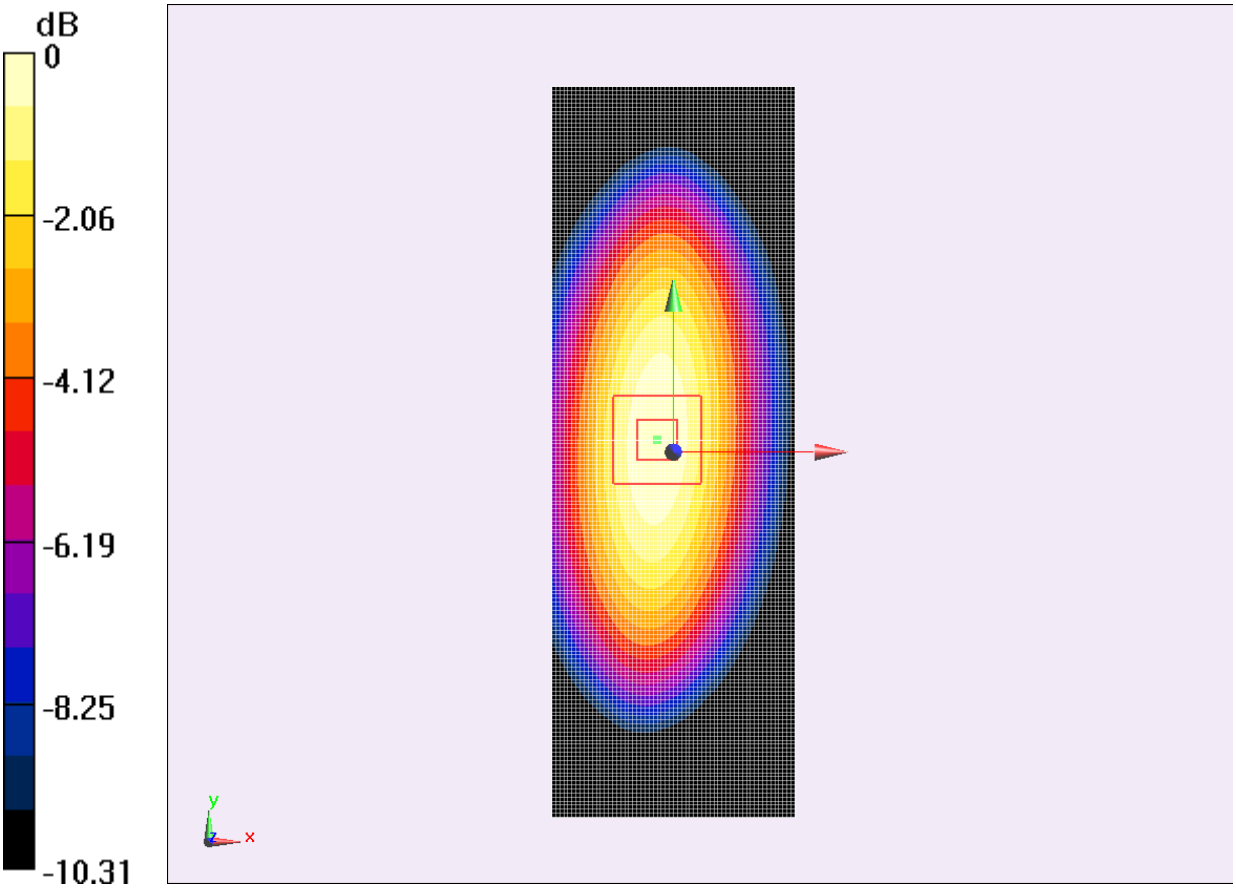
Configuration/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.989 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 3.60 W/kg

SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.6 W/kg

Maximum value of SAR (measured) = 2.66 W/kg



0 dB = 2.66 W/kg = 4.25 dBW/kg

Fig.B.2 validation 835MHz 250mW

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1800MHz

Date/Time: 2015-6-15

Electronics: DAE4 Sn786

Medium: Head 1800 MHz

Medium parameters used: f = 1800 MHz; σ = 1.358 S/m; ε_r = 40.822; ρ = 1000 kg/m^3

Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C

Communication System: CW_TMC Frequency: 1800 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3151 ConvF(5.44, 5.44, 5.44); Calibrated: 2014-9-1

Configuration/Area Scan (61x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

SAR(1 g) = 9.41 W/kg; SAR(10 g) = 5.02 W/kg

Maximum value of SAR (interpolated) = 10.4 W/kg

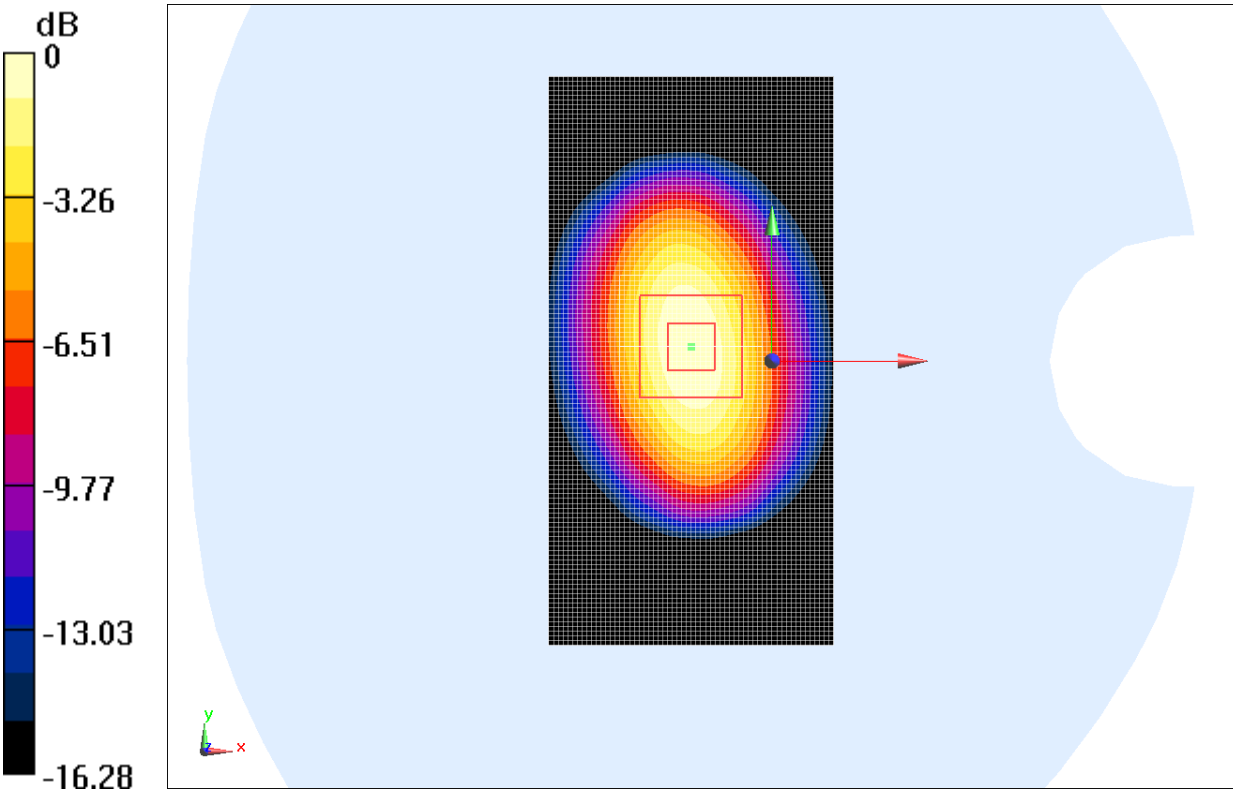
Configuration/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.788 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 16.7 W/kg

SAR(1 g) = 9.45 W/kg; SAR(10 g) = 5.09 W/kg

Maximum value of SAR (measured) = 10.6 W/kg



0 dB = 10.6 W/kg = 10.25 dBW/kg

Fig.B.3 validation 1800MHz 250mW

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1800MHz

Date/Time: 2015-6-22

Electronics: DAE4 Sn786

Medium: 1800 Body

Medium parameters used: f = 1800 MHz; σ = 1.523 S/m; ε_r = 53.317; ρ = 1000 kg/m^3

Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C

Communication System: CW_TMC Frequency: 1800 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3151 ConvF(5.03, 5.03, 5.03); Calibrated: 2014-9-1

Configuration/Area Scan (61x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

SAR(1 g) = 9.87 W/kg; SAR(10 g) = 5.07 W/kg

Maximum value of SAR (interpolated) = 10.1 W/kg

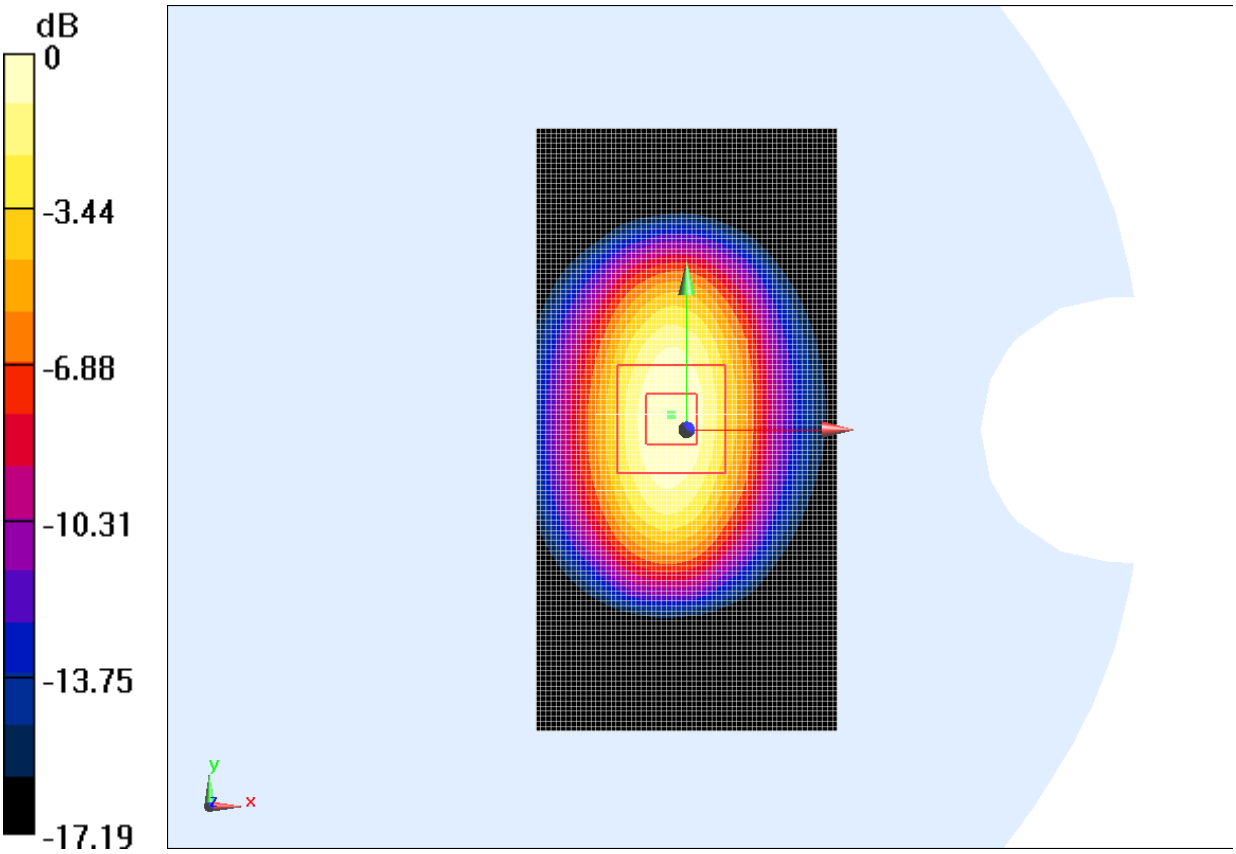
Configuration/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 82.581 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 16.3 W/kg

SAR(1 g) = 9.90 W/kg; SAR(10 g) = 5.15 W/kg

Maximum value of SAR (measured) = 10.4 W/kg



0 dB = 10.4 W/kg = 10.17 dBW/kg

Fig.B.4 validation 1800MHz 250mW

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1900MHz

Date/Time: 2015-6-18

Electronics: DAE4 Sn786

Medium: 1900 Head

Medium parameters used: f = 1900 MHz; σ = 1.441 S/m; ε_r = 40.438; ρ = 1000 kg/m^3

Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C

Communication System: CW_TMC Frequency: 1900 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3151 ConvF(5.16, 5.16, 5.16); Calibrated: 2014-9-1

Configuration/Area Scan (61x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

SAR(1 g) = 9.89 W/kg; SAR(10 g) = 5.04 W/kg

Maximum value of SAR (interpolated) = 11.0 W/kg

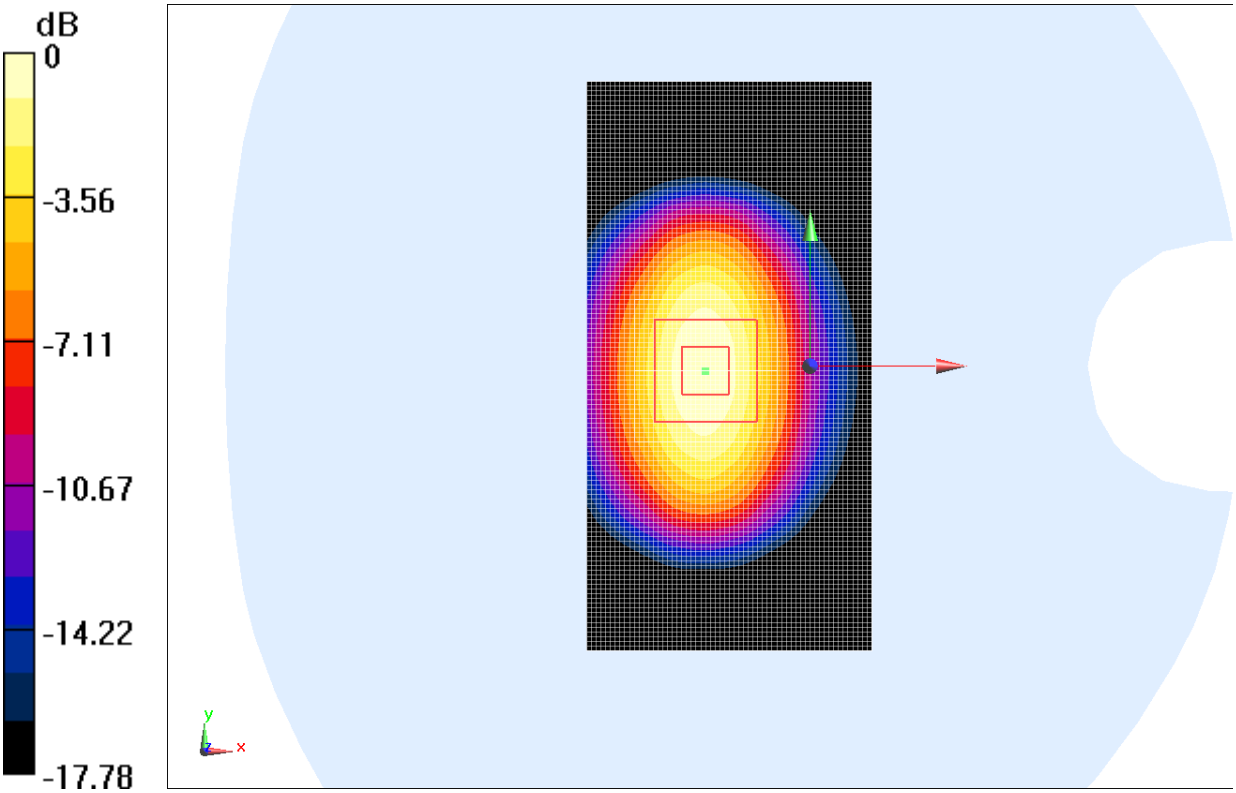
Configuration/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.837 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 18.8 W/kg

SAR(1 g) = 9.93 W/kg; SAR(10 g) = 5.13 W/kg

Maximum value of SAR (measured) = 11.2 W/kg



0 dB = 11.2 W/kg = 10.49 dBW/kg

Fig.B.3 validation 1900MHz 250mW

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1900MHz

Date/Time: 2015-6-19

Electronics: DAE4 Sn786

Medium: Body 1900MHz

Medium parameters used: f = 1900 MHz; σ = 1.543 S/m; ε_r = 50.791; ρ = 1000 kg/m^3

Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C

Communication System: CW_TMC Frequency: 1900 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3151 ConvF(4.7, 4.7, 4.7); Calibrated: 2012-4-24

Configuration/Area Scan (61x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

SAR(1 g) = 10.27 W/kg; SAR(10 g) = 5.49 W/kg

Maximum value of SAR (interpolated) = 12.4 W/kg

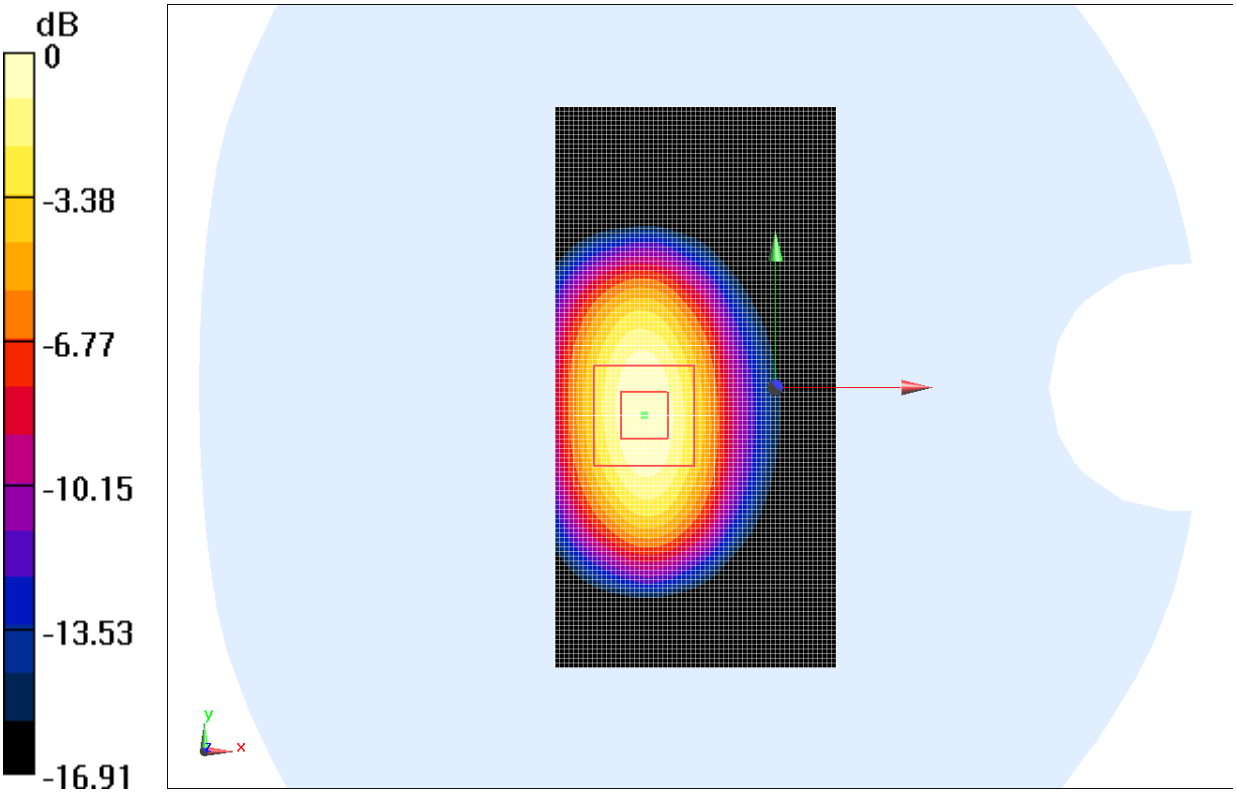
Configuration/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 58.846 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 19.2 W/kg

SAR(1 g) = 10.32 W/kg; SAR(10 g) = 5.56 W/kg

Maximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.3 W/kg = 10.90 dBW/kg

Fig.B.4 validation 1900MHz 250mW

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2450MHz

Date/Time: 2015-6-26

Electronics: DAE4 Sn786

Medium: Head 2450

Medium parameters used: f = 2450 MHz; σ = 1.878 S/m; ε_r = 39.326; ρ = 1000 kg/m^3

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

Communication System: CW_TMC Frequency: 2450 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3151 ConvF(4.71, 4.71, 4.71); Calibrated: 2014-9-1

Configuration/Area Scan (61x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

SAR(1 g) = 13.76 W/kg; SAR(10 g) = 6.12 W/kg

Maximum value of SAR (interpolated) = 15.8 W/kg

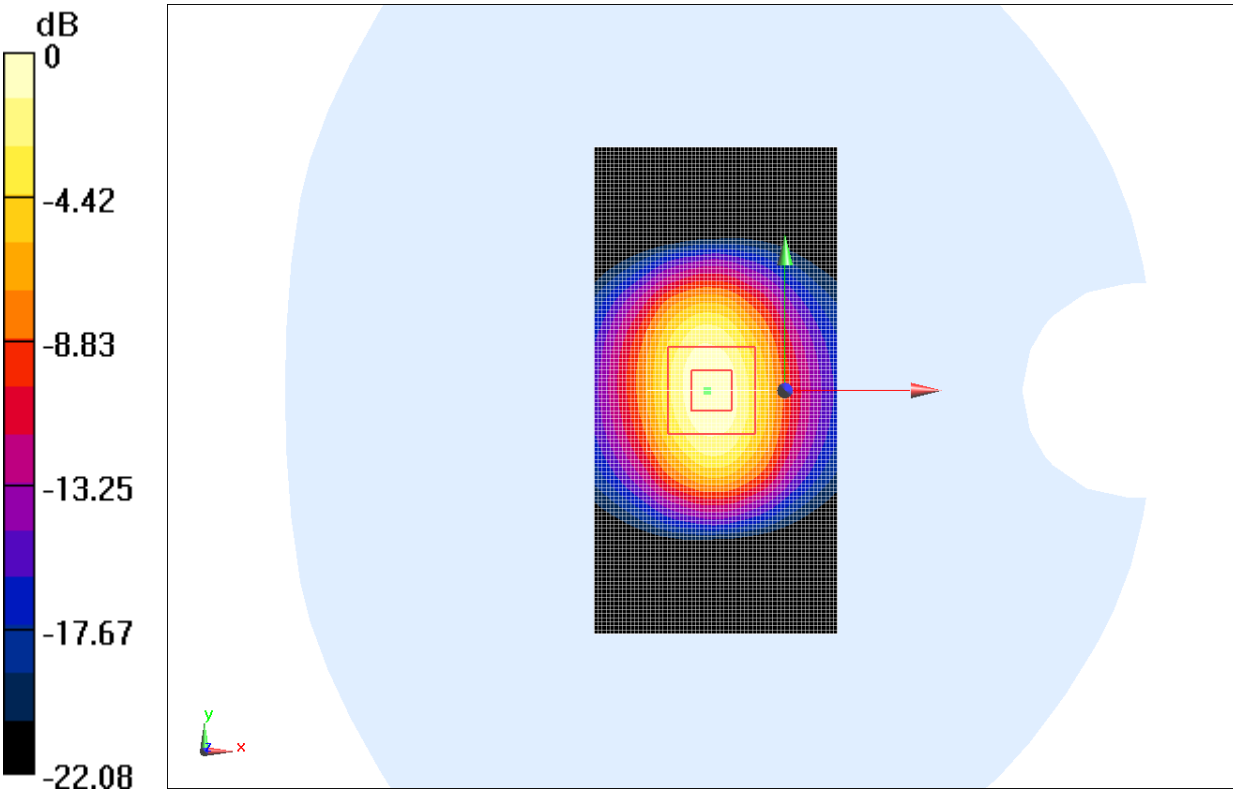
Configuration/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.372 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 29.7 W/kg

SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.31 W/kg

Maximum value of SAR (measured) = 15.7 W/kg



0 dB = 15.7 W/kg = 11.96 dBW/kg

Fig.B.5 validation 2450MHz 250mW

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2450MHz

Date/Time: 2015-6-26

Electronics: DAE4 Sn786

Medium: Body 2450

Medium parameters used: f = 2450 MHz; σ = 1.978 S/m; ε_r = 51.283; ρ = 1000 kg/m^3

Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C

Communication System: CW_TMC Frequency: 2550 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3151 ConvF(4.42, 4.42, 4.42); Calibrated: 2014-9-1

Configuration/Area Scan (61x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 86.639 V/m; Power Drift = 0.18 dB

SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.28 W/kg

Maximum value of SAR (interpolated) = 16.5 W/kg

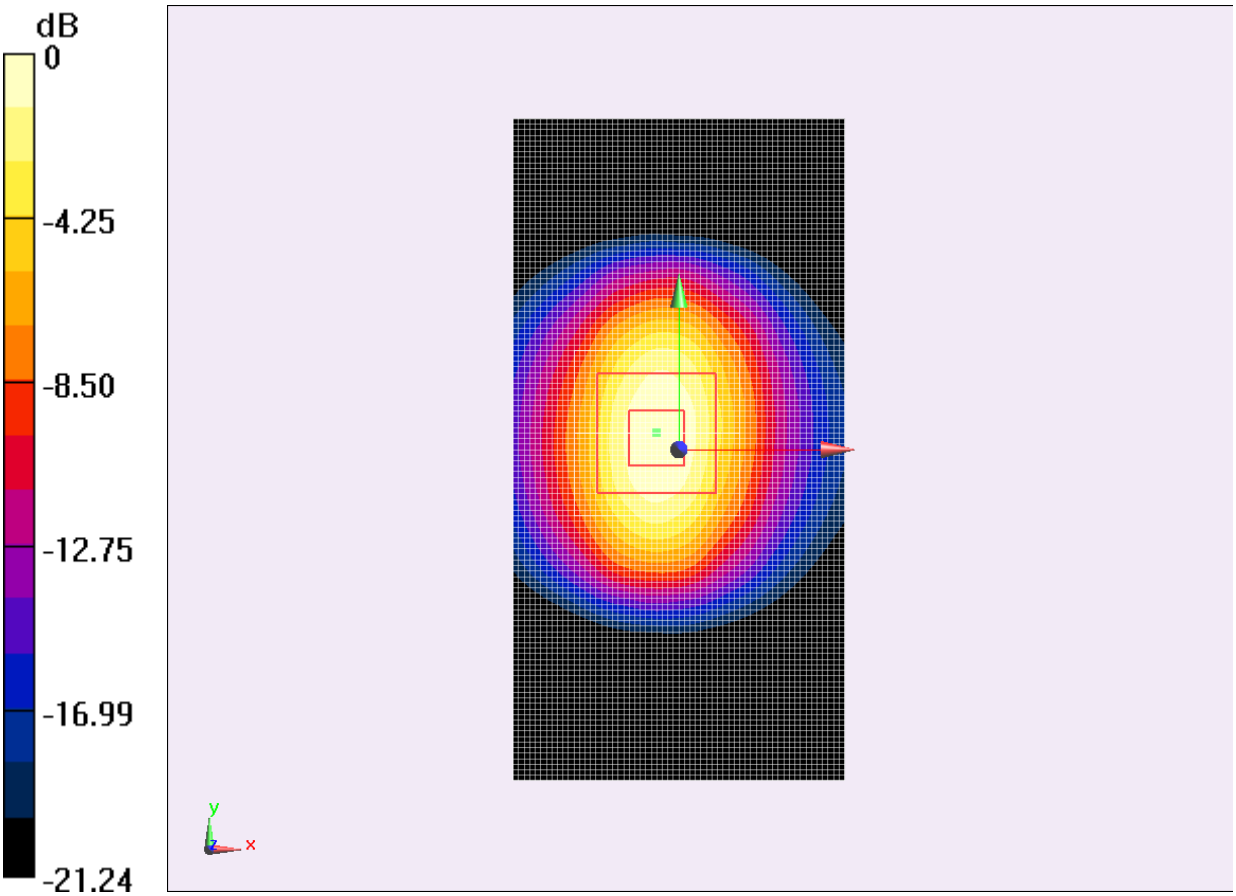
Configuration/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 86.639 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 29.7 W/kg

SAR(1 g) = 13.48 W/kg; SAR(10 g) = 6.33 W/kg

Maximum value of SAR (measured) = 16.7 W/kg



0 dB = 16.7 W/kg = 12.23 dBW/kg

Fig.B.6 validation 2450MHz 250mW

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2550MHz

Date/Time: 2015-6-25

Electronics: DAE4 Sn786

Medium: Head 2600 MHz

Medium parameters used: f = 2550 MHz; σ = 1.982 S/m; ε_r = 38.218; ρ = 1000 kg/m^3

Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C

Communication System: CW_TMC Frequency: 2550 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3151 ConvF(4.71, 4.71, 4.71); Calibrated: 2014-9-1

Configuration/Area Scan (61x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

SAR(1 g) = 14.78 W/kg; SAR(10 g) = 6.51 W/kg

Maximum value of SAR (interpolated) = 17.3 W/kg

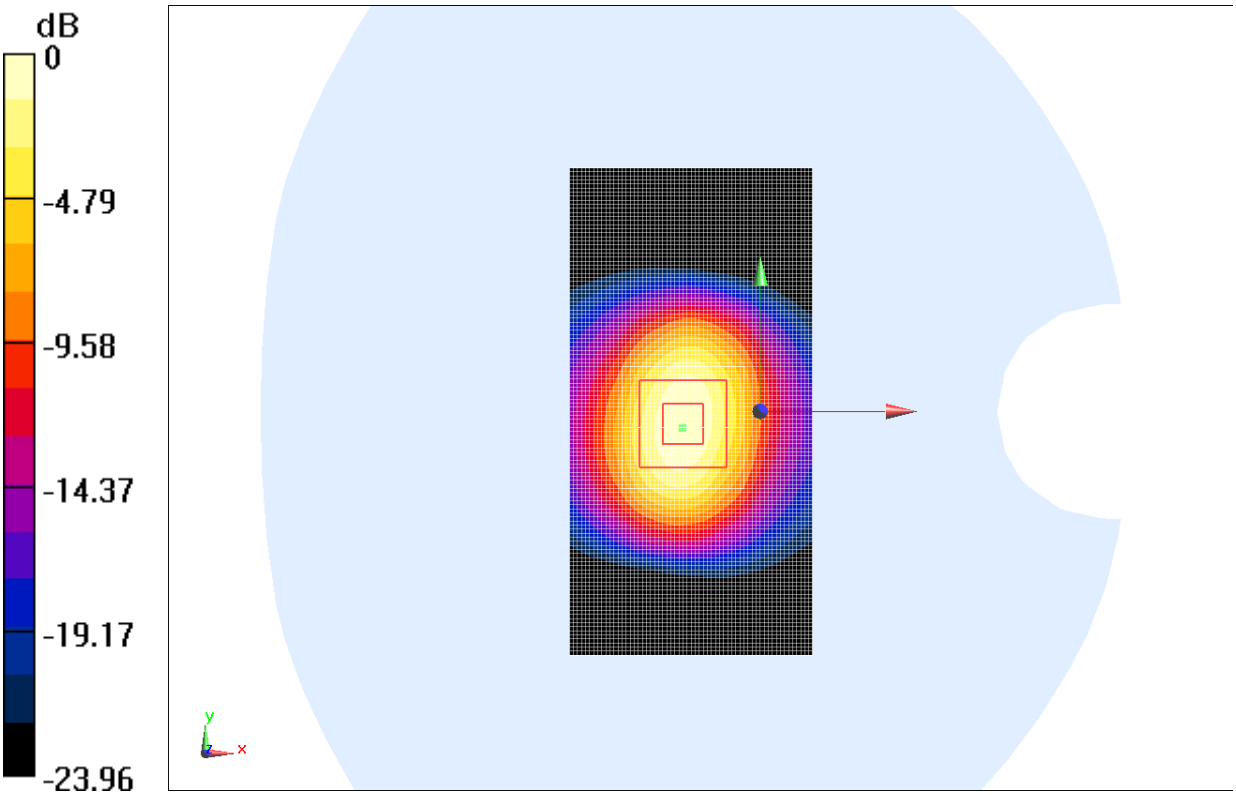
Configuration/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.185 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 33.3 W/kg

SAR(1 g) = 14.8 W/kg; SAR(10 g) = 6.52 W/kg

Maximum value of SAR (measured) = 16.8 W/kg



0 dB = 16.8 W/kg = 12.25 dBW/kg

Fig.B.3 validation 2550MHz 250mW

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2550MHz

Date/Time: 2015-6-26

Electronics: DAE4 Sn786

Medium: Body 2600

Medium parameters used: f = 2550 MHz; σ = 2.103 S/m; ε_r = 50.973; ρ = 1000 kg/m^3

Ambient Temperature:22.0^{o}C Liquid Temperature:21.5^{o}C

Communication System: CW_TMC Frequency: 2550 MHz Duty Cycle: 1:1

Probe: ES3DV3 - SN3151 ConvF(4.42, 4.42, 4.42); Calibrated: 2014-9-1

Configuration/Area Scan (61x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

SAR(1 g) = 13.56 W/kg; SAR(10 g) = 5.95 W/kg

Maximum value of SAR (interpolated) = 15.0 W/kg

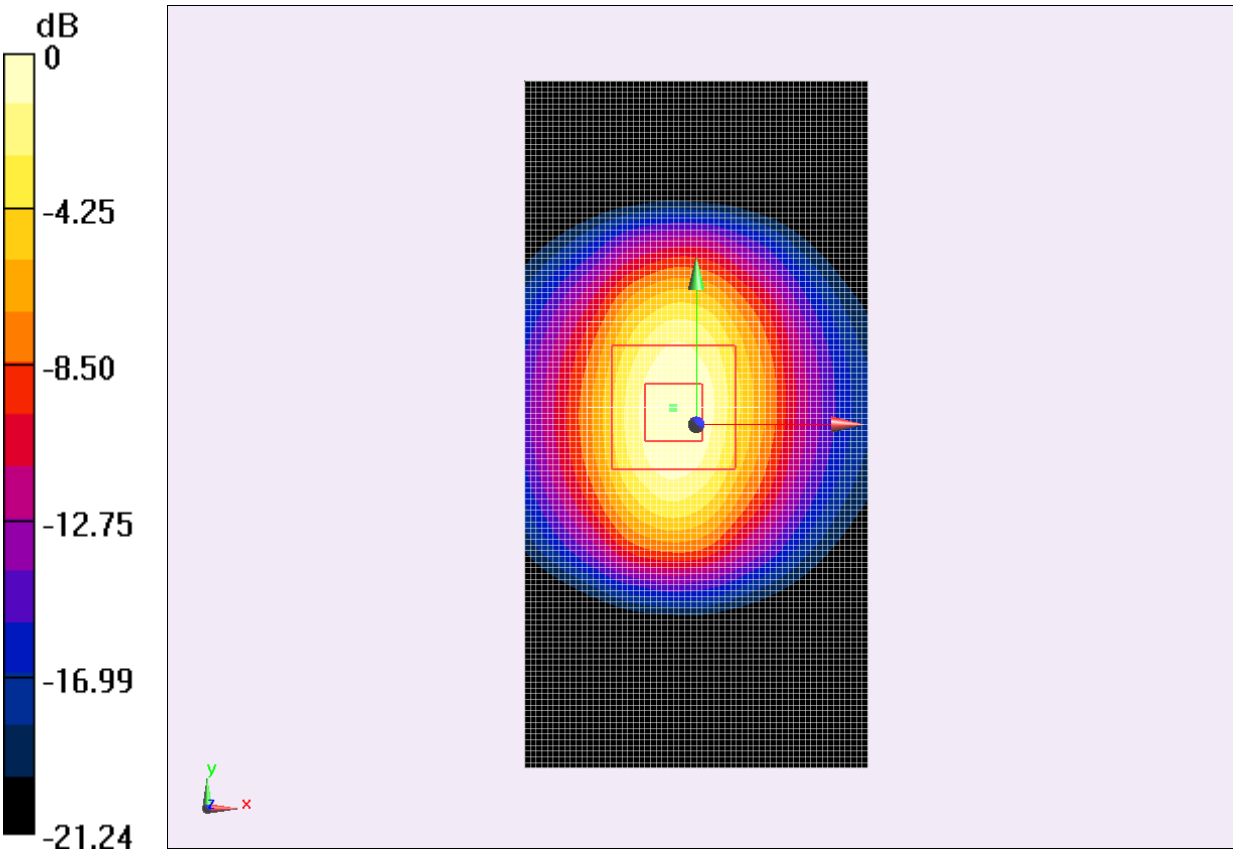
Configuration/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 86.639 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 29.7 W/kg

SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.02 W/kg

Maximum value of SAR (measured) = 15.4 W/kg



0 dB = 15.4 W/kg = 11.88 dBW/kg

Fig.B.4 validation 2550MHz 250mW

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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

Band	Position	Area scan (1g)	Zoom scan (1g)	Drift (%)
835	Head	2.40	2.44	-1.64
835	Body	2.41	2.45	-1.63
1800	Head	9.41	9.45	-0.42
1800	Body	9.87	9.90	-0.30
1900	Head	9.89	9.93	-0.40
1900	Body	10.27	10.32	-0.48
2450	Head	13.76	13.80	-0.29
2450	Body	13.40	13.48	-0.59
2550	Head	14.78	14.80	-0.14
2550	Body	13.56	13.60	-0.29

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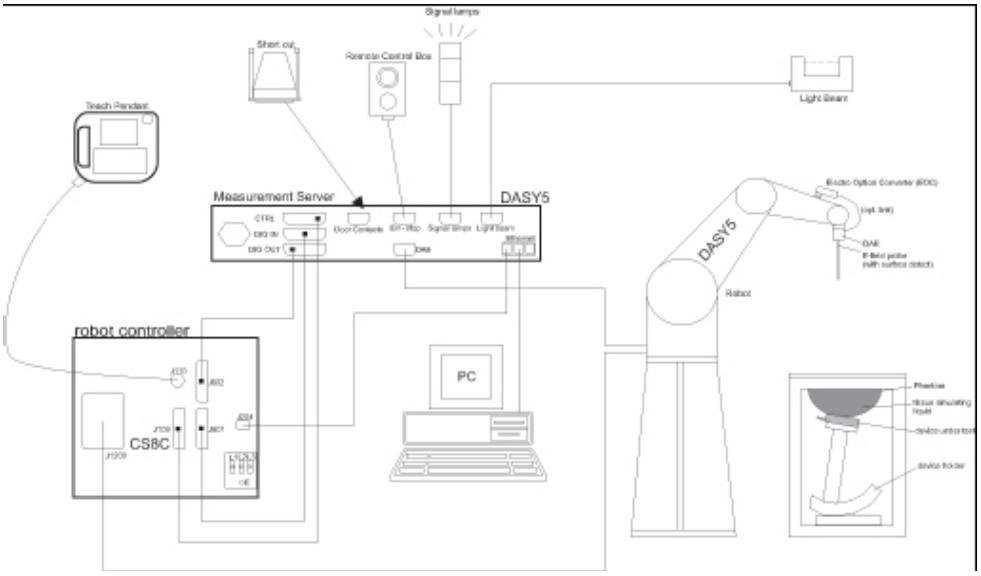
ANNEX C SAR Measurement Setup

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.

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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 10MHz — 6.0GHz(EX3DV4)
Range: 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

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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

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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.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.

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