SAR TEST REPORT

Report No. 2015SAR177

FCC ID:	2AEU7-LONDON
Applicant:	Zound Industries Smartphones AB
Product:	Marshall London
Brand:	Marshall
Model:	KB-1501
HW Version:	3000
SW Version:	KB15_0_R122_150519
Issue Date:	2015-05-28

Prepared by: Chen Qiang **Reviewed by:** Yin Xiaoming **Approved by:** Wang Jianrong (General Manager)

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

Standards

Applicable Limit Regulations	**ANSI/IEEE C95.1-2005** Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields. 3 kHz to 300 GHz
	ANSI/IEEE C95.3-2002 Recommended Practice For Measurements and Computations of Radio Frequency Electromagnetic Fields with Respect to Human Exposure to such Fields. 100 kHz-300 GHz
Applicable Standards	**IEEE Std 1528™-2013:** IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
	KDB865664 D01v01r03: SAR Measurement Requirements for 100 MHz to 6 GHz
	KDB447498 D01v05r02: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Polices
	KDB648474 D02v01r02: Review and Approval Policies for SAR Evaluation of Handsets with Multiple Transmitters and Antennas.
	KDB248227 D01v02: SAR Measurement Procedures for IEEE 802.11 Wi-Fi Transmitters
	KDB941225 D01v03: SAR Measurement Procedures for 3G Devices
	KDB941225 D05v02r03: SAR Test Consideration for LTE Handsets and Data Modems
	KDB941225 D06v02: SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities.

Conclusion

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

Change History

Version	Change Contents	Author	Date
V1.0	First edition	Chen Qiang	2015-05-28

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

CONTENTS:

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Zound Industries Smartphones AB Marshall London KB-1501** are as follows.

Highest standalone SAR Summary:

Exposure Position	Frequency Band	Maximum reported 1g SAR (W/kg)	Highest reported 1g SAR (W/kg)
Head	GSM850	**0.759**	0.759
	GSM1900	0.221	
	WCDMA BAND II	0.579	
	WCDMA BAND V	0.751	
	LTE BAND 7	0.358	
	Wi-Fi（2.45G）	0.213	0.263
	Wi-Fi（5.2G）	0.216	
	Wi-Fi（5.8G）	**0.263**	
Body-worn (10mm)	GSM850	0.254	1.143
	GSM1900	0.637	
	WCDMA BAND II	1.086	
	WCDMA BAND V	0.269	
	LTE BAND 7	**1.143**	
	Wi-Fi（2.45G）	0.363	0.428
	Wi-Fi（5.2G）	**0.428**	
	Wi-Fi（5.8G）	0.365	

Evaluation for Simultaneous SAR			
Summation BAND	**Exposure Position**	**Maximum reported 1g SAR (W/kg)**	**Summation SAR(1g) (W/kg)**
WWAN +WiFi	Head	0.759+0.263=1.022	＜1.6
	Body-worn(10mm)	1.143+0.428=1.571	＜1.6
WWAN +BT	Head	0.759+0.525=1.284	＜1.6
	Body-worn(10mm)	1.143+0.263=1.406	＜1.6

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits(1.6W/kg) specified in FCC 47 CFR part 2(2.1093) and ANSI/IEEE C95.1-2005,and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.

2. Administrative Information

2.1 Project Information

Date of start test	2015-04-17
Date of end test:	2015-05-15

2.2 Test Laboratory Information

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

2.3 Test Environment

Temperature:	20℃～25 ℃
Relative Humidity:	20%～70%

3. Client Information

3.1 Applicant information

Company Name:	Zound Industries Smartphones AB
Address:	Torsgatan 2, 111 23 Stockholm, Sweden
City:	/
Postal Code:	/
Country:	Sweden
Telephone:	+46076707220713
Fax:	+46076707220713

3.2 Manufacturer Information

Company Name:	Zound Industries Smartphones AB
Address:	Torsgatan 2, 111 23 Stockholm, Sweden
City:	/
Postal Code:	/
Country:	Sweden
Telephone:	+46076707220713
Fax:	+46076707220713

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

4.1 Information of EUT

<table>
<tr><td>Device Type</td><td colspan="2">Portable device</td></tr>
<tr><td>Product</td><td colspan="2">Marshall London</td></tr>
<tr><td>Model</td><td colspan="2">KB-1501</td></tr>
<tr><td>Type</td><td colspan="2">Identical Prototype</td></tr>
<tr><td>Exposure Category</td><td colspan="2">Uncontrolled environment / general population</td></tr>
<tr><td colspan="3">Device operation configuration:</td></tr>
<tr><td rowspan="5">Operating Mode(s):</td><td colspan="2">GSM850</td></tr>
<tr><td colspan="2">PCS1900</td></tr>
<tr><td colspan="2">WCDMA BAND II/V</td></tr>
<tr><td colspan="2">LTE BAND 7</td></tr>
<tr><td colspan="2">802.11a/b/g/n（20M/40M）</td></tr>
<tr><td>Test Modulation</td><td colspan="2">(GSM)GMSK，（WCDMA）QPSK,(LTE)QPSK/16QAM</td></tr>
<tr><td>GPRS Operation Class</td><td colspan="2">B</td></tr>
<tr><td>GPRS Multislot Class</td><td colspan="2">33</td></tr>
<tr><td>EDGE Class</td><td colspan="2">33</td></tr>
<tr><td>DTM Support</td><td colspan="2">N/A</td></tr>
<tr><td>AP Support</td><td colspan="2">Yes</td></tr>
<tr><td rowspan="6">Rated Output Power</td><td colspan="2">GSM 850:34dBm</td></tr>
<tr><td colspan="2">PCS1900: 31dBm</td></tr>
<tr><td colspan="2">WCDMA BAND II/V: 24dBm</td></tr>
<tr><td colspan="2">LTE BAND 7: 22dBm</td></tr>
<tr><td colspan="2">802.11b：18dBm
802.11g：14dBm
802.11n：13dBm
802.11a：12dBm</td></tr>
<tr><td colspan="2">BT ：11dBm</td></tr>
<tr><td>Band Width</td><td colspan="2">LTE BAND 7: 5,10,15,20</td></tr>
<tr><td>Antenna Type:</td><td colspan="2">Internal antenna</td></tr>
<tr><td rowspan="5">Operating Frequency Range(s):</td><td>Band</td><td>Tx(MHz)</td></tr>
<tr><td>GSM850</td><td>824.2～848.8</td></tr>
<tr><td>PCS1900</td><td>1850.2～1909.8</td></tr>
<tr><td>WCDMA BAND II</td><td>1852.4～1907.6</td></tr>
<tr><td>WCDMA BAND V</td><td>826.4～846.6</td></tr>
</table>

	LTE BAND 7	2500～2570
Power Class	GSM850: 4,test with power level 5	
	PCS1900: 1,test with power level 0	
	WCDMA BAND II/V：3，test with maximum output power	
	LTE BAND 7： test with maximum output power	

4.2 Identification of EUT

EUT ID	SN or IMEI	HW Version	SW Version	Received Date
TN07	004402770022642	3000	KB15_0_R122_150519	2015-04-15

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

4.3 Identification of AE

AE ID*	Description
AE1	Battery
AE2	Travel Adaptor
AE3	Earphone

AE1

Model	M62
Manufacturer	BYD
Capacitance	2500mAh
Nominal Voltage	3.8V

AE2

Model	BUUS050100-B01
Manufacturer	HUIZHOU BYD ELECTRONIC CO.,LTD
Length of DC line	0cm with USB connector

AE3

Model	/
Manufacturer	/
Length of DC line	126cm

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

5. Operational Conditions during Test

5.1 General description of test procedures

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

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

The AP is supported，
According to KDB941225 D06,

1. The device size is 14 cm x 7 cm > 9 cm x 5 cm, so test separation distance was 10mm. The test separation distance is given by user manual
2. SAR must be tested for all surfaces and edges with a transmit antenna within 2.5cm, at a test separation distance of 10mm. And also the worst position of head are tested with Wi-Fi keep transmitting.

5.2 GSM Test Configuration

SAR test for GSM 850/1900, a communication link is set up with a system simulator by air link. Using CMU200 the power level is set to “5” in SAR of GSM850，set to “0” in SAR of GSM 1900，The tests in the band of GSM850/1900 are performed in the mode of voice and data transfer function.

5.3 WCDMA Test Configuration

SAR test for WCDMA BANDII/V, a communication link is set up with a system simulator by air link. Using CMU200 the power level is set to “3” in SAR of WCDMA BAND II/V. The tests in the band of WCDMA BAND II/V are performed in the mode of RMC 12.2kbps transfer function.

SAR for body exposure configurations in voice and data modes is measured using 12.2kbps RMC with TPC bits configured to all “1’s”. SAR for other spreading codes and multiple DPDCHn , when supported by the DYT, are not required when the maximum average output of each RF channel, for each spreading code and DPDCHn configuration, are lessthan 1/4 dB higher than those measured in 12.2 kbps RMC. Otherwise , SAR is measured on the maximum output channel with an applicable RMC configuration for the corresponding spreading code or DPDCHn using the exposure configuration that results in the highest SAR with 12.2 kbps RMC. When more than 2 DPDCHn are supported by the DUT, it may be necessary to configure additional DPDCHn for a DUT using FTM(Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384kbps and 968 kbps RMC.

HSDPA Test Configuration

Body SAR is also measured for HSDPA when the maximum average output of each RF channel with HSDPA active is at least 1/4 dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR 12.2 kbps RMC is above75% of the SAR limit. Body SAR is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1 , using the highest body SAR configuration in 12.2 kbps RMC without HSDPA.

HSDPA should be configured according to the UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HARQ processes , minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set f. To maintain a consistent test configuration and stable transmission condition, QPSK is user in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DODCH gain factors(β c,β d), and HS_DPCCH power offset parameters(△ACK, △NACK, △CQI) should be set according to values indicated in the Table below. The CQI value is determined by the UE category, transport block size, number of HS_PDSCHs and modulation used in the H-set.

Table 1:Subtest for UMTS Release 5 HSDPA

Sub-set	β c	β d	B d（SF）	B 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	24/15	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
Note 1: △ACK, △NACK, △CQI=8⇔Ahs=β hs/β c=30/15⇔β hs=30/15c Note 2: CM=1 forβ c/β d=12/15, β hs/β c=24/15 Note 3: For subset 2 theβ cβ d ratio of 12/15 for the TFC during the measurement period(TF1,TF0) is achieved by setting the signaled gain factor for the reference TFC (TFC1,TF1) toβ c=11/15 andβ d=15/15.						

Table 2:Settings of required H-set 1 QPSK in HSDPA mode

Parameter	Unit	Value
Nominal Avg.Inf.Bit Rate	Kbps	534
Inter-TTI Distance	TTI's	3
Number of HARQ Processes	Processes	2
Information Bit Payload	Bitw	3202
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bots	4800
Total Avaliable SML's in UE	SML's	19200

Number of SML's per HARQ Proc.	SML's	9600
Coding Rate	/	0.67
Number of Physical Channel Codes	Codes	5
Modulation	/	QPSK

Table 3：HSDPA UE category

HS-DSCH Category	Maximum HS_DSCH Codes Received	Minimum Inter-TTI Interval	Maximum Transport Bits/HS-DSCH	Total Channel
1	5	3	7298	19200
2	5	3	7298	28800
3	5	2	7298	28800
4	5	2	7298	38400
5	5	1	7298	57600
6	5	1	7298	67200
7	10	1	14411	115200
8	10	1	14411	134400
9	15	1	25251	172800
1 2	15	1	27952	172800
1 1	5	2	3630	14400
1 2	5	1	3630	28800
1 3	15	1	34800	259200
1 4	15	1	42196	259200
1 5	15	1	23370	345600
1 6	15	1	27952	345600

HSUPA Test Configuration

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM(2) (dB)	MPR (dB)	AG(4) Index	E-TFCI
1	11/15(3)	15/15(3)	64	11/15(3)	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	94/75	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	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15(4)	15/15(4)	64	15/15(4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.

Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

applicable only if Maximum Power Reduction (MPR) is implemented according to Cubic Metric (CM) requirements.[37]

SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table

C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

5.4 LTE Test Configuration

SAR tests for LTE are performed with a base station simulator, Anritsu MT8820C.
Closed loop power control was used so the UE transmits with maximum output power during SAR testing. All powers were measured with the MT8820C.

Maximum power reduction (MPR)
It must be clearly identified if Maximum Power Reduction (MPR) is implemented and whether it is an optional or permanent feature, i.e., built-in by design. MPR may be considered during SAR testing only when the maximum output power is permanently limited by the MPR implemented within the device, according to the RB (resource block) configurations specified in 3GPP/LTE standards. Regardless of network requirements, only those RB configurations allowed by 3GPP for the channel bandwidth and modulation combinations may be tested with MPR active. Configurations with RB allocations less than the RB thresholds required by 3GPP must be tested without MPR. A-MPR (additional MPR) must be disabled during SAR testing.

The maximum average conducted output power measurd
according to the following configurations, for the required test channels, channel bandwidths and uplink modulations, in each frequency band, are used to support the SAR test reduction and exclusion.

• 100% RB allocation

• 1 RB and also 50% RB allocation, offset to the upper edge, middle and lower edge of the channel bandwidth of each required test channel

Higher order modulations
For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in sections 4.2.1, 5.2.2 and 4.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

5.5 Bluetooth Test Configuration

The Bluetooth transmitter of the device under test can be excluded from stand-alone and simultaneous SAR evaluation, per the requirements from FCC KDB 648474, as follows:

1. The separation between the Bluetooth antenna and the main antenna is 9.5cm>5cm
2. The maximum conducted output power of Bluetooth is 9.96dBm=9.9mW <P（max）=19mW

According to FCC KDB648474, stand along SAR and Simultaneous Transmission SAR are not required.

According to FCC KDB447498v05, Apppendix A

Appendix A

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

For 2450MHz，10mm test distance, P（max）=19mW

For Simultaneous Transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05 based on the formula below.

(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;

where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.

0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm

Bluetooth	Turn-up Maximum Power(dBm)	Head 0mm gap	Body-worn 10mm gap
Estimated SAR(W/kg)	11	0.525	0.263

According to FCC KDB447498v05, Apppendix D

For 2450MHz，10mm test distance ,SAR1g（BT）=0.263W/Kg

5.6 Wi-Fi Test Configuration

The Wi-Fi is set to different data rate and channels by the software.

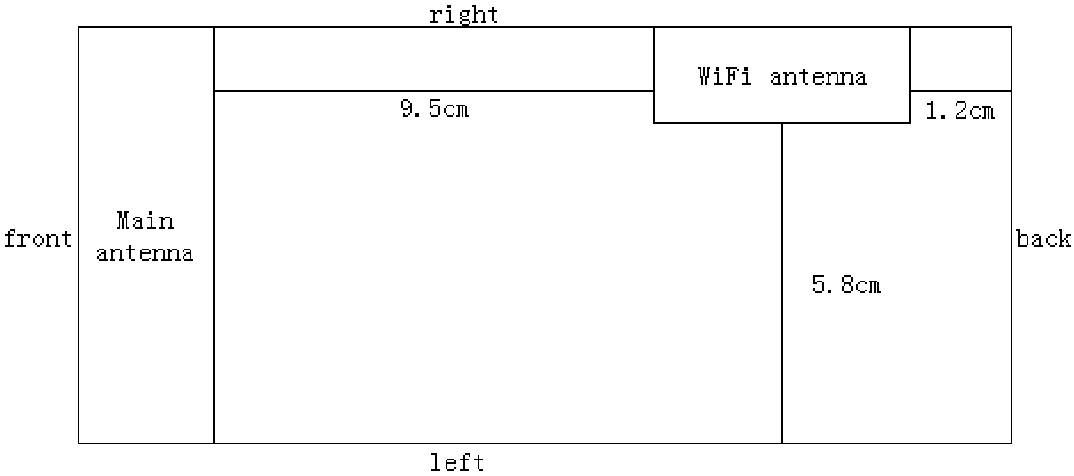
According to KDB648474:

1. The separation between the Wi-Fi antenna and the main antenna is 9.5cm>5cm
2.The maximum conducted output power of Wi-Fi is16.45dBm=44.2mW＞P（max）=19mW

So stand along SAR is needed。

According to KDB248227

SAR is not required for 802.11g channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels.



Picture of antennas

According to KDB941225 D06

SAR must be tested for all surfaces and edges with a transmit antenna within 2.5cm, at a test separation distance of 10mm

Band	Position for test (yes or n/a)					
	Top	Bottom	Leftside	Rightside	Front	Back
WWAN	yes	yes	yes	yes	yes	n/a 9.5cm>2.5cm
WLAN	yes	yes	n/a 5.2cm>2.5cm	yes	n/a 9.5cm>2.5cm	yes

.

Top—toward phantom

Bottom---towards ground

6. SAR Measurements system configuration

6.1 SAR Measurement set-up

The DASY5 system for performing compliance tests consists of the following items:

·A standard high precision 6-axis robot (Staubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
·An isotropic _field probe optimized and calibrated for the targeted measurement.
·A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
·The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
·The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
·The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
·A computer running WinXP and the DASY5 software.
·Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
·The generic twin phantom enabling the testing of left-hand and right-hand usage.
·The device holder for handheld mobile phones.
·Tissue simulating liquid mixed according to the given recipes.
·System validation dipoles allowing to validate the proper functioning of the system.

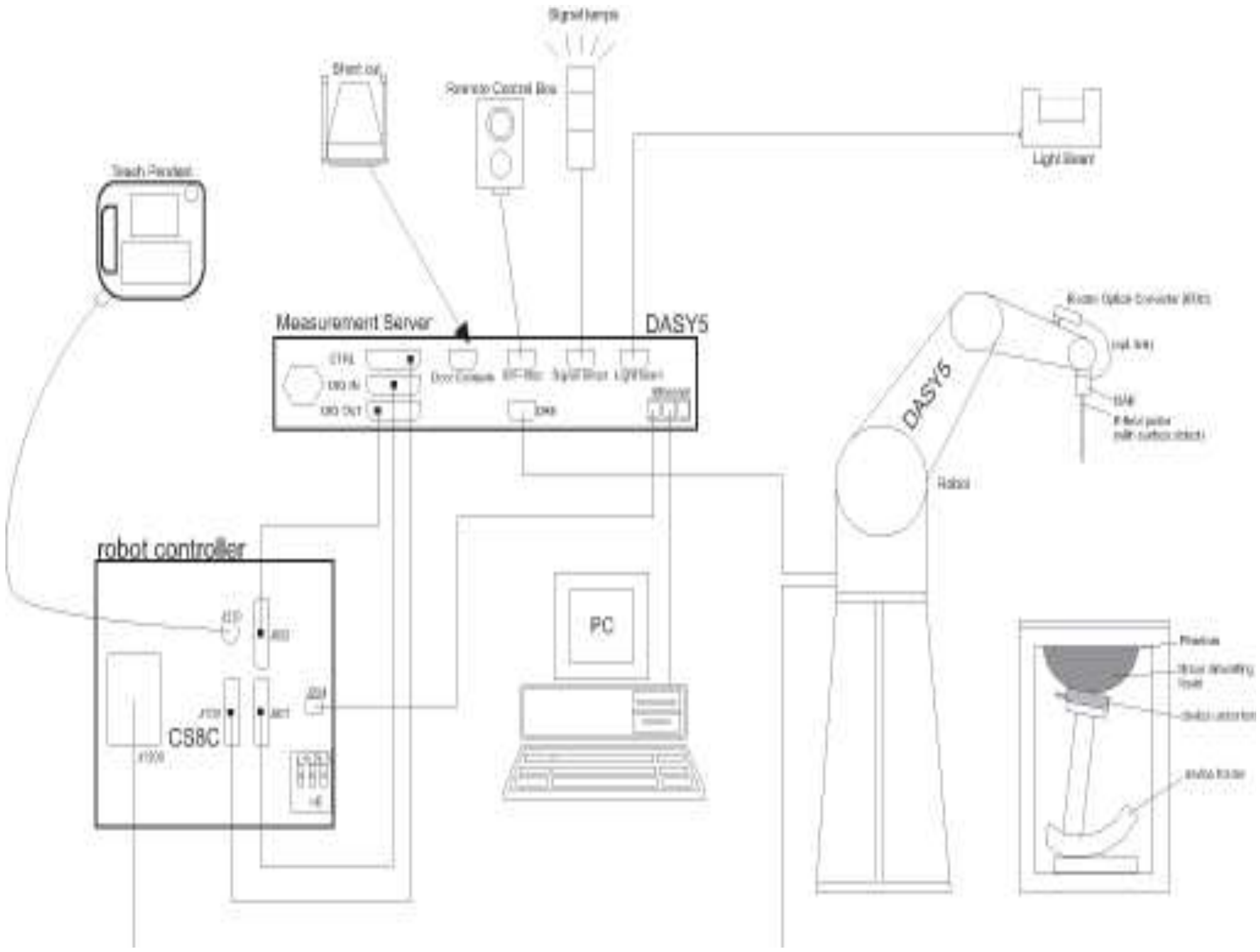


Figure 5-1 SAR Lab Test Measurement Set-up

6.2 DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe ES3DV3 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

6.2.1 Es3DV3 Probe Specification

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

Dimensions Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm)
Typical distance from probe tip to dipole centers: 1 mm

Application High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

Figure 5-2.ES3DV3 E-field Probe

Figure 5-3. ES3DV3 E-field probe

6.2.2 E-field Probe Calibration

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

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

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

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

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

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

Where:
σ = Simulated tissue conductivity,
ρ = Tissue density (kg/m3).

6.3 Other Test Equipment

6.3.1 Device Holder for Transmitters

The DASY5 device holder is designed to cope with the die rent positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the inference of the clamp on the test results could thus be lowered.

Figure 5-4.Device Holder

6.3.2 Phantom

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

Shell Thickness 2±0.1 mm
Filling Volume Approx. 20 liters
Dimensions 810 x l000 x 500 mm (H x L x W)

Aailable Special

Figure 5-5.Generic Twin Phantom

6.4 Scanning procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

• The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. ±5%.

• The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

• Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot. Before starting the area scan a grid spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged.
After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

・ Zoom Scan

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

・ Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY5 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard 's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space.

They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

・A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

6.5 Data Storage and Evaluation

6.5.1 Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated. The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

6.5.2 Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	Dcp_i
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	
	- Density	

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

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

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

$\boldsymbol{cf}$ = crest factor of exciting field (DASY parameter)

$\boldsymbol{dcp_i}$ = diode compression point (DASY parameter)

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

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

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

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

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

[mV/(V/m)²] for E-field Probes

$ConvF$ = sensitivity enhancement in solution

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

f = carrier frequency [GHz]

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

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

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

$$E_{tot} = (E_X^2 + E_Y^2 + E_Z^2)^{1/2}$$

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

$$SAR = (E_{tot}^2 \cdot \quad) \square \; / (\quad \cdot 1000)$$

with SAR = local specific absorption rate in mW/g

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

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

□ = equivalent tissue density in g/cm3

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

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

with P_{pwe} = equivalent power density of a plane wave in mW/cm²

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

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

6.6 System check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulates, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the 6.2.1 and6.2.2

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).
System check is performed regularly on all frequency bands where tests are performed with the DASY 5 system.

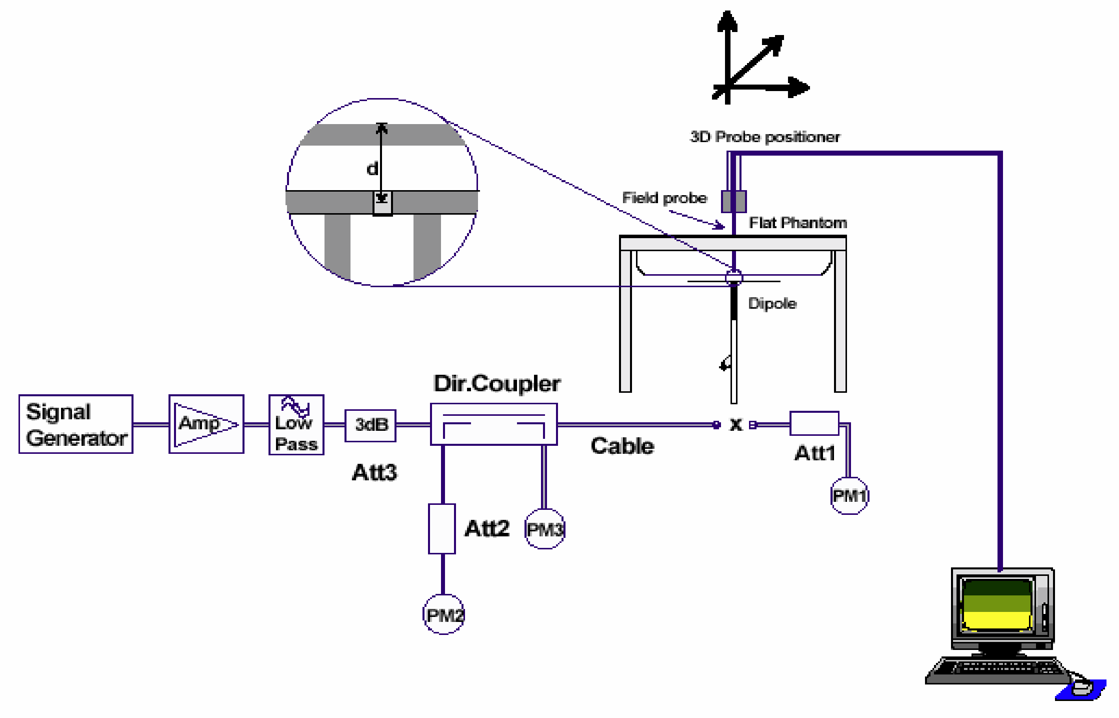


Figure 5-6. System Check Set-up

6.7 Equivalent Tissues

The liquid is consisted of water, salt, Glycol, Sugar, Preventol and Cellulose. The liquid has previously been proven to be suited for worst-case. The Table show the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the OET 65.

MIXTURE%	FREQUENCY(head) 835MHz
Water	40.4
Sugar	56
Salt	2.5
Preventol	0.1
Cellulose	1.0
Dielectric Parameters Target Value	f=835MHz ε=41.5 σ=0.90
MIXTURE%	FREQUENCY(body) 835MHz
Water	52.5
Sugar	45
Salt	1.4
Preventol	0.1
Cellulose	1.0
Dielectric Parameters Target Value	f=835MHz ε=55.2 σ=0.97
MIXTURE%	FREQUENCY(head)1900MHz
Water	55.242
Glycol monobutyl	44.452
Salt	0.306
Dielectric Parameters Target Value	f=1900MHz ε=40.0 σ=1.40
MIXTURE%	FREQUENCY(body)1900MHz
Water	69.91
Glycol monobutyl	29.96
Salt	0.13
Dielectric Parameters Target Value	f=1900MHz ε=53.3 σ=1.52
MIXTURE%	FREQUENCY(head)2450MHz
Water	56
Glycol monobutyl	44
Salt	0.00
Dielectric Parameters Target Value	f=2450MHz ε=39.2 σ=1.8

MIXTURE%	FREQUENCY(body)2450MHz
Water	70
Glycol monobutyl	30
Salt	0
Dielectric Parameters Target Value	f=2450MHz ε=52.7 σ=1.95
MIXTURE%	FREQUENCY(head)2600MHz
Water	55.49
Glycol monobutyl	44.39
Salt	0.12
Dielectric Parameters Target Value	f=2600MHz ε=39.0 σ=1.96
MIXTURE%	FREQUENCY(Body)2600MHz
Water	69.5
Glycol monobutyl	30.4
Salt	0
Dielectric Parameters Target Value	f=2600MHz ε=52.5 σ=2.16
MIXTURE%	FREQUENCY(head)5200/5800MHz
Water	65.52
Triton X-100	17.24
Diethylenglycol monohexylether	17.24
Dielectric Parameters Target Value	f=5200MHz ε=36.0 σ=4.66 f=5800MHz ε=35.3 σ=5.27
MIXTURE%	FREQUENCY(body)5200/5800MHz
Water	75.48
Triton X-100	12.26
Diethylenglycol monohexylether	12.26
Dielectric Parameters Target Value	f=5200MHz ε=49.0 σ=5.30 f=5800MHz ε=48.2 σ=6.00

7. Summary of Test Results

7.1 Conducted Output Power Measurement

7.1.1 Summary

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

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

This result contains conducted output power for the EUT.

7.1.2 Conducted Power Results

GSM850		Conducted output power(dBm)						
		low	middle	high				
		CH128	CH189	CH251				
		824.2MHz	836.6MHz	848.8MHz				
GSM		32.9	32.9	32.9	(dB)	CH128	CH189	CH251
GPRS	1 TX-slot result	32.9	32.9	32.9	-9.03	23.87	23.87	23.87
	2 TX-slot result	30.6	30.6	30.6	-6.02	**24.58**	**24.58**	**24.58**
	3 TX-slot result	28.5	28.5	28.4	-4.26	24.24	24.24	24.14
	4 TX-slot result	26.2	26.2	26.2	-3.01	23.19	23.19	23.19
EDGE (GMSK)	1 TX-slot result	32.9	32.9	32.9	-9.03	23.87	23.87	23.87
	2 TX-slot result	30.6	30.6	30.6	-6.02	**24.58**	**24.58**	**24.58**
	3 TX-slot result	28.5	28.4	28.4	-4.26	24.24	24.14	24.14
	4 TX-slot result	26.1	26.2	26.2	-3.01	23.09	23.19	23.19

GSM1900		Conducted output power(dBm)						
		low	middle	high				
		CH512	CH661	CH810				
		1850.2MHz	1880MHz	1909.8MHz				
GSM		30.1	30.1	30.1	(dB)	CH512	CH661	CH810
GPRS	1 TX-slot result	30.1	30.1	30.1	-9.03	21.07	21.07	21.07
	2 TX-slot result	27.1	27.1	27.1	-6.02	**21.08**	**21.08**	**21.08**
	3 TX-slot result	24.8	24.8	24.8	-4.26	20.54	20.54	20.54
	4 TX-slot result	22.5	22.5	22.5	-3.01	19.49	19.49	19.49

EDGE (GMSK)	1 TX-slot result	30.1	30.1	30.1	-9.03	21.07	21.07	21.07
	2 TX-slot result	27.1	27.1	27.1	-6.02	**21.08**	**21.08**	**21.08**
	3 TX-slot result	24.8	24.8	24.8	-4.26	20.54	20.54	20.54
	4 TX-slot result	22.5	22.5	22.5	-3.01	19.49	19.49	19.49

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

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

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

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

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

Body-worn of GSM850/1900 are tested with GPRS 2 timeslots

WCDMA BAND II		Conducted Output power (dBm)		
		low	middle	high
		CH9262	CH9400	CH9538
		1852.4MHz	1800MHz	1907.6MHz
12.2kbps RMC		**22.7**	**22.7**	**22.5**
HSDPA	SUB-TEST 1	21.7	21.8	21.8
	SUB-TEST 2	21.5	21.6	21.5
	SUB-TEST 3	20.0	20.2	20.1
	SUB-TEST 4	19.9	20.1	20.0
HSUPA	SUB-TEST 1	21.6	21.7	21.8
	SUB-TEST 2	20.9	20.9	20.6
	SUB-TEST 3	21.0	21.2	21.0
	SUB-TEST 4	20.6	20.8	20.7
	SUB-TEST 5	21.6	21.7	21.7

WCDMA BAND V		Conducted Output power (dBm)		
		low	middle	high
		CH4132	CH4183	CH4233
		826.4 MHz	836.6MHz	846.6MHz
12.2kbps RMC		**22.8**	**23.0**	**22.9**
HSDPA	SUB-TEST 1	21.8	22.1	22.1
	SUB-TEST 2	21.7	21.8	21.9
	SUB-TEST 3	20.4	20.4	20.5

	SUB-TEST 4	20.1	20.4	20.1
HSUPA	SUB-TEST 1	22.0	22.1	22.1
	SUB-TEST 2	20.9	21.0	21.1
	SUB-TEST 3	21.3	21.4	21.4
	SUB-TEST 4	21.2	21.3	21.2
	SUB-TEST 5	21.8	22.1	22.0

Body-worn of WCDMA BAND II/V are tested with 12.2kbps RMC.

LTE Band 7				
Bandwidth	RB	Frequency(MHz)	Actual output power(dBm)	
			QPSK	16QAM
5MHz	12RB	2567.5	20.68	19.79
		2535	20.85	19.86
		2502.5	20.71	19.79
10MHz	25RB	2565	20.80	19.88
		2535	20.74	20.06
		2505	20.66	19.87
15MHz	36RB	2562.5	21.23	20.70
		2535	20.84	20.86
		2507.5	20.75	20.54
20MHz	50RB	2560	21.94	21.13
		2535	20.85	20.00
		2510	20.81	20.03
	1RB-low	2560	**21.95**	20.9
		2535	**21.74**	20.65
		2510	**21.84**	20.81
	1RB-mid	2560	21.89	21.04
		2535	21.84	21.02
		2510	21.55	20.98
	1RB-high	2560	21.75	20.19
		2535	21.75	20.79
		2510	21.45	20.97

LTE BAND 7 are tested with QPSK 20MHz 1RB low and check for QPAK 20MHz 1RB mid and high.

For Bluetooth maximum conducted power is 9.96dBm

Wi-Fi

Average Conducted Power

Model	Ch.	Freq. (MHz)	AVG POWER (dBm)
B	1	2412	15.98
	6	2437	16.08
	11	2462	16.45
G	1	2412	12.68
	6	2437	12.7
	11	2462	12.91
N20	1	2412	11.27
	6	2437	11.29
	11	2462	11.23
N40	3	2422	11.02
	6	2437	11.08
	9	2452	11.14

MODE	BAND	Frequency	AVG POWER
A	BAND 1	5180	11.72
		5200	11.35
		5240	11.12
	BAND 4	5745	11.25
		5785	11.52
		5825	11.22
N20	BAND 1	5180	11.71
		5200	11.47
		5240	11.14
	BAND 4	5745	11.15
		5785	11.49
		5825	11.3
N40	BAND 1	5190	11.18
		5230	11.17
	BAND 4	5755	11.08
		5795	11.23

The maximum conducted output power of Wi-Fi is 16.45dBm=44.2mW>P(max)=19mW..
So stand alone SAR is required.
SAR is not required for 802.11g/n channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels.

SAR of WLAN should be tested on 802.11b 1Mbps.

7.2 Test Results

7.2.1. Dielectric Performance

Dielectric Performance of Tissue Simulating Liquid

Frequency	Description	Dielectric Parameters εr	σ(s/m)	temp ℃
835MHz (head)	Target value 5% window	41.5 39.43-43.58	0.90 0.86- 0.95	/
	Measurement value 2015-04-17	41.33	0.89	21.8
	Measurement value 2015-04-24	41.72	0.91	21.7
835MHz (body)	Target value 5% window	55.2 52.44-57.96	0.97 0.92-1.02	/
	Measurement value 2015-04-30	54.03	0.95	21.8
1900MHz (head)	Target value 5% window	40.0 38-42	1.40 1.33 -1.47	/
	Measurement value 2015-04-24	39.54	1.38	21.8
	Measurement value 2015-04-25	39.45	1.38	21.8
1900MHz (body)	Target value 5% window	53.3 50.63-55.96	1.52 1.44 -1.60	/
	Measurement value 2015-04-26	52.36	1.49	21.8
	Measurement value 2015-04-27	52.54	1.50	21.9
2450MHz (head)	Target value 5% window	39.2 37.24-41.16	1.8 1.71-1.89	/
	Measurement value 2015-04-29	38.65	1.79	21.7
2450MHz (body)	Target value 5% window	52.7 50.06-55.33	1.95 1.85 -2.05	/
	Measurement value 2015-04-29	51.96	1.93	21.9
2600MHz (head)	Target value 5% window	39.0 37.05-40.95	1.96 1.86-2.06	/
	Measurement value 2015-05-15	38.9	1.98	21.7
2600MHz (body)	Target value 5% window	52.5 49.88-55.13	2.16 2.05 -2.27	/

	Measurement value 2015-05-14	51.97	2.12	21.8
5200MHz (head)	Target value 5% window	36 34.2-37.8	4.66 4.43-4.89	/
	Measurement value 2015-05-14	37.15	4.74	21.7
5200MHz (body)	Target value 5% window	49 46.55-51.45	5.3 5.04-5.57	/
	Measurement value 2015-05-13	47.82	5.21	21.9
5800MHz (head)	Target value 5% window	35.3 33.54-37.07	5.27 5.01-5.53	/
	Measurement value 2015-05-15	35.44	5.36	21.8
5800MHz (body)	Target value 5% window	48.2 45.79-50.61	6 5.7-6.3	/
	Measurement value 2015-05-14	47.56	6.08	21.9

7.2.2. System Check Results

System Check for tissue simulation liquid

Frequency	**Description**	**SAR(W/kg)**		**Targeted SAR1g（W/kg）**	**Normalized SAR1g（W/kg）**	**Deviation（%）**
		10g	**1g**			
835 MHz (head)	Recommended result ±10% window	1.6 1.44-1.76	2.44 2.2-2.68	/	/	/
	Measurement value 2015-04-17	1.54	2.33	9.51	9.32	-2.00
	Measurement value 2015-04-24	1.61	2.42	9.51	9.68	1.79
835MHz (body)	Recommended result ±10% window	1.6 1.44-1.76	2.41 2.17-2.65	/	/	/
	Measurement value 2015-04-30	1.51	2.32	9.52	9.28	-2.52
1900MHz (head)	Recommended result ±10% window	5.04 4.54-5.54	9.70 8.73-10.67	/	/	/
	Measurement value 2015-04-24	5.14	9.98	39.4	39.42	1.32
	Measurement value 2015-04-25	4.88	9.63	39.4	38.52	-2.23

1900MHz (body)	Recommended result ±10% window	5.28 4.75-5.81	10.1 9.09-11.11	/	/	/
	Measurement value 2015-04-26	4.98	9.77	39.6	39.08	-1.31
	Measurement value 2015-04-27	5.12	9.88	39.6	39.52	-0.20
2450MHz (head)	Recommended result ±10% window	6.01 5.41-6.61	12.9 11.61-14.19	/	/	/
	Measurement value 2015-04-29	6.12	13.2	51.1	52.8	3.33
2450MHz (body)	Recommended result ±10% window	5.95 5.36-6.55	12.7 11.43-13.97	/	/	/
	Measurement value 2015-04-29	5.86	12.8	50.3	51.2	1.79
2600MHz (head)	Recommended result ±10% window	6.66 5.99-7.33	14.8 13.32-16.28	/	/	/
	Measurement value 2015-05-15	6.58	14.7	58.9	58.8	-0.17
2600MHz (body)	Recommended result ±10% window	6.63 5.88-7.18	14.5 13.05-15.95	/	/	/
	Measurement value 2015-05-14	6.44	14.1	58.1	56.4	-2.93
5200MHz (head)	Recommended result ±10% window	2.32 2.09-2.55	8.12 7.31-8.93	/	/	/
	Measurement value 2015-05-14	2.21	8.03	80.5	80.3	-0.25
5200MHz (body)	Recommended result ±10% window	2.12 1.91-2.33	7.61 6.85-8.37	/	/	/
	Measurement value 2015-05-13	2.18	7.83	75.5	78.3	3.71
5800MHz (head)	Recommended result ±10% window	2.28 2.05-2.51	8.03 7.23-8.83	/	/	/
	Measurement value 2015-05-15	2.26	8.12	79.5	81.2	2.14
5800MHz (body)	Recommended result ±10% window	2.08 1.87-2.29	7.55 6.8-8.31	/	/	/
	Measurement value 2015-05-14	2.12	7.76	74.8	77.6	3.74

Note: 1. the graph results see ANNEX B.1.
2 .Recommended Values used derive from the calibration certificate and 250 mW is used as feeding power to the calibrated dipole.

7.2.3 Test Results

7.2.3.1 Summary of Measurement Results (GSM850)

SAR Values (GSM850)

Test Case		Measurement Result(W/kg)	Power Drift(dB)	Note
Different Test Position	Channel	1 g Average		
Test position of Head				
Left head, Touch cheek	middle	0.552	-0.15	
Left head, Tilt 15 Degree	middle	0.328	-0.09	
Right head, Touch cheek	middle	**0.589**	-0.13	**max**
Right head, Tilt 15 Degree	middle	0.34	-0.02	
Right head, Touch cheek	low	0.553	-0.09	
	high	0.535	-0.03	
Test position of Body with GPRS(2UP) (Distance 10mm)				
Towards phantom	middle	0.134	0.12	
Towards Ground	middle	0.195	0.06	
Front	middle	0.189	0.36	
Left side	middle	0.0778	0.03	
Right side	middle	0.109	0.02	
Towards Ground	low	**0.197**	0.05	**max**
	high	0.194	-0.15	
Worst case position of Body with (Distance 10mm)				
Towards Ground	low	0.177	0.10	earphone

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

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

3. The SAR test shall be performed at the high, middle and low frequency channels of

each operating mode. If the SAR measured at mid-band channel for each test configuration is lower than the SAR limit (< 0.4W/kg), testing at the high and low channels is optional.

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

7.2.3.2 Summary of Measurement Results (PCS1900)

SAR Values (PCS1900)

Test Case		Measurement Result(W/kg) 1 g Average	Power Drift(dB)	Note
Different Test Position	Channel			
Test position of Head				
Left head, Touch cheek	middle	**0.180**	0.04	**max**
Left head, Tilt 15 Degree	middle	0.0675	0.03	
Right head, Touch cheek	middle	0.110	-0.05	
Right head, Tilt 15 Degree	middle	0.0539	-0.18	
Left head, Touch cheek	low	0.155	0.15	
	high	0.155	0.07	
Test position of Body with GPRS(2UP) (Distance 10mm)				
Towards phantom	middle	0.305	0.13	
Towards Ground	middle	0.198	-0.08	
Front	middle	0.424	-0.10	
Left side	middle	0.0446	0.08	
Right side	middle	0.0555	-0.14	
Front	low	0.377	-0.12	
	high	0.483	-0.10	
Worst case position of Body with (Distance 10mm)				
Front	high	**0.518**	-0.14	**Max** earphone

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

2. Upper and lower frequencies were measured at the worst position.
3. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is lower than the SAR limit (< 0.4W/kg), testing at the high and low channels is optional.
4. Per KDB 865664 d01v01, for each frequency band ,repeated SAR measurement is required only when the measured SAR is ⩾0.8(W/kg).

7.2.3.3 Summary of Measurement Results (WCDMA BAND II)

SAR Values (WCDMA BANDII)

Test Case		Measurement Result(W/kg)	Power Drift(dB)	Note
Different Test Position	Channel	1 g Average		
Test position of Head				
Left head, Touch cheek	middle	0.335	0.01	
Left head, Tilt 15 Degree	middle	0.251	0.06	
Right head, Touch cheek	middle	**0.429**	0.12	**max**
Right head, Tilt 15 Degree	middle	0.08	0.03	
Right head, Touch cheek	low	0.428	0.18	
	high	0.250	-0.06	
Test position of Body (Distance 10mm)				
Towards phantom	middle	**0.805**	0.13	**max**
Towards Ground	middle	0.348	0.09	
Front	middle	0.592	-0.07	
Left side	middle	0.175	-0.13	
Right side	middle	0.135	0.08	
Towards phantom	low	0.677	0.16	
	high	0.459	0.17	
Worst case position of Body with (Distance 10mm)				

Towards phantom	middle	0.761	-0.15	earphone
Towards phantom	middle	0.766	-0.11	repeat

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

2. Upper and lower frequencies were measured at the worst position.
3. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is lower than the SAR limit (< 0.4W/kg), testing at the high and low channels is optional.
4. Per KDB 865664 d01v01, for each frequency band ,repeated SAR measurement is required only when the measured SAR is ≥0.8(W/kg).

7.2.3.4 Summary of Measurement Results (WCDMA BAND V)

SAR Values (WCDMA BAND V)

Test Case		Measurement Result(W/kg)	Power Drift(dB)	Note
Different Test Position	Channel	1 g Average		
Test position of Head				
Left head, Touch cheek	middle	0.442	0.04	
Left head, Tilt 15 Degree	middle	0.283	-0.01	
Right head, Touch cheek	middle	0.506	-0.03	
Right head, Tilt 15 Degree	middle	0.299	0.01	
Right head, Touch cheek	low	**0.570**	-0.14	**max**
	high	0.373	0.16	
Test position of Body (Distance 10mm)				
Towards phantom	middle	0.0929	0.09	
Towards Ground	middle	0.0827	0.01	
Front	middle	**0.214**	-0.03	**max**
Left side	middle	0.058	0.00	
Right side	middle	0.078	0.08	

Front	low	0.159	0.01	
	high	0.134	0.06	
Worst case position of Body with (Distance 10mm)				
Front	middle	0.155	0.17	earphone

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

2. Upper and lower frequencies were measured at the worst position.
3. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is lower than the SAR limit (< 0.4W/kg), testing at the high and low channels is optional.
4. Per KDB 865664 d01v01, for each frequency band ,repeated SAR measurement is required only when the measured SAR is ≥0.8(W/kg).

7.2.3.5 Summary of Measurement Results (LTE BAND 7)

SAR Values (LTE BAND 7)

Test Case			Measurement Result(W/kg) 10 g Average	Power Drift(dB)	Note
Different Test Position		Channel			
Test position of Head					
QPSK_20M_1RB_low	Left head, Touch cheek	middle	0.125	-0.15	
	Left head, Tilt 15 Degree	middle	0.0246	-0.02	
	Right head, Touch cheek	middle	0.043	0.12	
	Right head, Tilt 15 Degree	middle	0.0357	0.18	
	Left head, Touch cheek	low	0.269	-0.11	
		high	0.275	0.09	
QPSK_20M_1RB_mid	Left head, Touch cheek	high	0.161	-0.09	
QPSK_20M_1RB_high	Left head, Touch cheek	high	**0.315**	-0.15	max

Worst case position of Body with (Distance 10mm)					
QPSK_20M_1RB_low	Towards phantom	middle	0.159	-0.22	
	Towards Ground	middle	0.167	0.39	
	front	middle	0.397	0.14	
	left side	middle	0.088	0.19	
	right side	middle	0.011	-0.12	
	front	low	**1.13**	0.06	**max**
		high	0.814	0.06	
QPSK_20M_1RB_mid	front	low	0.557	0.18	
QPSK_20M_1RB_high	front	low	0.317	0.13	
Worst case position of Body with (Distance 10mm)					
QPSK_20M_1RB_low	front	low	0.652	-0.02	earphone
QPSK_20M_1RB_low	front	low	1.11	0.15	repeat

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

2. Upper and lower frequencies were measured at the worst position.
3. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit (< 1.0W/kg), testing at the high and low channels is optional.
4. 16QAM SAR for body was not required since the average output power of the 16QAM was not more than 0.25dB higher than the QPSK level and the maximum SAR for QPSK_20M_1RB was less than 75% SAR limit

7.2.3.6 Summary of Measurement Results (802.11b/g/n)

SAR Values (802.11b/g/n)

Test Case		Measurement Result(W/kg)	Power Drift(dB)	Note
Different Test Position	Channel	1 g Average		
Test position of Head				

Left head, Touch cheek	middle	0.111	0.14	
Left head, Tilt 15 Degree	middle	0.016	0.14	
Right head, Touch cheek	middle	0.015	0.07	
Right head, Tilt 15 Degree	middle	0.00768	0.18	
Left head, Touch cheek	low	**0.134**	-0.04	**max**
	high	0.109	-0.05	
Test position of Body (Distance 10mm)				
Towards phantom	middle	0.0104	-0.12	
Towards Ground	middle	0.204	0.12	
Back	middle	0.00304	-0.07	
Left side	middle	0.000925	0.12	
right side	middle	0.0247	0.13	
Towards Ground	low	**0.228**	0.15	**max**
	high	0.159	0.17	

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

2. Upper and lower frequencies were measured at the worst position.
3. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is lower than the SAR limit (< 0.4W/kg), testing at the high and low channels is optional.
4. Per KDB 865664 d01v01, for each frequency band ,repeated SAR measurement is required only when the measured SAR is ≥0.8(W/kg).

7.2.3.7 Summary of Measurement Results (802.11a/n band 1)

SAR Values (802.11a/n band 1)

Test Case		Measurement Result(W/kg)	Power Drift(dB)	Note
Different Test Position	Channel	1 g Average		
Test position of Head				

Left head, Touch cheek	low	0.0883	0.25	
Left head, Tilt 15 Degree	low	0.0596	-0.09	
Right head, Touch cheek	low	0.0630	-0.18	
Right head, Tilt 15 Degree	low	0.0413	-0.26	
Left head, Touch cheek	middle	0.125	0.36	
	high	0.131	-0.35	
Left head, Touch cheek	high	0.156	0.45	n20
Left head, Touch cheek	high	0.179	0.14	**max** n40 ch38
Left head, Touch cheek	high	0.174	-0.30	n40 ch46
Test position of Body (Distance 10mm)				
Towards phantom	low	0.0301	-0.11	
Towards Ground	low	0.304	0.34	
Back	low	0.0761	-0.42	
Left side	low	0.0106	0.26	
right side	low	0.114	0.20	
Towards Ground	middle	0.340	-0.16	
	high	0.305	0.31	
Towards Ground	middle	0.379	-0.02	**max** n20
Towards Ground	middle	0.293	-0.41	n40 ch38
Towards Ground	middle	0.314	-0.35	n40 ch46

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

2. Upper and lower frequencies were measured at the worst position.
3. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is lower than the SAR limit (< 0.4W/kg), testing at the high and low channels is optional.

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

7.2.3.8 Summary of Measurement Results (802.11a/n band 4)

SAR Values (802.11a/n band 4)

Test Case		Measurement Result(W/kg)	Power Drift(dB)	Note
Different Test Position	Channel	1 g Average		
Test position of Head				
Left head, Touch cheek	middle	0.151	-0.17	
Left head, Tilt 15 Degree	middle	0.0506	0.20	
Right head, Touch cheek	middle	0.147	-0.22	
Right head, Tilt 15 Degree	middle	0.0466	0.15	
Left head, Touch cheek	low	0.154	-0.39	
	high	0.220	-0.19	**max**
Left head, Touch cheek	high	0.167	-0.35	n20
Left head, Touch cheek	high	0.130	-0.36	n40 ch151
Left head, Touch cheek	high	0.172	-0.36	n40 ch159
Test position of Body (Distance 10mm)				
Towards phantom	middle	0.0702	-0.44	
Towards Ground	middle	0.301	-0.16	
Back	middle	0.0160	0.14	
Left side	middle	0.0107	-0.14	
right side	middle	0.177	-0.35	
Towards Ground	low	0.260	-0.23	
	high	0.277	0.27	
Towards Ground	middle	0.325	-0.15	**max** n20

Towards Ground	middle	0.243	-0.18	n40 ch151
Towards Ground	middle	0.283	-0.39	n40 ch159

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

2. Upper and lower frequencies were measured at the worst position.
3. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is lower than the SAR limit (< 0.4W/kg), testing at the high and low channels is optional.
4. Per KDB 865664 d01v01, for each frequency band ,repeated SAR measurement is required only when the measured SAR is ≥0.8(W/kg).

7.2.4 Maximum SAR

Test Case				Measurement Result (W/kg)	conducted power (dBm)	maximum power (dBm)	Maximum reported 1g SAR (W/kg)	Limit 1g SAR (W/kg)
band	Different Test Position		Ch	1g Average				
GSM 850	head	Right head, Touch cheek	middle	0.589	32.9	34	0.759	1.6
	body	Towards Ground with GPRS(2up)	low	0.197	32.9		0.254	1.6
GSM 1900	head	Left head, Touch cheek	middle	0.180	30.1	31	0.221	1.6
	body	Front with earphone	high	0.518	30.1		0.579	1.6
WCDMA BAND II	head	Right head, Touch cheek	middle	0.429	22.7	24	0.637	1.6
	body	Towards phantom	middle	0.805	22.7		1.086	1.6
WCDMA BAND V	head	Right head, Touch cheek	low	0.570	22.8	24	0.751	1.6
	body	Front	middle	0.214	23		0.269	1.6
LTE BAND 7	head	QPSK_20M_1RB_high Left head, Touch cheek	high	0.315	21.45	22	0.358	1.6
	body	QPSK_20M_1RB_low front	low	1.13	21.95		1.143	1.6

Wi-Fi2.4 G	head	Left head, Touch cheek	low	0.134	15.98	18	0.213	1.6
	body	Towards Ground	low	0.228	15.98		0.363	1.6
Wi-Fi5.2 G	head	Left head, Touch cheek n40 ch38	high	0.179	11.18	12	0.216	1.6
	body	Towards Ground n20	middle	0.379	11.47		0.428	1.6
Wi-Fi5.8 G	head	Left head, Touch cheek	high	0.220	11.22	12	0.263	1.6
	body	Towards Ground n20	middle	0.325	11.49		0.365	1.6

Evaluation for Simultaneous SAR

Summation BAND	Exposure Position	Maximum reported 1g SAR (W/kg)	Summation SAR(1g) (W/kg)	SAR –to-peak-location Separation Ratio	Simultaneous Measurement Required?
WWAN +WiFi	Head	0.759+0.263=1.022	＜1.6	/	No
	Body-worn(10mm)	1.143+0.428=1.571	＜1.6	/	No
WWAN+BT	Head	0.759+0.525=1.284	＜1.6	/	No
	Body-worn(10mm)	1.143+0.263=1.406	＜1.6	/	No

General Judgment： PASS

8. Test Equipments Utilized

No.	Name	Type	S/N	Calibration Date	Valid Period
01	Network analyzer	Agilent E5071E	MY46109425	Oct 30th, 2014	One year
02	Dielectric Probe Kit	Agilent 85070E	MY44300524	No Calibration Requested	
03	Power meter	Agilent E4418B	MY50000852	Oct 30th, 2014	One year
04	Power sensor	Agilent E9200B	MY50300011	Oct 30th, 2014	One year
05	Signal Generator	Agilent N5182A	MY49071248	Oct 30th, 2014	One year
06	Amplifier	ZHL-42W	QA1020005	No Calibration Requested	
07	BTS	CMU200	121464	Oct 30th, 2014	One year
08	BTS	MT8820C	6201107310	May 23th, 2014	One year
09	E-field Probe	ES3DV3	3241	Sep 29th, 2014	One year
10	E-field Probe	EX3DV4	3717	Sep 02th, 2014	One year
11	DAE	DAE4	1226	Sep 15th, 2014	One year
12	DAE	DAE4	1327	Apr 21th, 2015	One year
13	Validation Kit 835MHz	D835V2	4d100	Sep 23th, 2014	One year
14	Validation Kit 1900MHz	D1900V2	5d155	Apr 21th, 2015	One year
15	Validation Kit 2450MHz	D2450V2	845	Sep 17th, 2014	One year
16	Validation Kit 2600MHz	D2600V2	1059	Apr 27th, 2015	One year
17	Validation Kit 5GHz	D5GHzV2	1180	Aug 08th, 2014	One year

9. Measurement Uncertainty

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

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

ANNEX A: Detailed Test Results

Annex A.1 System Check Results

System check 835 head

Date/Time: 17/04/2015 08:10:58

Communication System: UID 10000, CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz;Communication System PAR: 0 dB

Medium parameters used (interpolated): f = 835 MHz; σ = 0.891 S/m; ε_r = 41.332; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(6.41, 6.41, 6.41); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: SAM1; Type: SAM; Serial: TP1576
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

835head/d=15mm, Pin=250 mW/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 2.40 W/kg

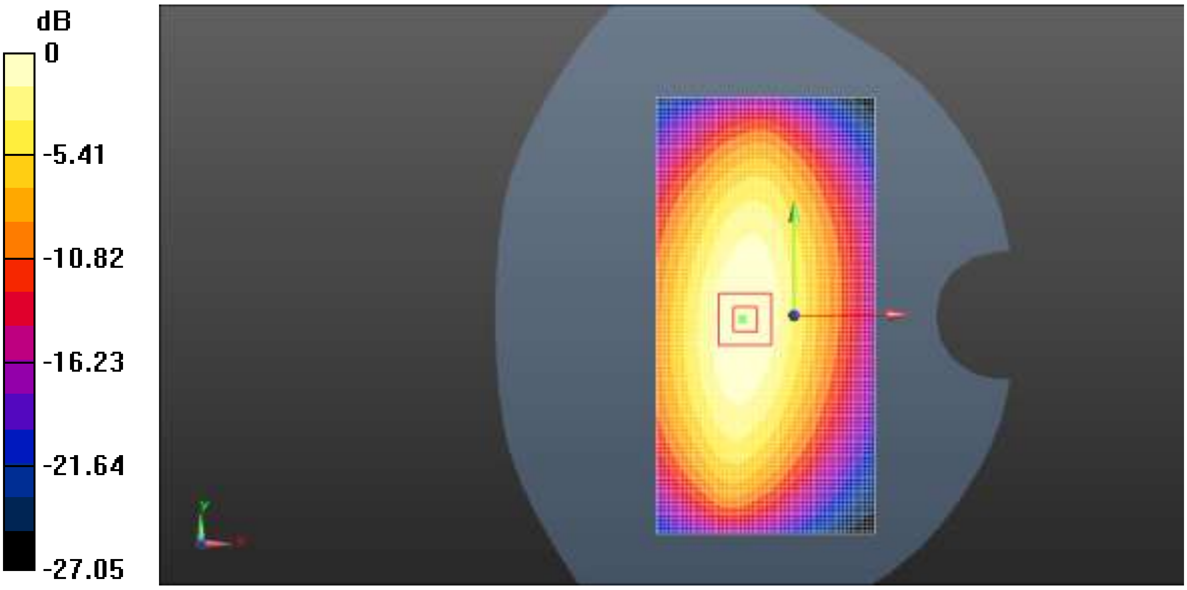
835head/d=15mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.873 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.43 W/kg

SAR(1 g) = 2.33 W/kg; SAR(10 g) = 1.54 W/kg

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



0 dB = 2.40 W/kg = 3.80 dBW/kg

System check 835 head

Date/Time: 24/04/2015 08:13:38

Communication System: UID 10000, CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz;Communication System PAR: 0 dB

Medium parameters used (interpolated): f = 835 MHz; σ = 0.913 S/m; ε_r = 41.723; ρ = 1000 kg/m^3

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(6.41, 6.41, 6.41); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: SAM1; Type: SAM; Serial: TP1576
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

835head/d=15mm, Pin=250 mW/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 3.16 W/kg

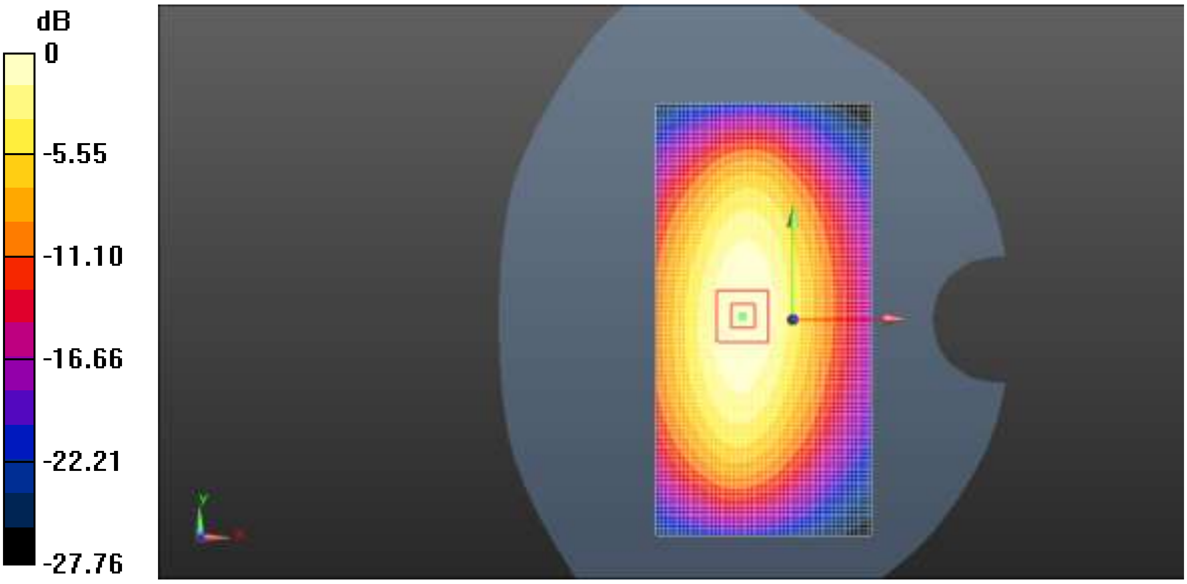
835head/d=15mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.676 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 4.17 W/kg

SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.61 W/kg

Maximum value of SAR (measured) = 3.21 W/kg



0 dB = 3.16 W/kg = 5.00 dBW/kg

System check 835body

Date/Time: 30/04/2015 09:38:00

Communication System: UID 10000, CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 835 MHz; σ = 0.948 S/m; ε_r = 54.025; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(6.37, 6.37, 6.37); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

835body/d=15mm, Pin=250 mW/Area Scan (61x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 2.39 W/kg

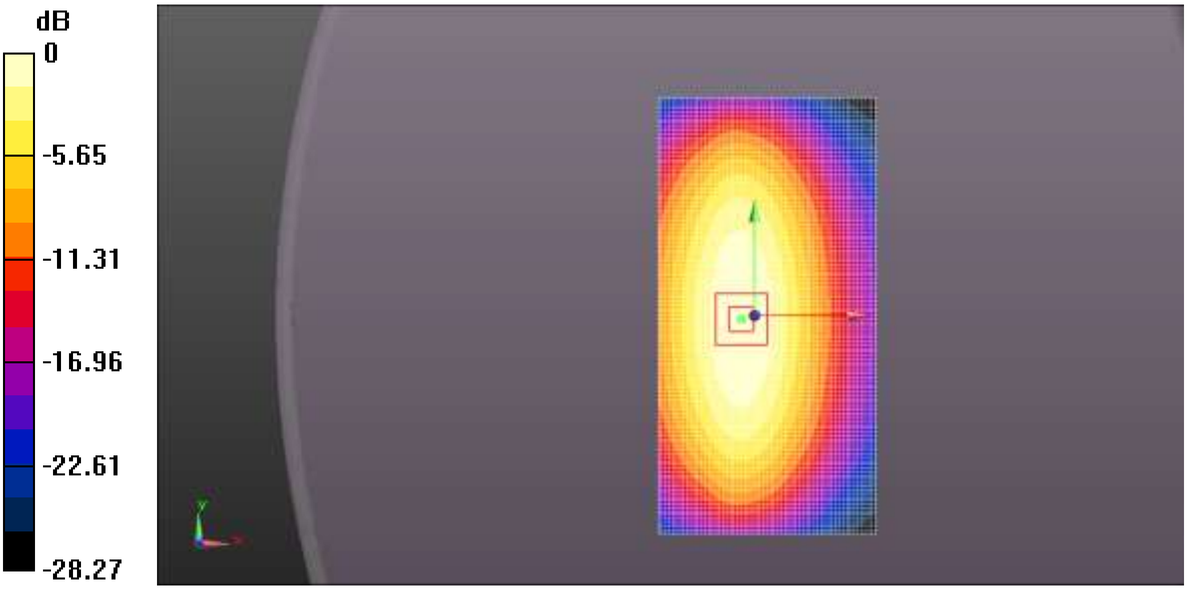
835body/d=15mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.344 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 3.19 W/kg

SAR(1 g) = 2.32 W/kg; SAR(10 g) = 1.51 W/kg

Maximum value of SAR (measured) = 2.38 W/kg



0 dB = 2.39 W/kg = 3.78 dBW/kg

System check 1900head

Date/Time: 24/04/2015 16:08:27

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

Medium parameters used: f = 1900 MHz; σ = 1.383 S/m; ε_r = 39.538; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.12, 5.12, 5.12); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: SAM2; Type: SAM; Serial: TP-1575
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

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

Maximum value of SAR (interpolated) = 12.0 W/kg

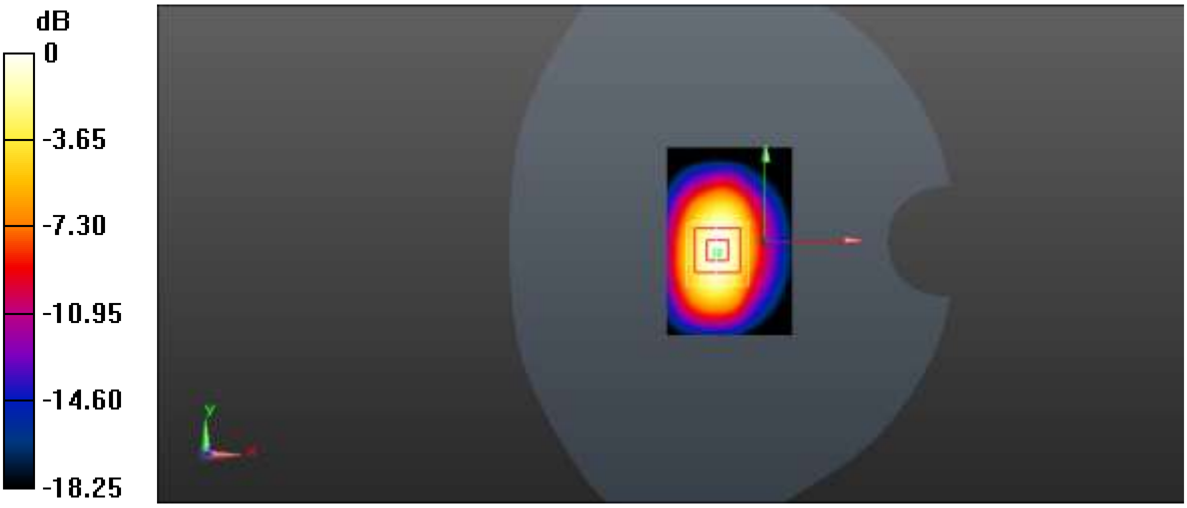
1900head/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.925 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 19.1 W/kg

SAR(1 g) = 9.98 W/kg; SAR(10 g) = 5.14 W/kg

Maximum value of SAR (measured) = 11.3 W/kg



0 dB = 12.0 W/kg = 10.79 dBW/kg

System check 1900head

Date/Time: 25/04/2015 08:21:41

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

Medium parameters used: f = 1900 MHz; σ = 1.383 S/m; ε_r = 39.448; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.12, 5.12, 5.12); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: SAM2; Type: SAM; Serial: TP-1575
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

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

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

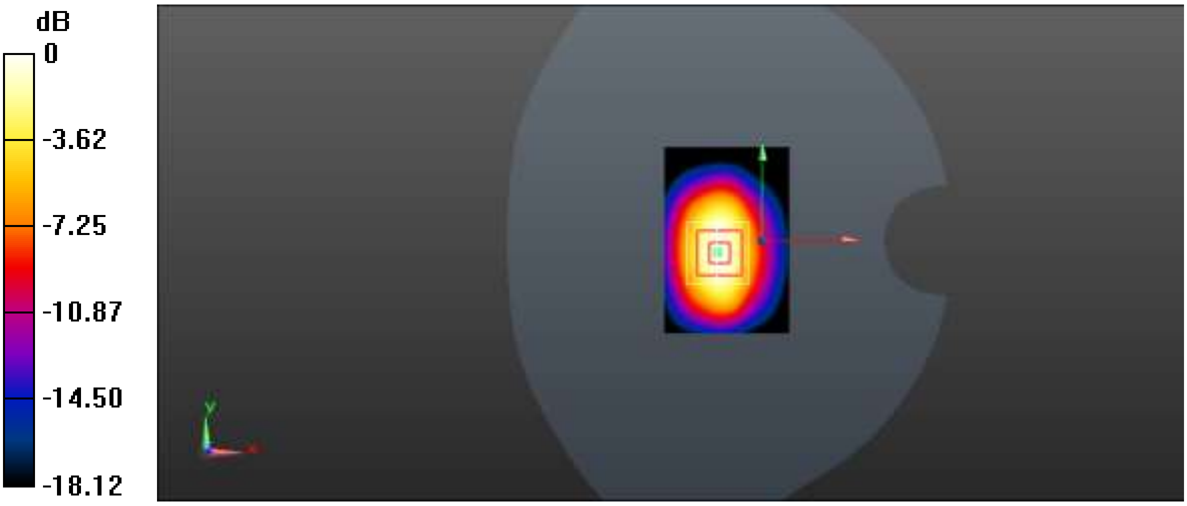
1900 head/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.887 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 18.1 W/kg

SAR(1 g) = 9.63 W/kg; SAR(10 g) = 4.88 W/kg

Maximum value of SAR (measured) = 10.7 W/kg



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

System check 1900 body

Date/Time: 26/04/2015 07:37:35

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

Medium parameters used: f = 1900 MHz; σ = 1.493 S/m; ε_r = 52.357; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(4.85, 4.85, 4.85); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

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

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

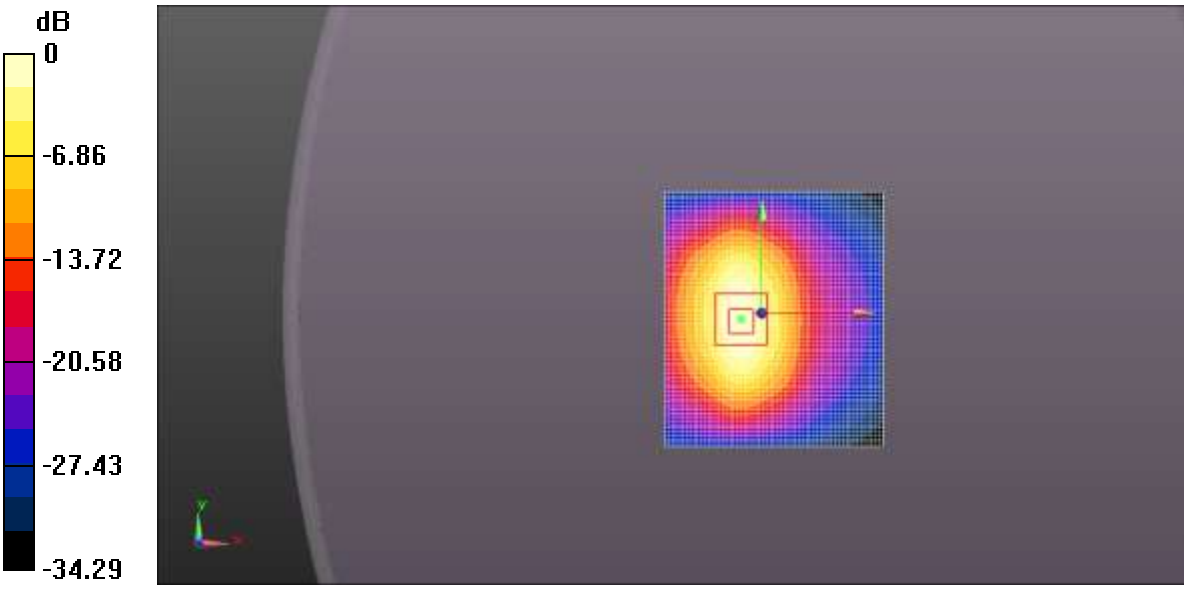
1900body/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 70.500 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 16.0 W/kg

SAR(1 g) = 9.77 W/kg; SAR(10 g) = 4.98 W/kg

Maximum value of SAR (measured) = 11.7 W/kg



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

System check 1900body

Date/Time: 27/04/2015 05:38:41

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

Medium parameters used: f = 1900 MHz; σ = 1.502 S/m; ε_r = 52.537; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- P Probe: ES3DV3 - SN3241; ConvF(4.85, 4.85, 4.85); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

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

Maximum value of SAR (interpolated) = 12.8 W/kg

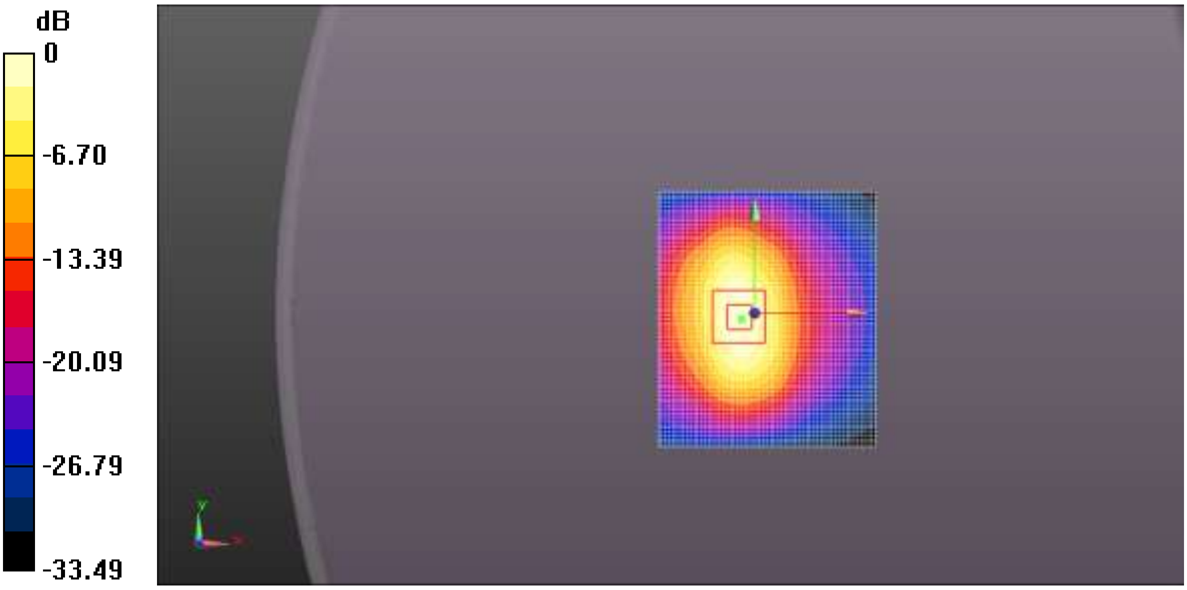
1900body/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 80.747 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 16.3 W/kg

SAR(1 g) = 9.88 W/kg; SAR(10 g) = 5.12 W/kg

Maximum value of SAR (measured) = 11.8 W/kg



0 dB = 12.8 W/kg = 11.06 dBW/kg

System check 2450head

Date/Time: 29/04/2015 08:34:20

Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 2450 MHz; σ = 1.785 S/m; ε_r = 38.652; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(4.64, 4.64, 4.64); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

2450head/d=10mm, Pin=250 mW/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 17.7 W/kg

2450head/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

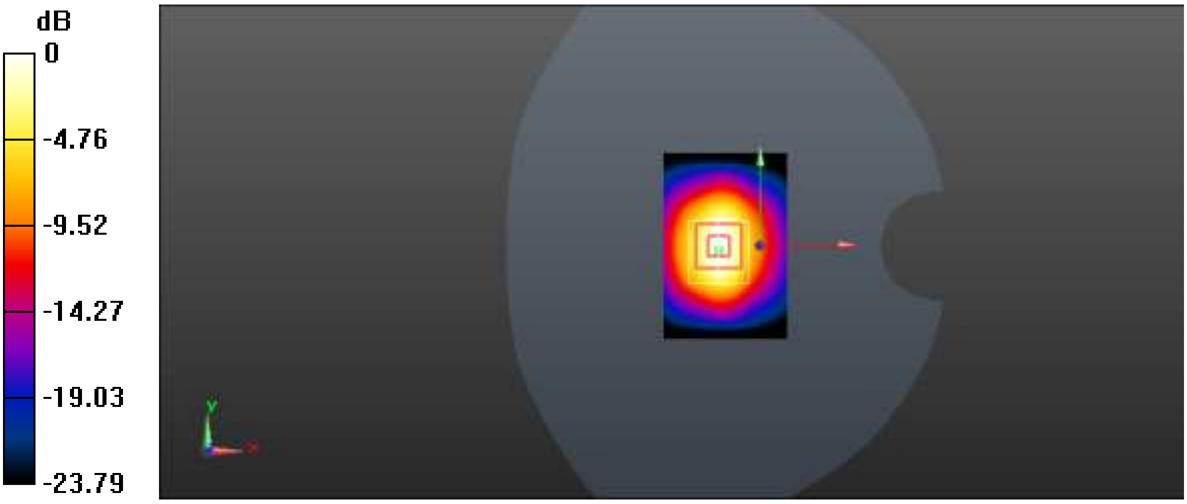
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.244 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 28.1 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) =6.12W/kg

Maximum value of SAR (measured) = 17.0 W/kg



0 dB = 17.0 W/kg = 12.30 dBW/kg

System check 2450 body

Date/Time: 29/04/2015 18:20:12

Communication System: UID 10000, CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 2450 MHz; σ = 1.932 S/m; ε_r = 51.964; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(4.64, 4.64, 4.64); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

2450body/d=10mm, Pin=250 mW/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 17.6 W/kg

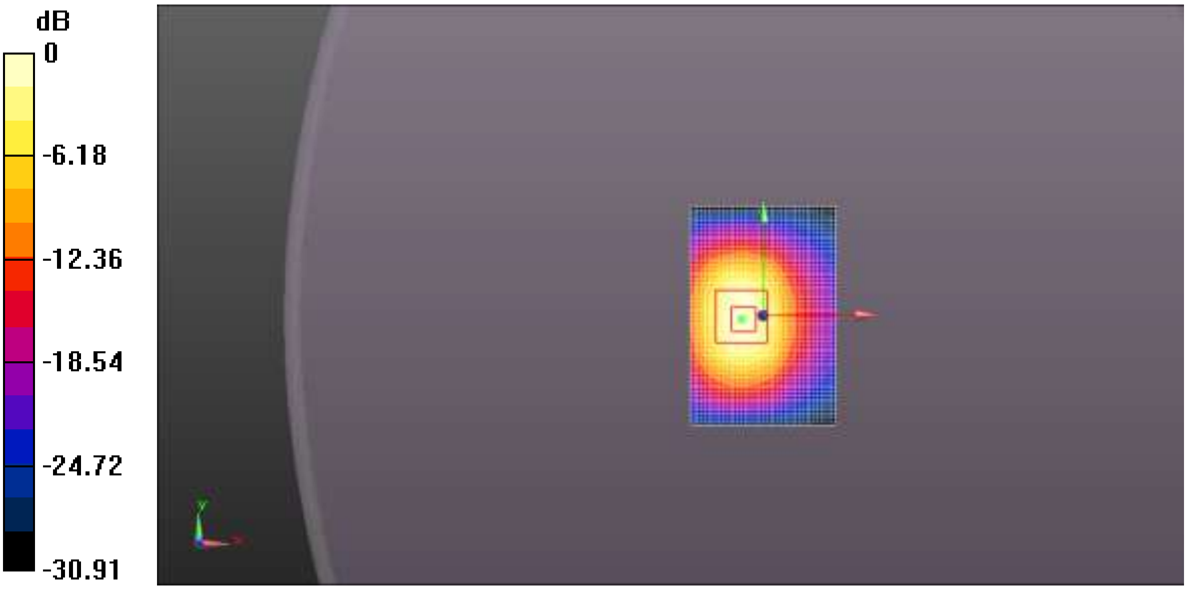
2450body/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 71.463 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 26.2 W/kg

SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.86 W/kg

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



0 dB = 17.6 W/kg = 12.46 dBW/kg

System check 2600head

Date/Time: 15/05/2015 07:26:17

Communication System: UID 0, CW; Communication System Band: D2600 (2600.0 MHz); Frequency: 2600 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 2600 MHz; σ = 1.981S/m; ε_r = 38.9; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(7.01, 7.01, 7.01); Calibrated: 02/09/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 21/04/2015
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

2600head/d=10mm, Pin=250 mW/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 18.8 W/kg

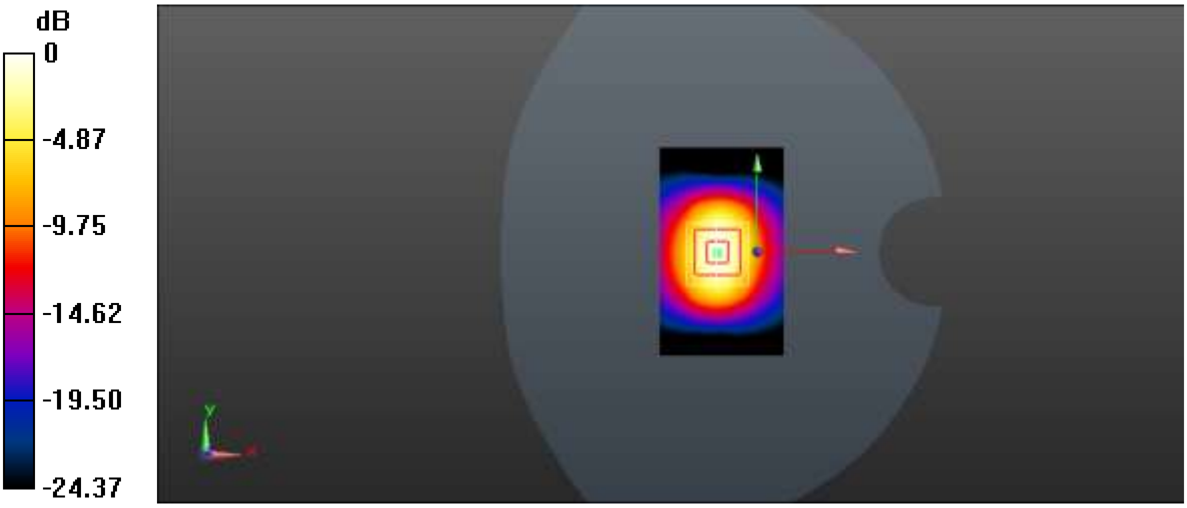
2600head/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.316 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 36.2 W/kg

SAR(1 g) = 14.7 kg; SAR(10 g) = 6.58 W/kg

Maximum value of SAR (measured) = 18.4 W/kg



0 dB = 18.8 W/kg = 12.74 dBW/kg

System check 2600body

Date/Time: 14/05/2015 15:20:12

Communication System: UID 0, CW; Communication System Band: D2600 (2600.0 MHz); Frequency: 2600 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 2600 MHz; σ = 2.121 S/m; ε_r = 51.972; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(7.11, 7.11, 7.11); Calibrated: 02/09/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 21/04/2015
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

2600body/d=10mm, Pin=250 mW/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 17.6 W/kg

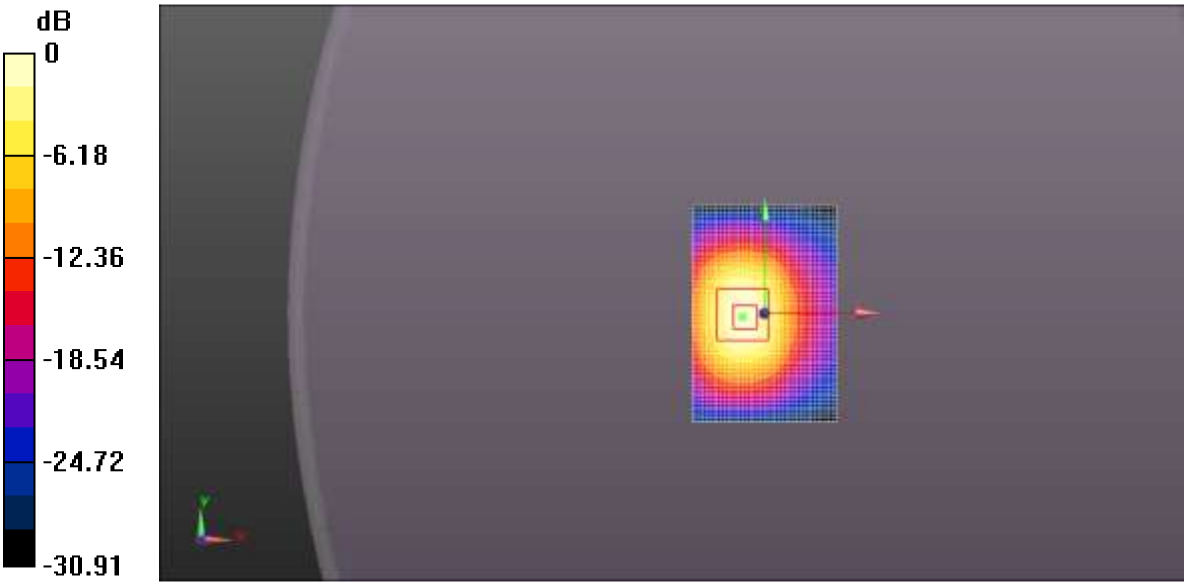
2600body/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 71.463 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 26.2 W/kg

SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.44 W/kg

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



0 dB = 17.6 W/kg = 12.46 dBW/kg

System check 5200 head

Date/Time: 14/05/2015 08:26:17

Communication System: CW; Communication System Band: 5.2G; Frequency: 5200 MHz;Communication System PAR: 0 dB

Medium parameters used (interpolated): f = 5200 MHz; σ = 4.738 S/m; ε_r = 37.145; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(5.49, 5.49, 5.49); Calibrated: 02/09/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 21/04/2015
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

5200head/d=10mm, Pin=100 mW/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 18.4 W/kg

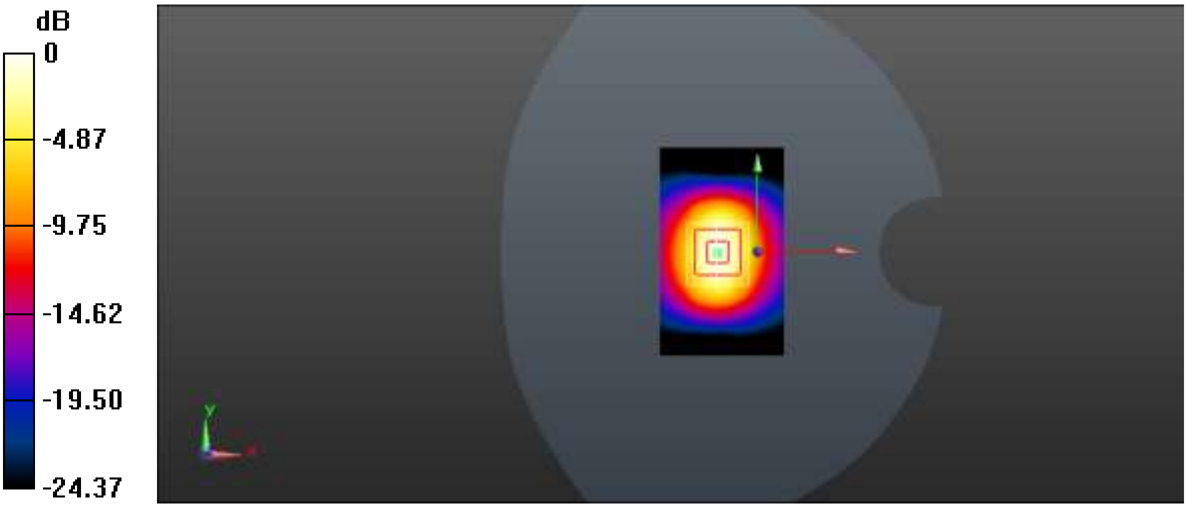
5200head/d=10mm, Pin=100 mW/Zoom Scan (8x8x10) /Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.316 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 30.2 W/kg

SAR(1 g) = 8.03 kg; SAR(10 g) = 2.21 W/kg

Maximum value of SAR (measured) = 18.2 W/kg



0 dB = 18.4 W/kg = 12.65 dBW/kg

System check 5200body

Date/Time: 13/05/2015 17:15:40

Communication System: CW; Communication System Band: 5.2G; Frequency: 5200 MHz;Communication System PAR: 0 dB

Medium parameters used (interpolated): f = 5200 MHz; σ = 5.213 S/m; ε_r = 47.824; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(4.49, 4.49, 4.49); Calibrated: 02/09/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 21/04/2015
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

5200body/d=10mm, Pin=100 mW/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 18.1 W/kg

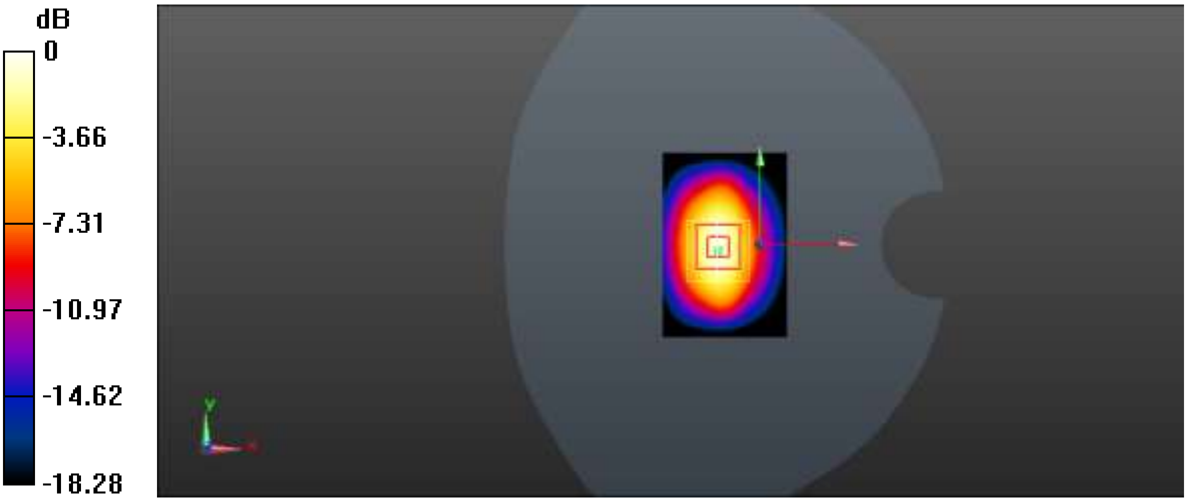
5200body/d=10mm, Pin=100 mW/Zoom Scan (8x8x10)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 61.914 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 29.5 W/kg

SAR(1 g) = 7.83 W/kg; SAR(10 g) = 2.18 W/kg

Maximum value of SAR (measured) = 18.0 W/kg



0 dB = 18.0 W/kg = 12.55 dBW/kg

System check 5800head

Date/Time: 15/05/2015 14:42:33

Communication System: CW; Communication System Band: 5.8G; Frequency: 5800 MHz;Communication System PAR: 0 dB

Medium parameters used (interpolated): f = 5800 MHz; σ = 5.363 S/m; ε_r = 35.442; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(5.49, 5.49, 5.49); Calibrated: 02/09/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 21/04/2015
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

5800/d=10mm, Pin=100 mW/Area Scan (41x61x1): Measurement grid: dx=4mm, dy=4mm

Maximum value of SAR (interpolated) = 19.4 W/kg

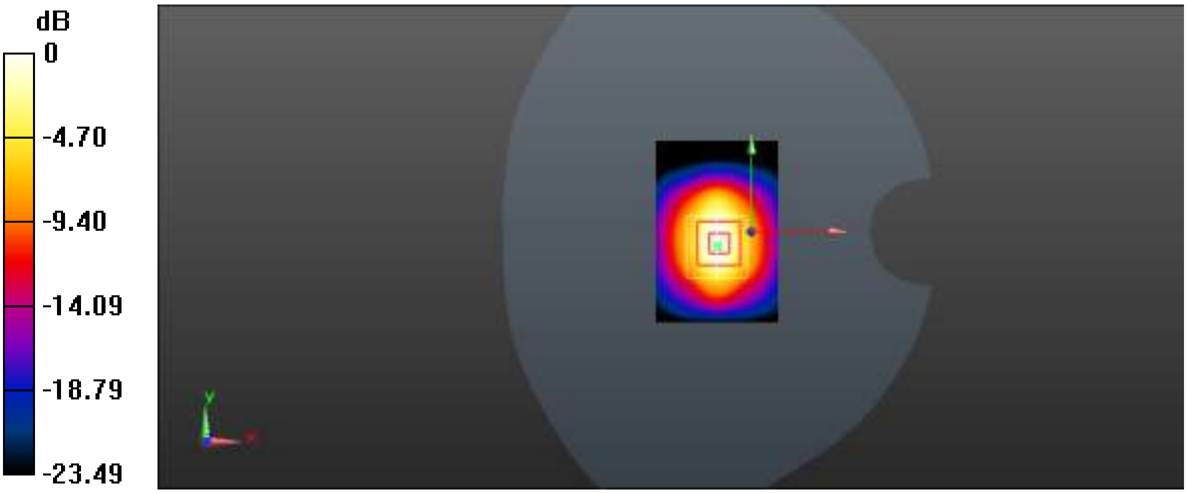
5800/d=10mm, Pin=100 mW/Zoom Scan (8x8x10)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.41 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) =31.5 W/kg

SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.26 W/kg

Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 19.4 W/kg = 12.88 dB W/kg

System check 5800body

Date/Time: 14/05/2015 18:38:31

Communication System: CW; Communication System Band: 5.8G; Frequency: 5800 MHz;Communication System PAR: 0 dB

Medium parameters used (interpolated): f = 5800 MHz; σ = 6.083 S/m; ε_r = 47.563; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(4.58, 4.58, 4.58); Calibrated: 02/09/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 21/04/2015
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

5800body/d=10mm, Pin=100 mW/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 19.3 W/kg

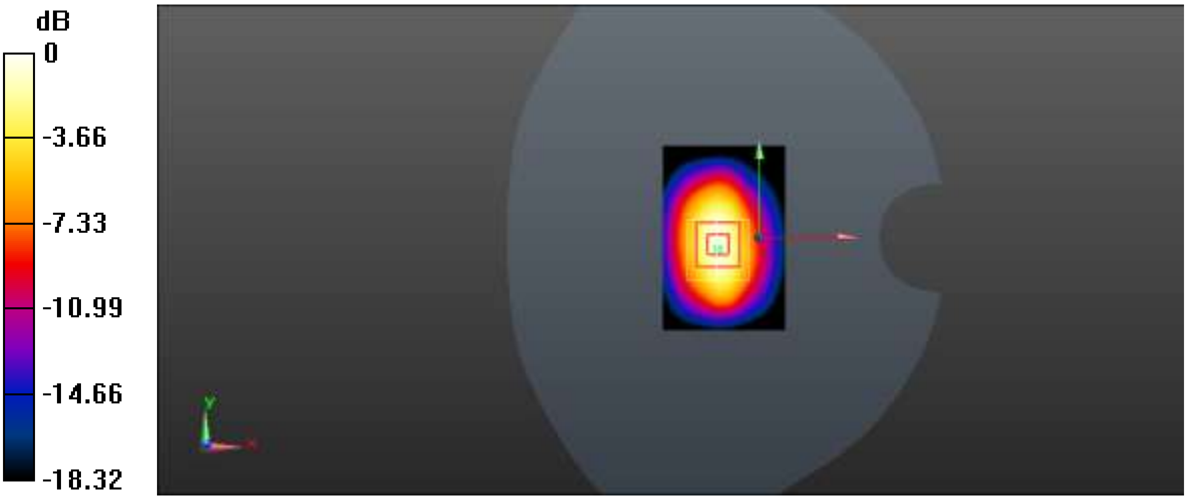
5800body/d=10mm, Pin=100 mW/Zoom Scan (8x8x10) /Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 53.028 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 18.3 W/kg

SAR(1 g) = 7.76 W/kg; SAR(10 g) = 2.12 W/kg

Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 19.3 W/kg = 12.86 dBW/kg

Annex A.2 Graph Result

GSM850 right touch mid

Date/Time: 17/04/2015 17:48:50

Communication System: UID 0, GSM (0); Communication System Band: GSM850(824.0-849.0MHz); Frequency: 836.6 MHz;Communication System PAR: 9.191 dB

Medium parameters used: f = 837 MHz; σ = 0.882 S/m; ε_r = 41.635; ρ = 1000 kg/m^3

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(6.41, 6.41, 6.41); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: SAM1; Type: SAM; Serial: TP1576
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

right/touch mid/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.622 W/kg

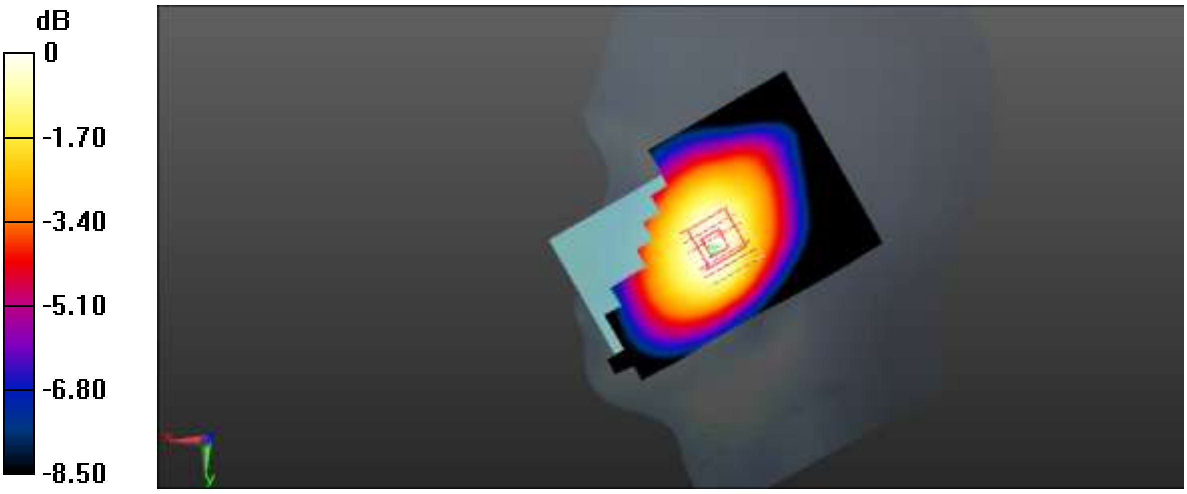
right/touch mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.712 V/m; Power Drift = -0.13 dB

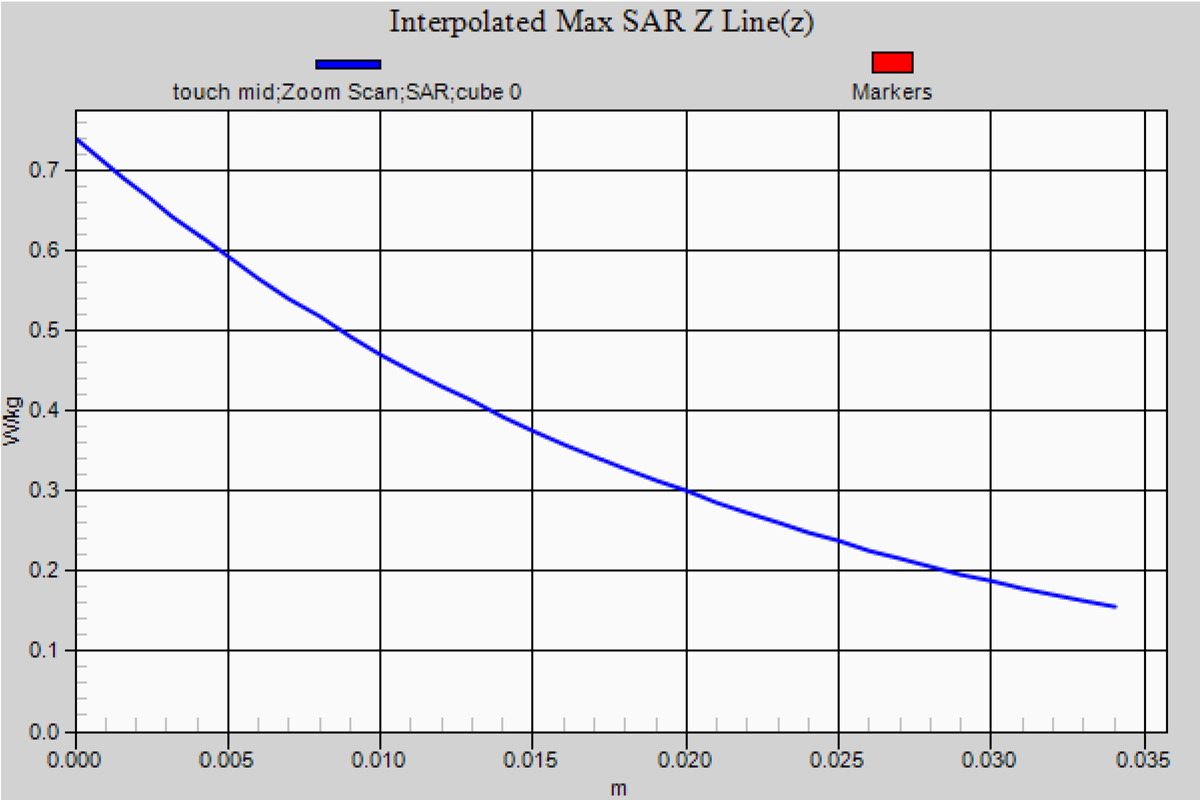
Peak SAR (extrapolated) = 0.740 W/kg

SAR(1 g) = 0.589 W/kg; SAR(10 g) = 0.446 W/kg

Maximum value of SAR (measured) = 0.622 W/kg



0 dB = 0.622 W/kg = -2.06 dBW/kg


Interpolated Max SAR Z Line(z)
touch mid;Zoom Scan;SAR;cube 0
Markers
W/kg
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

GSM850 towards ground low

Date/Time: 30/04/2015 20:20:36

Communication System: UID 0, GPRS/EGPRS(2UP) (0); Communication System Band: GSM850; Frequency: 824.2 MHz;Communication System PAR: 6.19 dB

Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.933 S/m; ε_r = 54.311; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(6.37, 6.37, 6.37); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/towards ground low/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.249 W/kg

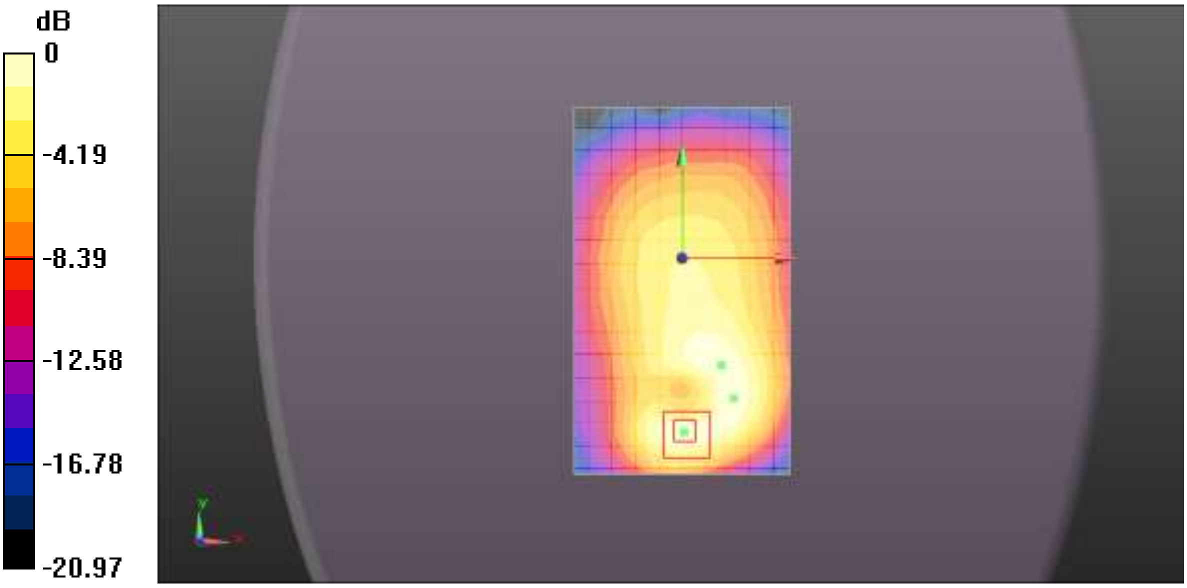
Configuration/towards ground low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.274 V/m; Power Drift = 0.05 dB

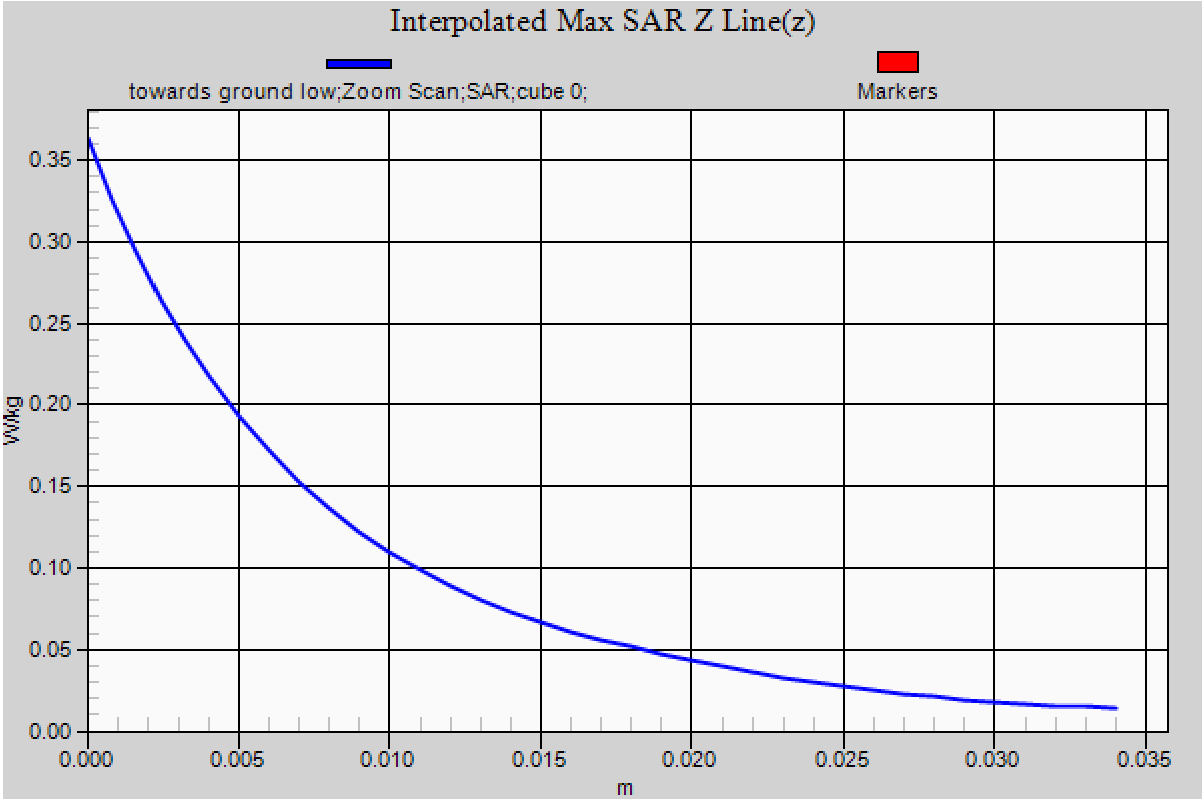
Peak SAR (extrapolated) = 0.363 W/kg

SAR(1 g) = 0.197 W/kg; SAR(10 g) = 0.107 W/kg

Maximum value of SAR (measured) = 0.219 W/kg



0 dB = 0.249 W/kg = -6.03 dBW/kg


Interpolated Max SAR Z Line(z)
towards ground low;Zoom Scan;SAR;cube 0;
Markers
W/kg
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

GSM1900 right touch mid

Date/Time: 25/04/2015 20:49:23

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

Medium parameters used: f = 1880 MHz; σ = 1.45 S/m; ε_r = 39.74; ρ = 1000 kg/m^3

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.12, 5.12, 5.12); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: SAM2; Type: SAM; Serial: TP-1575
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

left/touch mid/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.193 W/kg

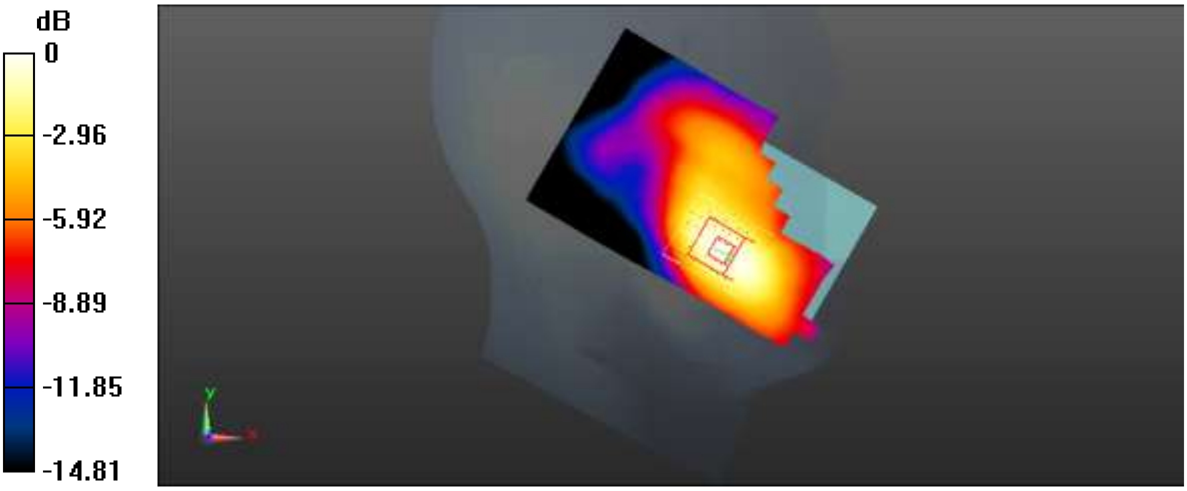
left/touch mid/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.809 V/m; Power Drift = 0.04 dB

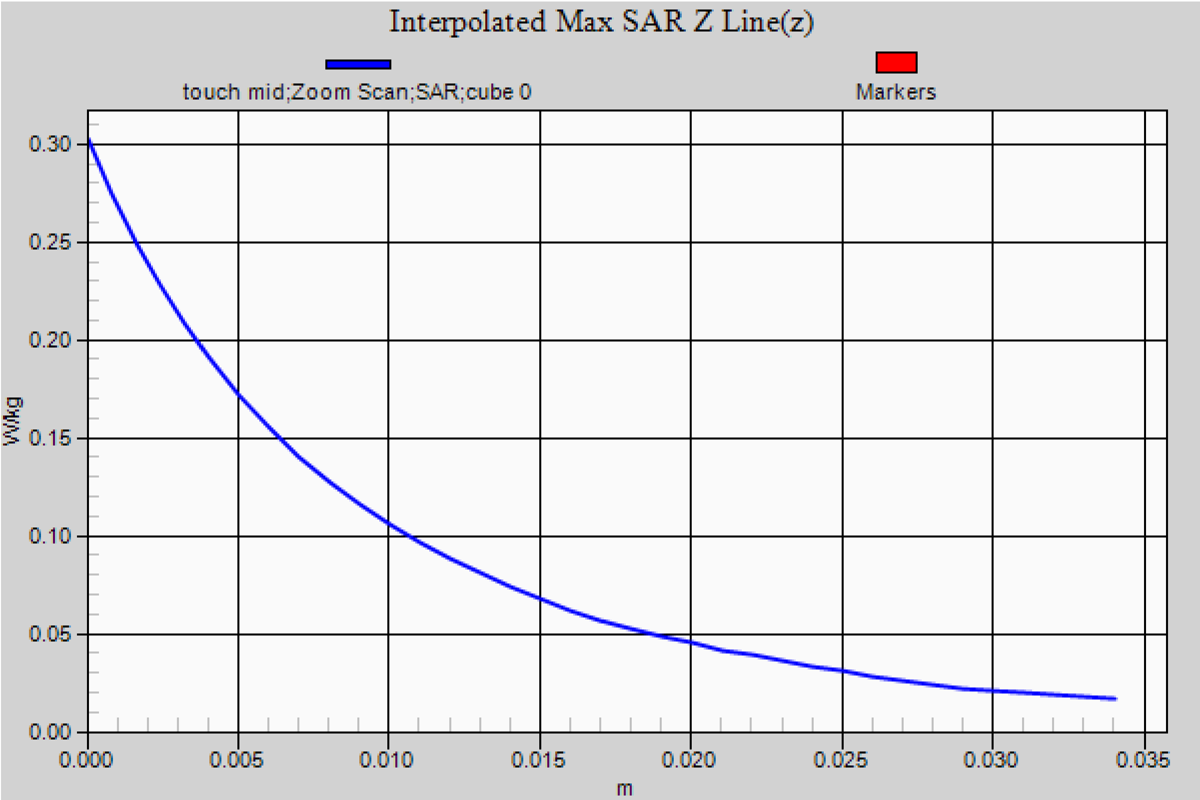
Peak SAR (extrapolated) = 0.303 W/kg

SAR(1 g) = 0.180 W/kg; SAR(10 g) = 0.109 W/kg

Maximum value of SAR (measured) = 0.195 W/kg



0 dB = 0.195 W/kg = -7.10 dBW/kg


Interpolated Max SAR Z Line(z)
touch mid;Zoom Scan;SAR;cube 0
Markers
W/kg
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

GSM1900 front high with earphone

Date/Time: 27/04/2015 07:19:49

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

Medium parameters used: f = 1910 MHz; σ = 1.503 S/m; ε_r = 52.325; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(4.85, 4.85, 4.85); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

body/front high with earphone/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.758 W/kg

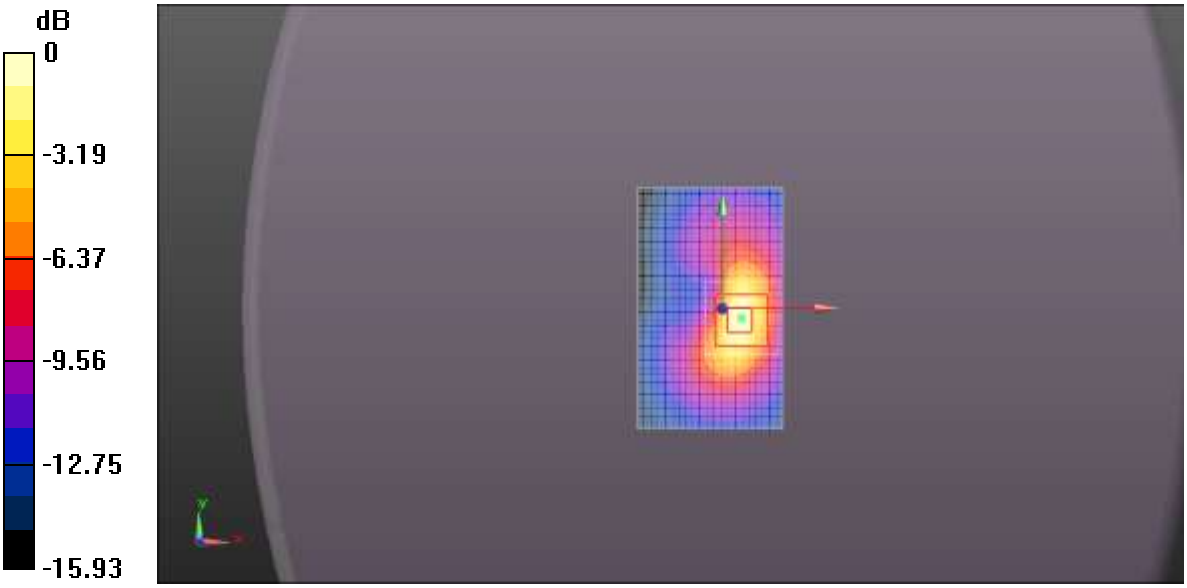
body/front high with earphone/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 16.633 V/m; Power Drift = -0.14 dB

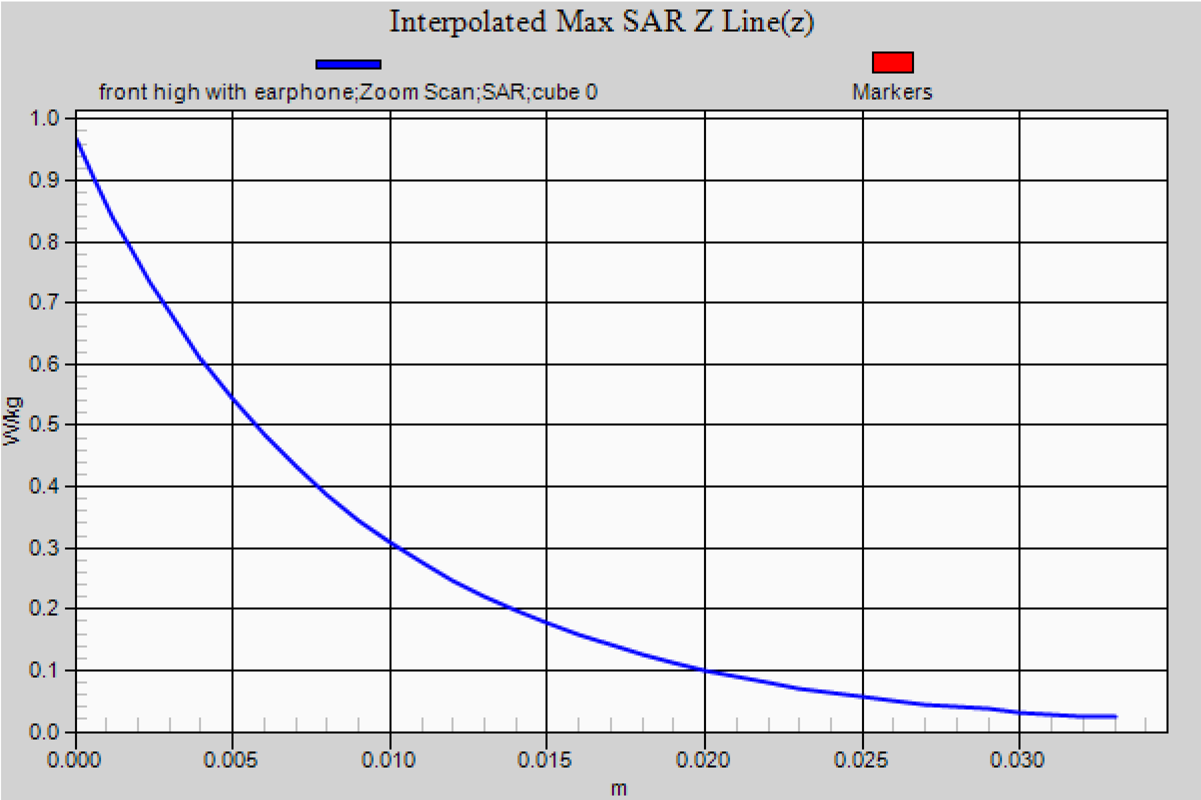
Peak SAR (extrapolated) = 0.967 W/kg

SAR(1 g) = 0.518 W/kg; SAR(10 g) = 0.242 W/kg

Maximum value of SAR (measured) = 0.674 W/kg



0 dB = 0.758 W/kg = -1.20 dBW/kg


Interpolated Max SAR Z Line(z)
front high with earphone;Zoom Scan;SAR;cube 0
Markers
W/kg
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

WCDMA BAND II right touch mid

Date/Time: 24/04/2015 20:29:46

Communication System: UID 0, WCDMA (0); Communication System Band: BAND 2; Frequency: 1880 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 1880 MHz; σ = 1.45 S/m; ε_r = 39.74; ρ = 1000 kg/m^3

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(5.12, 5.12, 5.12); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: SAM2; Type: SAM; Serial: TP-1575
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

right/touch mid/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.479 W/kg

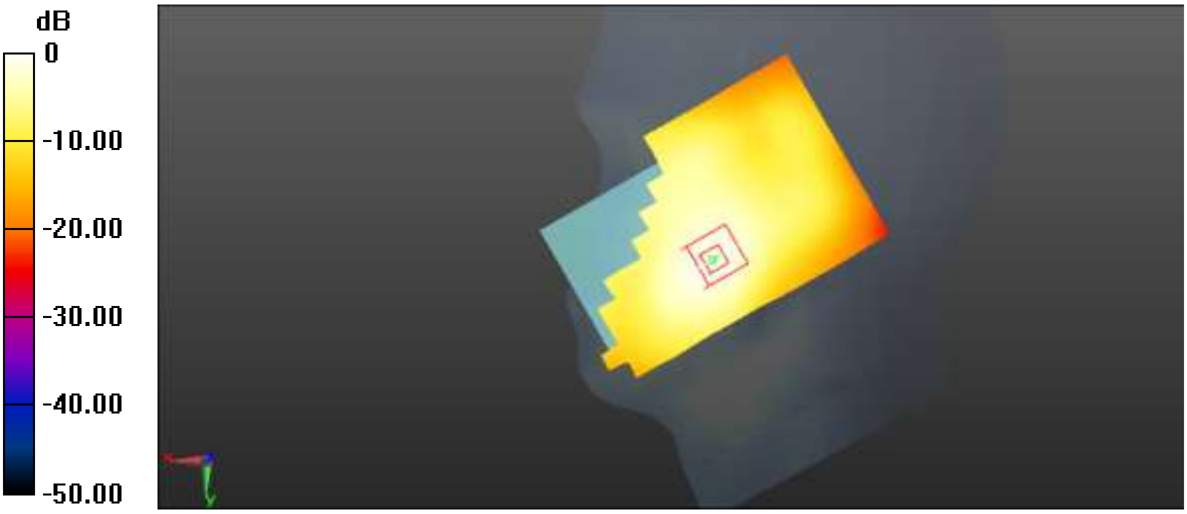
right/touch mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.825 V/m; Power Drift = 0.12 dB

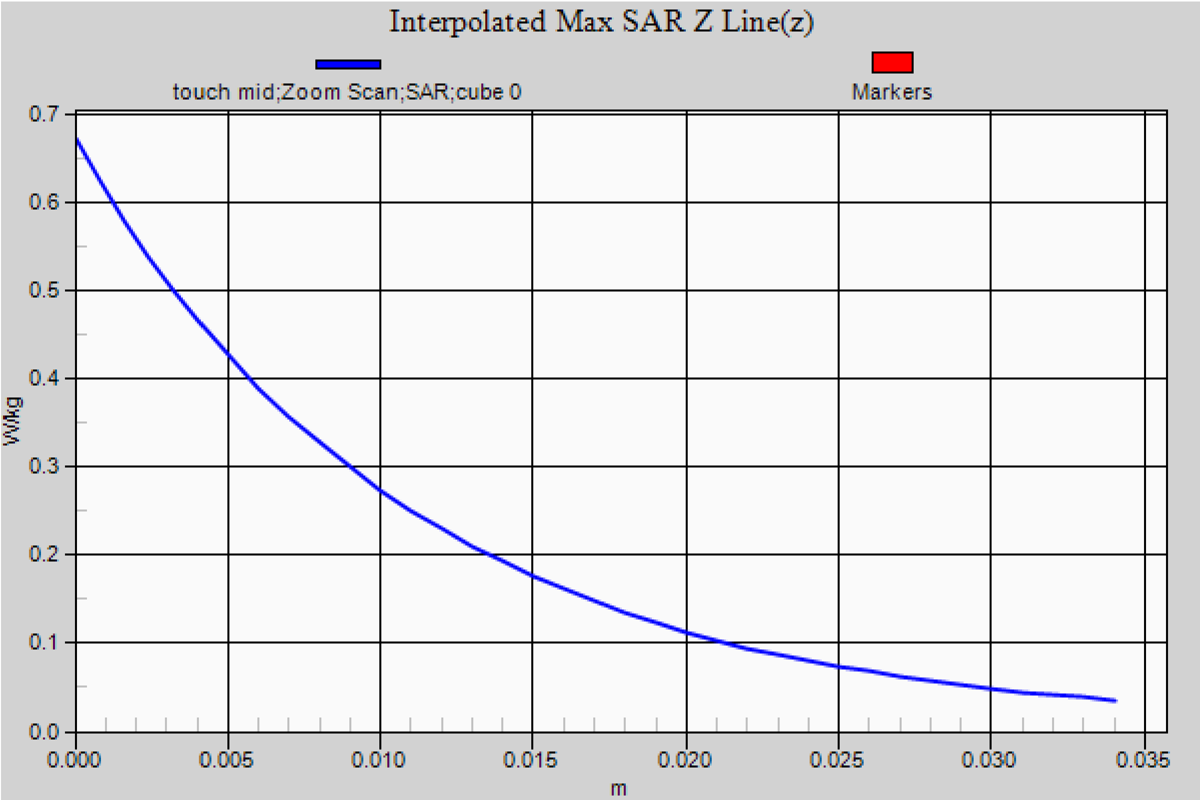
Peak SAR (extrapolated) = 0.672 W/kg

SAR(1 g) = 0.429 W/kg; SAR(10 g) = 0.259 W/kg

Maximum value of SAR (measured) = 0.474 W/kg



0 dB = 0.479 W/kg = -3.20 dBW/kg


Interpolated Max SAR Z Line(z)
touch mid;Zoom Scan;SAR;cube 0
Markers
W/kg
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

WCDMA BAND II towards phantom mid

Date/Time: 26/04/2015 10:49:05

Communication System: UID 0, WCDMA (0); Communication System Band: BAND 2; Frequency: 1880 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 1880 MHz; σ = 1.477 S/m; ε_r = 52.425; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(4.85, 4.85, 4.85); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

body/towards phantom mid/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.03 W/kg

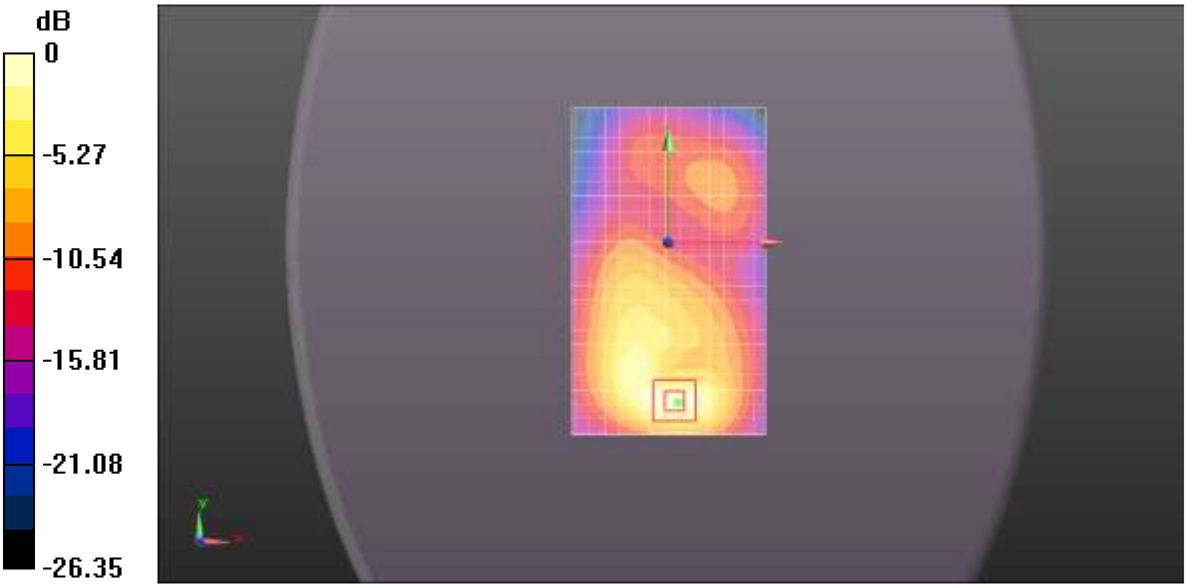
body/towards phantom mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.325 V/m; Power Drift = 0.13 dB

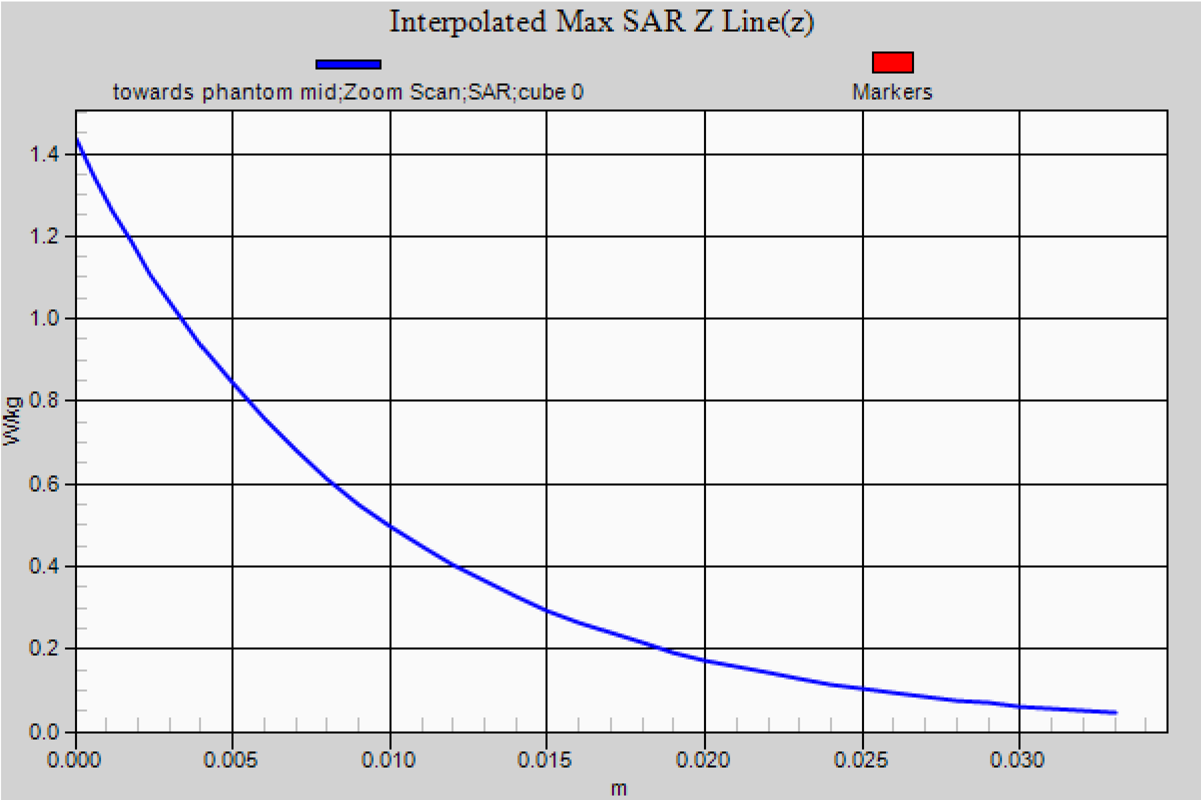
Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 0.805 W/kg; SAR(10 g) = 0.405 W/kg

Maximum value of SAR (measured) = 1.03 W/kg



0 dB = 1.03 W/kg = 0.11 dBW/kg


Interpolated Max SAR Z Line(z)
towards phantom mid;Zoom Scan;SAR;cube 0
Markers
W/kg
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

WCDMA BAND V right touch low

Date/Time: 24/04/2015 11:00:24

Communication System: UID 0, WCDMA (0); Communication System Band: BAND 5; Frequency: 826.4 MHz;Communication System PAR: 0 dB

Medium parameters used (interpolated): f = 826.4 MHz; σ = 0.871 S/m; ε_r = 41.789; ρ = 1000 kg/m^3

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(6.41, 6.41, 6.41); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: SAM1; Type: SAM; Serial: TP1576
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

right/touch low/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.597 W/kg

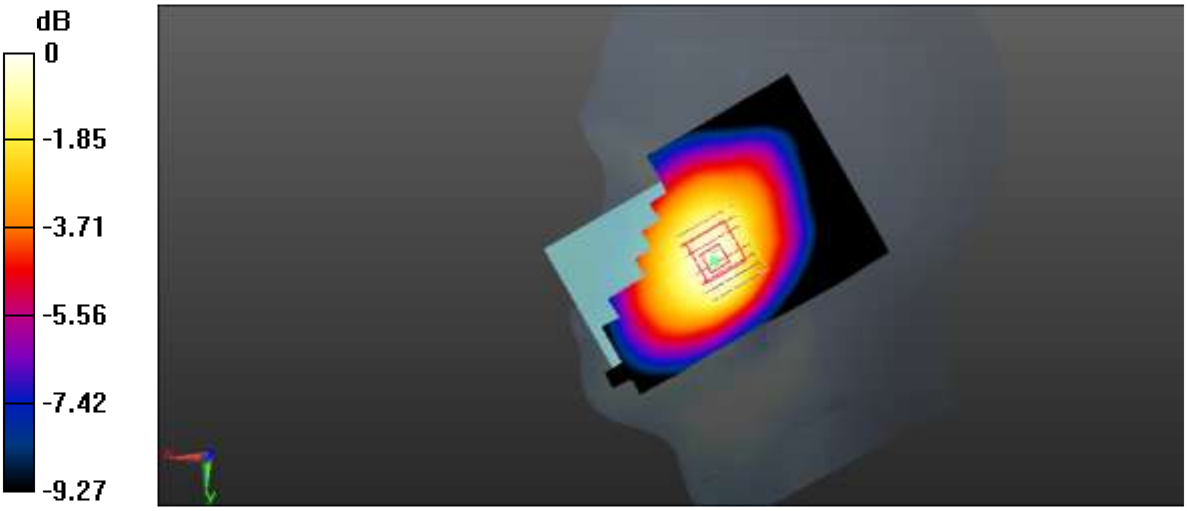
right/touch low/Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.729 V/m; Power Drift = -0.14 dB

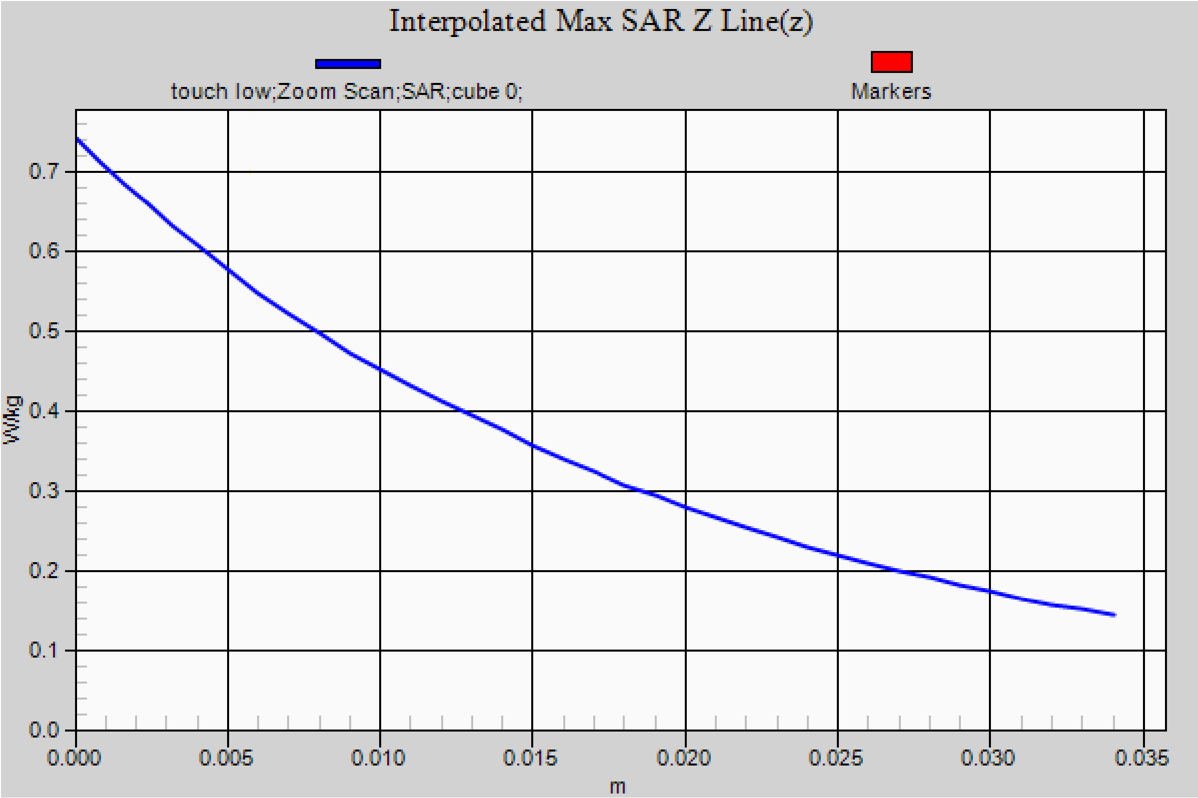
Peak SAR (extrapolated) = 0.742 W/kg

SAR(1 g) = 0.570 W/kg; SAR(10 g) = 0.420 W/kg

Maximum value of SAR (measured) = 0.607 W/kg



0 dB = 0.607 W/kg = -2.17 dBW/kg



Interpolated Max SAR Z Line(z)
touch low;Zoom Scan;SAR;cube 0;
Markers
W/kg
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

WCDMA BAND V front mid

Date/Time: 30/04/2015 15:49:07

Communication System: UID 0, WCDMA (0); Communication System Band: BAND 5; Frequency: 836.6 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 837 MHz; σ = 0.951 S/m; ε_r = 54.241; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(6.37, 6.37, 6.37); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/front mid 2/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.275 W/kg

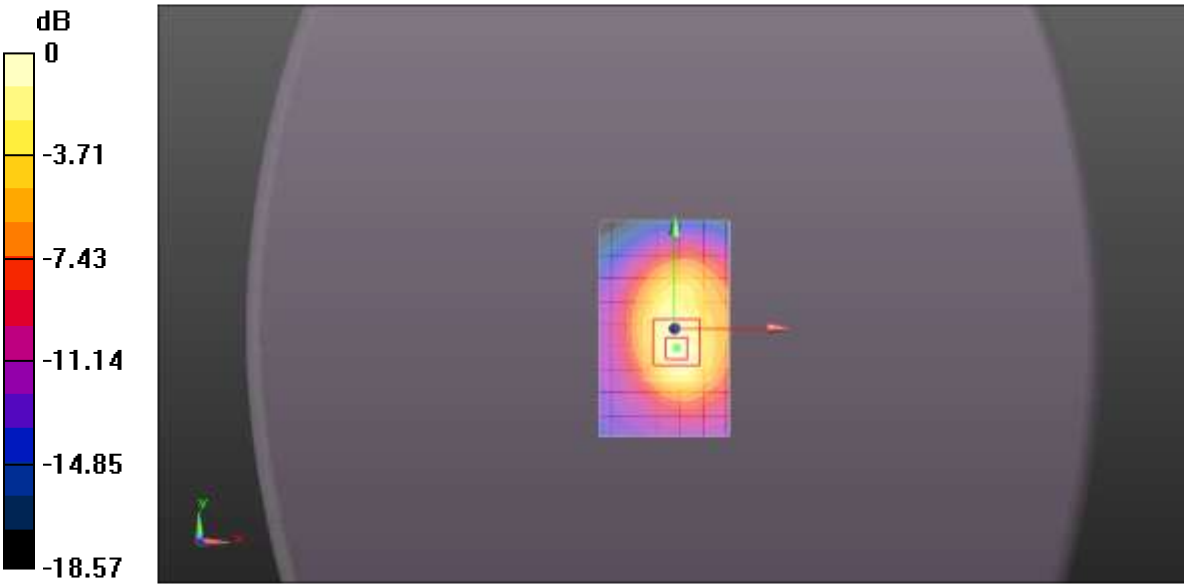
Configuration/front mid 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 16.069 V/m; Power Drift = -0.03 dB

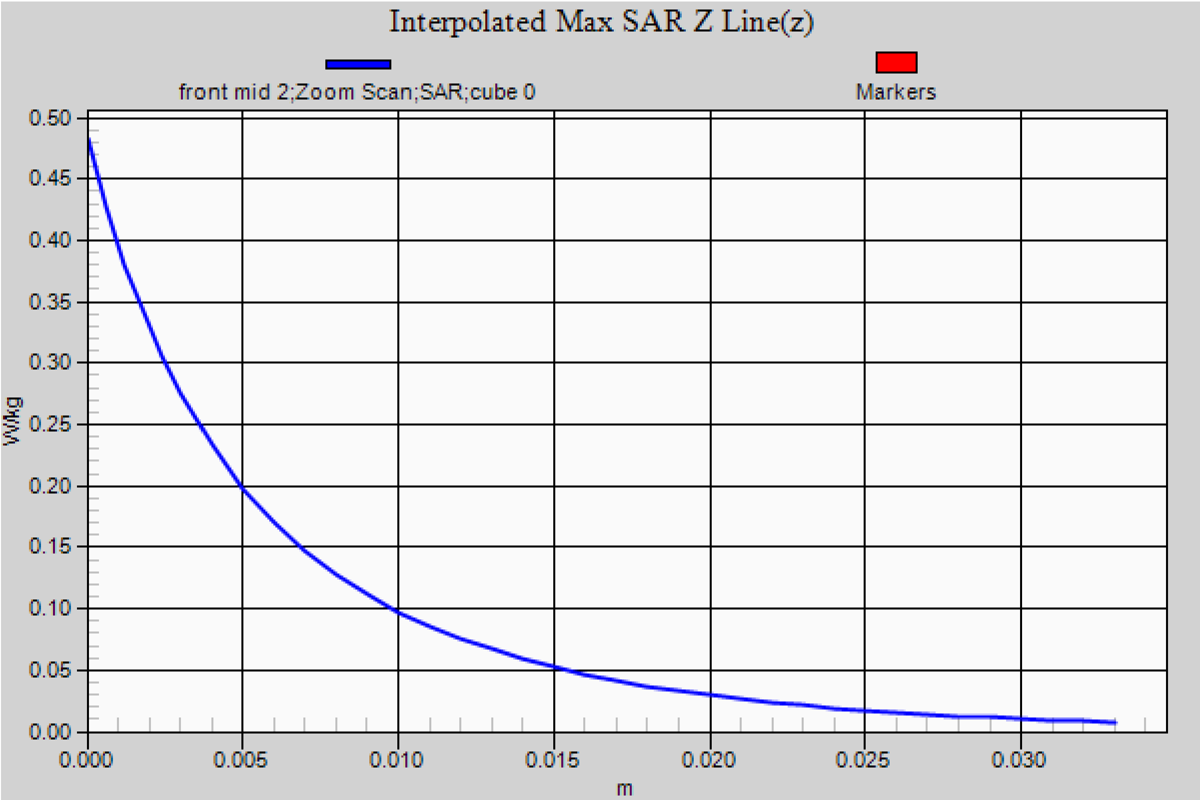
Peak SAR (extrapolated) = 0.482 W/kg

SAR(1 g) = 0.214 W/kg; SAR(10 g) = 0.107 W/kg

Maximum value of SAR (measured) = 0.276 W/kg



0 dB = 0.275 W/kg = -5.61 dBW/kg


Interpolated Max SAR Z Line(z)
front mid 2;Zoom Scan;SAR;cube 0
Markers
W/kg
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

LTE BAND 7 left touch high QPSK_20M_1RB_high

Date/Time: 15/05/2015 09:22:13

Communication System: UID 0, FDD-LTE(QPSK_20M_1RB) (0); Communication System Band: BAND 7; Frequency: 2560 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 2560 MHz; σ = 1.925 S/m; ε_r = 39.1; ρ = 1000 kg/m^3

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(7.01, 7.01, 7.01); Calibrated: 02/09/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 21/04/2015
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

left /touch high QPSK_20M_1RB_high/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

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

left /touch high QPSK_20M_1RB_high/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

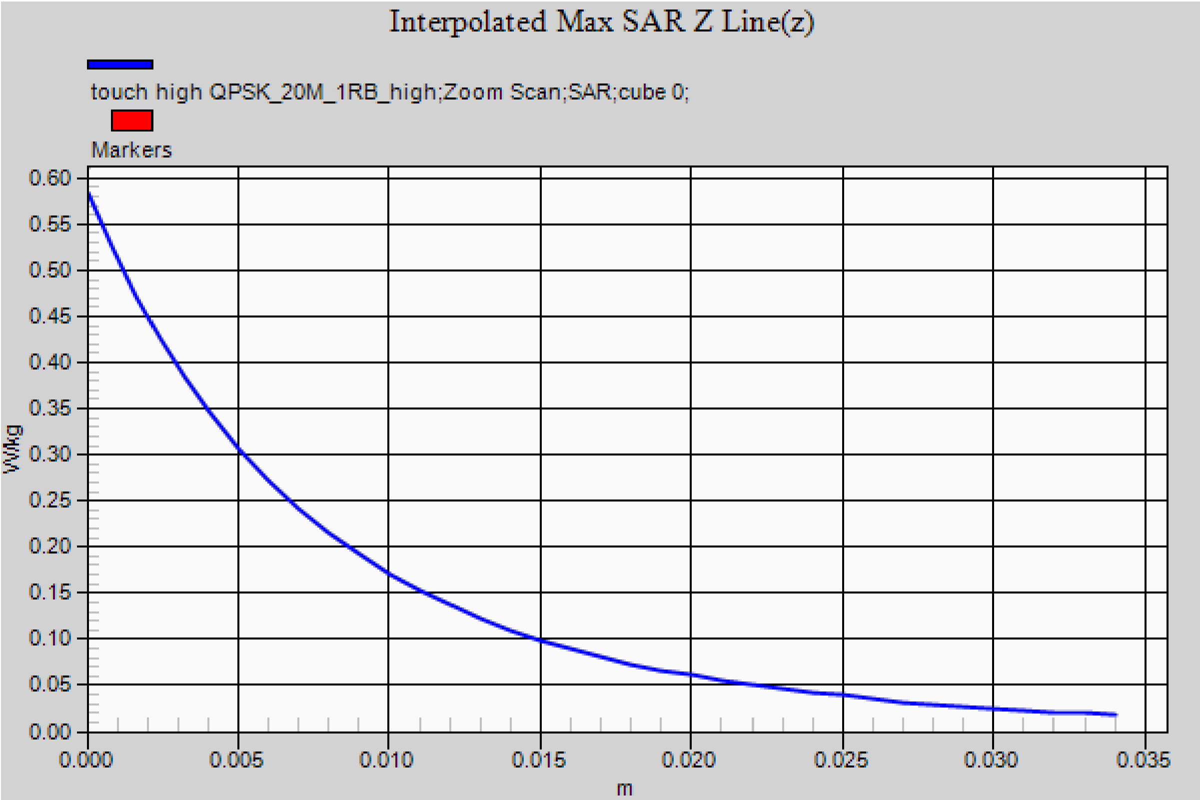
Reference Value = 3.413 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 0.584 W/kg

SAR(1 g) = 0.315 W/kg; SAR(10 g) = 0.165 W/kg

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

0 dB = 0.348 W/kg = -4.58 dBW/kg



Interpolated Max SAR Z Line(z)
touch high QPSK_20M_1RB_high;Zoom Scan;SAR;cube 0;
Markers
W/kg
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

LTE BAND 7 front low QPSK_20M_1RB low

Date/Time: 14/05/2015 17:55:39

Communication System: UID 0, FDD-LTE(QPSK_20M_1RB) (0); Communication System Band: BAND 7; Frequency: 2510 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 2510 MHz; σ = 2.095 S/m; ε_r = 51.424; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(7.11, 7.11, 7.11); Calibrated: 02/09/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 21/04/2015
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

body /front low QPSK_20M_1RB low/Area Scan (51x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.58 W/kg

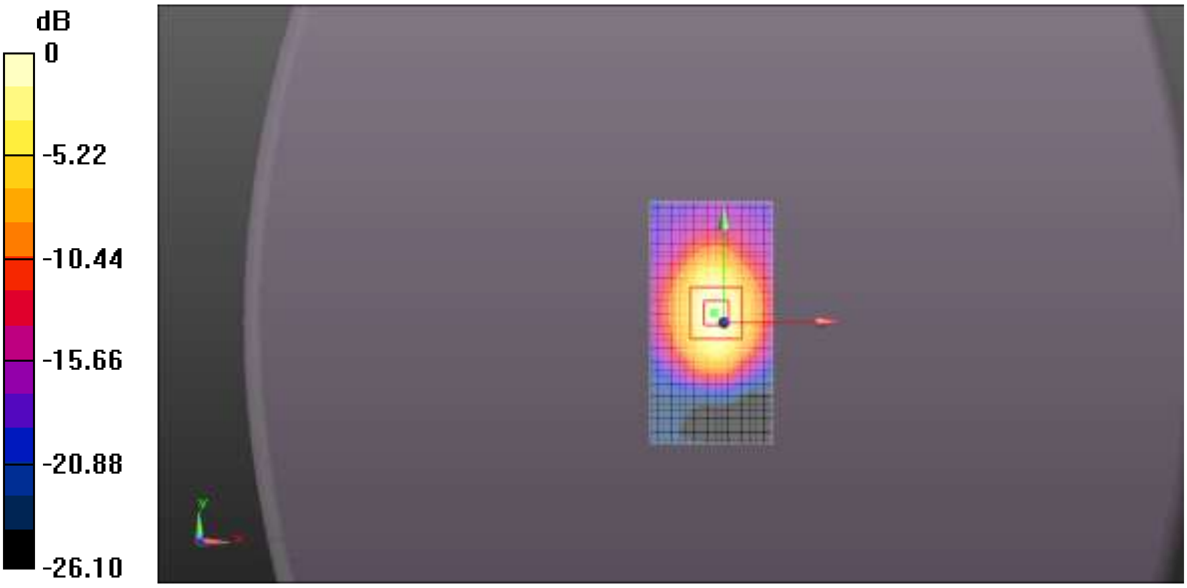
body /front low QPSK_20M_1RB low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 25.514 V/m; Power Drift = 0.06 dB

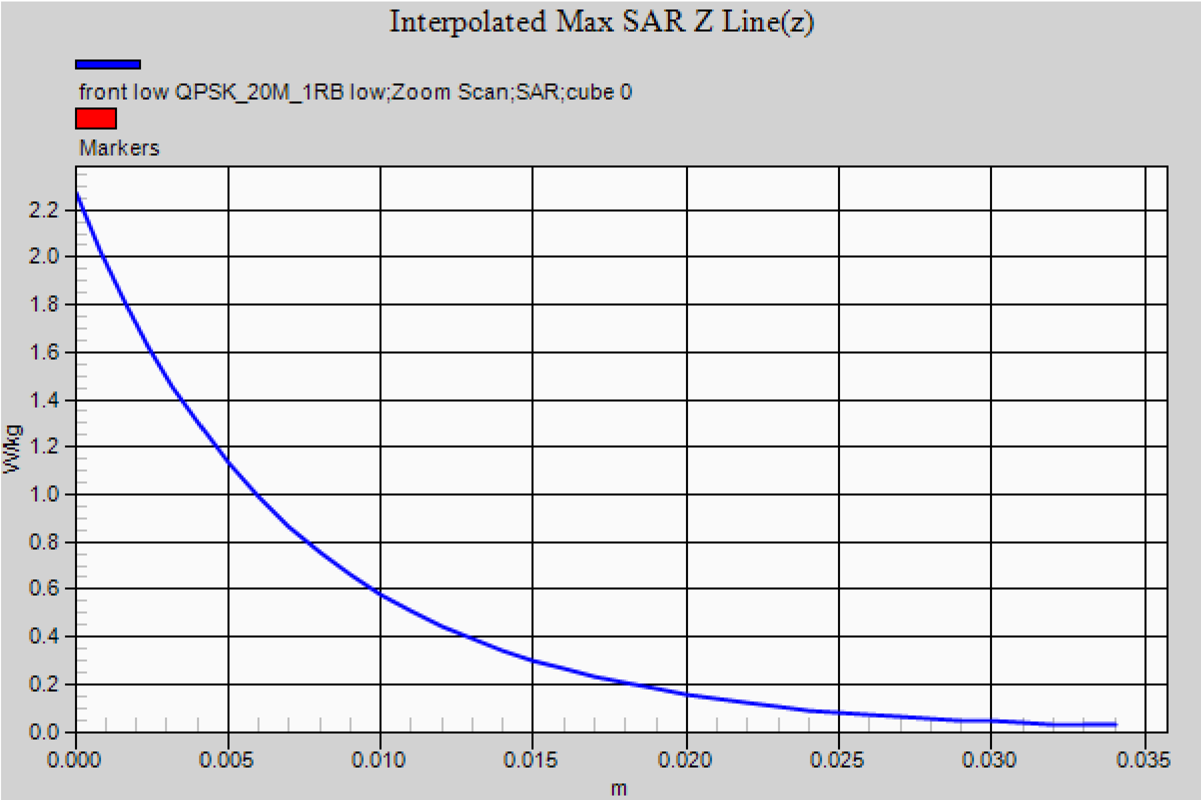
Peak SAR (extrapolated) = 2.27 W/kg

SAR(1 g) = 1.13 W/kg; SAR(10 g) = 0.515 W/kg

Maximum value of SAR (measured) = 1.30 W/kg



0 dB = 1.58 W/kg = 1.98 dBW/kg


Interpolated Max SAR Z Line(z)
front low QPSK_20M_1RB low;Zoom Scan;SAR;cube 0
Markers
W/kg
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

802.11b Data Rate: 1 Mbps left touch low

Date/Time: 29/04/2015 20:00:44

Communication System: UID 0, 802.11b/g/n 2.45GHz (0); Communication System Band: 2400-2483.5; Frequency: 2412 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 2412 MHz; σ = 1.74 S/m; ε_r = 37.907; ρ = 1000 kg/m^3

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(4.64, 4.64, 4.64); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

left/touch low/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.154 W/kg

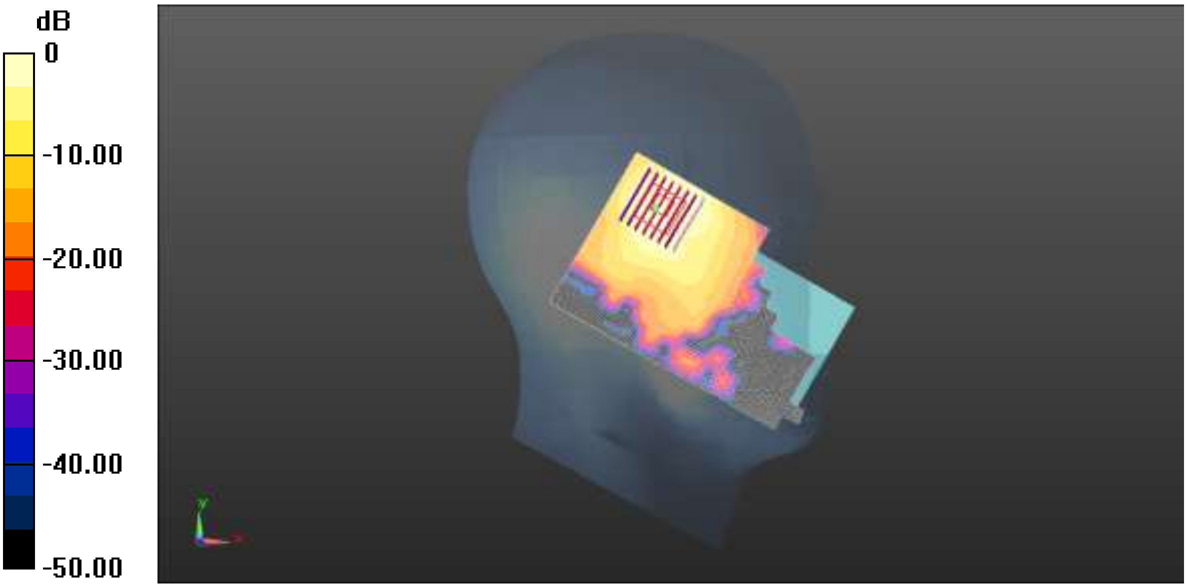
left/touch low/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.563 V/m; Power Drift = -0.04 dB

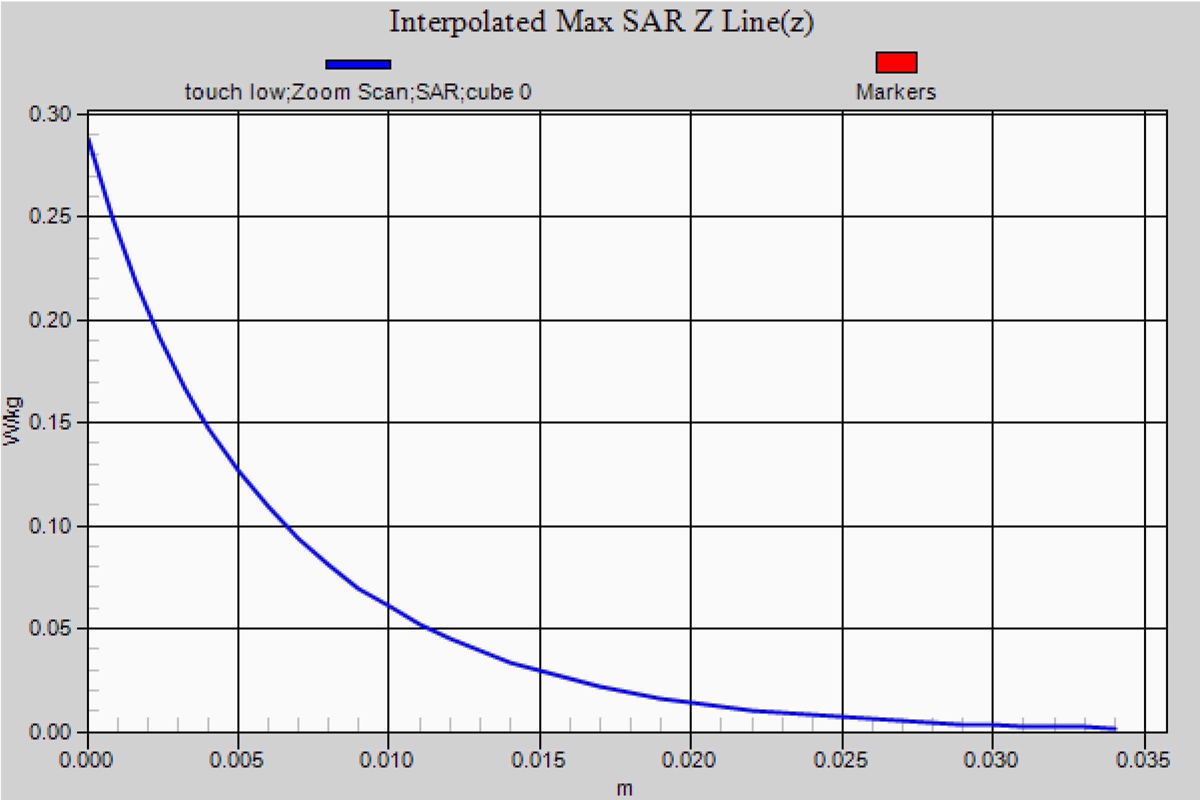
Peak SAR (extrapolated) = 0.288 W/kg

SAR(1 g) = 0.134 W/kg; SAR(10 g) = 0.065 W/kg

Maximum value of SAR (measured) = 0.146 W/kg



0 dB = 0.154 W/kg = -8.13 dBW/kg


Interpolated Max SAR Z Line(z)
touch low;Zoom Scan;SAR;cube 0
Markers
W/kg
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

802.11b Data Rate: 1 Mbps towards ground low

Date/Time: 29/04/2015 17:19:41

Communication System: UID 0, 802.11b/g/n 2.45GHz (0); Communication System Band: 2400-2483.5; Frequency: 2412 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 2412 MHz; σ = 1.74 S/m; ε_r = 37.907; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: ES3DV3 - SN3241; ConvF(4.64, 4.64, 4.64); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

body/towards ground low/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.308 W/kg

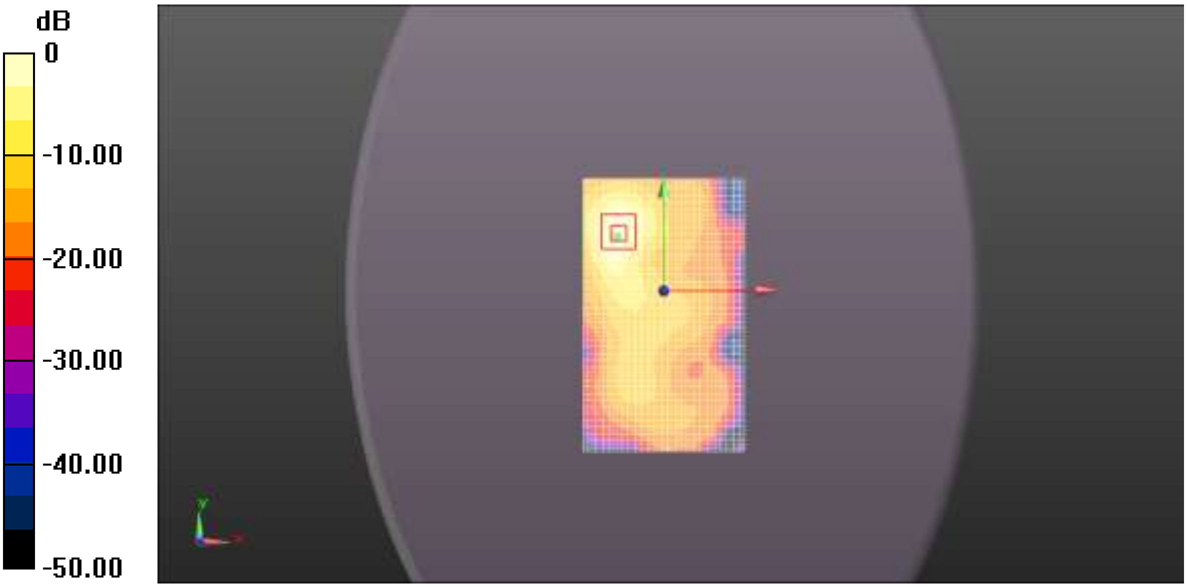
body/towards ground low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.545 V/m; Power Drift = 0.15 dB

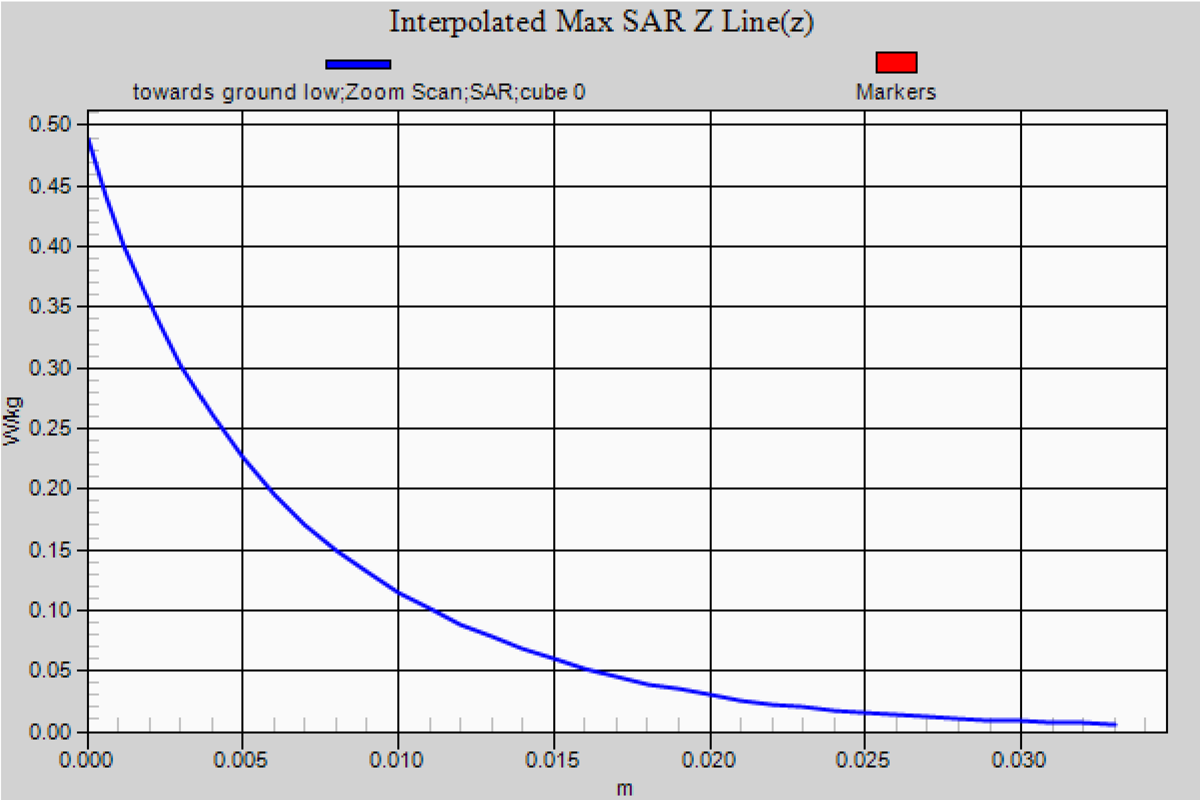
Peak SAR (extrapolated) = 0.489 W/kg

SAR(1 g) = 0.228 W/kg; SAR(10 g) = 0.103 W/kg

Maximum value of SAR (measured) = 0.303 W/kg



0 dB = 0.308 W/kg = -5.12 dBW/kg


Interpolated Max SAR Z Line(z)
towards ground low;Zoom Scan;SAR;cube 0
Markers
W/kg
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

802.11n(40MHz) 5.2G Data Rate:13.5 Mbps   left touch low

Date/Time: 14/05/2015 19:52:25

Communication System: UID 0, 802.11a/n 5G (0); Communication System Band: 5.2G; Frequency: 5190 MHz;Communication System PAR: 0 dB

Medium parameters used (interpolated): f = 5190 MHz; σ = 4.761 S/m; ε_r = 37.043; ρ = 1000 kg/m^3

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(5.49, 5.49, 5.49); Calibrated: 02/09/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 21/04/2015
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

5.2G left/touch high n40 ch38/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.192 W/kg

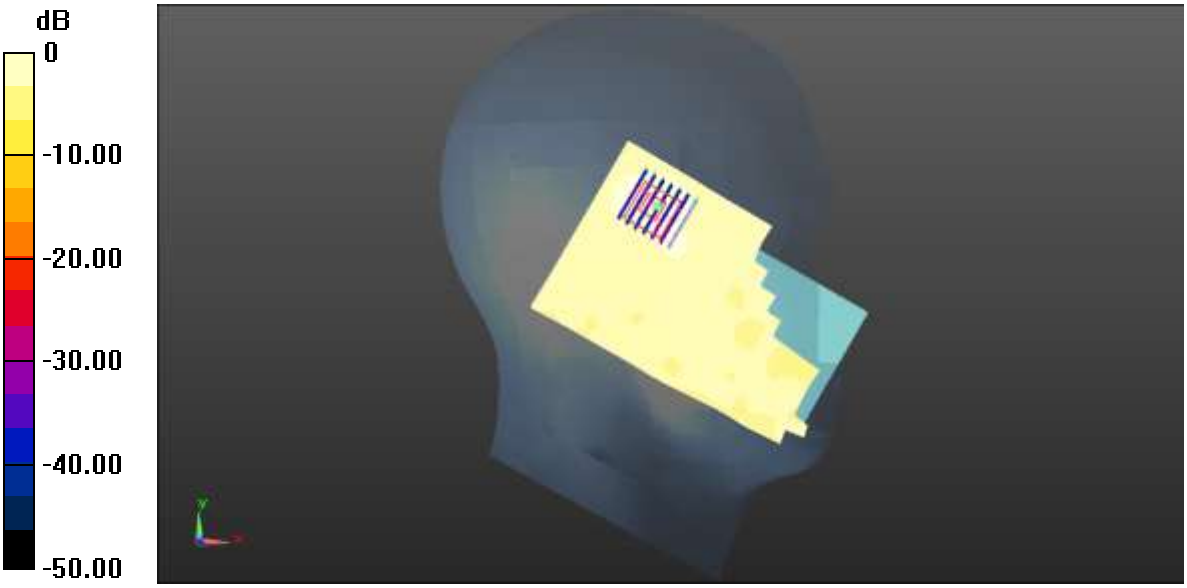
5.2G left/touch high n40 ch38/Zoom Scan (8x8x10) /Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 3.495 V/m; Power Drift = 0.14 dB

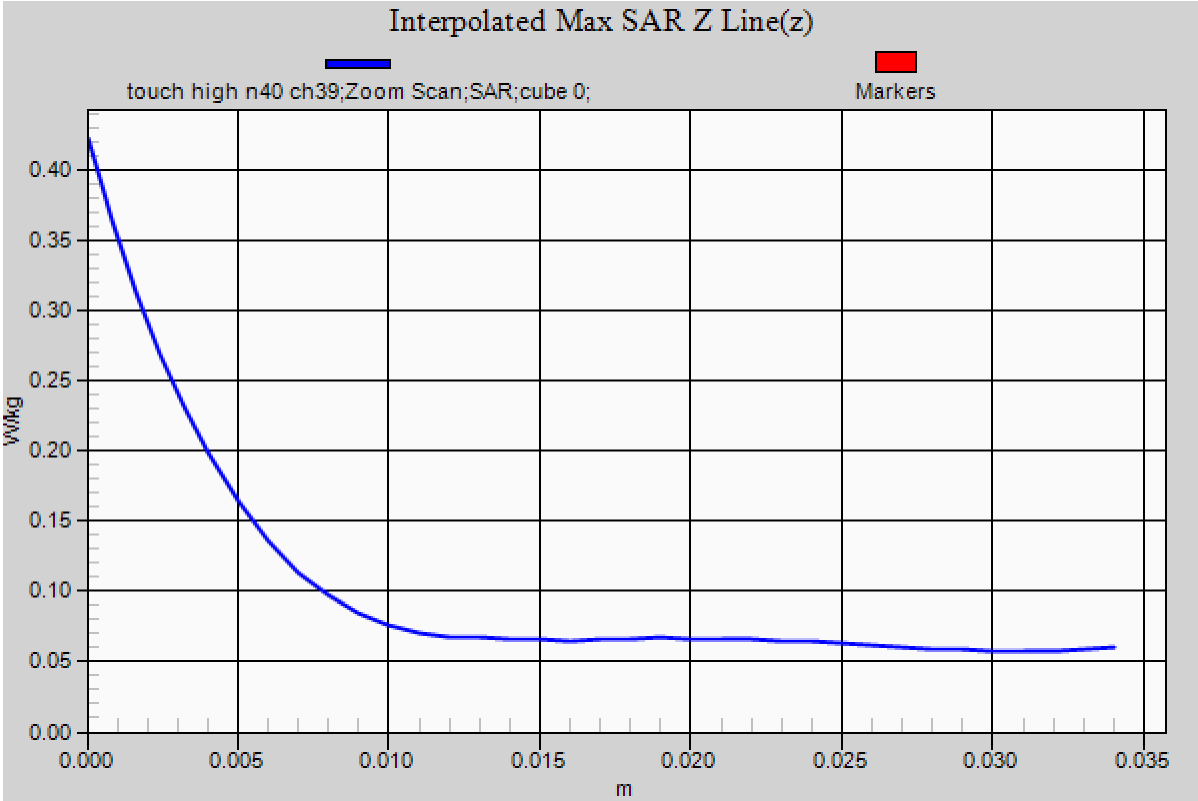
Peak SAR (extrapolated) = 0.422 W/kg

SAR(1 g) = 0.179 W/kg; SAR(10 g) = 0.098 W/kg

Maximum value of SAR (measured) = 0.198 W/kg



0 dB = 0.192 W/kg = -7.16 dBW/kg


Interpolated Max SAR Z Line(z)
touch high n40 ch39;Zoom Scan;SAR;cube 0;
Markers
W/kg
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

802.11n(20MHz) 5.2G Data Rate:6.5 Mbps towards ground mid

Date/Time: 13/05/2015 22:52:33

Communication System: UID 0, 802.11a/n 5G (0); Communication System Band: 5.2G; Frequency: 5200 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 5200 MHz; σ = 5.303 S/m; ε_r = 47.836; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(4.49, 4.49, 4.49); Calibrated: 02/09/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 21/04/2015
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

5.2G body/towards ground mid n20/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.899 W/kg

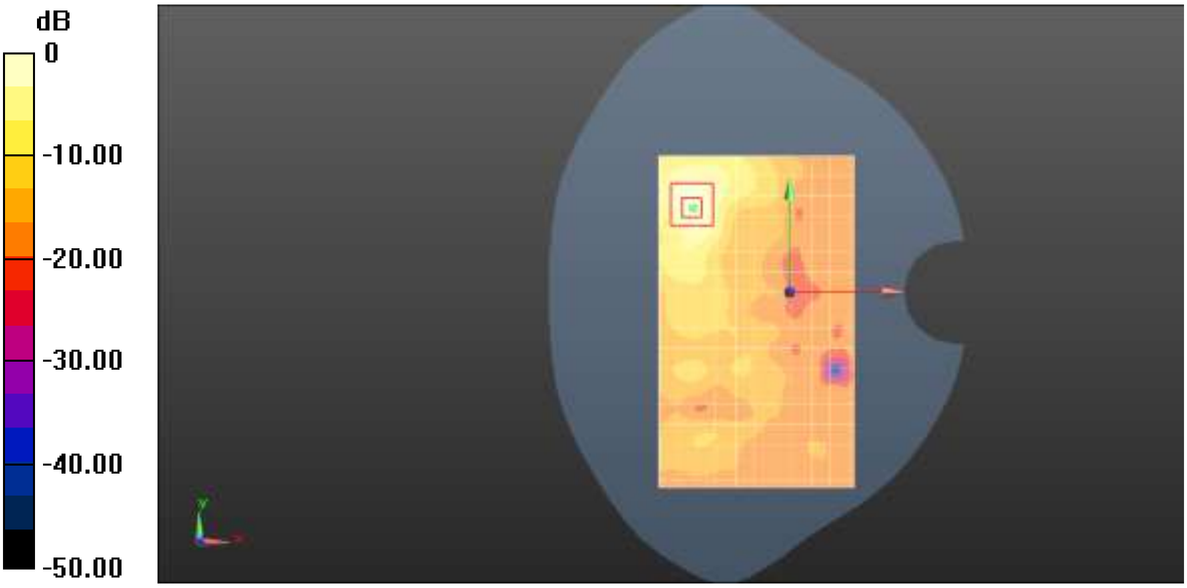
5.2G body/towards ground mid n20/Zoom Scan (8x8x10)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 1.724 V/m; Power Drift = -0.02 dB

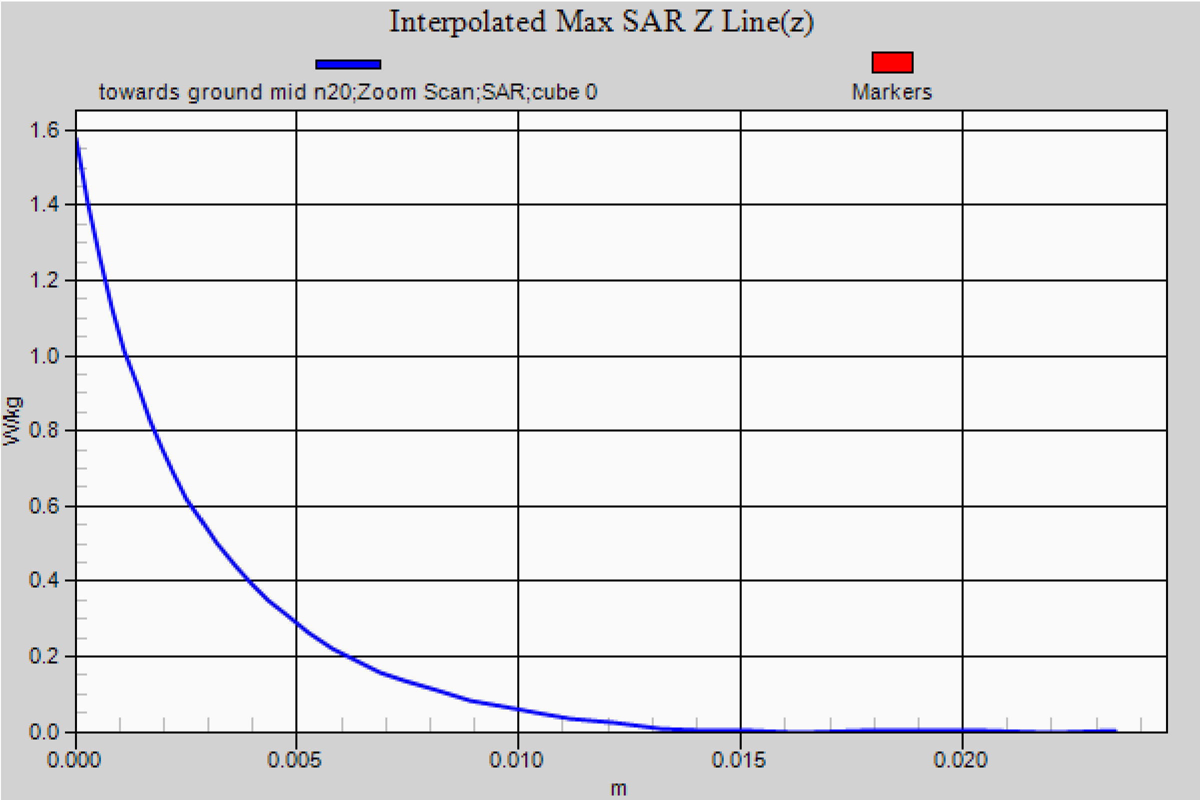
Peak SAR (extrapolated) = 1.58 W/kg

SAR(1 g) = 0.379 W/kg; SAR(10 g) = 0.126 W/kg

Maximum value of SAR (measured) = 0.902 W/kg



0 dB = 0.899 W/kg = -0.46 dBW/kg


Interpolated Max SAR Z Line(z)
towards ground mid n20;Zoom Scan;SAR;cube 0
Markers
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
W/kg
0.000
0.005
0.010
0.015
0.020
m

802.11a 5.8G Data Rate: 6 Mbps left touch high

Date/Time: 15/05/2015 11:11:15

Communication System: UID 0, 802.11a/n 5G (0); Communication System Band: 5.8G; Frequency: 5825 MHz;Communication System PAR: 0 dB

Medium parameters used (interpolated): f = 5825 MHz; σ = 5.511 S/m; ε_r = 35.429; ρ = 1000 kg/m^3

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(4.58, 4.58, 4.58); Calibrated: 02/09/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 21/04/2015
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

5.8G left/touch high/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.227 W/kg

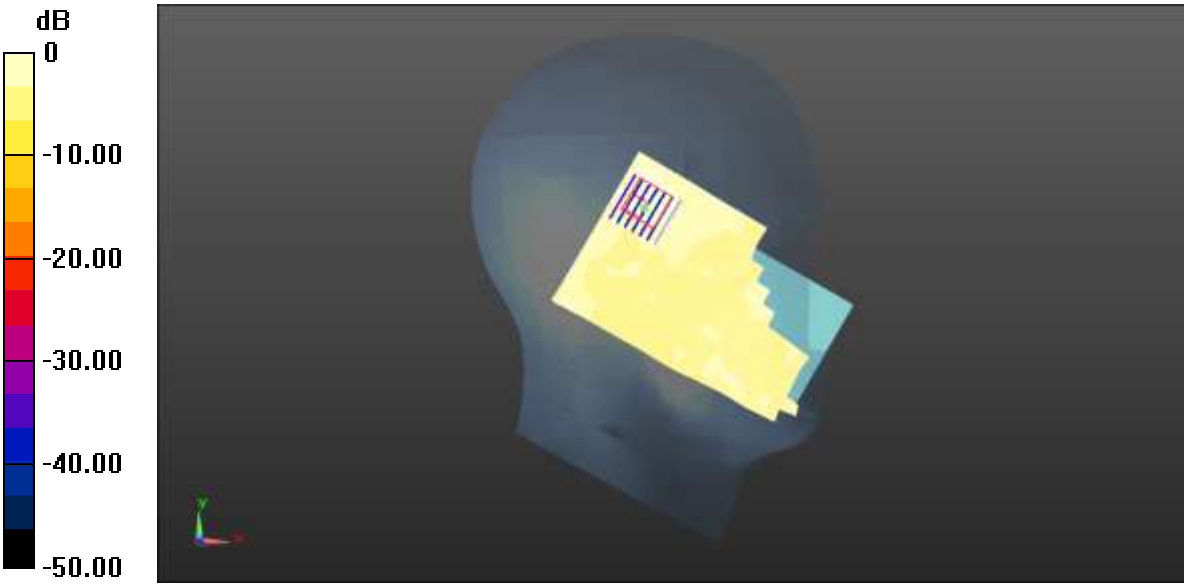
5.8G left/touch high/Zoom Scan (8x8x10) /Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 3.468 V/m; Power Drift = -0.19 dB

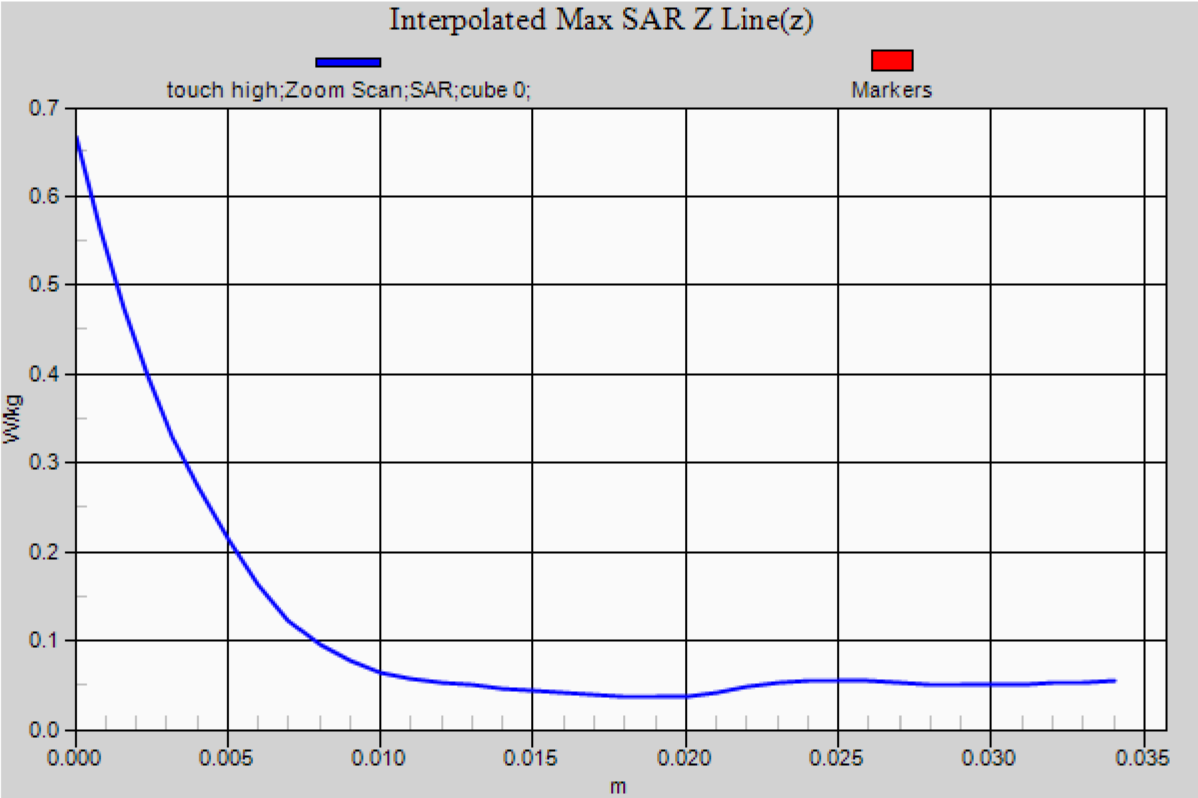
Peak SAR (extrapolated) = 0.666 W/kg

SAR(1 g) = 0.220 W/kg; SAR(10 g) = 0.106 W/kg

Maximum value of SAR (measured) = 0.273 W/kg



0 dB = 0.227 W/kg = -6.44 dBW/kg


Interpolated Max SAR Z Line(z)
touch high;Zoom Scan;SAR;cube 0;
Markers
W/kg
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

802.11n(20MHz) 5.8G Data Rate:6.5 Mbps towards ground mid

Date/Time: 14/05/2015 22:55:02

Communication System: UID 0, 802.11a/n 5G (0); Communication System Band: 5.8G; Frequency: 5785 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 5785 MHz; σ = 6.15 S/m; ε_r = 46.36; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(4.05, 4.05, 4.05); Calibrated: 02/09/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 21/04/2015
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

5.8G body/towards ground mid with n20/Area Scan (101x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.863 W/kg

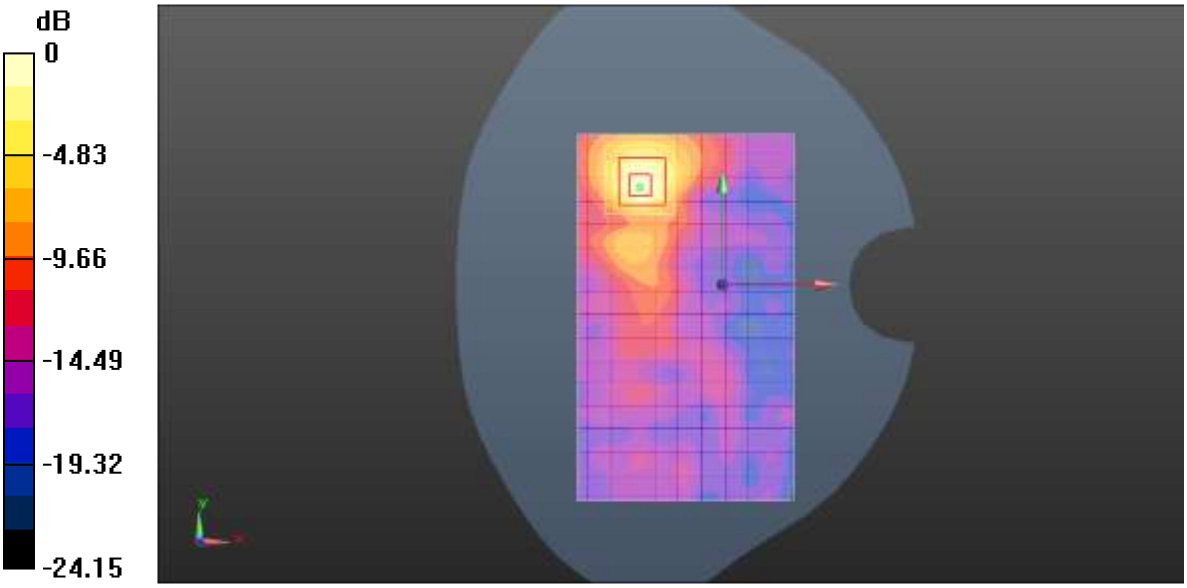
5.8G body/towards ground mid with n20/Zoom Scan (8x8x10)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 1.906 V/m; Power Drift = -0.15 dB

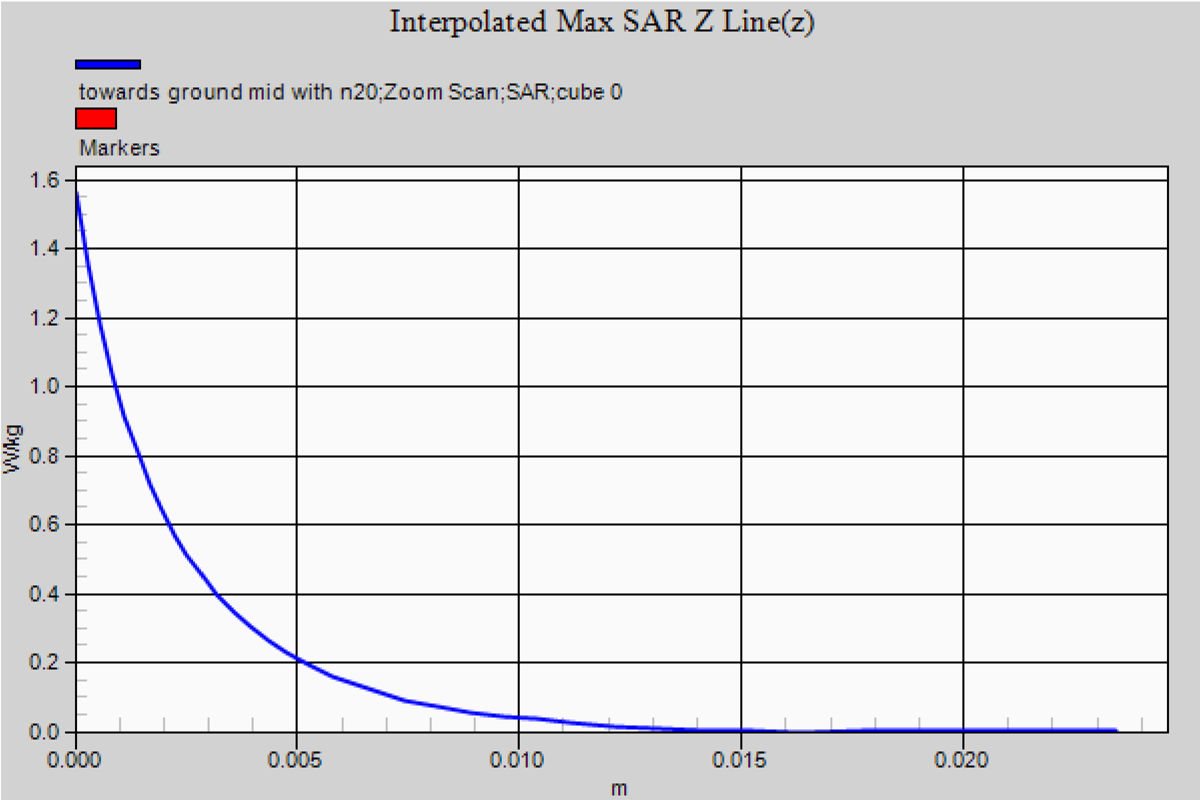
Peak SAR (extrapolated) = 1.56 W/kg

SAR(1 g) = 0.325 W/kg; SAR(10 g) = 0.110 W/kg

Maximum value of SAR (measured) = 0.804 W/kg



0 dB = 0.863 W/kg = -0.64 dBW/kg



Interpolated Max SAR Z Line(z)
towards ground mid with n20;Zoom Scan;SAR;cube 0
Markers
W/kg
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
m

ANNEX B: Calibration Certificate

Annex B.1 Probe Calibration Certificate

CTTL In Collaboration with s p e a g CALIBRATION LABORATORY

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ilac-MRA CNAS CALIBRATION No. L0570

Client Tejet Certificate No: Z14-97105

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3241
Calibration Procedure(s)	TMC-OS-E-02-195 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	September 29, 2014

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

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101547	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101548	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Reference10dBAttenuator	BT0520	12-Dec-12(TMC,No.JZ12-867)	Dec-14
Reference20dBAttenuator	BT0267	12-Dec-12(TMC,No.JZ12-866)	Dec-14
Reference Probe EX3DV4	SN 3617	28-Aug-14(SPEAG,No.EX3-3617_Aug14)	Aug-15
DAE4	SN 1331	23-Jan-14 (SPEAG, DAE4-1331_Jan14)	Jan -15
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-14 (CTTL, No.J14X02145)	Jun-15
Network Analyzer E5071C	MY46110673	15-Feb-14 (TMC, No.JZ14-781)	Feb-15

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: October 10, 2014

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

Methods Applied and Interpretation of Parameters:

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

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Probe ES3DV3

SN: 3241

Calibrated: September 29, 2014

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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DASY – Parameters of Probe: ES3DV3 - SN: 3241

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)[A]	1.12	0.83	1.00	±10.8%
DCP(mV)[B]	105.8	106.3	106.4	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	294.1	±2.3%
		Y	0.0	0.0	1.0		250.2	
		Z	0.0	0.0	1.0		276.2	

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 5 and Page 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY – Parameters of Probe: ES3DV3 - SN: 3241

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz] [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.90	6.90	6.90	0.59	1.23	±12%
835	41.5	0.90	6.41	6.41	6.41	0.43	1.46	±12%
900	41.5	0.97	6.35	6.35	6.35	0.46	1.44	±12%
1750	40.1	1.37	5.48	5.48	5.48	0.47	1.50	±12%
1900	40.0	1.40	5.12	5.12	5.12	0.73	1.24	±12%
2000	40.0	1.40	5.10	5.10	5.10	0.52	1.48	±12%
2450	39.2	1.80	4.64	4.64	4.64	0.89	1.13	±12%

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

[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

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DASY – Parameters of Probe: ES3DV3 - SN: 3241

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	55.2	0.97	6.44	6.44	6.44	0.38	1.64	±12%
835	55.2	0.99	6.37	6.37	6.37	0.48	1.48	±12%
900	55.0	1.05	6.24	6.24	6.24	0.40	1.62	±12%
1750	53.4	1.49	5.01	5.01	5.01	0.52	1.53	±12%
1900	53.3	1.52	4.85	4.85	4.85	0.48	1.64	±12%
2000	53.3	1.52	4.92	4.92	4.92	0.52	1.58	±12%
2450	52.7	1.95	4.46	4.46	4.46	0.86	1.18	±12%

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

[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

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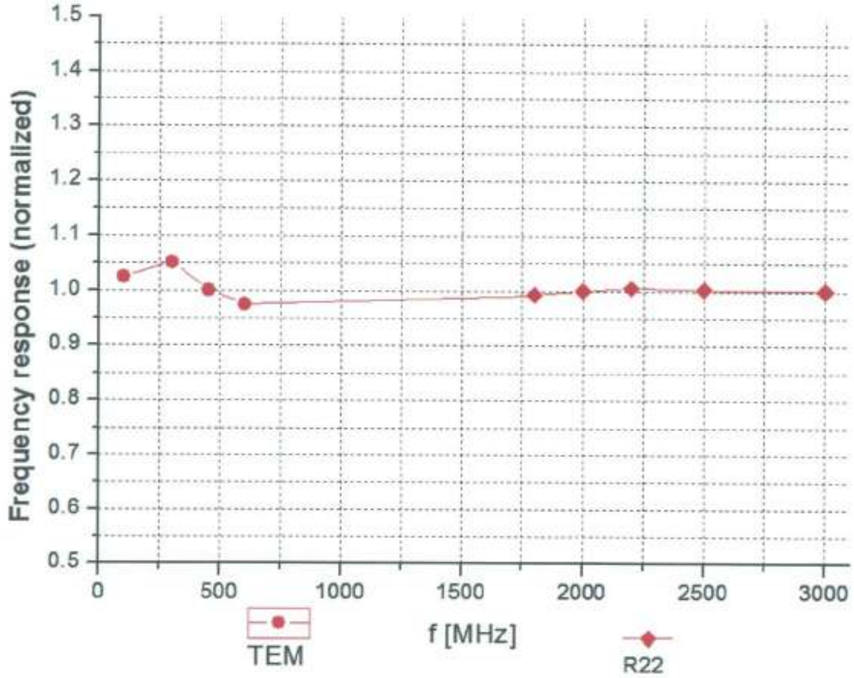
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



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

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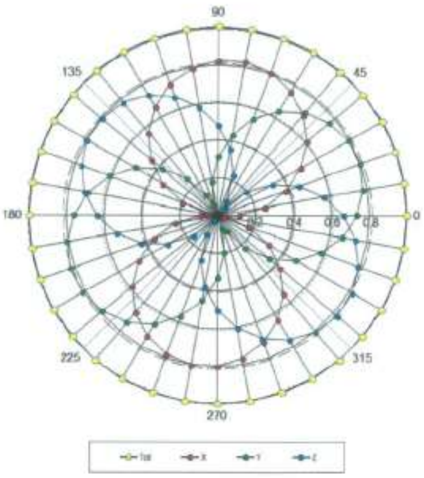
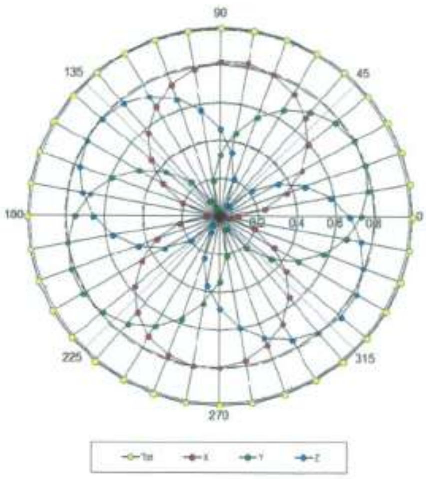
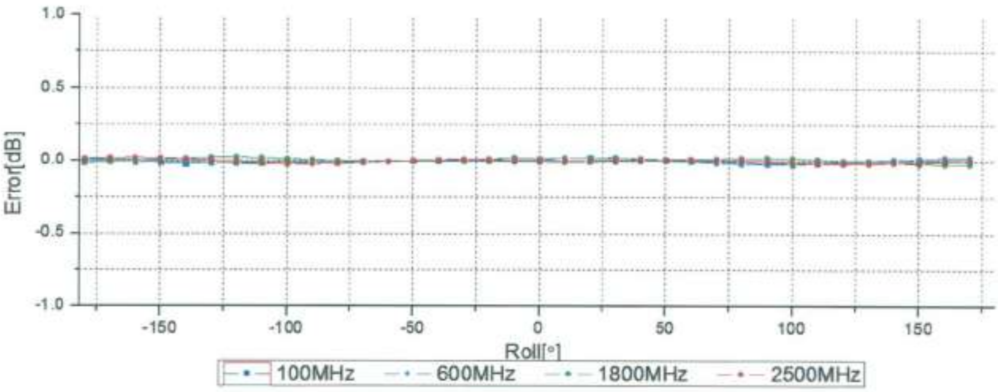
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





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

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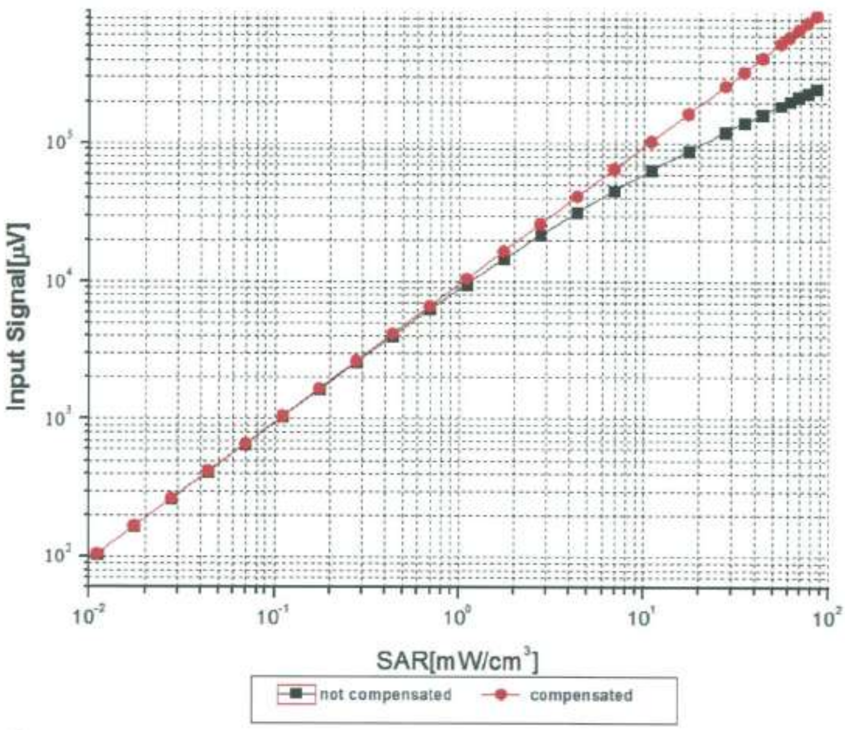
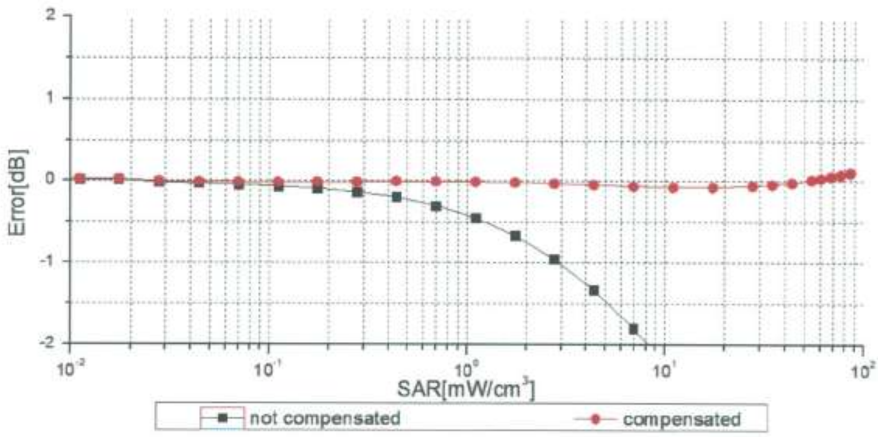
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





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

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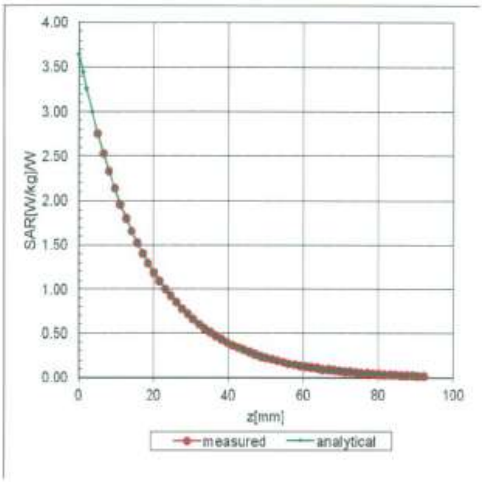
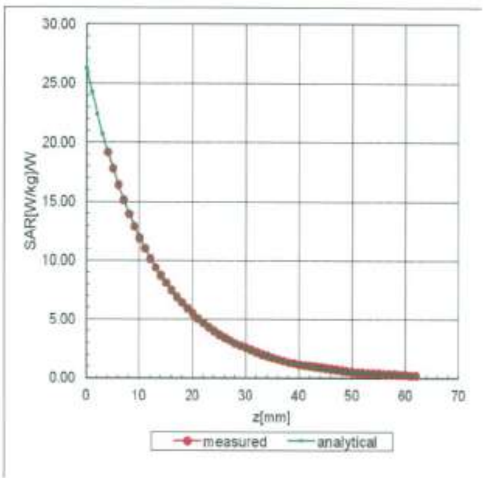
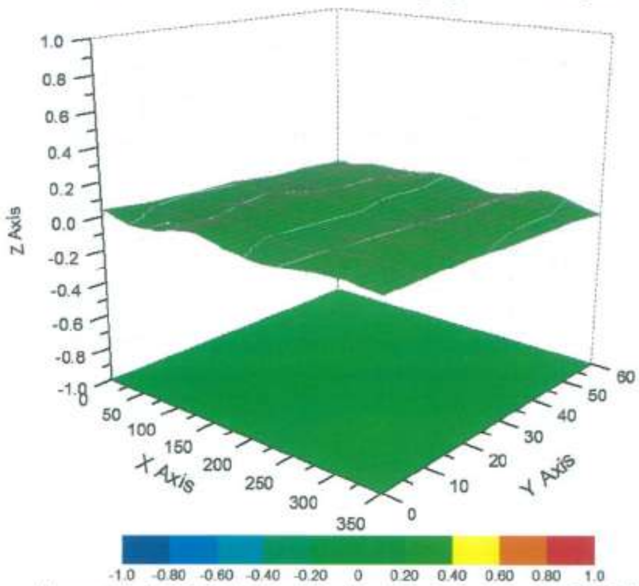
Conversion Factor Assessment





Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±2.8% (K=2)

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DASY - Parameters of Probe: ES3DV3 - SN: 3241

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	150.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	4mm
Probe Tip to Sensor X Calibration Point	2mm
Probe Tip to Sensor Y Calibration Point	2mm
Probe Tip to Sensor Z Calibration Point	2mm
Recommended Measurement Distance from Surface	3mm

June 26, 2013

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

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

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

1

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

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

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CALIBRATION No. L0570

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Client **Tejet** **Certificate No: Z14-97078**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3717
Calibration Procedure(s)	TMC-OS-E-02-195 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	September 02, 2014

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

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101547	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101548	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Reference10dBAttenuator	BT0520	12-Dec-12(TMC,No.JZ12-867)	Dec-14
Reference20dBAttenuator	BT0267	12-Dec-12(TMC,No.JZ12-866)	Dec-14
Reference Probe EX3DV4	SN 3846	03-Sep-13(SPEAG,No.EX3-3846_Sep13)	Sep-14
DAE4	SN 1331	23-Jan-14 (SPEAG, DAE4-1331_Jan14)	Jan -15
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-14 (CTTL, No.J14X02145)	Jun-15
Network Analyzer E5071C	MY46110673	15-Feb-14 (TMC, No.JZ14-781)	Feb-15

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: September 05, 2014

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

Methods Applied and Interpretation of Parameters:

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

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Probe EX3DV4

SN: 3717

Calibrated: September 02, 2014

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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DASY – Parameters of Probe: EX3DV4 - SN: 3717

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)[A]	0.49	0.45	0.54	±10.8%
DCP(mV)[B]	100.6	103.6	101.4	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	197.6	±2.1%
		Y	0.0	0.0	1.0		191.9	
		Z	0.0	0.0	1.0		205.7	

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 5 and Page 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY – Parameters of Probe: EX3DV4 - SN: 3717

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
850	41.5	0.92	9.08	9.08	9.08	0.12	2.08	±12%
900	41.5	0.97	8.89	8.89	8.89	0.16	1.25	±12%
1750	40.1	1.37	7.98	7.98	7.98	0.18	1.36	±12%
1900	40.0	1.40	7.74	7.74	7.74	0.22	1.12	±12%
2300	39.5	1.67	7.53	7.53	7.53	0.50	0.77	±12%
2450	39.2	1.80	7.24	7.24	7.24	0.55	0.75	±12%
2600	39.0	1.96	7.01	7.01	7.01	0.53	0.77	±12%
5200	36.0	4.66	5.49	5.49	5.49	0.41	0.97	±13%
5300	35.9	4.76	5.27	5.27	5.27	0.38	1.04	±13%
5600	35.5	5.07	4.58	4.58	4.58	0.25	2.31	±13%
5800	35.3	5.27	4.58	4.58	4.58	0.36	1.13	±13%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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DASY – Parameters of Probe: EX3DV4 - SN: 3717

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
2300	52.9	1.81	7.35	7.35	7.35	0.33	1.13	±12%
2450	52.7	1.95	7.11	7.11	7.11	0.39	1.01	±12%
2600	52.5	2.16	6.99	6.99	6.99	0.41	0.93	±12%
5200	49.0	5.30	4.49	4.49	4.49	0.38	1.52	±13%
5300	48.9	5.42	4.32	4.32	4.32	0.36	1.61	±13%
5600	48.5	5.77	3.89	3.89	3.89	0.39	1.64	±13%
5800	48.2	6.00	4.05	4.05	4.05	0.40	1.68	±13%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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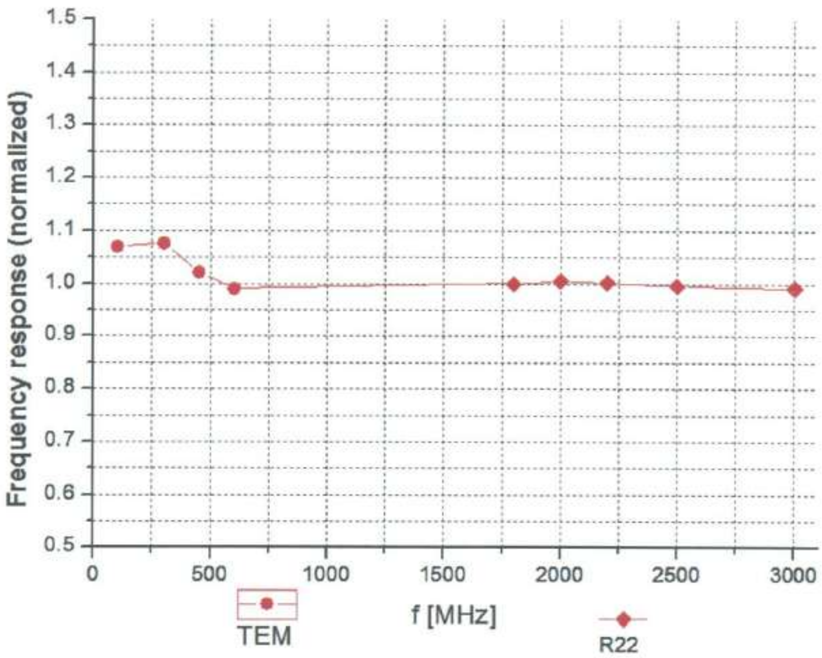
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



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

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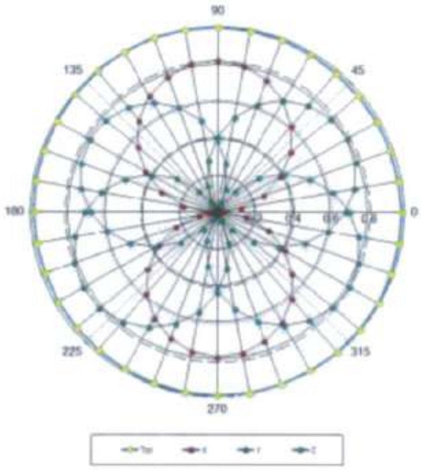
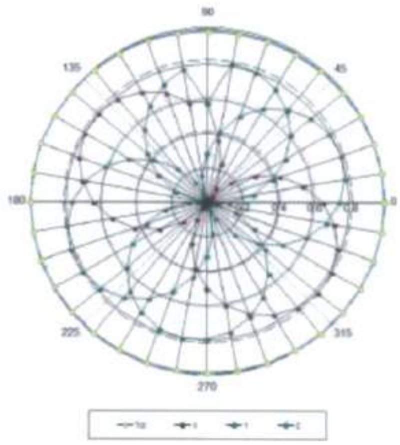
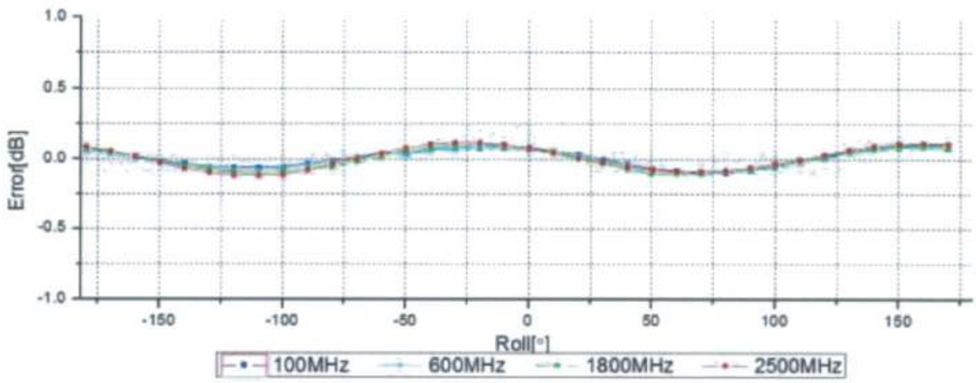
Receiving Pattern (Φ), θ=0°

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







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

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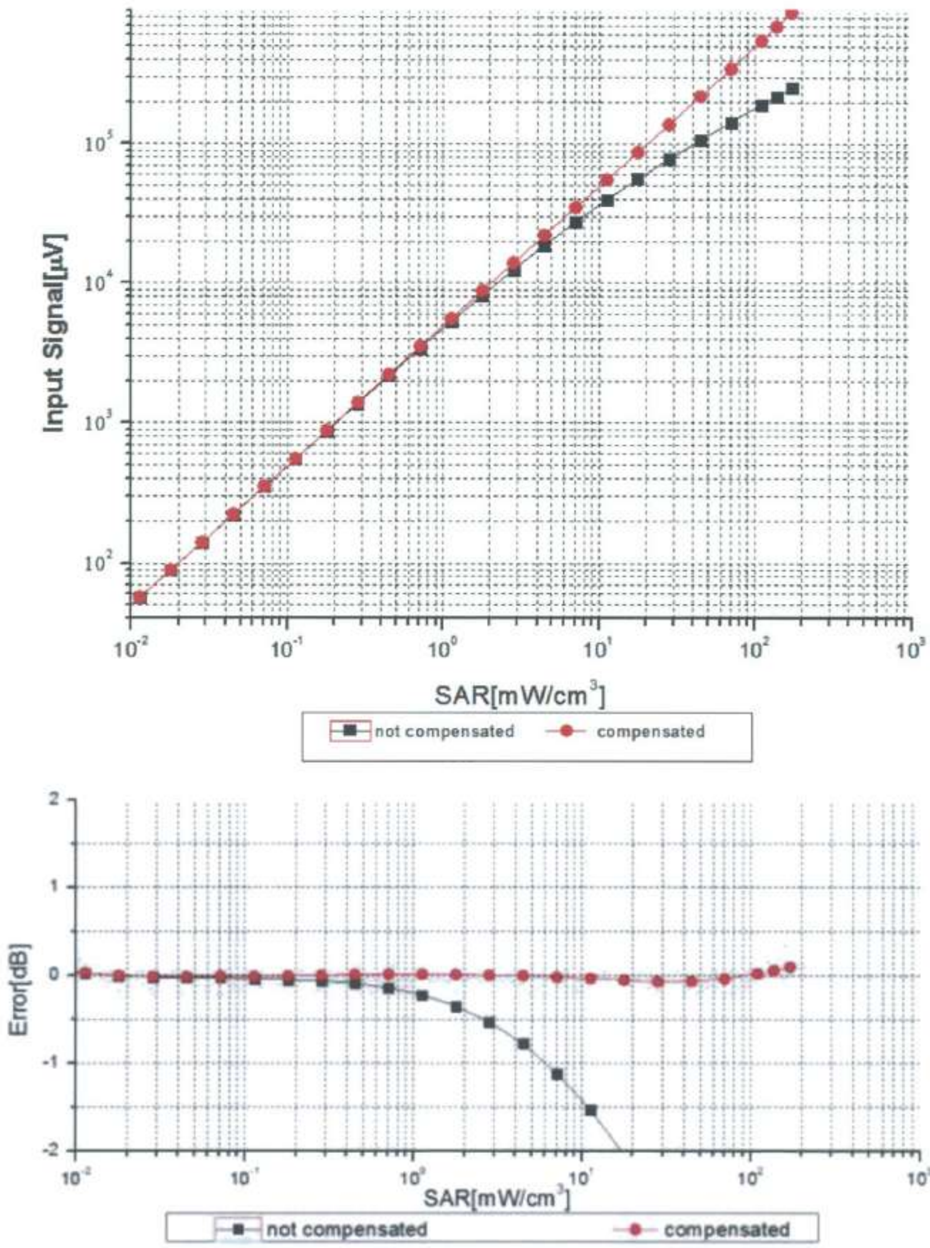
Dynamic Range f(SAR$_{head}$)
(TEM cell, f = 900 MHz)



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

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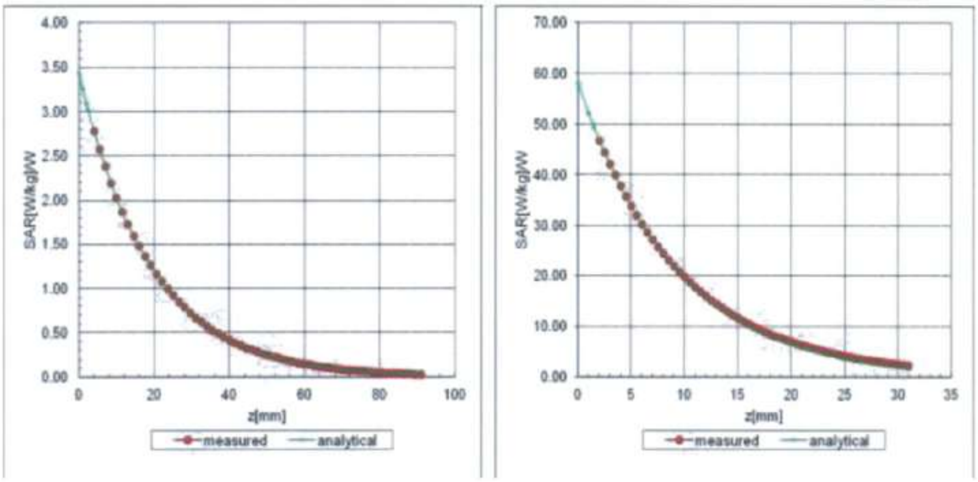
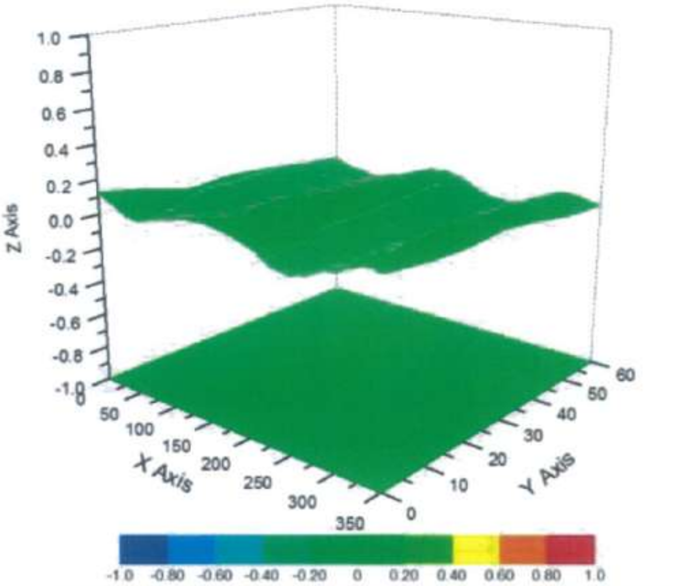
Conversion Factor Assessment

f=850 MHz, WGLS R9(H_convF) f=2450 MHz, WGLS R26(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±2.8% (K=2)

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DASY - Parameters of Probe: EX3DV4 - SN: 3717

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	155.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	2mm

OET

June 26, 2013

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

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

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2) Only a subset of the calibration services specified in the SPEAG-TMC agreement, while it remains valid, are applicable to SAR measurements performed using such equipment for supporting FCC equipment certification. These are identified in the following.
   a) Calibration of dosimetric (SAR) probes EX3DVx, ET3DVx and ES3DVx.
      i) Free-space E-field and H-field probes, including those used for HAC (hearing aid compatibility) evaluation, temperature probes, other probes or equipment not identified in this document, when calibrated by TMC, are excluded and cannot be used for measurements to support FCC equipment certification.
      ii) Signal specific and bundled probe calibrations based on PMR (probe modulation response) characteristics are handled according to the requirements of KDB 865664; that is, "Until standardized procedures are available to make such determination, the applicability of a signal specific probe calibration for testing specific wireless modes and technologies is determined on a case-by-case basis through KDB inquiries, including SAR system verification requirements."
   b) Calibration of SAR system validation dipoles, excluding HAC dipoles.
   c) Calibration of data acquisition electronics DAE3Vx, DAE4Vx and DAEasyVx.
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1

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

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

Annex B.2 DAE4 Calibration Certificate

TTL In Collaboration with speag CALIBRATION LABORATORY

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ilac-MRA CNAS CALIBRATION No. L0570

Client ： Tejet Certificate No: Z14-97086

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 1226
Calibration Procedure(s)	TMC-OS-E-01-198 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	September 15, 2014

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

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Process Calibrator 753	1971018	01-July-14 (CTTL, No:J14X02147)	July-15

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: September 17, 2014

In Collaboration with
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CALIBRATION LABORATORY

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Glossary:

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- *DC Voltage Measurement*: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.

- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.

- The report provide only calibration results for DAE, it does not contain other performance test results.

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

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

Calibration Factors	X	Y	Z
High Range	404.607 ± 0.15% (k=2)	404.376 ± 0.15% (k=2)	404.104 ± 0.15% (k=2)
Low Range	3.97906 ± 0.7% (k=2)	4.00337 ± 0.7% (k=2)	3.98461 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	114.5° ± 1 °

OET

June 26, 2013

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

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

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

1

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

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

2

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ilac-MRA CNAS CALIBRATION No. L0570

Client : Auden

Certificate No: Z14-97064

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 905
Calibration Procedure(s)	TMC-OS-E-01-198 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	July 14, 2014

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

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Documenting Process Calibrator 753	1971018	01-July-14 (CTTL, No:J14X02147)	July-15

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	赵靖
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	卢丙松

Issued: July 16, 2014

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

Certificate No: Z14-97064 Page 1 of 3

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Glossary:

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- *DC Voltage Measurement*: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.

- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.

- The report provide only calibration results for DAE, it does not contain other performance test results.

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E-mail: cttl@chinattl.com Http://www.chinattl.cn

DC Voltage Measurement

A/D - Converter Resolution nominal
High Range: 1LSB = 6.1μV , full range = -100...+300 mV
Low Range: 1LSB = 61nV , full range = -1.......+3mV
DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.736 ± 0.15% (k=2)	405.279 ± 0.15% (k=2)	404.866 ± 0.15% (k=2)
Low Range	3.98084 ± 0.7% (k=2)	4.0026 ± 0.7% (k=2)	3.99725 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	270° ± 1 °

OET

June 26, 2013

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

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

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

1

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

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

In Collaboration with s p e a g CALIBRATION LABORATORY

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CALIBRATION No. L0570

Client : Tejet

Certificate No: Z15-97067

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 1327
Calibration Procedure(s)	FD-Z11-2-002-01 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	April 21, 2015

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

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)□ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Process Calibrator 753	1971018	01-July-14 (CTTL, No:J14X02147)	July-15

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: April 22, 2015

Certificate No: Z15-97067 Page 1 of 3

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Glossary:

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- *DC Voltage Measurement*: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

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

Calibration Factors	X	Y	Z
High Range	404.882 ± 0.15% (k=2)	404.733 ± 0.15% (k=2)	404.933 ± 0.15% (k=2)
Low Range	3.99271 ± 0.7% (k=2)	3.99137 ± 0.7% (k=2)	3.99735 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	188.5° ± 1 °

June 26, 2013

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

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

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

1

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

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

Annex B.3 D835V2 Calibration Certificate

In Collaboration with
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CALIBRATION LABORATORY

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CALIBRATION No. L0570

Client: Tejet

Certificate No: Z14-97088

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d100
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits
Calibration date:	September 23, 2014

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

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102196	14-Mar-14 (CTTL, No.JZ14-896)	Mar-15
Power sensor NRV-Z5	100596	14-Mar-14 (CTTL, No. JZ14-896)	Mar -15
Reference Probe ES3DV3	SN 3142	1- Sep-14 (CTTL-SPEAG, No.JZ14-97079)	Aug-15
DAE3	SN 536	23-Jan-14 (SPEAG, DAE3-536_Jan14)	Jan -15
Signal Generator E4438C	MY49070393	13-Nov-13 (TMC, No.JZ13-394)	Nov-14
Network Analyzer E8362B	MY43021135	19-Oct-13 (TMC, No.JZ13-278)	Oct-14

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: September 30, 2014

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ilac-MRA CNAS CALIBRATION No. L0570

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

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

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

c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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ilac-MRA CNAS CALIBRATION No. L0570

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.4 ± 6 %	0.93 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.44 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.51 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.60 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.27 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.4 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.41 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.52 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.60 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.34 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.7Ω + 0.73jΩ
Return Loss	- 31.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.2Ω - 1.47jΩ
Return Loss	- 32.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.327 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

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