# SAR TEST REPORT

Report No. 2015SAR109

| | |
|---|---|
| FCC ID: | SRQ-IIMAXPLUS |
| Applicant: | ZTE Corporation |
| Product: | WCDMA/GSM（GPRS） Dual-Mode Digital Mobile Phone |
| Model: | ZTE Kis II Max/Kis II Max /ZTE KIS II Max /KIS II Max/ZTE Kis II Max plus/ZTE Kis II Max Plus |
| HW Version: | TMBI |
| SW Version: | ZTE-CN-FQB25S-P172R10V1.0.0 |
| Issue Date: | 2015-04-07 |

**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 D01:** SAR Measurement Requirements for 100 MHz to 6 GHz |
| | **KDB447498 D01:** Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Polices |
| | **KDB648474 D02:** Review and Approval Policies for SAR Evaluation of Handsets with Multiple Transmitters and Antennas. |
| | **KDB941225 D06:** 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 | 2015-04-07 |
| | | | |
| | | | |
| | | | |
| | | | |

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 **ZTE CORPORATION WCDMA/GSM（GPRS） Dual-Mode Digital Mobile Phone ZTE Kis II Max/Kis II Max /ZTE KIS II Max /KIS II Max/ZTE Kis II Max plus/ZTE Kis II Max Plus** 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 | 0.489 | 0.524 |
| | GSM1900 | 0.282 | |
| | WCDMA BAND II | 0.524 | |
| | WCDMA BAND V | 0.364 | |
| | Wi-Fi（2.45G） | 0.346 | |
| Body-worn (10mm) | GSM850 | 0.949 | 1.035 |
| | GSM1900 | 0.801 | |
| | WCDMA BAND II | 1.035 | |
| | WCDMA BAND V | 0.607 | |
| | Wi-Fi（2.45G） | 0.085 | |

| Evaluation for Simultaneous SAR | | | |
|---|---|---|---|
| **Summation BAND** | **Exposure Position** | **Maximum reported 1g SAR (W/kg)** | **Summation SAR(1g) (W/kg)** |
| WWAN +WiFi | Head | 0.524+0.346=0.87 | ＜1.6 |
| | Body-worn(10mm) | 1.035+0.085=1.120 | ＜1.6 |
| WWAN +BT | Head | 0.524+0.133=0.657 | ＜1.6 |
| | Body-worn(10mm) | 1.035+0.066=1.101 | ＜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 | 2015-02-27 |
| Date of end test: | 2015-03-09 |

## 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: | ZTE Corporation |
| Address: | ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China |
| City: | Shenzhen |
| Postal Code: | 518057 |
| Country: | China |
| Telephone: | +86-755-86360200 |
| Fax: | +86-755-86360298 |

## 3.2 Manufacturer Information

| | |
|---|---|
| Company Name: | ZTE Corporation |
| Address: | ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China |
| City: | Shenzhen |
| Postal Code: | 518057 |
| Country: | China |
| Telephone: | +86-755-86360200 |
| Fax: | +86-755-86360298 |

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

## 4.1 Information of EUT

| | | |
|---|---|---|
| Device Type | Portable device | |
| Product | WCDMA/GSM（GPRS） Dual-Mode Digital Mobile Phone | |
| Model | ZTE Kis II Max/Kis II Max /ZTE KIS II Max /KIS II Max/ZTE Kis II Max plus/ZTE Kis II Max Plus | |
| Type | Identical Prototype | |
| Exposure Category | Uncontrolled environment / general population | |
| Device operation configuration: | | |
| Operating Mode(s): | GSM850 | |
| | PCS1900 | |
| | WCDMA BAND II/V | |
| | 802.11b/g/n（20M/40M） | |
| Test Modulation | (GSM)GMSK，（WCDMA）QPSK | |
| GPRS Operation Class | B | |
| GPRS Multislot Class | 12 | |
| EDGE Class | 12(Downlink only) | |
| DTM Support | N/A | |
| AP Support | Yes | |
| Rated Output Power | GSM 850:33dBm | |
| | PCS1900: 30dBm | |
| | WCDMA BAND II/V: 23dBm | |
| | 802.11b：11dBm<br>802.11g：11dBm<br>802.11n(20M)：11dBm | |
| | BT（peak power）：5dBm | |
| Antenna Type: | Internal antenna | |
| Operating Frequency Range(s): | Band | Tx(MHz) |
| | GSM850 | 824.2～848.8 |
| | PCS1900 | 1850.2～1909.8 |
| | WCDMA BAND II | 1852.4～1907.6 |
| | WCDMA BAND V | 826.4～846.6 |
| 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 |

## 4.2 Identification of EUT

| EUT ID | SN or IMEI | HW Version | SW Version | Received Date |
|---|---|---|---|---|
| TN02 | 865730029523178 | TMBI | ZTE-CN-FQB25S-P172R10V1.0.0 | 2015-02-25 |

*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 | Li3712T42P3h634445 |
| Manufacturer | ZTE CORPORATION |
| Capacitance | 1200mAh |
| Nominal Voltage | 3.7V |

AE2

| | |
|---|---|
| Model | STC-A22O50I700USBA-Z |
| Manufacturer | ZTE CORPORATION |
| Length of DC line | 0cm with USB connector |

AE3

| | |
|---|---|
| Model | HMZ1-OMTP-3.5 |
| Manufacturer | ZTE CORPORATION |
| Length of DC line | 155cm |

*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 12.5 cm x 6.4 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 | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{hs}$ (1) | $\beta_{ec}$ | $\beta_{ed}$ | $\beta_{ed}$ (SF) | $\beta_{ed}$ (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 | $\beta_{ed1}$: 47/15<br>$\beta_{ed2}$: 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: $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI}$ = 8 ⇔ $A_{hs} = \beta_{hs}/\beta_c = 30/15$ ⇔ $\beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for $\beta_c/\beta_d$ =12/15, $\beta_{hs}/\beta_c$=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 $\beta_c/\beta_d$ 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 $\beta_c$ = 10/15 and $\beta_d$ = 15/15.
Note 4: For subtest 5 the $\beta_c/\beta_d$ 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 $\beta_c$ = 14/15 and $\beta_d$ = 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: $\beta_{ed}$ 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]

## 5.4 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 9.6cm>5cm
2. The maximum conducted output power of Bluetooth is 5 dBm=3.2mW <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) | 5 | 0.133 | 0.066 |

According to FCC KDB447498v05, Apppendix D

For 2450MHz，10mm test distance ,SAR1g（BT）=0.066W/Kg

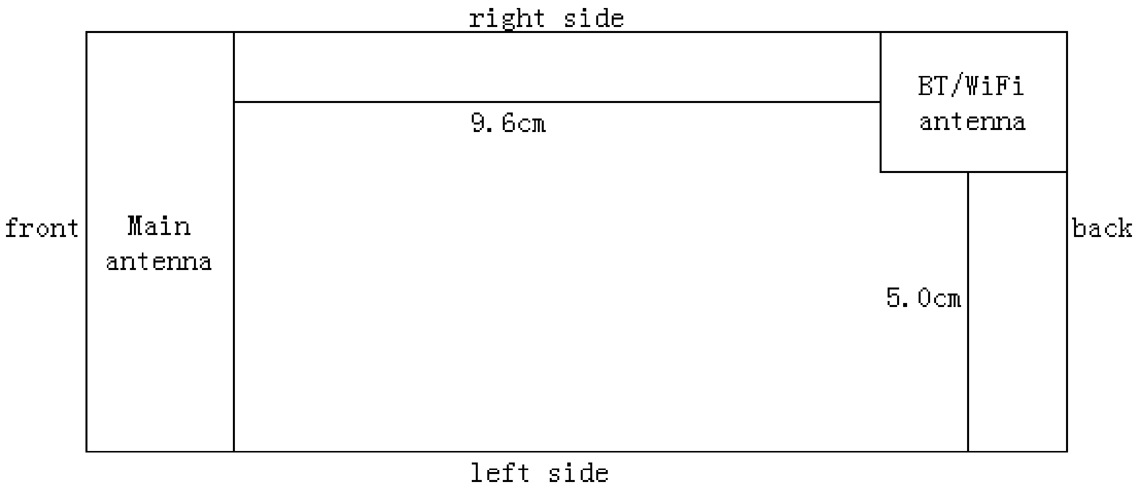
## 5.5 Wi-Fi Test Configuration

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 9.6cm>5cm
2.The maximum conducted output power of Wi-Fi is10.38dBm=10.9mW

According to KDB447498
According to the conducted power measurement result, we can draw the conclusion that: stand-alone SAR for WiFi should be performed.

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<br>9.6cm>2.5cm |
| WLAN | yes | yes | n/a<br>5.0cm>2.5cm | yes | n/a<br>9.7cm>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.

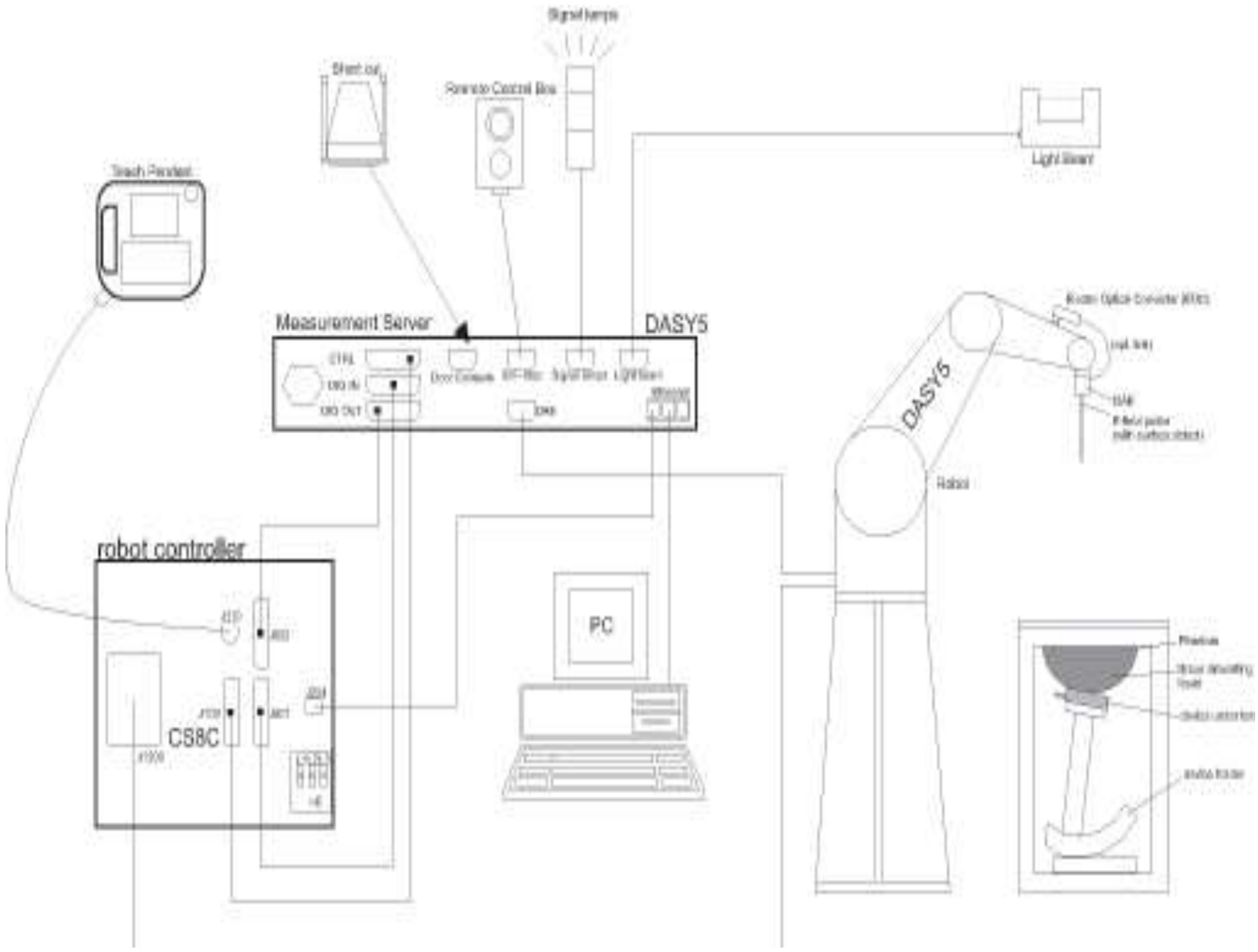



**Figure 5-1 SAR Lab Test Measurement Set-up**

## 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<br>Additional CF for other liquids and frequencies upon request |
| Frequency | 10 MHz to > 6 GHz<br>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)<br>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.

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

Where: $\Delta t$ = Exposure time (30 seconds),
C = Heat capacity of tissue (brain or muscle),
$\Delta T$ = 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 )

$cf$ = crest factor of exciting field (DASY parameter)

$dcp_i$ = 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/cm$^3$

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.

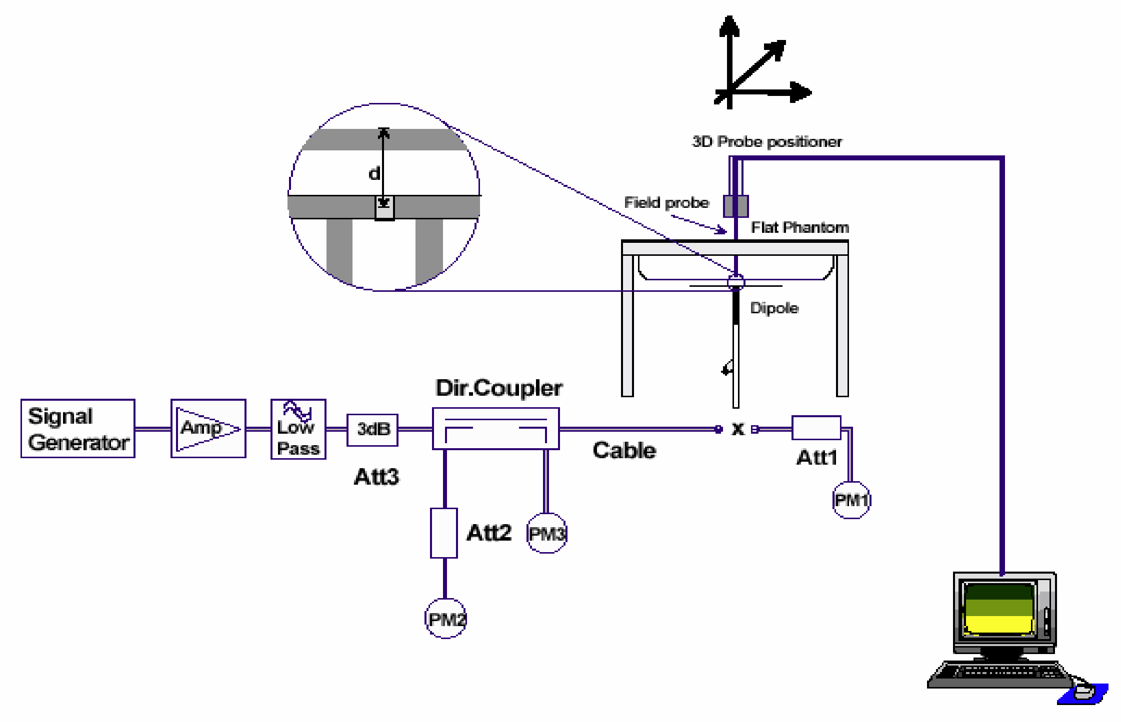



**Figure 5-6. System Check Set-up**

## 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<br>Target Value | f=2450MHz ε=52.7 σ=1.95 |

# 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 | | 32.5 | 32.5 | 32.5 | (dB) | CH128 | CH189 | CH251 |
| GPRS | 1 TX-slot result | 32.4 | 32.4 | 32.4 | -9.03 | 23.37 | 23.37 | 23.37 |
| | 2 TX-slot result | 31.4 | 31.4 | 31.5 | -6.02 | 25.38 | 25.38 | 25.48 |
| | 3 TX-slot result | 29.4 | 29.5 | 29.5 | -4.26 | 25.14 | 25.24 | 25.24 |
| | 4 TX-slot result | 28.6 | 28.6 | 28.6 | -3.01 | **25.59** | **25.59** | **25.59** |

| GSM1900 | | Conducted output power(dBm) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | low | middle | high | | | | |
| | | CH512 | CH661 | CH810 | | | | |
| | | 1850.2MHz | 1880MHz | 1909.8MHz | | | | |
| GSM | | 29.7 | 29.7 | 29.7 | (dB) | CH512 | CH661 | CH810 |
| GPRS | 1 TX-slot result | 29.7 | 29.7 | 29.7 | -9.03 | 20.67 | 20.67 | 20.67 |
| | 2 TX-slot result | 28.6 | 28.7 | 28.7 | -6.02 | 22.58 | 22.68 | 22.68 |
| | 3 TX-slot result | 26.8 | 26.7 | 26.6 | -4.26 | 22.54 | 22.44 | 22.34 |
| | 4 TX-slot result | 25.8 | 25.8 | 25.8 | -3.01 | **22.79** | **22.79** | **22.79** |

**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 4 timeslots**

| WCDMA BAND II | | Conducted Output power (dBm) | | |
|---|---|---|---|---|
| | | low | middle | high |
| | | CH9262 | CH9400 | CH9538 |
| | | 1852.4MHz | 1800MHz | 1907.6MHz |
| 12.2kbps RMC | | 22.7 | 22.8 | 22.7 |
| HSDPA | SUB-TEST 1 | 21.7 | 21.7 | 21.5 |
| | SUB-TEST 2 | 21.3 | 21.3 | 21 |
| | SUB-TEST 3 | 19.9 | 19.7 | 19.6 |
| | SUB-TEST 4 | 19.9 | 19.9 | 19.6 |
| HSUPA | SUB-TEST 1 | 21.8 | 21.8 | 21.5 |
| | SUB-TEST 2 | 20.7 | 20.7 | 20.6 |
| | SUB-TEST 3 | 21.7 | 21.7 | 21.4 |
| | SUB-TEST 4 | 19.8 | 19.6 | 19.6 |
| | SUB-TEST 5 | 21.7 | 21.7 | 21.5 |

| WCDMA BAND V | | Conducted Output power (dBm) | | |
|---|---|---|---|---|
| | | low | middle | high |
| | | CH4132 | CH4183 | CH4233 |
| | | 826.4 MHz | 836.6MHz | 846.6MHz |
| 12.2kbps RMC | | 22.9 | 22.8 | 22.8 |
| HSDPA | SUB-TEST 1 | 21.9 | 21.8 | 21.7 |
| | SUB-TEST 2 | 21.5 | 21.3 | 21.4 |
| | SUB-TEST 3 | 19.9 | 19.6 | 19.9 |
| | SUB-TEST 4 | 20 | 19.6 | 19.9 |
| HSUPA | SUB-TEST 1 | 21.9 | 21.8 | 21.7 |
| | SUB-TEST 2 | 20.8 | 20.6 | 20.8 |
| | SUB-TEST 3 | 21.7 | 21.6 | 21.6 |
| | SUB-TEST 4 | 19.9 | 19.7 | 19.8 |
| | SUB-TEST 5 | 21.9 | 21.8 | 21.7 |

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

For Bluetooth maximum conducted power is 5 dBm

Wi-Fi

Average Conducted Power

802.11b(dBm)

| Channel\data rate | | | 1Mbps | 2Mbps | 5.5Mbps | 11Mbps |
|---|---|---|---|---|---|---|
| low | 2412MHz | 1 | **10.11** | 9.91 | 9.23 | 8.46 |
| middle | 2437MHz | 6 | **10.38** | 10.37 | 9.98 | 9.68 |
| high | 2462MHz | 11 | **10.29** | 10.33 | 10.08 | 9.61 |

802.11g(dBm)

| Channel\data rate | | | 6Mbps | 9Mbps | 12Mbps | 18Mbps | 24Mbps | 36Mbps | 48Mbps | 54Mbps |
|---|---|---|---|---|---|---|---|---|---|---|
| low | 2412MHz | 1 | 10.60 | 9.67 | 9.48 | 9.18 | 8.86 | 8.36 | 9.66 | 7.42 |
| middle | 2437MHz | 6 | 10.33 | 10.14 | 9.94 | 9.65 | 9.28 | 8.34 | 7.84 | 7.67 |
| high | 2462MHz | 11 | 10.18 | 10.05 | 9.67 | 9.32 | 8.89 | 8.48 | 8.01 | 7.87 |

802.11n(20M)(dBm)

| Channel\data rate | | | MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 |
|---|---|---|---|---|---|---|---|---|---|---|
| low | 2412MHz | 1 | 9.88 | 9.50 | 9.17 | 8.79 | 8.36 | 7.66 | 7.52 | 7.30 |
| middle | 2437MHz | 6 | 10.31 | 9.94 | 9.58 | 8.85 | 8.34 | 7.91 | 7.73 | 7.53 |
| high | 2462MHz | 11 | 10.27 | 9.68 | 9.33 | 9.02 | 8.53 | 8.11 | 7.94 | 7.78 |

802.11n(40M)(dBm)

| Channel\data rate | | | MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 |
|---|---|---|---|---|---|---|---|---|---|---|
| low | 2422MHz | 3 | 9.78 | 8.7 | 8.3 | 7.79 | 7.17 | 6.45 | 6.23 | 6.16 |
| middle | 2437MHz | 6 | 9.49 | 8.82 | 8.29 | 7.91 | 7.04 | 6.58 | 6.36 | 6.28 |
| high | 2452MHz | 9 | 9.77 | 8.91 | 8.38 | 7.94 | 7.28 | 6.82 | 6.6 | 6.48 |

**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<br>5% window | 41.5<br>39.43-43.58 | 0.90<br>0.86- 0.95 | / |
| | Measurement value<br>2015-03-02 | 41.31 | 0.88 | 21.9 |
| **835MHz (body)** | Target value<br>5% window | 55.2<br>52.44-57.96 | 0.97<br>0.92-1.02 | / |
| | Measurement value<br>2015-02-28 | 54.03 | 0.95 | 21.7 |
| | Measurement value<br>2015-03-02 | 54.26 | 0.96 | 21.8 |
| **1900MHz (head)** | Target value<br>5% window | 40.0<br>38-42 | 1.40<br>1.33 -1.47 | / |
| | Measurement value<br>2015-03-03 | 39.27 | 1.38 | 21.7 |
| **1900MHz (body)** | Target value<br>5% window | 53.3<br>50.63-55.96 | 1.52<br>1.44 -1.60 | / |
| | Measurement value<br>2015-02-27 | 52.36 | 1.49 | 21.9 |
| | Measurement value<br>2015-02-28 | 52.49 | 1.49 | 21.8 |
| **2450MHz (head)** | Target value<br>5% window | 39.2<br>37.24-41.16 | 1.8<br>1.71-1.89 | / |
| | Measurement value<br>2015-03-05 | 38.56 | 1.78 | 21.8 |
| **2450MHz (body)** | Target value<br>5% window | 52.7<br>50.06-55.33 | 1.95<br>1.85 -2.05 | / |
| | Measurement value<br>2015-03-09 | 51.96 | 1.93 | 21.9 |

### 7.2.2. System Check Results

**System Check for tissue simulation liquid**

| Frequency | Description | SAR(W/kg) 10g | SAR(W/kg) 1g | Targeted SAR1g (W/kg) | Normalized SAR1g (W/kg) | Deviation (%) |
|---|---|---|---|---|---|---|
| **835 MHz (head)** | Recommended result ±10% window | 1.6<br>1.44-1.76 | 2.44<br>2.2-2.68 | / | / | / |
| | Measurement value 2015-03-02 | 1.48 | 2.28 | 9.51 | 9.12 | -4.10 |
| **835MHz (body)** | Recommended result ±10% window | 1.6<br>1.44-1.76 | 2.41<br>2.17-2.65 | / | / | / |
| | Measurement value 2015-02-28 | 1.52 | 2.32 | 9.52 | 9.28 | -2.52 |
| | Measurement value 2015-03-02 | 1.54 | 2.39 | 9.52 | 9.56 | 0.42 |
| **1900MHz (head)** | Recommended result ±10% window | 5.21<br>4.69-5.73 | 9.69<br>8.72-10.66 | / | / | / |
| | Measurement value 2015-03-03 | 5.15 | 9.91 | 39.3 | 39.64 | 0.87 |
| **1900MHz (body)** | Recommended result ±10% window | 5.29<br>4.76-5.82 | 10.1<br>9.09-11.11 | / | / | / |
| | Measurement value 2015-02-27 | 4.97 | 9.75 | 40.9 | 39 | -4.65 |
| | Measurement value 2015-02-28 | 5.13 | 9.88 | 40.9 | 39.52 | -3.37 |
| **2450MHz (head)** | Recommended result ±10% window | 6.01<br>5.41-6.61 | 12.9<br>11.61-14.19 | / | / | / |
| | Measurement value 2015-03-05 | 6.12 | 13.4 | 51.1 | 53.6 | 4.89 |
| **2450MHz (body)** | Recommended result ±10% window | 5.95<br>5.36-6.55 | 12.7<br>11.43-13.97 | / | / | / |
| | Measurement value 2015-03-09 | 5.86 | 12.7 | 50.3 | 50.8 | 0.99 |

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 | 0.398 | -0.06 | |
| Left head, Tilt 15 Degree | middle | 0.258 | -0.03 | |
| Right head, Touch cheek | middle | 0.406 | 0.14 | |
| Right head, Tilt 15 Degree | middle | 0.264 | -0.02 | |
| Right head, Touch cheek | low | 0.372 | 0.13 | |
| | high | **0.436** | 0.06 | **max** |
| Test position of Body with GPRS(4UP) (Distance 10mm) | | | | |
| Towards phantom | middle | 0.685 | -0.07 | |
| Towards Ground | middle | **0.846** | 0.20 | **max** |
| Front | middle | 0.156 | 0.19 | |
| Left side | middle | 0.522 | 0.06 | |
| Right side | middle | 0.460 | -0.06 | |
| Towards Ground | low | 0.813 | -0.15 | |
| | high | 0.741 | -0.01 | |
| Worst case position of Body with (Distance 10mm) | | | | |
| Towards Ground | middle | 0.355 | -0.01 | 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 | 0.223 | 0.12 | |
| Left head, Tilt 15 Degree | middle | 0.119 | -0.18 | |
| Right head, Touch cheek | middle | 0.178 | 0.09 | |
| Right head, Tilt 15 Degree | middle | 0.129 | 0.02 | |
| Left head, Touch cheek | low | **0.263** | -0.05 | **max** |
| | high | 0.195 | 0.03 | |
| Test position of Body with GPRS(4UP) (Distance 10mm) | | | | |
| Towards phantom | middle | 0.532 | -0.18 | |
| Towards Ground | middle | 0.526 | 0.12 | |
| Front | middle | **0.748** | 0.01 | **max** |
| Left side | middle | 0.153 | 0.03 | |
| Right side | middle | 0.146 | -0.04 | |
| Front | low | 0.646 | -0.04 | |
| | high | 0.666 | 0.09 | |
| Worst case position of Body with (Distance 10mm) | | | | |
| front | middle | 0.511 | -0.18 | 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 BAND II)**

| 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 | 0.500 | 0.19 | **max** |
| Left head, Tilt 15 Degree | middle | 0.211 | -0.17 | |
| Right head, Touch cheek | middle | 0.370 | 0.09 | |
| Right head, Tilt 15 Degree | middle | 0.236 | 0.08 | |
| Left head, Touch cheek | low | 0.385 | 0.09 | |
| | high | 0.322 | 0.05 | |
| Test position of Body (Distance 10mm) | | | | |
| Towards phantom | middle | 0.734 | 0.01 | |
| Towards Ground | middle | 0.848 | 0.13 | |
| Front | middle | 0.949 | -0.00 | |
| Left side | middle | 0.160 | 0.02 | |
| Right side | middle | 0.169 | 0.10 | |
| Towards Ground | low | 0.652 | 0.10 | |
| | high | 0.751 | 0.02 | |

| | | | | |
|---|---|---|---|---|
| Front | low | 0.930 | -0.06 | |
| | high | **0.955** | 0.01 | **max** |
| Worst case position of Body with (Distance 10mm) | | | | |
| front | high | 0.919 | 0.07 | earphone |
| front | high | 0.759 | 0.06 | 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 | 0.340 | 0.18 | |
| Left head, Tilt 15 Degree | middle | 0.200 | 0.04 | |
| Right head, Touch cheek | middle | 0.348 | -0.19 | |
| Right head, Tilt 15 Degree | middle | 0.22 | 0.02 | |
| Right head, Touch cheek | low | **0.348** | 0.13 | **max** |
| | high | 0.342 | 0.01 | |
| Test position of Body (Distance 10mm) | | | | |
| Towards phantom | middle | 0.419 | 0.00 | |
| Towards Ground | middle | 0.523 | -0.02 | |

| | | | | |
|---|---|---|---|---|
| Front | middle | 0.089 | 0.11 | |
| Left side | middle | 0.370 | 0.04 | |
| Right side | middle | 0.327 | 0.03 | |
| Towards Ground | low | **0.580** | -0.01 | **max** |
| | high | 0.529 | -0.01 | |
| Worst case position of Body with (Distance 10mm) | | | | |
| Towards Ground | low | 0.377 | -0.02 | 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 (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 | 0.292 | -0.39 | |
| Left head, Tilt 15 Degree | middle | 0.280 | 0.22 | |
| Right head, Touch cheek | middle | 0.189 | 0.19 | |
| Right head, Tilt 15 Degree | middle | 0.135 | -0.42 | |
| Left head, Touch cheek | low | 0.265 | -0.15 | |
| | high | **0.294** | -0.07 | **max** |

| Test position of Body (Distance 10mm) | | | | |
|---|---|---|---|---|
| Towards phantom | middle | 0.047 | -0.14 | |
| Towards Ground | middle | 0.064 | -0.39 | |
| Back | middle | 0.042 | -0.26 | |
| Left side | middle | 0.026 | 0.23 | |
| Right side | middle | 0.049 | -0.04 | |
| Towards Ground | low | 0.069 | -0.14 | |
| | high | **0.072** | -0.18 | **max** |

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 | high | 0.436 | 32.5 | 33 | 0.489 | 1.6 |
| | body | Towards Ground with GPRS(4up) | middle | 0.846 | 32.5 | | 0.949 | 1.6 |
| GSM 1900 | head | Left head, Touch cheek | low | 0.263 | 29.7 | 30 | 0.282 | 1.6 |
| | body | Front with GPRS(2up) | middle | 0.748 | 29.7 | | 0.801 | 1.6 |
| WCDMA BAND II | head | Left head, Touch cheek | middle | 0.500 | 22.8 | 23 | 0.524 | 1.6 |
| | body | front | high | 0.955 | 22.7 | | 1.035 | 1.6 |
| WCDMA BAND V | head | Right head, Touch cheek | low | 0.348 | 22.8 | 23 | 0.364 | 1.6 |
| | body | Towards Ground | low | 0.580 | 22.8 | | 0.607 | 1.6 |
| Wi-Fi | head | Left head, Touch cheek | high | 0.294 | 10.29 | 11 | 0.346 | 1.6 |
| | body | Towards Ground | high | 0.072 | 10.29 | | 0.085 | 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 | 0.524+0.346=0.87 | ＜1.6 | / | No |
| | Body-worn(10mm) | 1.035+0.085=1.120 | ＜1.6 | / | No |
| WWAN+BT | Head | 0.524+0.133=0.657 | ＜1.6 | / | No |
| | Body-worn(10mm) | 1.035+0.066=1.101 | ＜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 $30^{th}$，2014 | One year |
| 02 | Dielectric Probe Kit | Agilent 85070E | MY44300524 | No Calibration Requested | |
| 03 | Power meter | Agilent E4418B | MY50000852 | Oct $30^{th}$，2014 | One year |
| 04 | Power sensor | Agilent E9200B | MY50300011 | Oct $30^{th}$，2014 | One year |
| 05 | Signal Generator | Agilent N5182A | MY49071248 | Oct $30^{th}$，2014 | One year |
| 06 | Amplifier | ZHL-42W | QA1020005 | No Calibration Requested | |
| 07 | BTS | CMU200 | 121464 | Oct $30^{th}$，2014 | One year |
| 08 | E-field Probe | ES3DV3 | 3241 | Sep $29^{th}$，2014 | One year |
| 09 | E-field Probe | EX3DV4 | 3717 | Sep $02^{th}$，2014 | One year |
| 10 | DAE | DAE4 | 1226 | Sep $15^{th}$，2014 | One year |
| 11 | DAE | DAE4 | 1327 | May $05^{th}$，2014 | One year |
| 12 | Validation Kit 835MHz | D835V2 | 4d100 | Sep $23^{th}$，2014 | One year |
| 13 | Validation Kit 1900MHz | D1900V2 | 5d155 | May $23^{th}$，2014 | One year |
| 14 | Validation Kit 2450MHz | D2450V2 | 845 | Sep $17^{th}$，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 835head

Date/Time: 02/03/2015 08:15:58

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 = 0.882 S/m; $\varepsilon_r$ = 41.312; ρ = 1000 kg/$m^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(9.08, 9.08, 9.08); Calibrated: 02/09/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- 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) = 2.64 W/kg

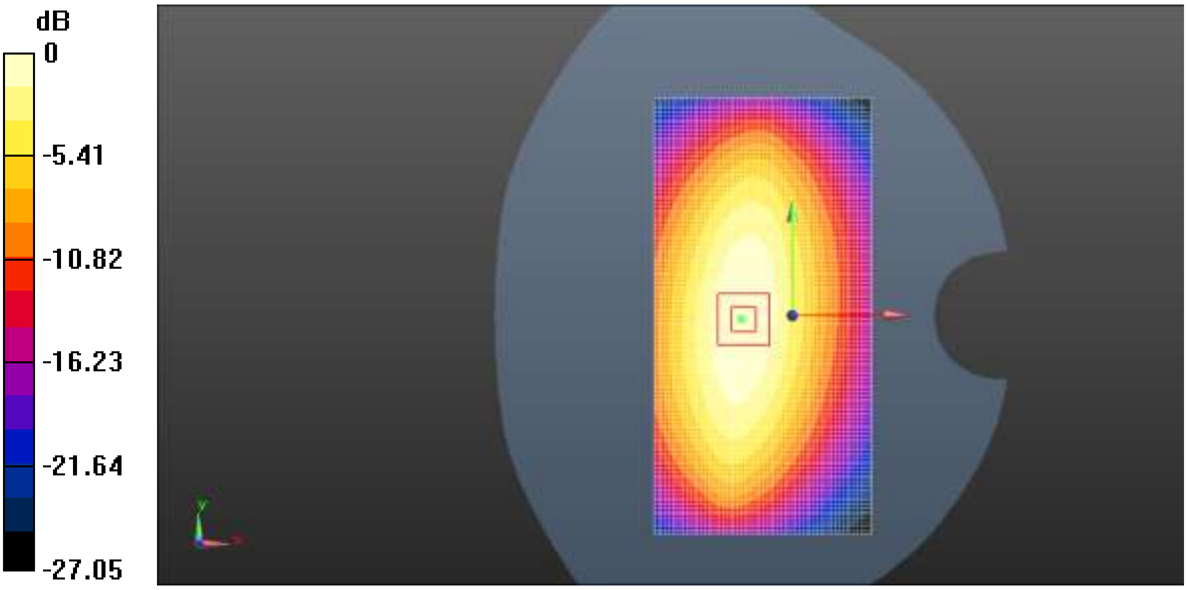
**835head/d=15mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 3.43 W/kg

**SAR(1 g) = 2.28 W/kg; SAR(10 g) = 1.48 W/kg**

Maximum value of SAR (measured) = 2.67 W/kg




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

**System check 835body**

Date/Time: 28/02/2015 14:38:00

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; $\sigma$ = 0.948 S/m; $\varepsilon_r$ = 54.025; $\rho$ = 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

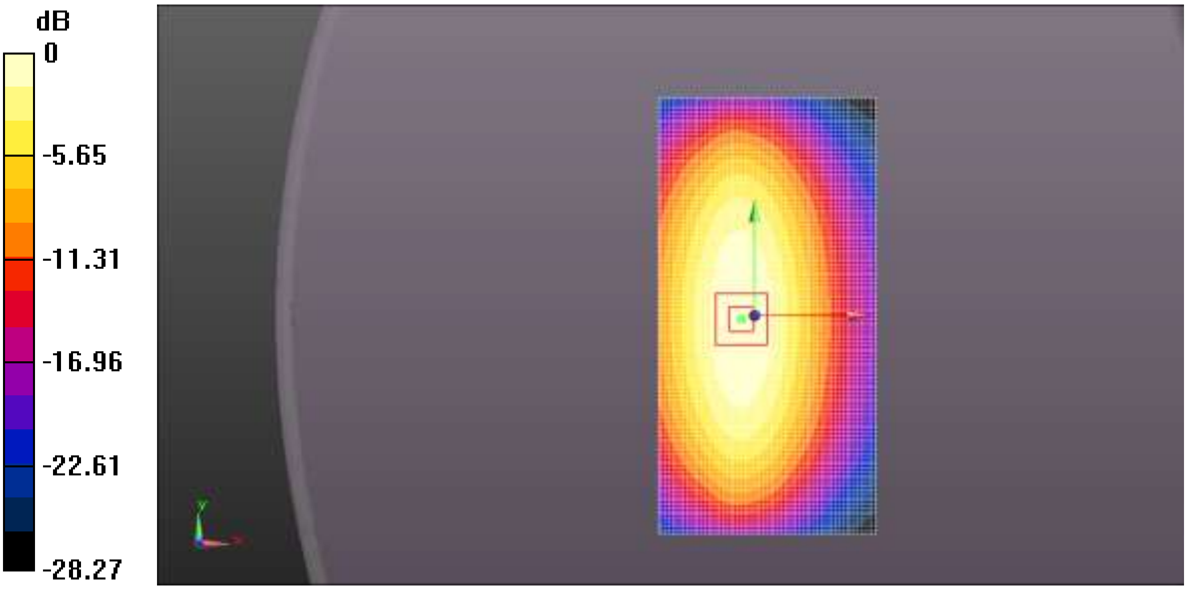
**835body/d=15mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

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) = 1.52 W/kg**

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




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

## System check 835body

Date/Time: 02/03/2015 13:03:13

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; $\sigma$ = 0.958 S/m; $\varepsilon_r$ = 54.255; $\rho$ = 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) = 2.78 W/kg

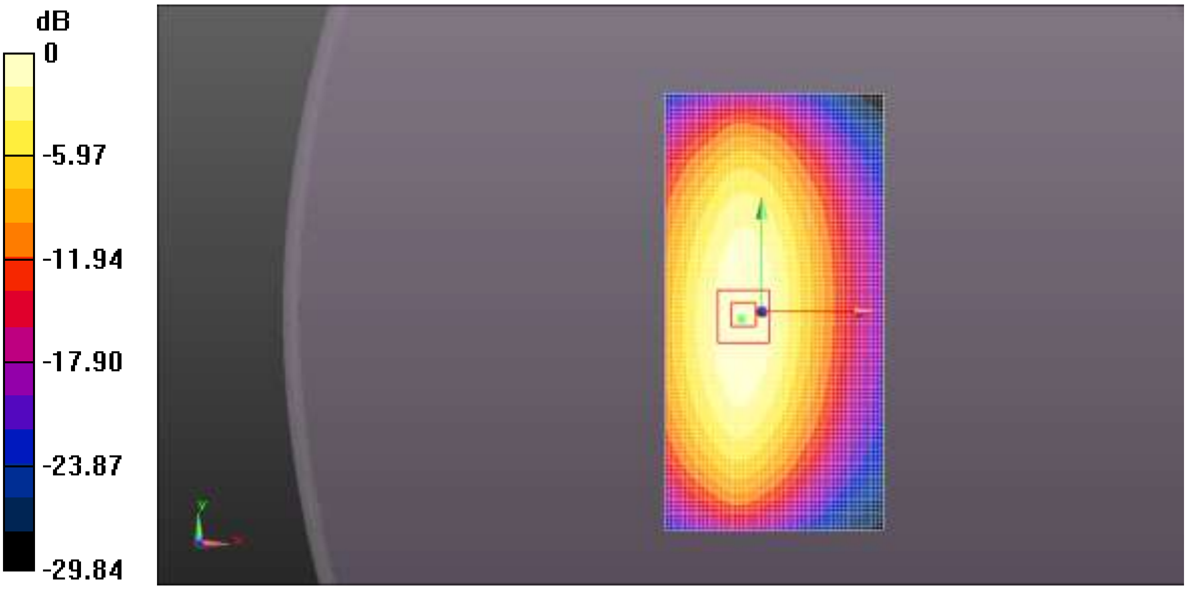
**835body/d=15mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 50.978 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.46 W/kg

**SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.54 W/kg**

Maximum value of SAR (measured) = 2.72 W/kg



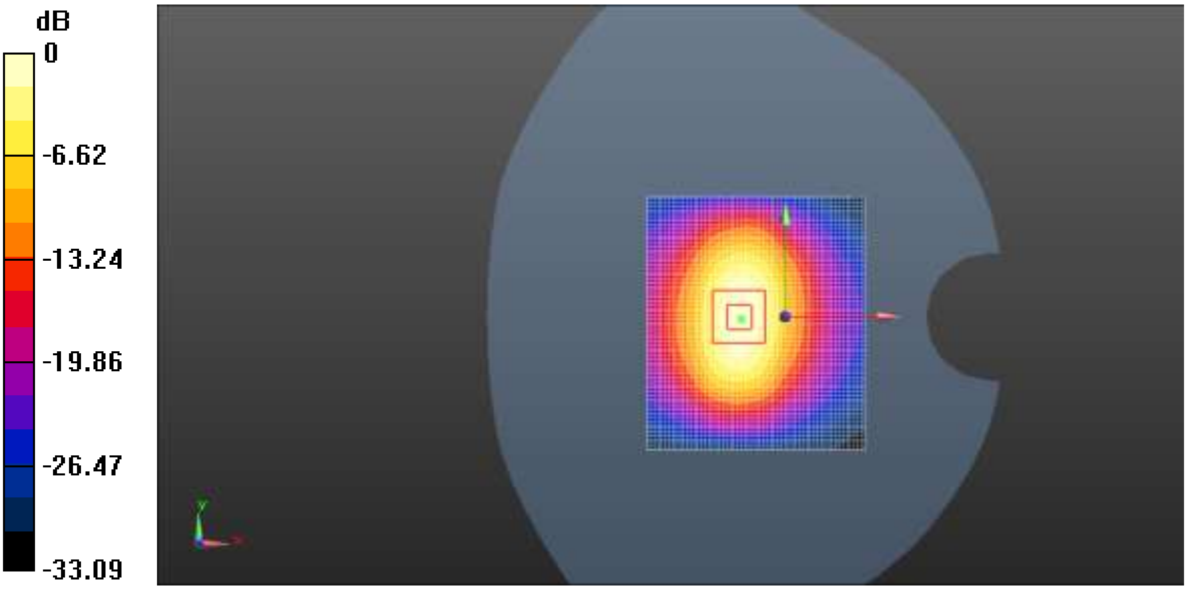

0 dB = 2.78 W/kg = 4.43 dBW/kg

**System check 1900head**
Date/Time: 03/03/2015 08:10:41
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 = 1.383 S/m; $\varepsilon_r$ = 39.268; 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: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**1900head/d=10mm, Pin=250 mW/Area Scan (61x71x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 14.1 W/kg

**1900head/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.657 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 19.2 W/kg
**SAR(1 g) = 9.91 W/kg; SAR(10 g) = 5.15 W/kg**
Maximum value of SAR (measured) = 12.9 W/kg




0 dB = 14.1 W/kg = 11.49 dBW/kg

**System check 1900 body**

Date/Time: 27/02/2015 08:37:35

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 = 1.483 S/m; $\varepsilon_r$ = 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

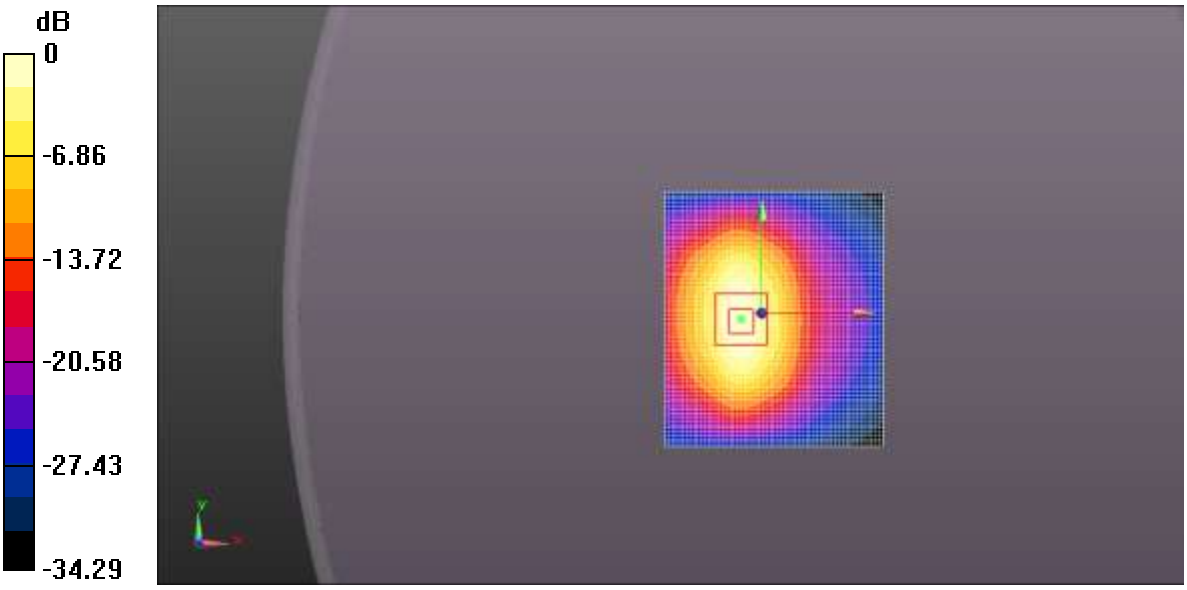
**1900body/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 16.0 W/kg

**SAR(1 g) = 9.75 W/kg; SAR(10 g) = 4.97 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: 28/02/2015 08:38:41

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; $\sigma$ = 1.492 S/m; $\varepsilon_r$ = 52.487; $\rho$ = 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

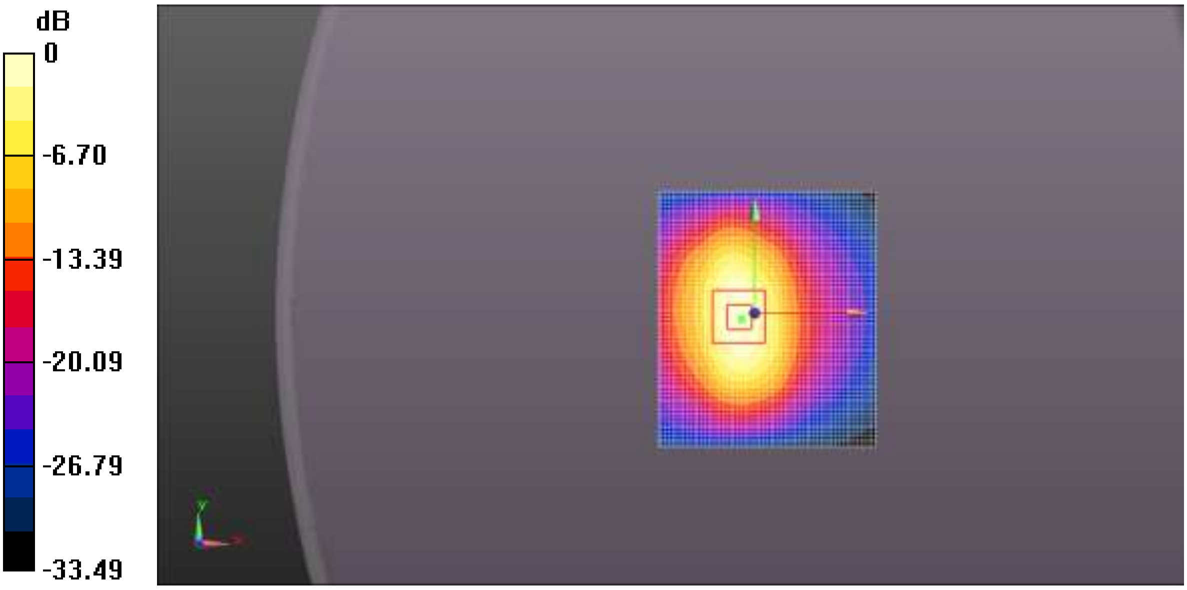
**1900body/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

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) = 5.13 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: 05/03/2015 08:30:57

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 = 1.785 S/m; $\varepsilon_r$ = 38.561; ρ = 1000 kg/$m^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(7.24, 7.24, 7.24); Calibrated: 02/09/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- 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) = 19.8 W/kg

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

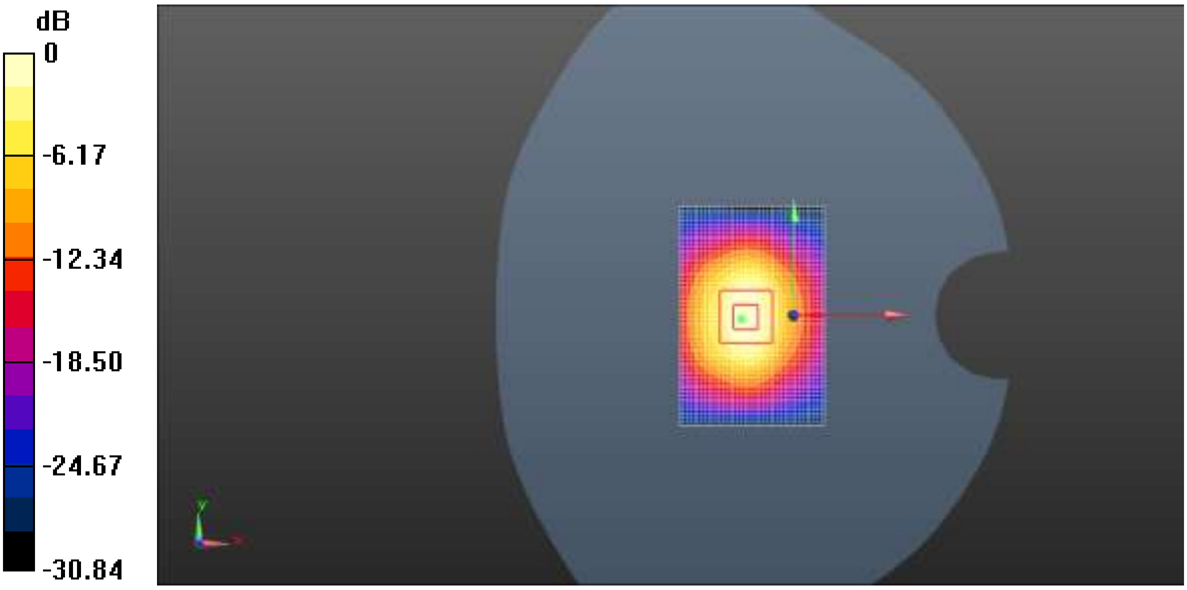
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.5 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 31.7 W/kg

**SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.12 W/kg**

Maximum value of SAR (measured) = 19.1 W/kg




0 dB = 19.8 W/kg = 12.97 dBW/kg

**System check 2450 body**

Date/Time: 09/03/2015 08:20:12

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; $\varepsilon_r$ = 51.964; 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: 05/05/2014
- 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

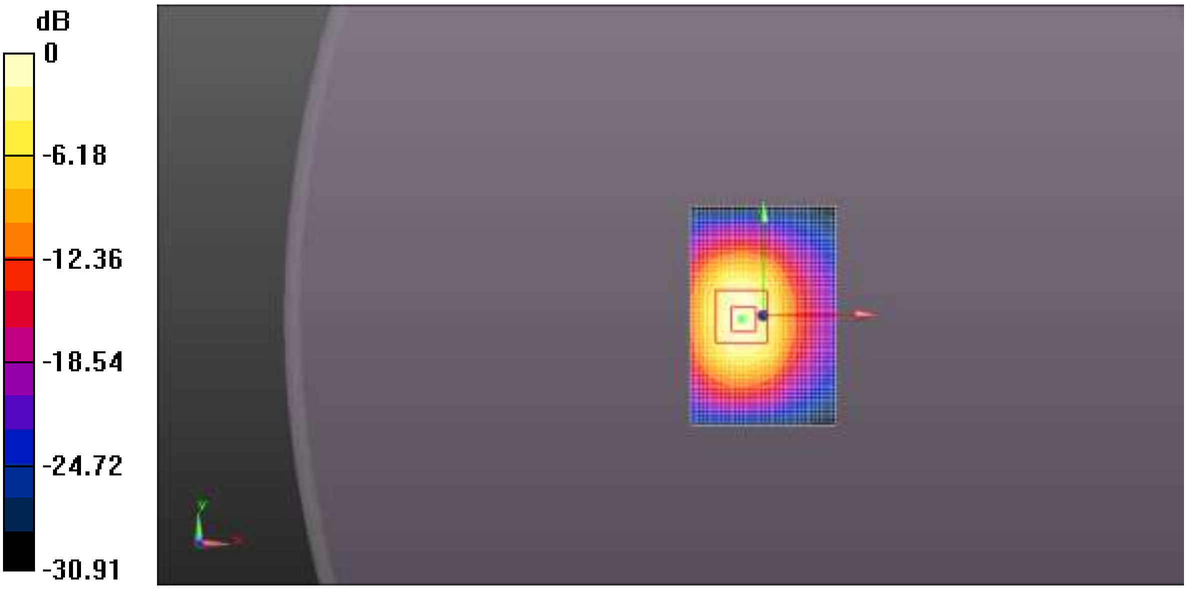
**2450body/d=10mm, Pin=250 mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 26.2 W/kg

**SAR(1 g) = 12.7 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

## Annex A.2 Graph Result

### GSM850 right touch high

Date/Time: 02/03/2015 15:58:05

Communication System: UID 0, GSM (0); Communication System Band: GSM850(824.0-849.0MHz); Frequency: 848.8 MHz;Communication System PAR: 9.191 dB

Medium parameters used: f = 849 MHz; $\sigma$ = 0.894 S/m; $\varepsilon_r$ = 41.431; $\rho$ = 1000 kg/$m^3$

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(9.08, 9.08, 9.08); Calibrated: 02/09/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: SAM1; Type: SAM; Serial: TP1576
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**right/touch high/Area Scan (91x151x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.460 W/kg

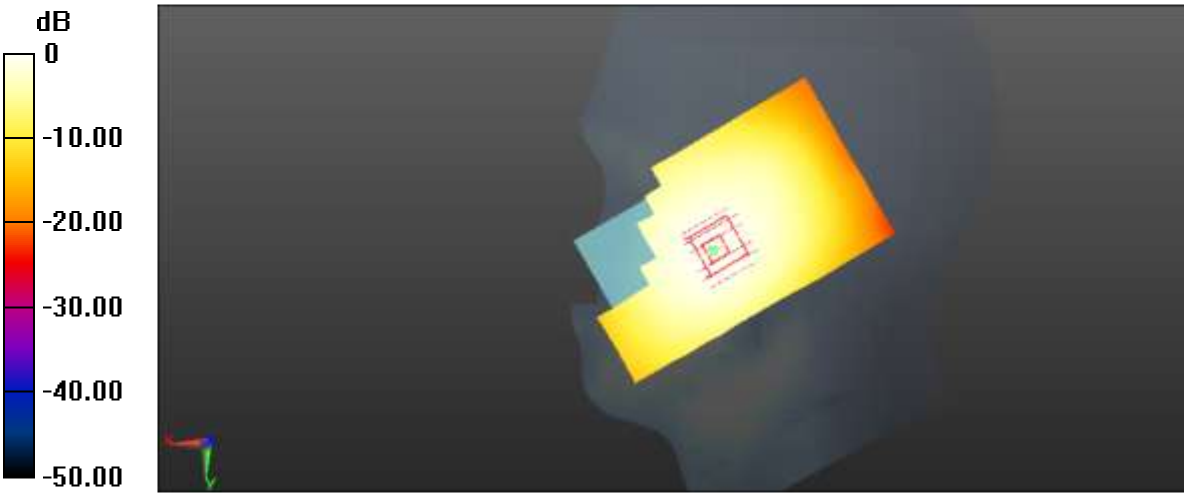
**right/touch high/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.863 V/m; Power Drift = 0.06 dB

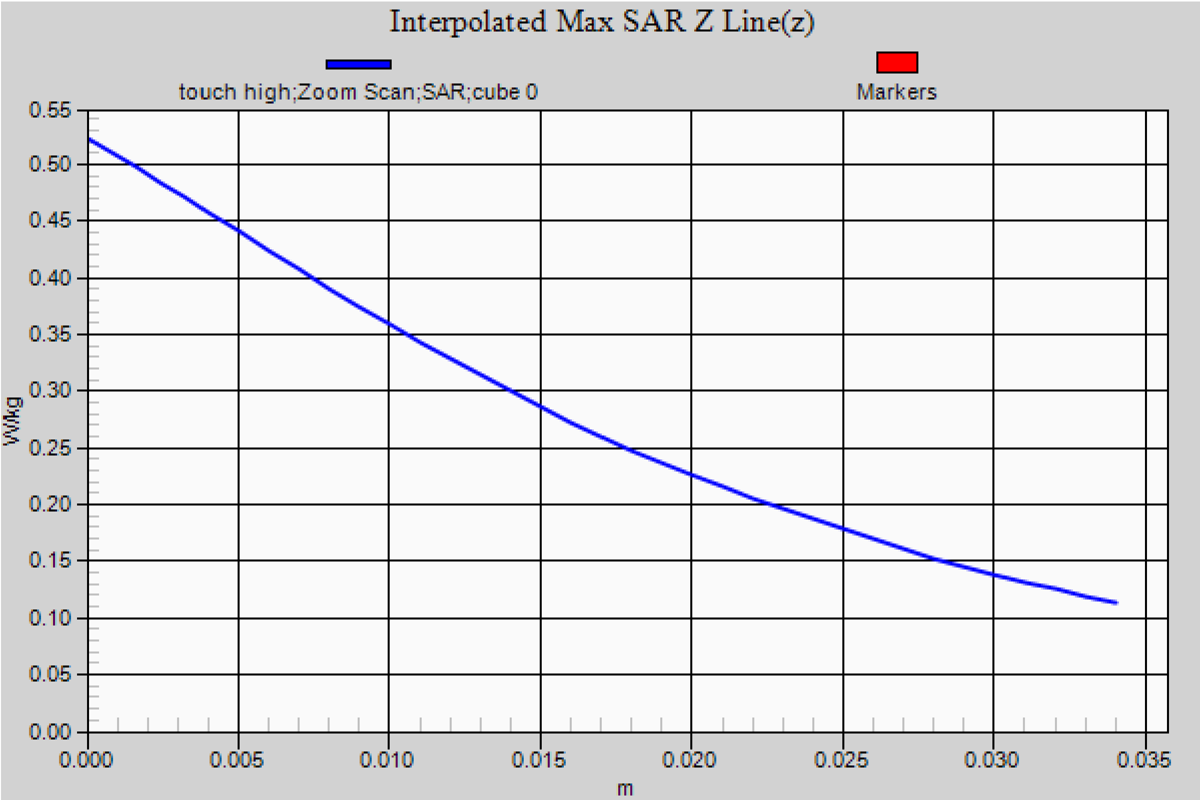
Peak SAR (extrapolated) = 0.522 W/kg

**SAR(1 g) = 0.436 W/kg; SAR(10 g) = 0.334 W/kg**

Maximum value of SAR (measured) = 0.460 W/kg




0 dB = 0.460 W/kg = -3.37 dBW/kg


Interpolated Max SAR Z Line(z)
touch high;Zoom Scan;SAR;cube 0
Markers
W/kg
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

**GSM850 towards ground mid**

Date/Time: 02/03/2015 17:19:53

Communication System: UID 0, GPRS/EGPRS(4UP) (0); Communication System Band: GSM850; Frequency: 836.6 MHz;Communication System PAR: 3.18 dB

Medium parameters used: f = 837 MHz; σ = 0.951 S/m; $\varepsilon_r$ = 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)

**body/towards ground mid/Area Scan (91x151x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.873 W/kg

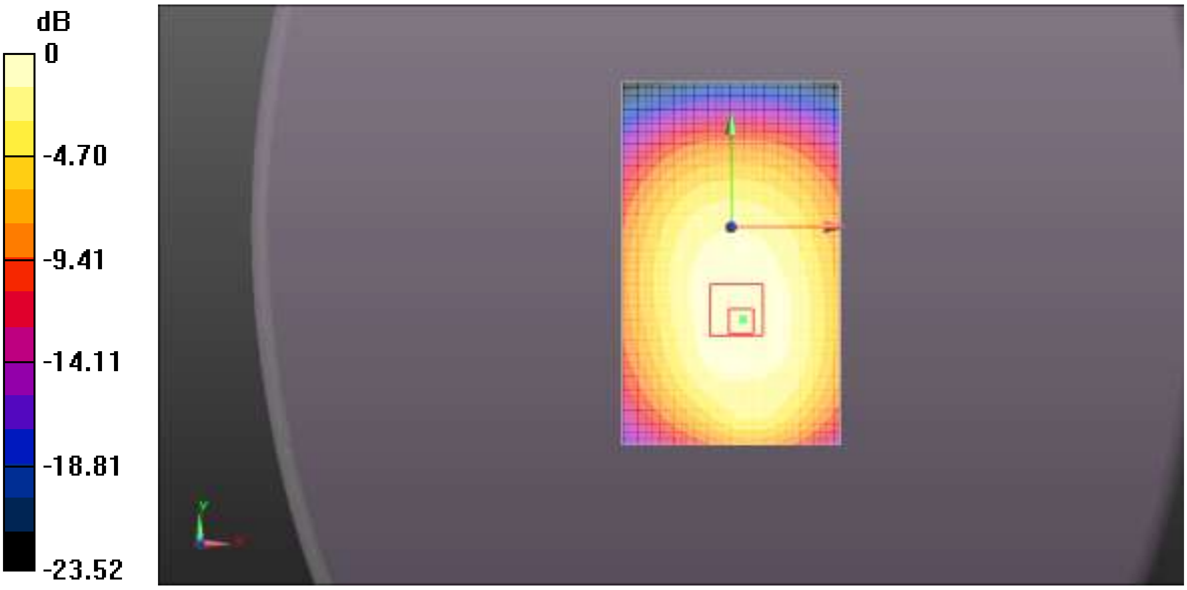
**body/towards ground mid/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 26.537 V/m; Power Drift = 0.20 dB

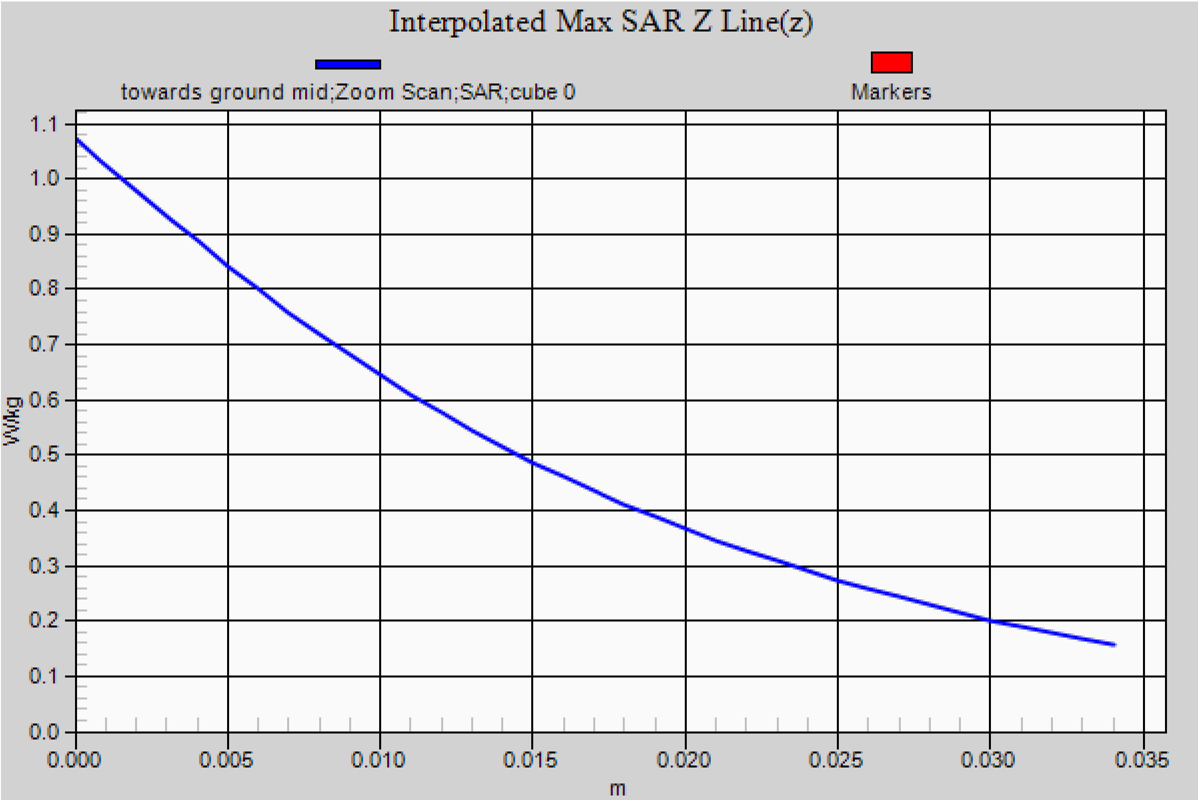
Peak SAR (extrapolated) = 1.07 W/kg

**SAR(1 g) = 0.846 W/kg; SAR(10 g) = 0.637 W/kg**

Maximum value of SAR (measured) = 0.892 W/kg




0 dB = 0.873 W/kg = -0.59 dBW/kg


Interpolated Max SAR Z Line(z)
towards ground mid;Zoom Scan;SAR;cube 0
Markers
W/kg
m
1.1
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
0.035

**GSM1900 left touch low**

Date/Time: 03/03/2015 14:15:05

Communication System: UID 0, GSM (0); Communication System Band: PCS1900(1850.0-1910.0MHz); Frequency: 1850.2 MHz;Communication System PAR: 9.191 dB

Medium parameters used (interpolated): f = 1850.2 MHz; $\sigma$ = 1.339 S/m; $\varepsilon_r$ = 39.255; $\rho$ = 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: 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 (91x151x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.289 W/kg

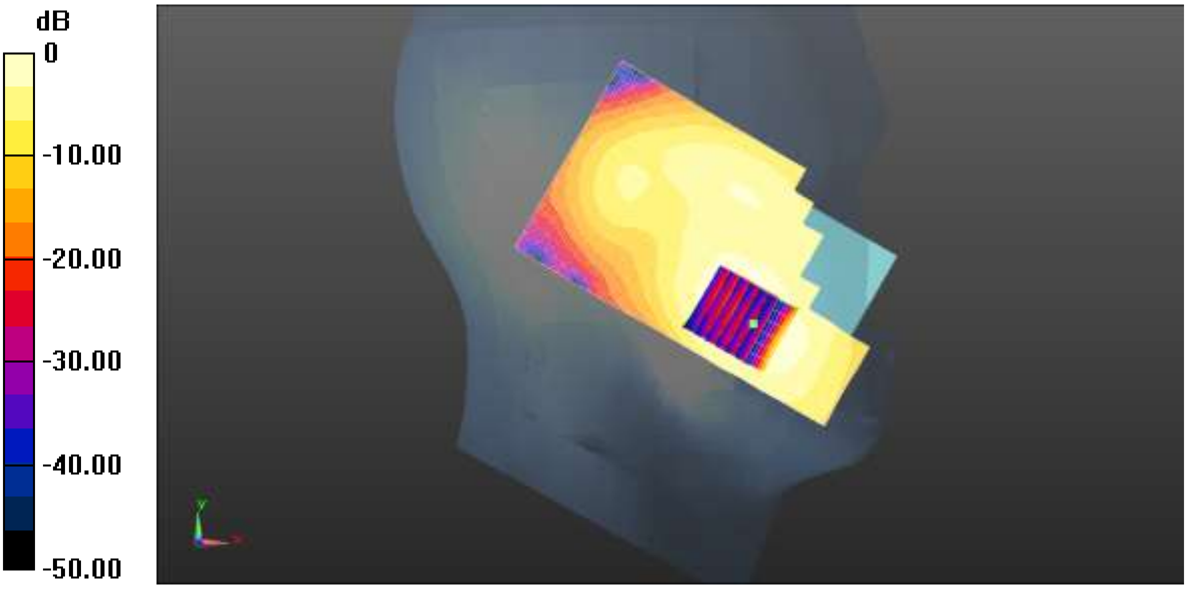
**left/touch low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.968 V/m; Power Drift = -0.05 dB

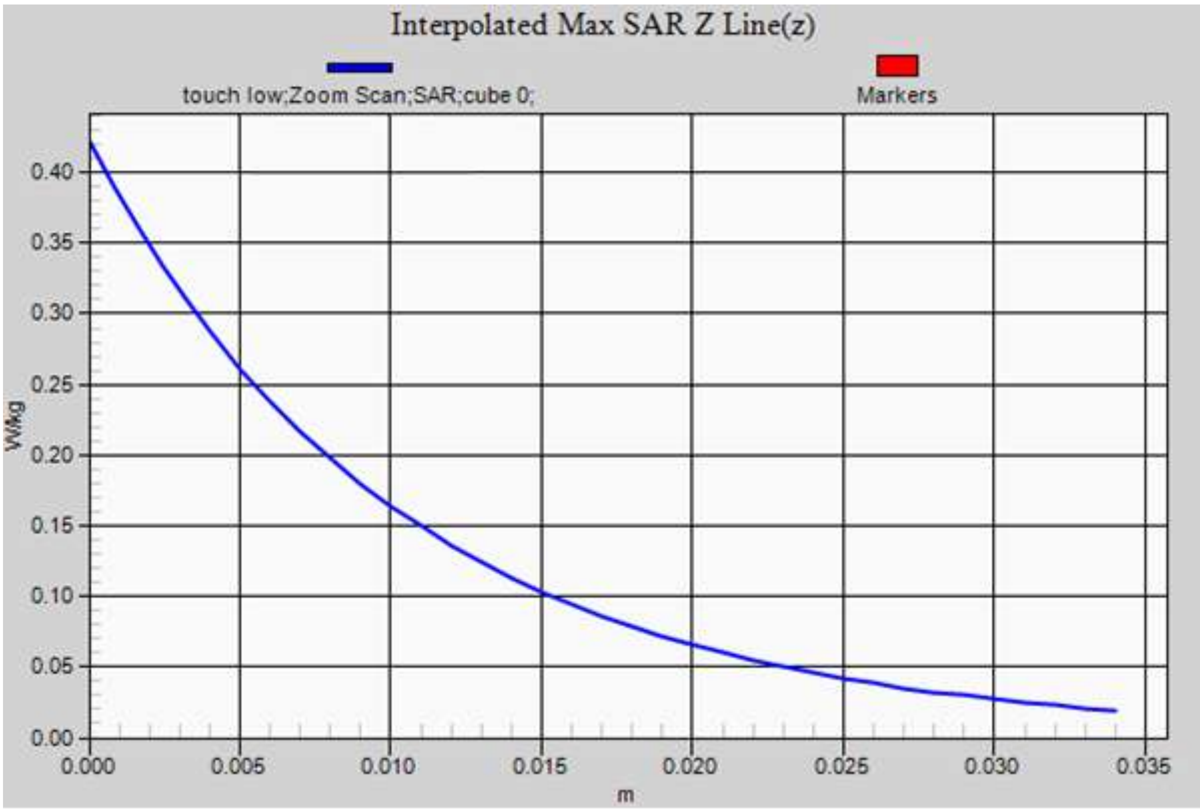
Peak SAR (extrapolated) = 0.421 W/kg

**SAR(1 g) = 0.263 W/kg; SAR(10 g) = 0.159 W/kg**

Maximum value of SAR (measured) = 0.288 W/kg




0 dB = 0.289 W/kg = -5.40 dBW/kg


Interpolated Max SAR Z Line(z)
touch low;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

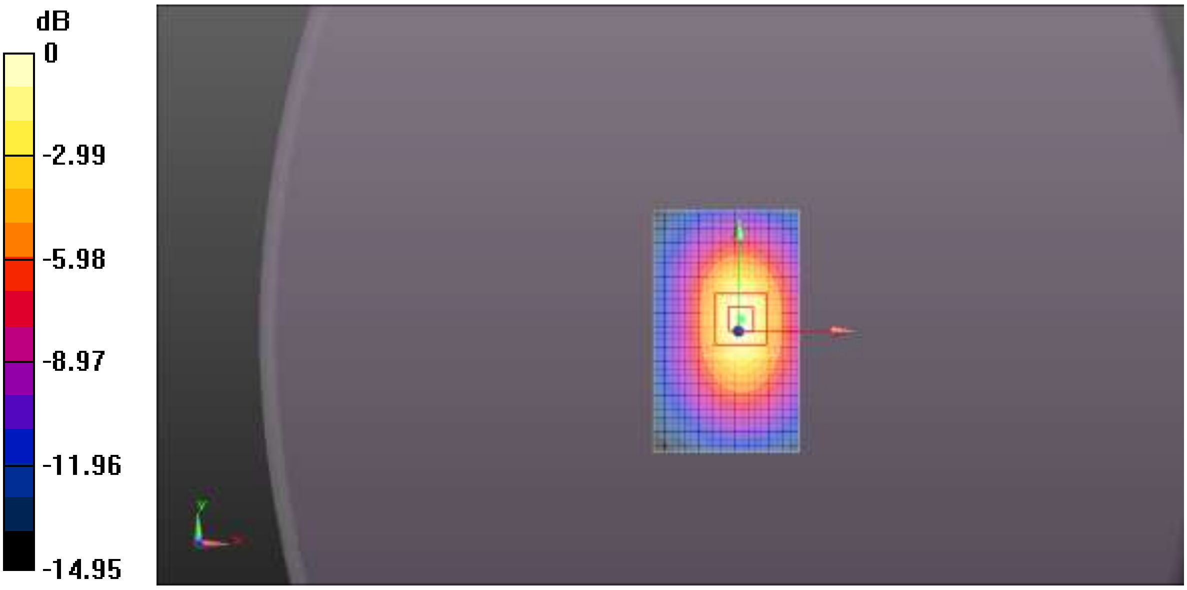
## GSM1900 front mid

Date/Time: 28/02/2015 10:27:14
Communication System: UID 0, GPRS/EGPRS(4UP) (0); Communication System Band: PCS1900; Frequency: 1880 MHz;Communication System PAR: 3.18 dB
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.477 S/m; $\varepsilon_r$ = 52.425; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE1528-2013)
DASY5 Configuration:

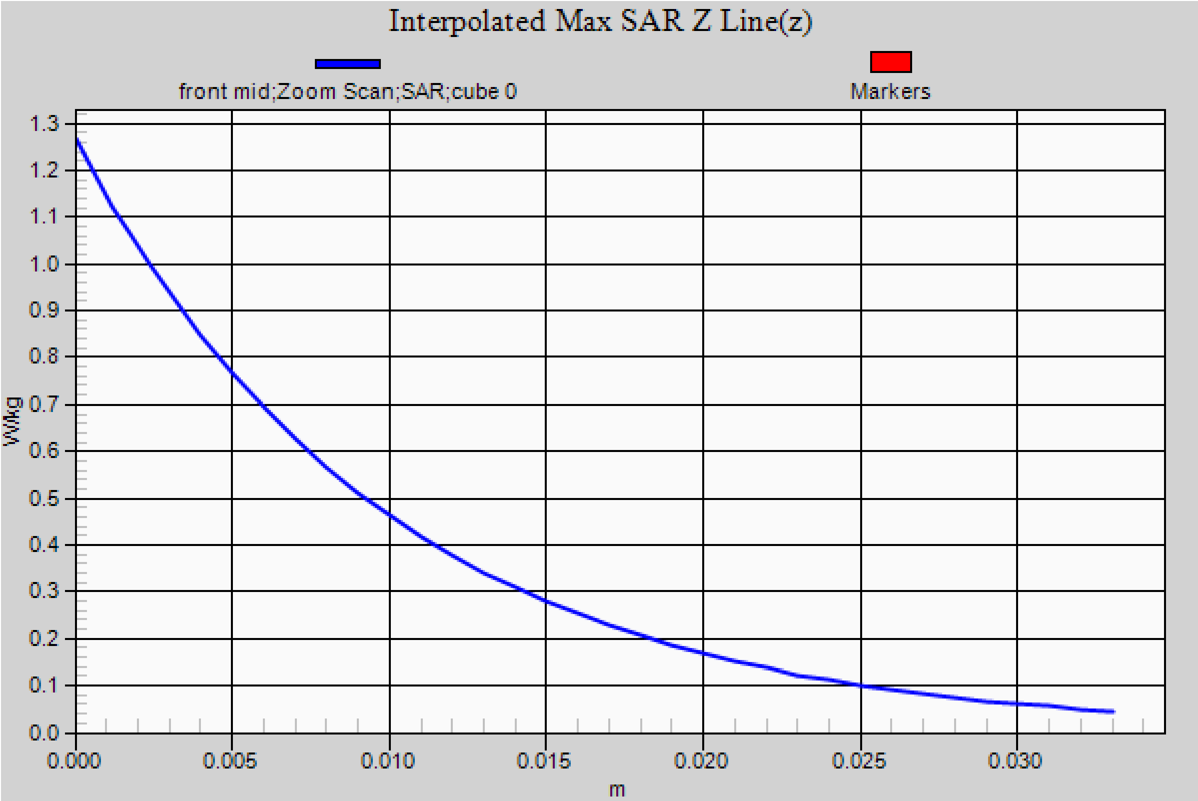
- Probe: ES3DV3 - SN3241; ConvF(4.85, 4.85, 4.85); Calibrated: 29/09/2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1226; Calibrated: 15/09/2014
- Phantom: ELI v4.0; Type: ELI4; Serial: TP:1086
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**body/front mid/Area Scan (61x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.869 W/kg

**body/front mid/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 25.342 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.27 W/kg
**SAR(1 g) = 0.748 W/kg; SAR(10 g) = 0.400 W/kg**
Maximum value of SAR (measured) = 0.940 W/kg




0 dB = 0.869 W/kg = -0.61 dBW/kg


Interpolated Max SAR Z Line(z)
front mid;Zoom Scan;SAR;cube 0
Markers
W/kg
1.3
1.2
1.1
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 left touch mid**

Date/Time: 03/03/2015 17:22:10

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; $\sigma$ = 1.364 S/m; $\varepsilon_r$ = 39.144; $\rho$ = 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: 4mm (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 mid/Area Scan (91x151x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.549 W/kg

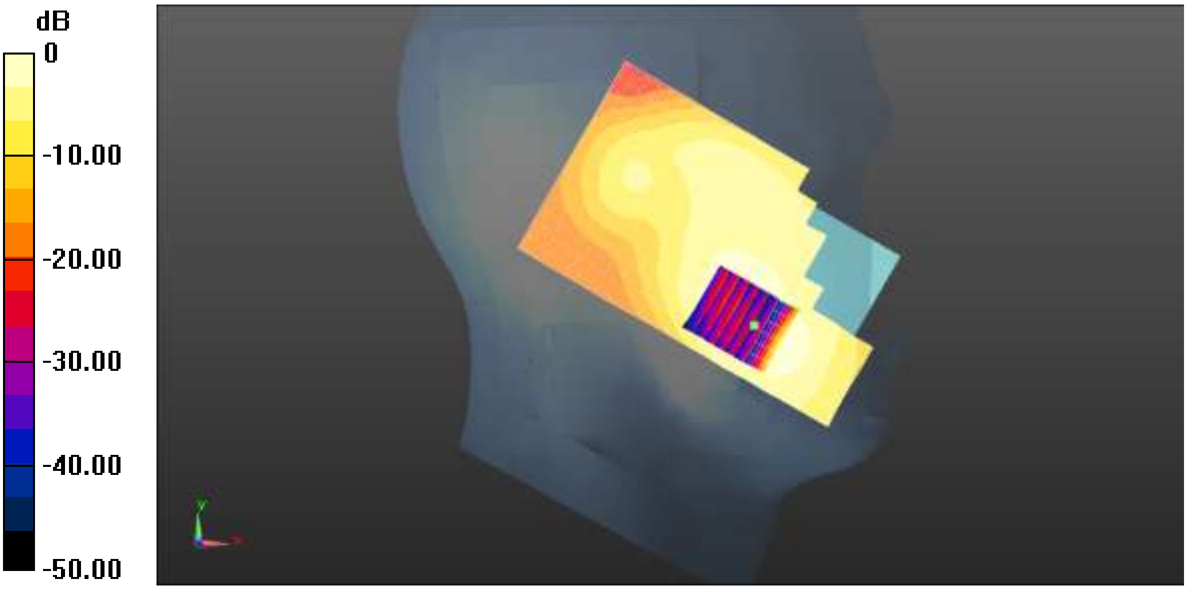
**left/touch mid/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.998 V/m; Power Drift = 0.19 dB

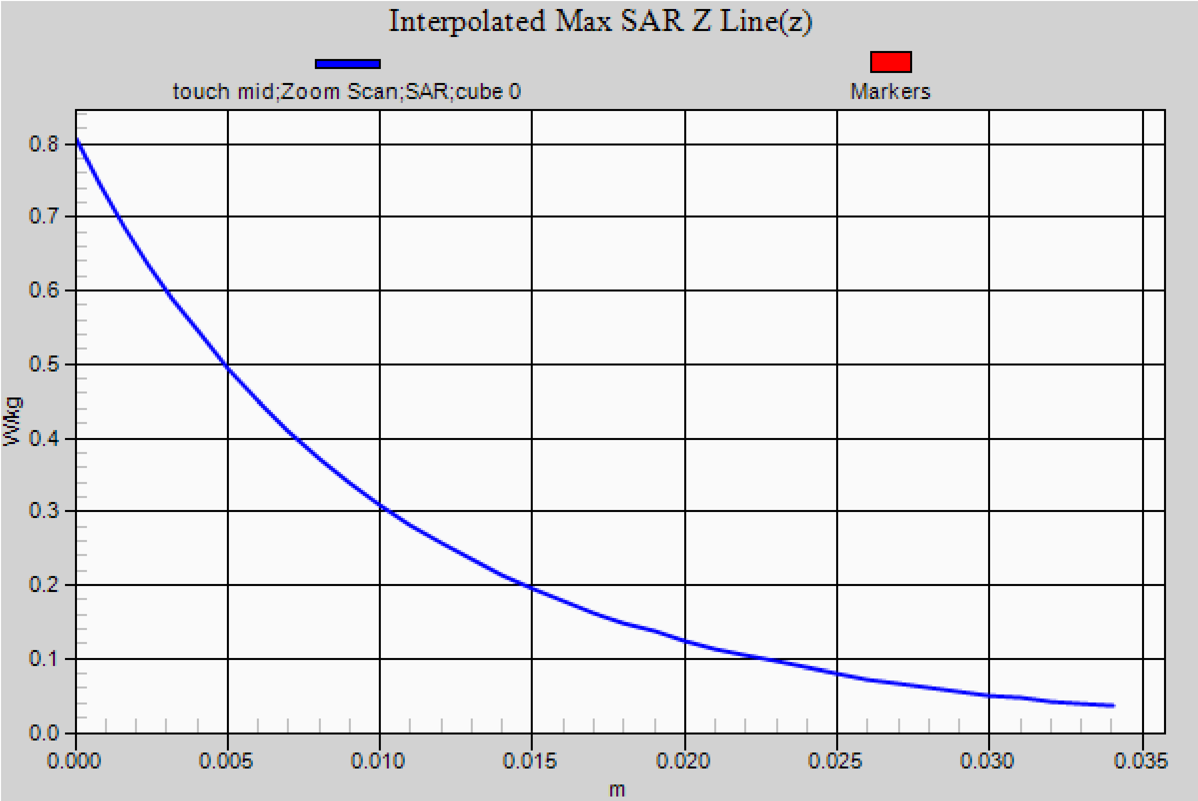
Peak SAR (extrapolated) = 0.806 W/kg

**SAR(1 g) = 0.500 W/kg; SAR(10 g) = 0.301 W/kg**

Maximum value of SAR (measured) = 0.548 W/kg




0 dB = 0.549 W/kg = -2.61 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
0.8
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

## WCDMA BAND II front high

Date/Time: 27/02/2015 20:35:19

Communication System: UID 0, WCDMA (0); Communication System Band: BAND 2; Frequency: 1907.6 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 1908 MHz; $\sigma$ = 1.502 S/m; $\varepsilon_r$ = 52.332; $\rho$ = 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/Area Scan (61x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.11 W/kg

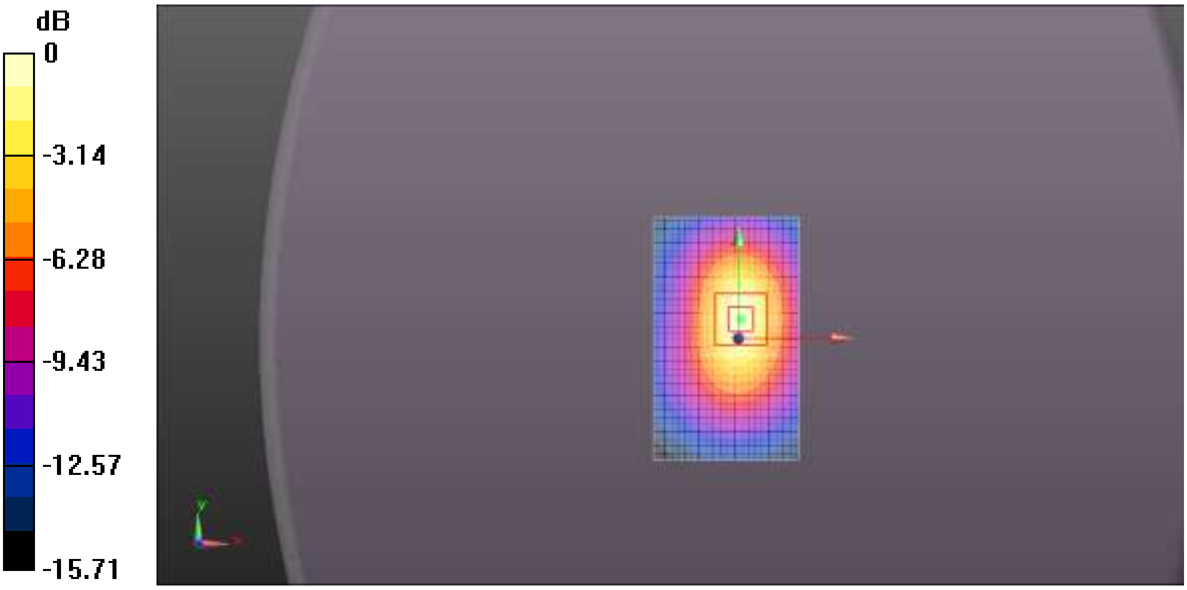
**body/front high/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 27.254 V/m; Power Drift = 0.01 dB

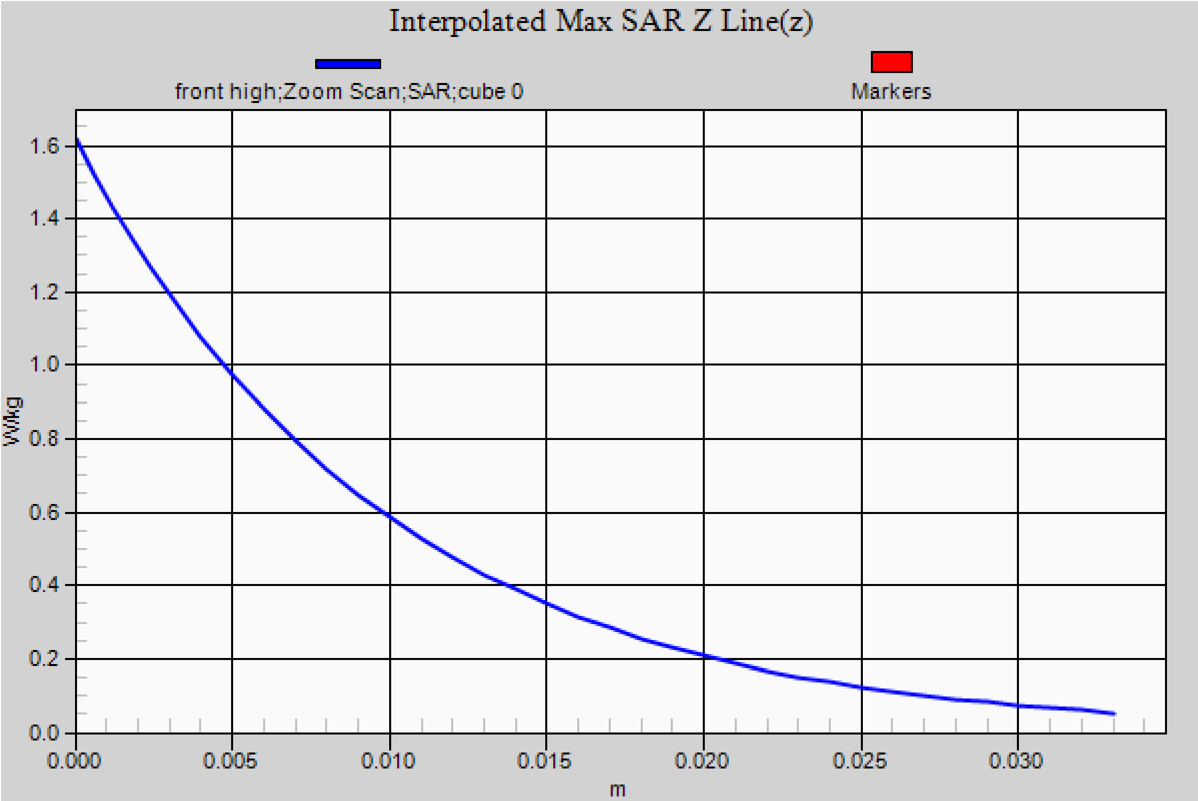
Peak SAR (extrapolated) = 1.62 W/kg

**SAR(1 g) = 0.955 W/kg; SAR(10 g) = 0.506 W/kg**

Maximum value of SAR (measured) = 1.19 W/kg




0 dB = 1.11 W/kg = 0.45 dBW/kg


Interpolated Max SAR Z Line(z)
front high;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
0.025
0.030
m

## WCDMA BAND V right touch low

Date/Time: 02/03/2015 11:05:03

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; $\sigma$ = 0.871 S/m; $\varepsilon_r$ = 41.789; $\rho$ = 1000 kg/$m^3$

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(9.08, 9.08, 9.08); Calibrated: 02/09/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- 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 (91x151x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.369 W/kg

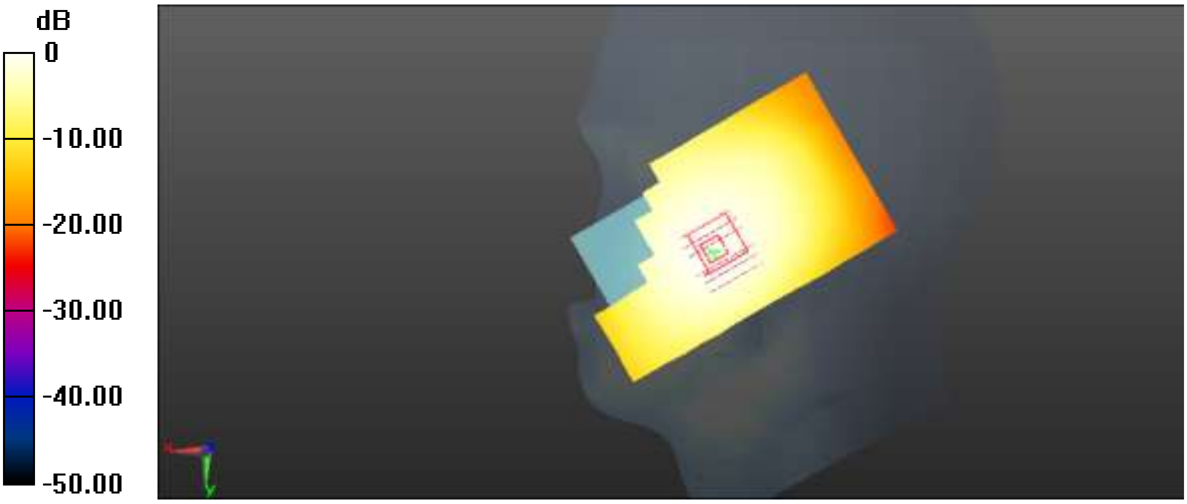
**right/touch low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.118 V/m; Power Drift = 0.13 dB

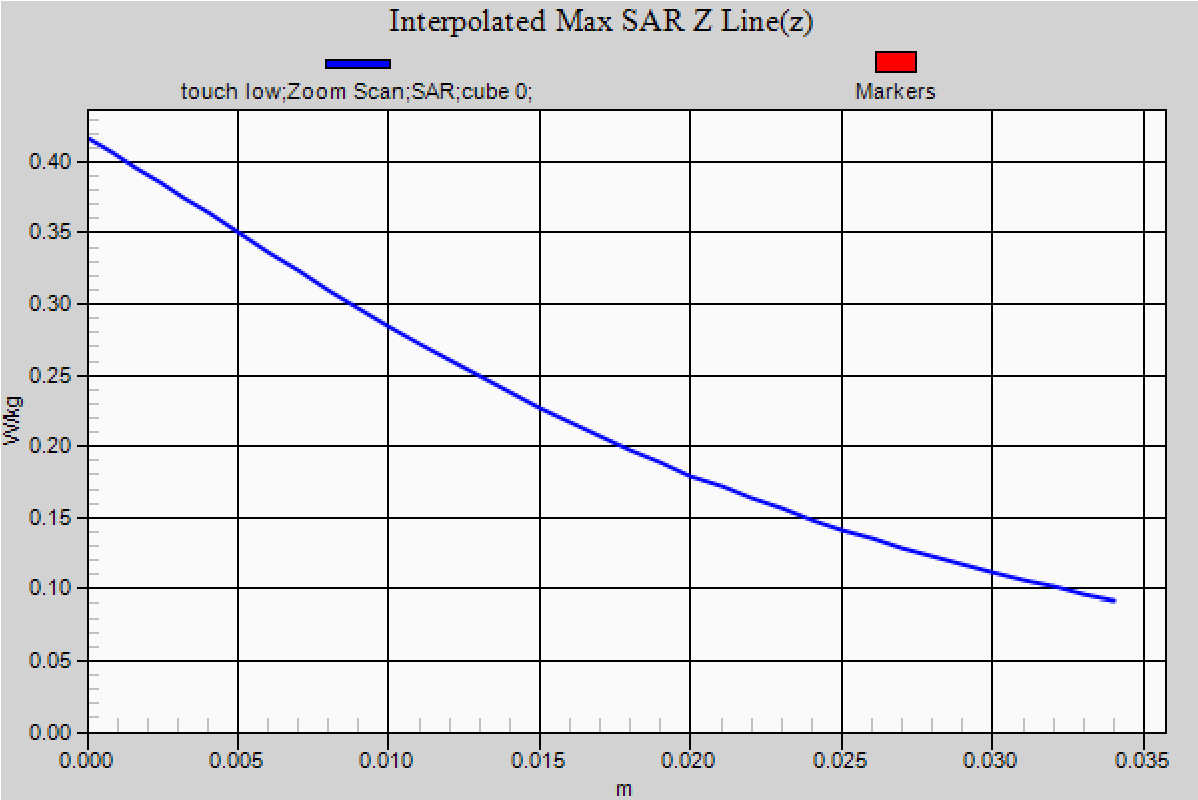
Peak SAR (extrapolated) = 0.416 W/kg

**SAR(1 g) = 0.348 W/kg; SAR(10 g) = 0.268 W/kg**

Maximum value of SAR (measured) = 0.366 W/kg




0 dB = 0.369 W/kg = -4.33 dBW/kg


Interpolated Max SAR Z Line(z)
touch low;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

**WCDMA BAND V towards ground low**

Date/Time: 28/02/2015 21:05:22

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 = 0.936 S/m; $\varepsilon_r$ = 54.3; 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)

**body/towards ground low/Area Scan (91x151x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.566 W/kg

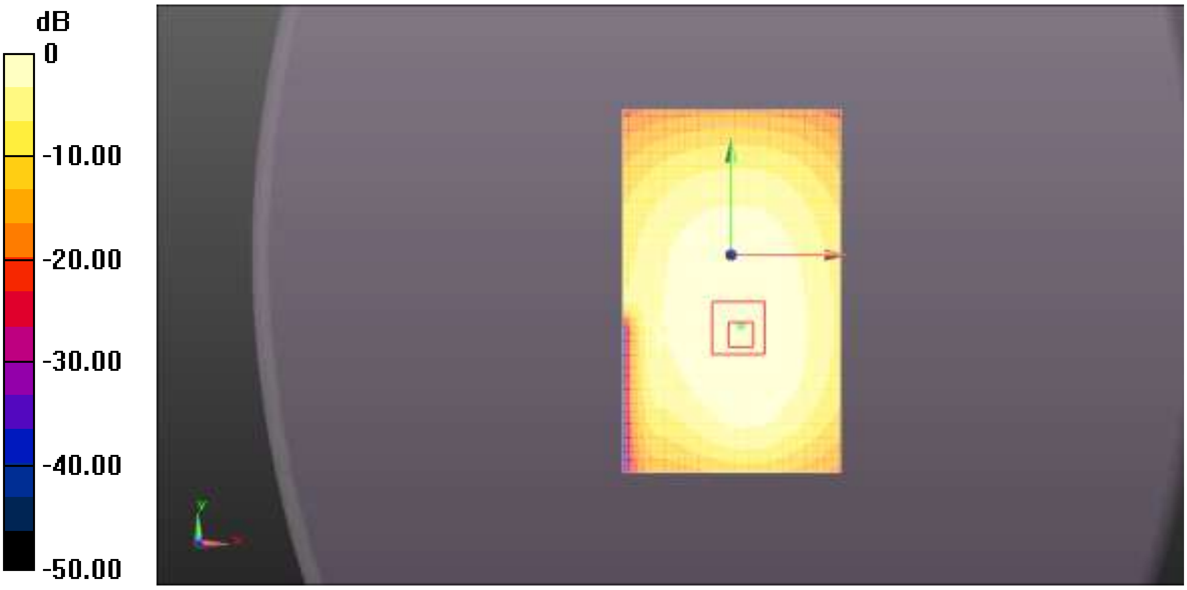
**body/towards ground low/Zoom Scan (7x8x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.360 V/m; Power Drift = -0.01 dB

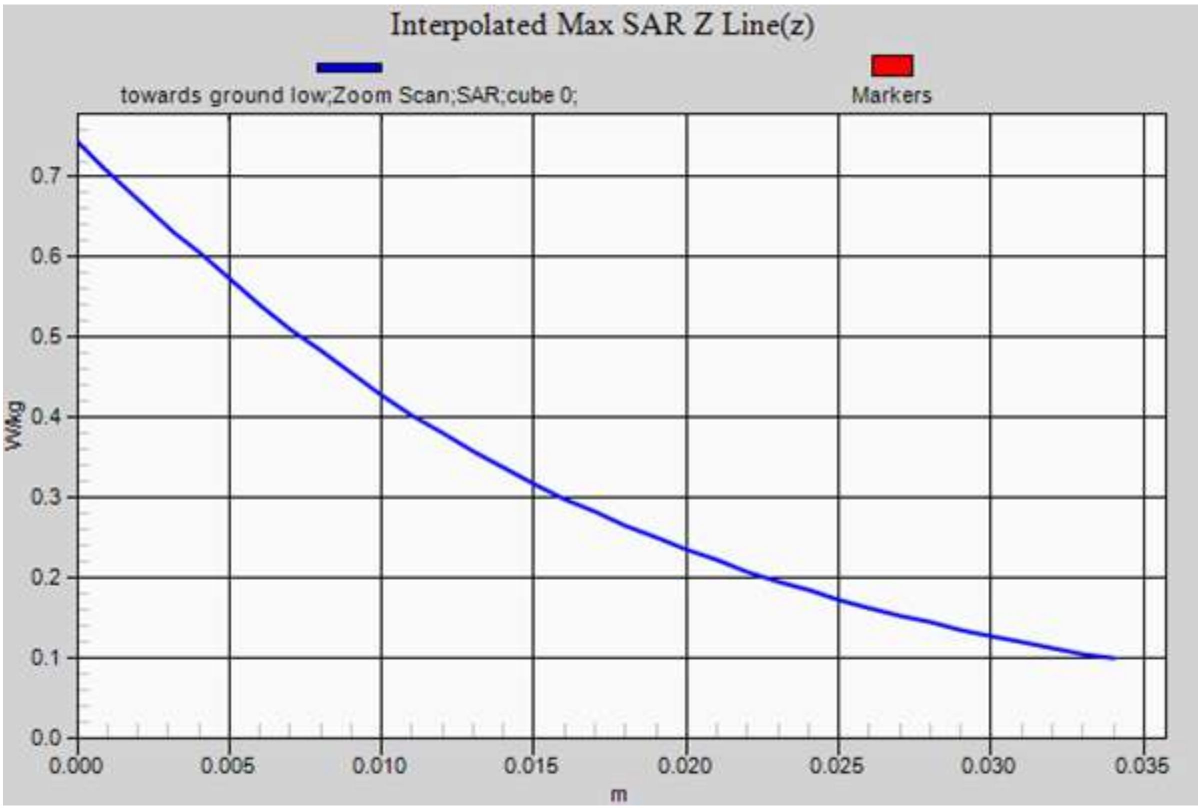
Peak SAR (extrapolated) = 0.743 W/kg

**SAR(1 g) = 0.580 W/kg; SAR(10 g) = 0.429 W/kg**

Maximum value of SAR (measured) = 0.613 W/kg




0 dB = 0.566 W/kg = -2.47 dBW/kg


Interpolated Max SAR Z Line(z)
towards ground 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

**802.11b Data Rate: 1 Mbps left touch high**

Date/Time: 05/03/2015 16:15:41

Communication System: UID 0, 802.11b/g/n 2.45GHz (0); Communication System Band: 2400-2483.5; Frequency: 2462 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 2462 MHz; $\sigma$ = 1.789 S/m; $\varepsilon_r$ = 37.883; $\rho$ = 1000 kg/m$^3$

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE1528-2013)

DASY5 Configuration:

- Probe: EX3DV4 - SN3717; ConvF(7.24, 7.24, 7.24); Calibrated: 02/09/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1327; Calibrated: 05/05/2014
- Phantom: SAM 1; Type: SAM; Serial: TP:1702
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

**left/touch high/Area Scan (91x151x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.349 W/kg

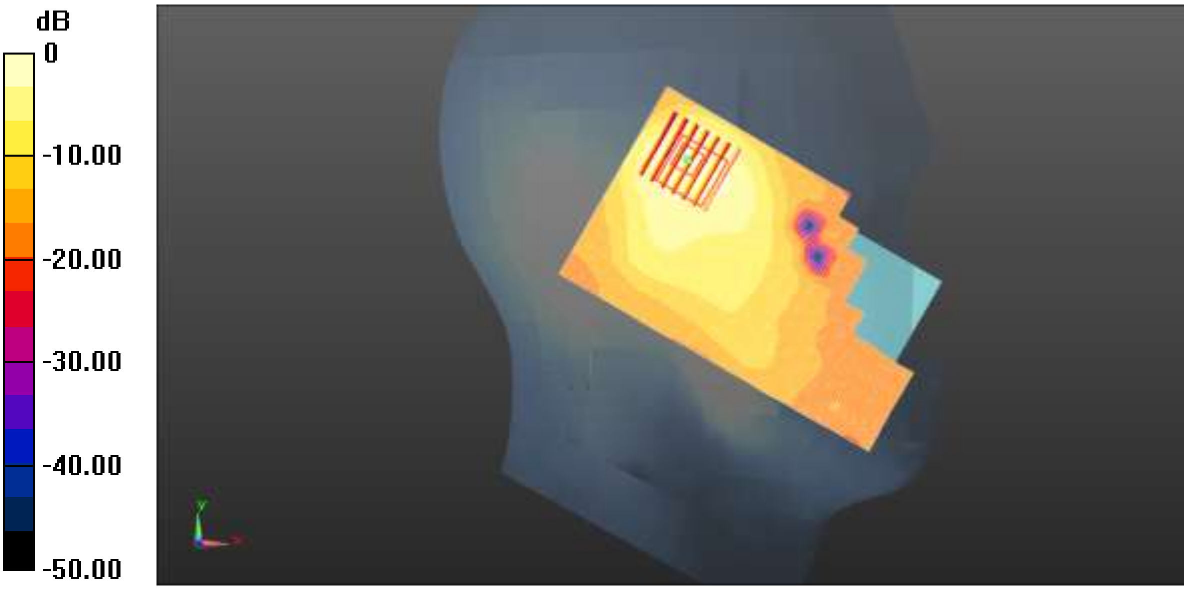
**left/touch high/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.205 V/m; Power Drift = -0.07 dB

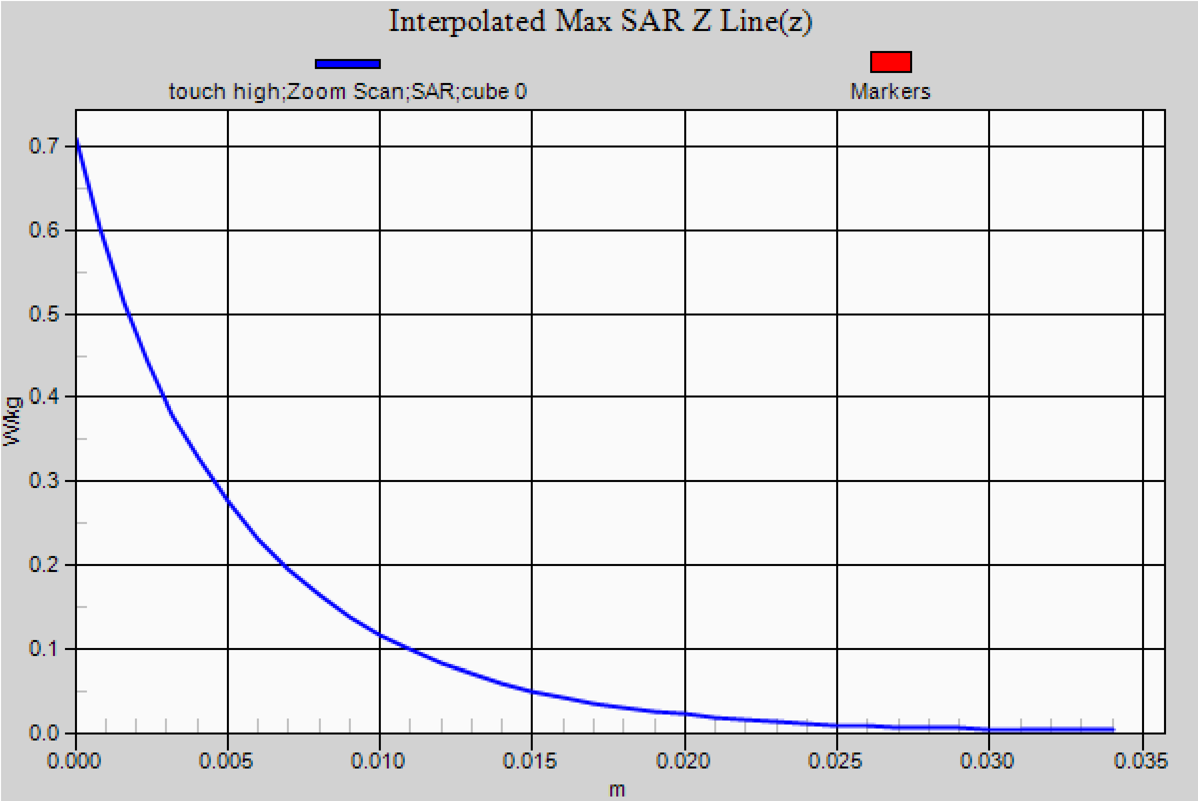
Peak SAR (extrapolated) = 0.709 W/kg

**SAR(1 g) = 0.294 W/kg; SAR(10 g) = 0.134 W/kg**

Maximum value of SAR (measured) = 0.334 W/kg




0 dB = 0.349 W/kg = -4.57 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

**802.11b Data Rate: 1 Mbps towards ground high**

Date/Time: 09/03/2015 09:12:01

Communication System: UID 0, 802.11b/g/n 2.45GHz (0); Communication System Band: 2400-2483.5; Frequency: 2462 MHz;Communication System PAR: 0 dB

Medium parameters used: f = 2462 MHz; $\sigma$ = 1.934 S/m; $\varepsilon_r$ = 51.886; $\rho$ = 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: 05/05/2014
- 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 high/Area Scan (91x151x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.0869 W/kg

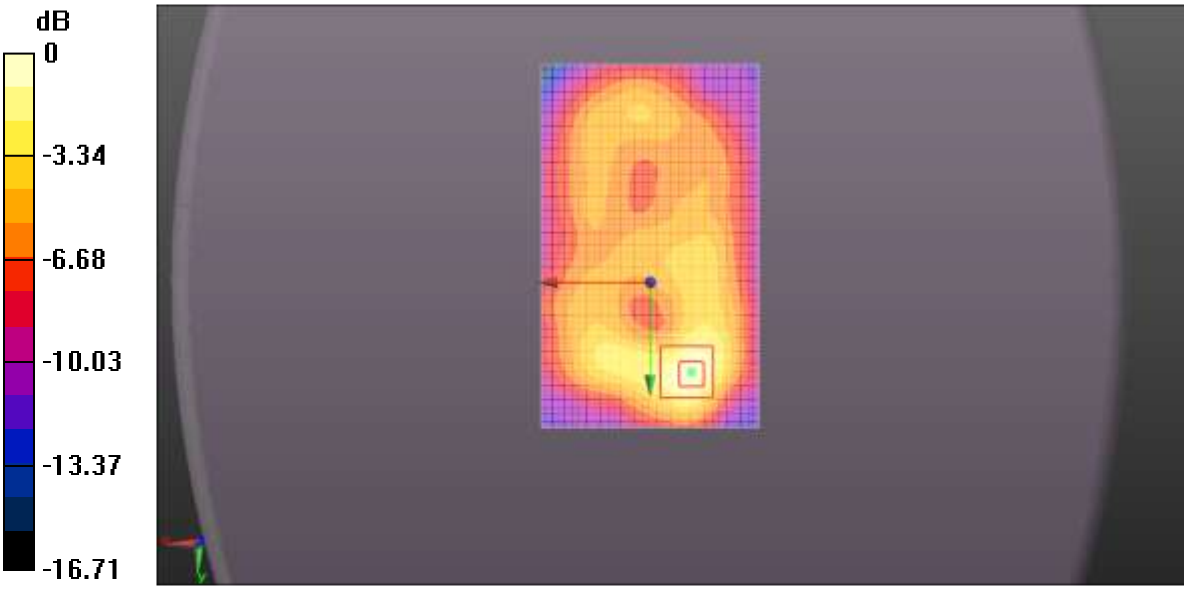
**body/towards ground high/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.853 V/m; Power Drift = -0.18 dB

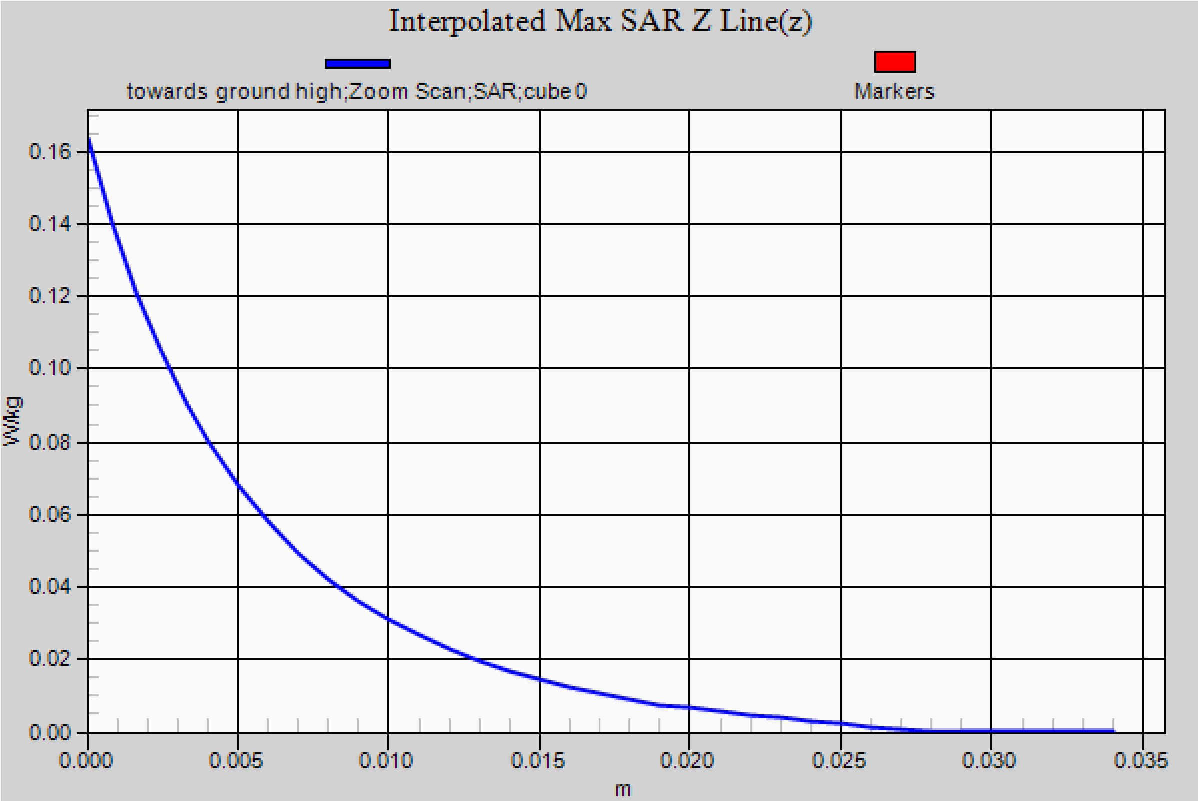
Peak SAR (extrapolated) = 0.163 W/kg

**SAR(1 g) = 0.072 W/kg; SAR(10 g) = 0.034 W/kg**

Maximum value of SAR (measured) = 0.0811 W/kg




0 dB = 0.0869 W/kg = -10.61 dBW/kg


Interpolated Max SAR Z Line(z)
towards ground high;Zoom Scan;SAR;cube 0
Markers
W/kg
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

# ANNEX B: Calibration Certificate

## Annex B.1 Probe Calibration Certificate

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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<br>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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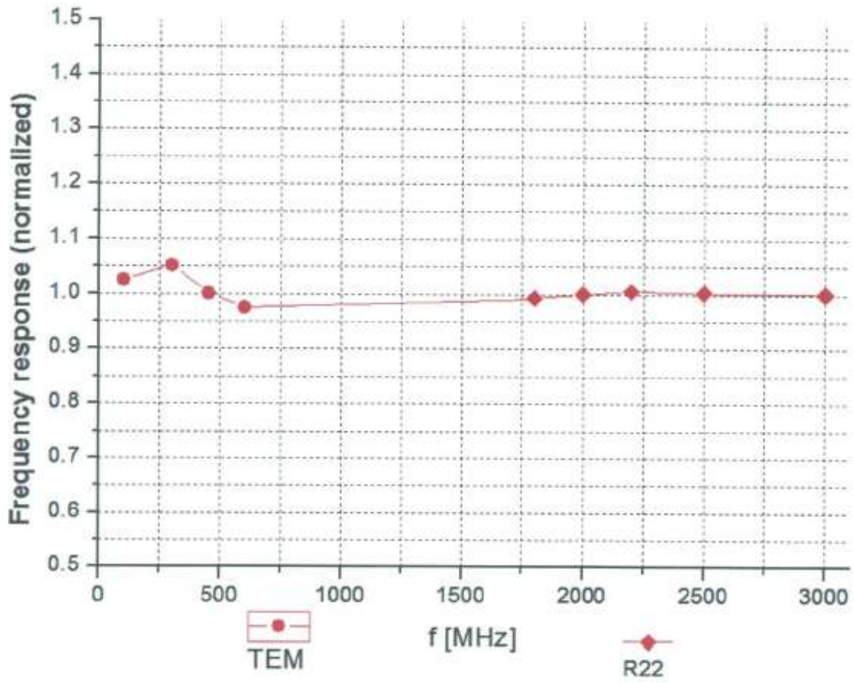
## Frequency Response of E-Field

**(TEM-Cell: ifi110 EXX, Waveguide: R22)**




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

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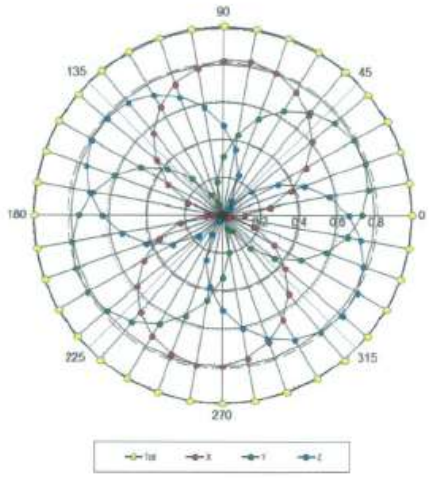
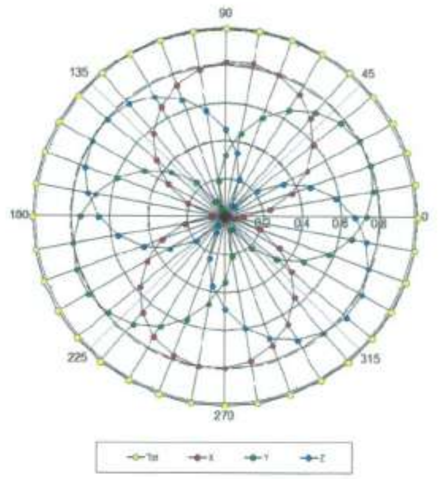
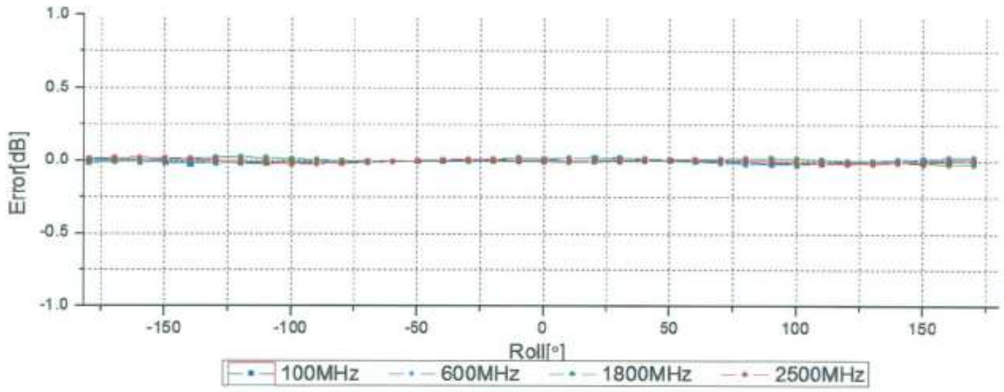
# Receiving Pattern (Φ), θ=0°

## f=600 MHz, TEM




## f=1800 MHz, R22




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

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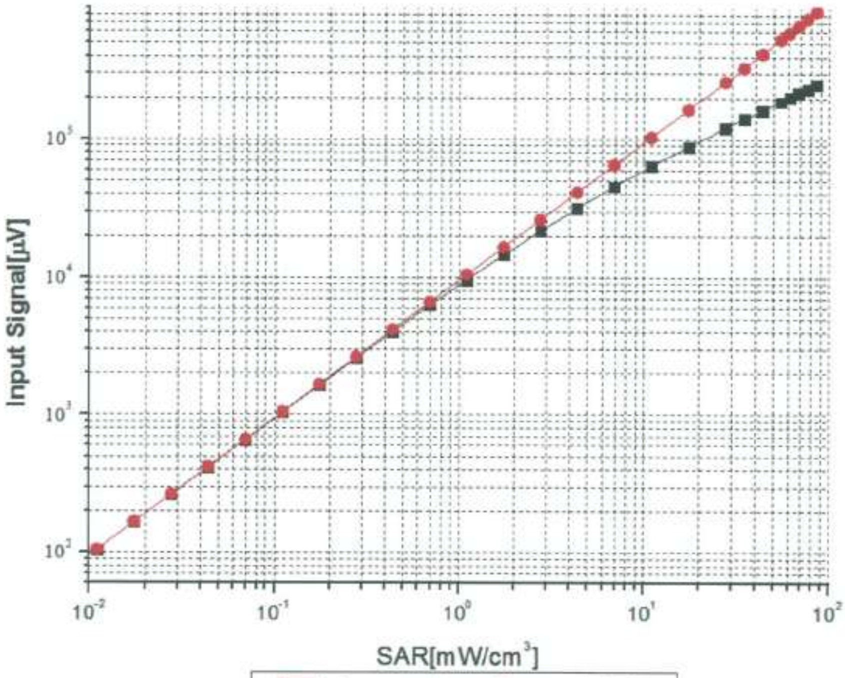
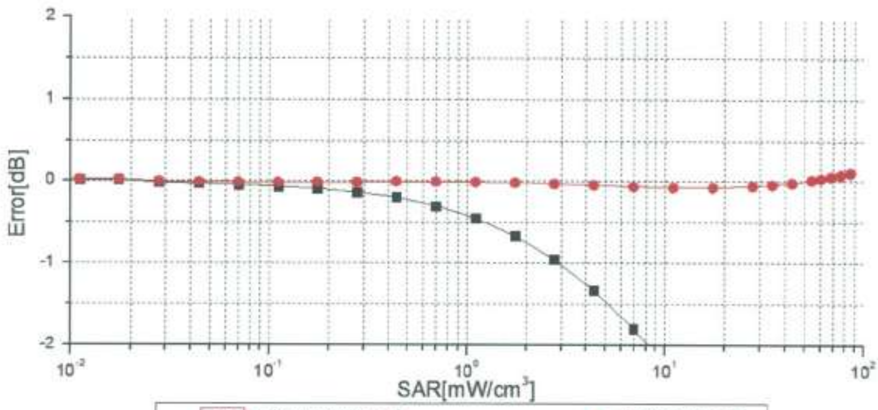
## Dynamic Range f($SAR_{head}$)
## (TEM cell, f = 900 MHz)




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

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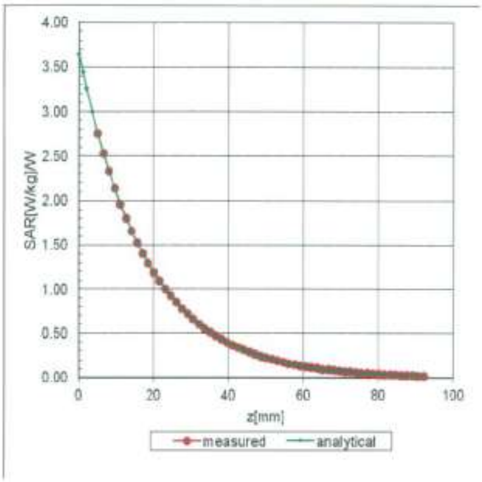
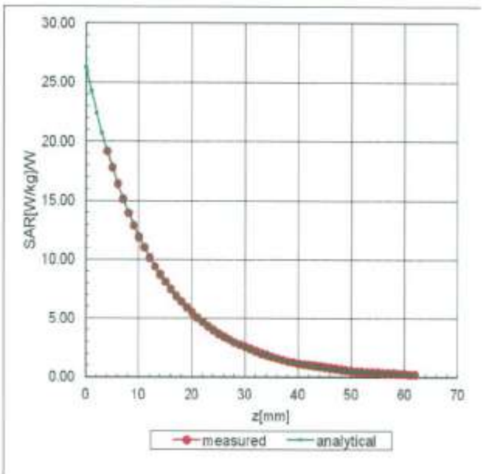
## Conversion Factor Assessment

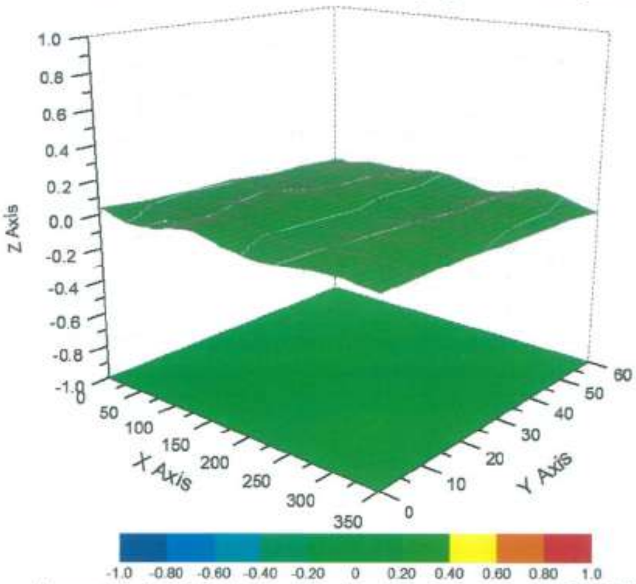
**f=900 MHz, WGLS R9(H_convF)**




**f=1750 MHz, WGLS R22(H_convF)**




## 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 |