# SAR TEST REPORT

## No. I14Z47766-SEM01

**For**

**TCT Mobile Limited**

**HSUPA/HSDPA/UMTS dual-band/GSM quad-band mobile phone**

**Model Name: 4015A,4016A**

**With**

**Hardware Version:PIO**

**Software Version: v6CGK**

**FCC ID: RAD406**

**Issued Date: 2014-12-15**

TESTING
CNAS L0570

**Note:**

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

**Test Laboratory:**

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## Revision Version

| Report Number | Revision | Issue Date | Description |
|---|---|---|---|
| I14Z47766-SEM01 | Rev.0 | 2014-12-05 | Initial creation of test report |
| I14Z47766-SEM01 | Rev.1 | 2014-12-15 | Correction of table 8.1 on page 18, 2450 MHz system verification results |

# TABLE OF CONTENT

# 1 Test Laboratory

## 1.1 Testing Location

| | |
|---|---|
| Company Name: | CTTL(huayuan North Road) |
| Address: | No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China100191 |

## 1.2 Testing Environment

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

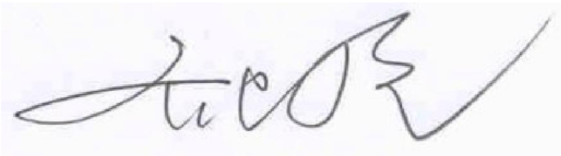
## 1.3 Project Data

| | |
|---|---|
| Project Leader: | Qi Dianyuan |
| Test Engineer: | Lin Xiaojun |
| Testing Start Date: | September 26, 2014 |
| Testing End Date: | December 4, 2014 |

## 1.4 Signature

**Lin Xiaojun**

**(Prepared this test report)**



**Qi Dianyuan**

**(Reviewed this test report)**

**Xiao Li**

**Deputy Director of the laboratory**

**(Approved this test report)**

## 2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for TCT Mobile LimitedHSUPA/HSDPA/UMTS dual-band/GSM quad-band mobile phone 4015A,4016A are as follows:

**Table 2.1:HighestReported SAR(1g)**

| Exposure Configuration | Technology Band | Highest Reported SAR 1g(W/Kg) | Equipment Class |
|---|---|---|---|
| Head (Separation Distance 0mm) | GSM 850 | 0.81 | PCE |
| | PCS 1900 | 0.89 | |
| | UMTS FDD 5 | 0.91 | |
| | UMTS FDD 2 | 1.15 | |
| | WLAN 2.4 GHz | 0.21 | DTS |
| Body-worn (Separation Distance 10mm) | GSM 850 | 0.8 | PCE |
| | PCS 1900 | 0.98 | |
| | UMTS FDD 5 | 1.14 | |
| | UMTS FDD 2 | **1.25** | |
| | WLAN 2.4 GHz | 0.10 | DTS |

The SAR values found for the Mobile Phone are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1g tissue according to the ANSI C95.1-1999.

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

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

The measurement together with the test system set-up is described in annex C of this test report. A detailed description of the equipment under test can be found in chapter 4 of this test report.
The highest reported SAR value is obtained at the case of **(Table 2.1),** and the values are**: 1.25W/kg(1g).**

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

| | Position | Main antenna | WiFi | Sum |
|---|---|---|---|---|
| **Highest reported SAR value for Head** | Left hand, Touch cheek | 1.15 | 0.21 | **1.36** |
| **Highest reported SAR value for Body** | Bottom Side | 1.25 | / | **1.25** |
| | Rear | 1.21 | 0.10 | **1.31** |

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

| | Position | Main antenna | BT* | Sum |
|---|---|---|---|---|
| **Highest reported SAR value for Head** | Left hand, Touch cheek | 1.15 | 0.29 | **1.44** |
| **Highest reported SAR value for Body** | Bottom | 1.25 | 0.15 | **1.40** |

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

According to the above tables, the highest sum of reported SAR values is **1.44 W/kg (1g)**. The detail for simultaneous transmission consideration isdescribed in chapter 13.

# 3 Client Information

## 3.1 Applicant Information

| | |
|---|---|
| Company Name: | TCT Mobile Limited |
| Address /Post: | 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203 |
| City: | Shanghai |
| Postal Code: | 201203 |
| Country: | P.R.China |
| Contact: | Gong Zhizhou |
| Email: | zhizhou.gong@tcl.com |
| Telephone: | 0086-21-61460890 |
| Fax: | 0086-21-61460602 |

## 3.2 Manufacturer Information

| | |
|---|---|
| Company Name: | TCT Mobile Limited |
| Address /Post: | 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203 |
| City: | Shanghai |
| Postal Code: | 201203 |
| Country: | P.R.China |
| Contact: | Gong Zhizhou |
| Email: | zhizhou.gong@tcl.com |
| Telephone: | 0086-21-61460890 |
| Fax: | 0086-21-61460602 |

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

## 4.1 About EUT

| | |
|---|---|
| Description: | HSUPA/HSDPA/UMTS dual-band/GSM quad-band mobile phone |
| Model Name: | 4015A,4016A |
| Operating mode(s): | GSM 850/900/1800/1900, WCDMA 850/1900, BT, Wi-Fi |
| Tested Tx Frequency: | 825 – 848.8 MHz (GSM 850) |
| | 1850.2 – 1910 MHz (GSM 1900) |
| | 826.4–846.6 MHz (WCDMA850 Band V) |
| | 1852.4–1907.6 MHz (WCDMA1900 Band II) |
| | 2412 – 2462 MHz (Wi-Fi 2.4G) |
| GPRS/EGPRS Multislot Class: | 12 |
| GPRS capability Class: | B |
| WCDMA Category: | USAT: 4 |
| | HSDPA: 10 |
| | HSUPA: 6 |
| | HSPA+: 14 |
| Release Version: | GSM: Rel5 |
| | GPRS: Rel5 |
| | UMTS: Rel7 |
| Test device Production information: | Production unit |
| Device type: | Portable device |
| Antenna type: | Integrated antenna |
| Accessories/Body-wornconfigurations: | Headset |
| Hotspot mode: | Support simultaneous transmission of hotspot and voice(or data) |
| Form factor: | 112.5 mm ×62 mm |

## 4.2 Internal Identification of EUT used during the test

| EUT ID* | SN or IMEI | HW Version | SW Version |
|---|---|---|---|
| EUT1 | 014199007787215 | PIO | v6CGK |
| EUT2 | 014199007788536 | PIO | v6CGK |

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

**Note:** It is performed to test SAR with the EUT1and conducted power with the EUT 2

### 4.3 Internal Identification of AE used during the test

| AE ID* | Description | Model | SN | Manufacturer |
|---|---|---|---|---|
| AE1 | Battery | CAB31P0000C1 | / | BYD |
| AE2 | Battery | CAB31P0000C2 | / | BAK |
| AE3 | Battery | CAB31P0000C3 | / | SCUD |
| AE4 | Headset | CCB3160A11C1 | / | Juwei |
| AE5 | Headset | CCB3160A11C4 | / | Meihao |
| AE6 | Headset | CCB3160A15C1 | / | Juwei |
| AE7 | Headset | CCB3160A15C4 | / | Meihao |

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

**Note:** AE4 is same as AE6, so they can use the same results.AE5 is same as AE7, so they can use the same results.

## 5 TEST METHODOLOGY

### 5.1 Applicable Limit Regulations

**ANSI C95.1–1999:**IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

### 5.2 Applicable Measurement Standards

**IEEE 1528–2013:** Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Headfrom Wireless Communications Devices:ExperimentalTechniques.
**KDB447498 D01:General RF Exposure Guidance v05r02:**Mobile and Portable Devices RF Exposure ProceduresandEquipment Authorization Policies.
**KDB648474 D04 Handset SAR v01r02:**SAR Evaluation Considerations for Wireless Handsets.
**KDB941225 D06 Hotspot Mode SAR v01r01:** SAR Evaluation Procedures for Portable Devices withWireless Router Capabilities
**KDB248227 D01 SAR meas for 802 11 a b g v01r02 :** SAR measurement procedures for 802.112abg transmitters.
**KDB 865664 D01SAR measurement 100 MHz to 6 GHz v01r03:**SAR Measurement Requirements for 100 MHz to 6 GHz.
**KDB 865664 D02RF Exposure Reporting v01r01:**RF Exposure Compliance Reporting and Documentation Considerations

# 6 Specific Absorption Rate(SAR)

## 6.1 Introduction

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

## 6.2 SAR Definition

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

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

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

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

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

Where: C is the specific head capacity, $\delta T$ is the temperature rise and $\delta t$ is the exposure duration, or related to the electrical field in the tissue by

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

Where: $\sigma$ is the conductivity of the tissue, $\rho$ is the mass density of tissue and $E$ is the RMS electrical field strength.

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

# 7 Tissue Simulating Liquids

## 7.1 Targets for tissue simulating liquid

**Table 7.1: Targets for tissue simulating liquid**

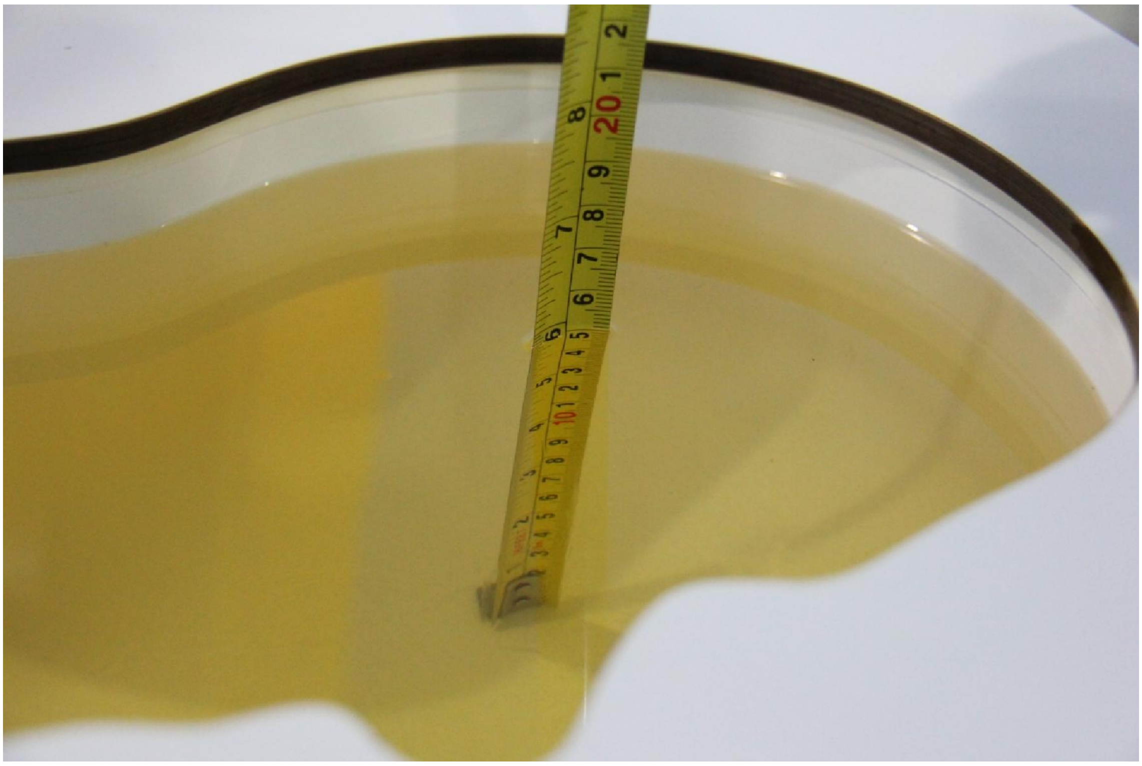
| Frequency (MHz) | Liquid Type | Conductivity (σ) | ± 5% Range | Permittivity (ε) | ± 5% Range |
|---|---|---|---|---|---|
| 835 | Head | 0.90 | 0.86～0.95 | 41.5 | 39.4～43.6 |
| 835 | Body | 0.97 | 0.92～1.02 | 55.2 | 52.4～58.0 |
| 1900 | Head | 1.40 | 1.33～1.47 | 40.0 | 38.0～42.0 |
| 1900 | Body | 1.52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

## 7.2 Dielectric Performance

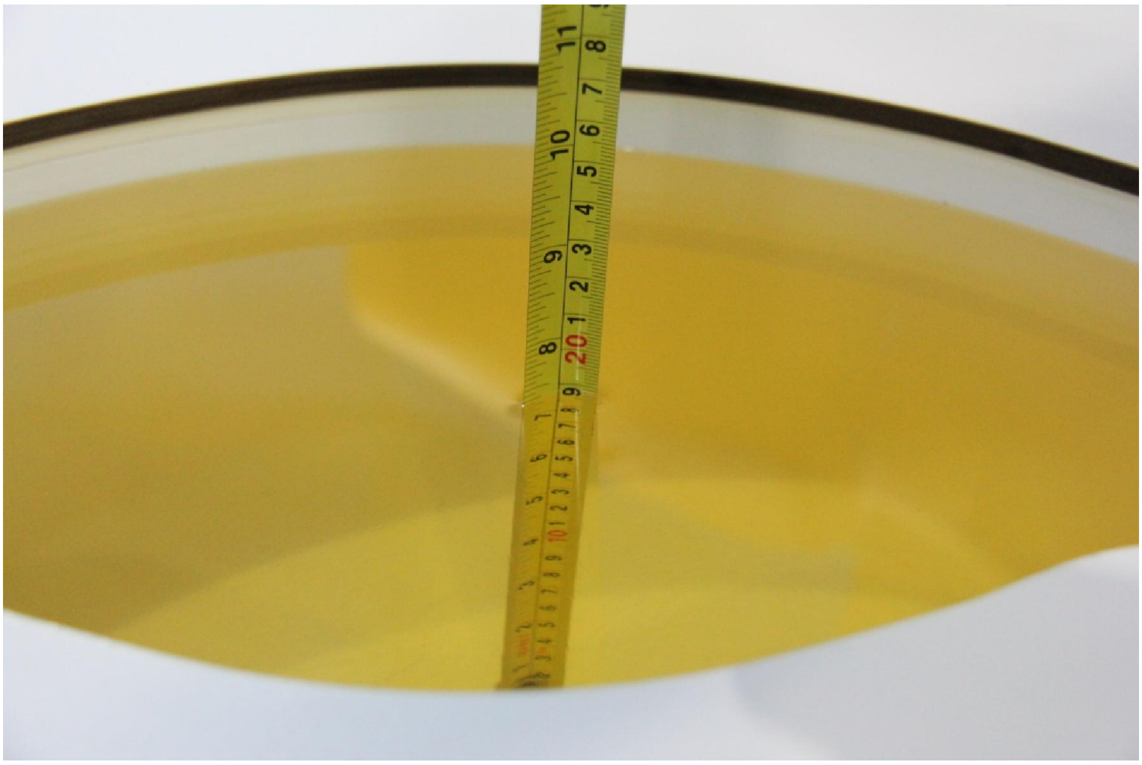
**Table 7.2: Dielectric Performance of Tissue Simulating Liquid**

| Measurement Date (yyyy-mm-dd) | Type | Frequency | Permittivity ε | Drift (%) | Conductivity σ (S/m) | Drift (%) |
|---|---|---|---|---|---|---|
| 2014-09-26 | Head | 835 MHz | 41.42 | -0.19 | 0.894 | -0.67 |
| | Body | 835 MHz | 54.63 | -1.03 | 0.981 | 1.13 |
| 2014-10-28 | Head | 1900 MHz | 39.20 | -2.00 | 1.398 | -0.14 |
| | Body | 1900 MHz | 53.52 | 0.41 | 1.506 | -0.92 |
| 2014-12-04 | Head | 2450 MHz | 38.73 | -1.20 | 1.818 | 1.00 |
| | Body | 2450 MHz | 53.42 | 1.37 | 1.965 | 0.77 |

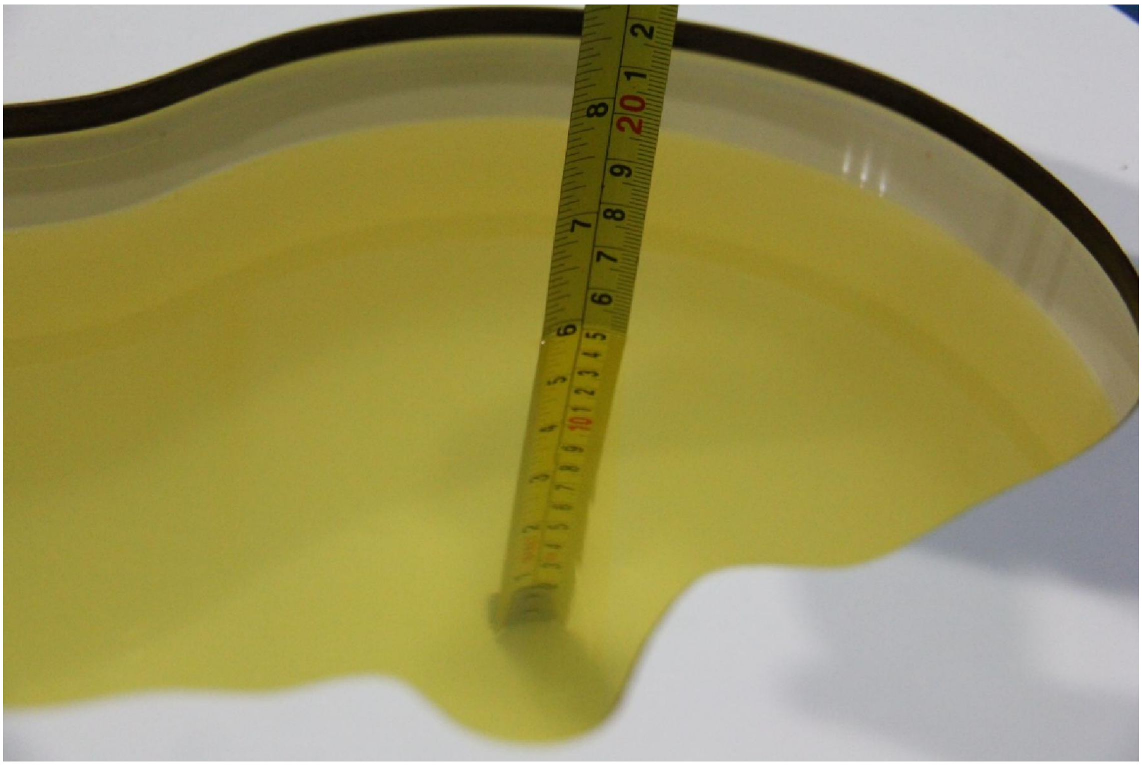
Note: The liquid temperature is 22.0℃



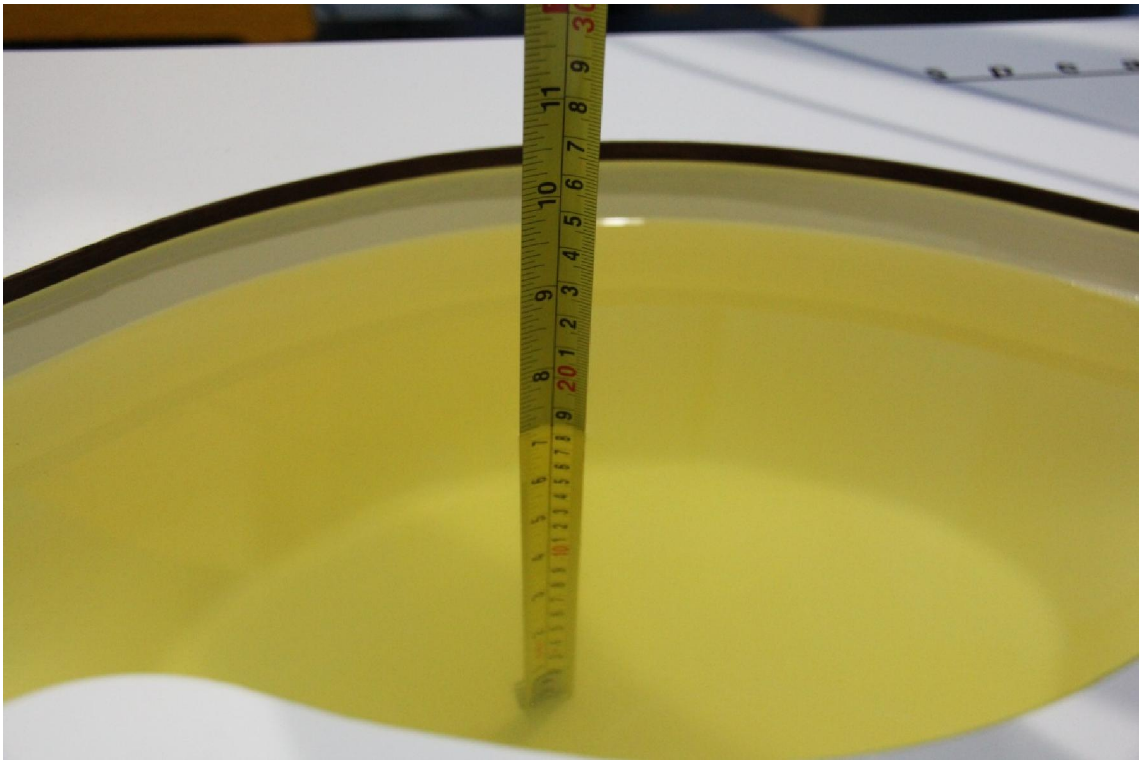
**Picture 7-1: Liquid depth in the Head Phantom (835MHz)**



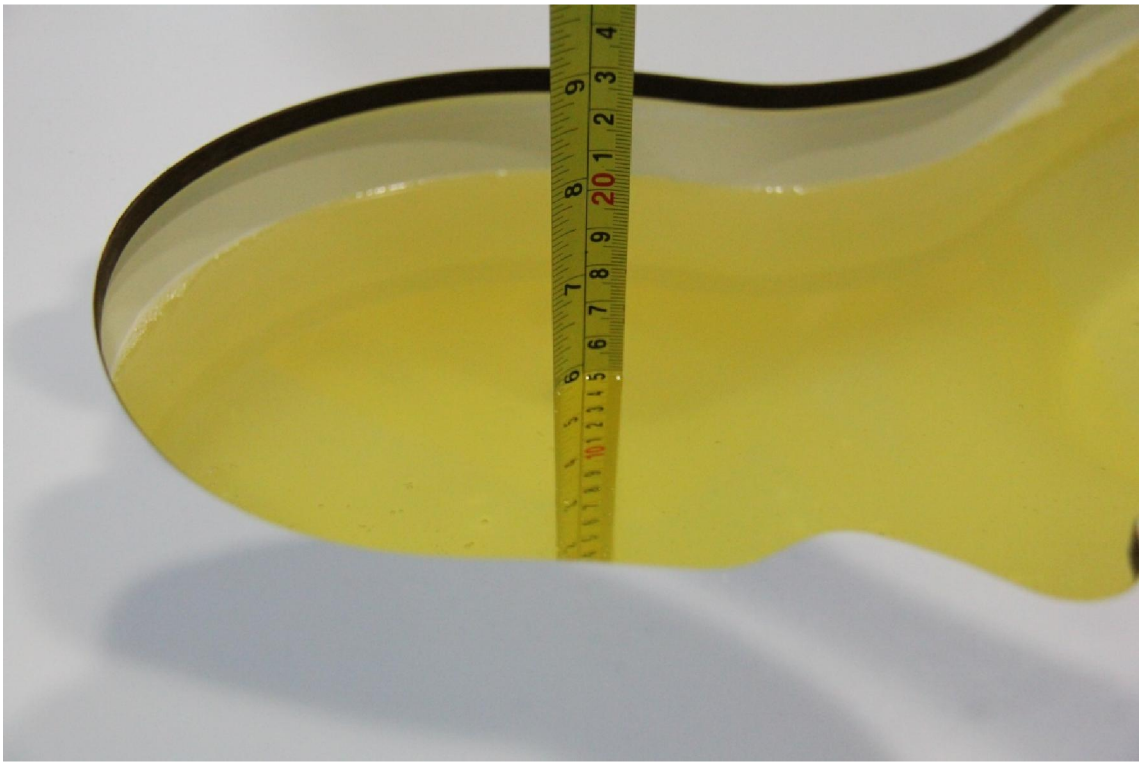
**Picture 7-2: Liquid depth in the Flat Phantom (835MHz)**



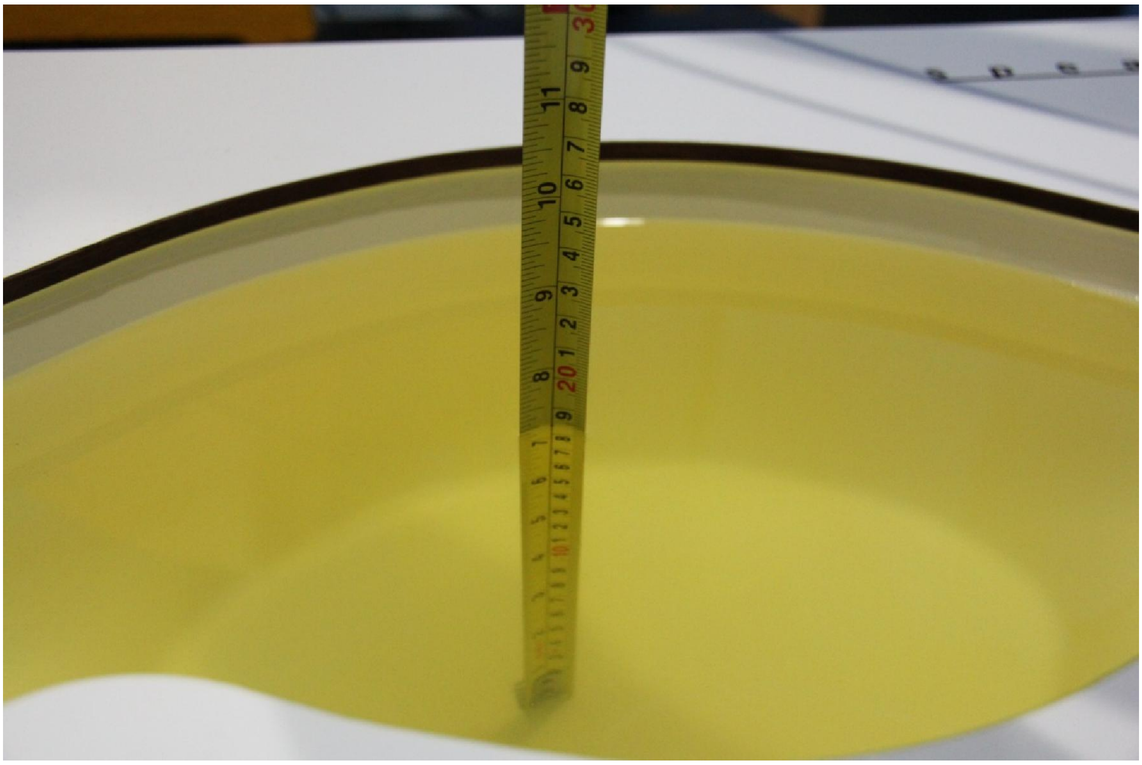
Picture 7-3: Liquid depth in the Head Phantom (1900 MHz)



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



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

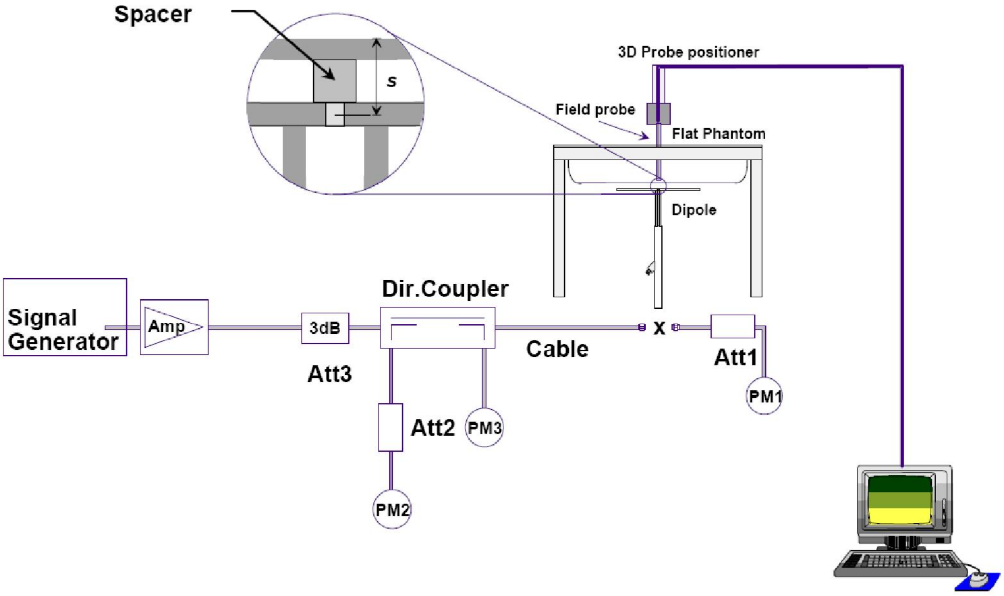


**Picture 7-6 Liquid depth in the Flat Phantom (2450MHz)**

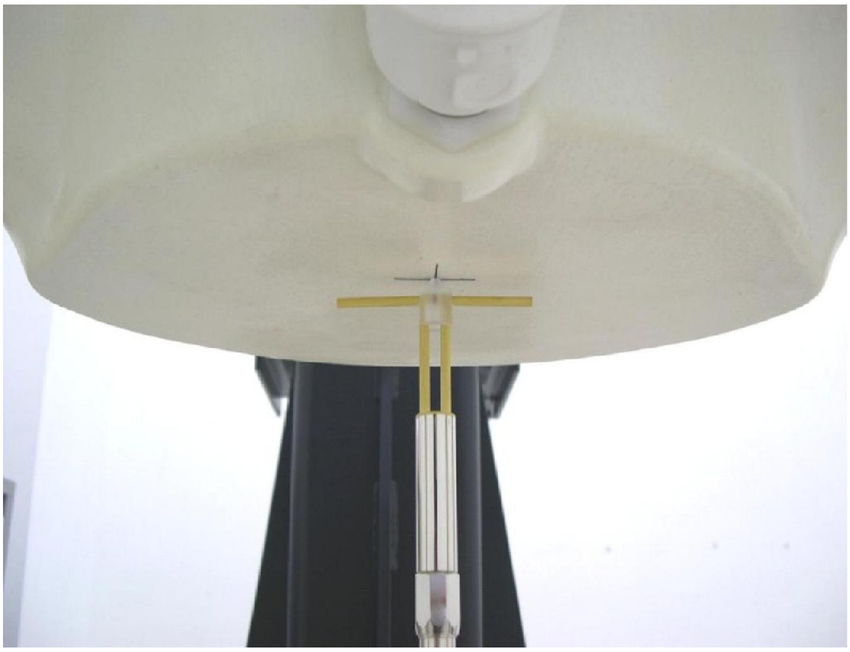
# 8 System verification

## 8.1 System Setup

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




**Picture 8.1 System Setup for System Evaluation**



**Picture 8.2 Photo of Dipole Setup**

## 8.2 System Verification

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

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

**Table 8.1: System Verification of Head**

| Measurement Date (yyyy-mm-dd) | Frequency | Target value (W/kg) | | Measured value(W/kg) | | Deviation | |
|---|---|---|---|---|---|---|---|
| | | 10 g Average | 1 g Average | 10 g Average | 1 g Average | 10 g Average | 1 g Average |
| 2014-09-26 | 835 MHz | 6.17 | 9.43 | 6.24 | 9.68 | 1.13% | 2.65% |
| 2014-10-28 | 1900 MHz | 21.1 | 40.1 | 21.28 | 40.48 | 0.85% | 0.95% |
| 2014-12-04 | 2450 MHz | 24.8 | 52.8 | 24.4 | 51.6 | -1.61% | -2.27% |

**Table 8.2: System Verification of Body**

| Measurement Date (yyyy-mm-dd) | Frequency | Target value (W/kg) | | Measured value (W/kg) | | Deviation | |
|---|---|---|---|---|---|---|---|
| | | 10 g Average | 1 g Average | 10 g Average | 1 g Average | 10 g Average | 1 g Average |
| 2014-09-26 | 835 MHz | 6.33 | 9.55 | 6.16 | 9.52 | -2.69% | -0.31% |
| 2014-10-28 | 1900 MHz | 21.0 | 39.8 | 21.48 | 41.2 | 2.29% | 3.52% |
| 2014-12-04 | 2450 MHz | 23.6 | 50.3 | 22.68 | 48.8 | -3.90% | -2.98% |

# 9 Measurement Procedures

## 9.1 Tests to be performed

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

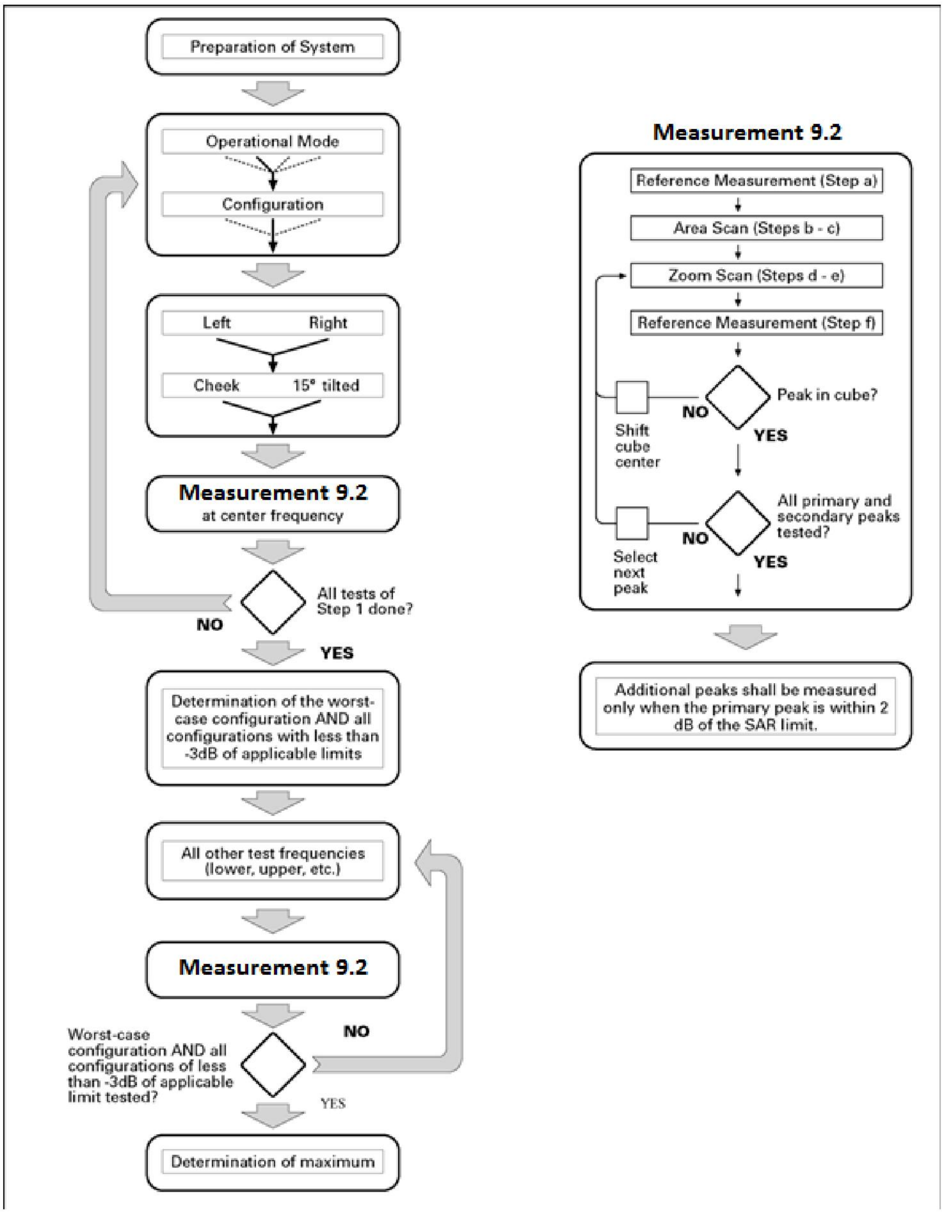
**Step 1**: The tests described in 9.2 shall be performed at the channel that is closest to the centre of the transmit frequency band ( $f_c$ ) for:

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

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

**Step 2**: For the condition providing highest peak spatial-average SAR determined in Step 1,perform all tests described in 9.2 at all other test frequencies, i.e., lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the peak spatial-average SAR value determined in Step 1 is within3 dB of the applicable SAR limit, it is recommended that all other test frequencies shall betested as well.

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




**Picture 9.1Block diagram of the tests to be performed**

## 9.2 General Measurement Procedure

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements andfully documented in SAR reports to qualify for TCB approval. Probe boundary effect error compensation isrequired for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Boththe probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundaryeffect errors are minimized and the higher fields closest to the phantom surface can be correctly measured andextrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms mustbe verified by the test laboratory for the scan resolutions used in the SAR measurements, according to thereference distribution functions specified in IEEE Std 1528-2003. The results should be documented as part of thesystem validation records and may be requested to support test results when all the measurement parameters in thefollowing table are not satisfied.

| | | | ≤ 3 GHz | > 3 GHz |
|---|---|---|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | | | 5 ± 1 mm | $\frac{1}{2}\cdot\delta\cdot\ln(2) \pm 0.5$ mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | | | 30° ± 1° | 20° ± 1° |
| Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$ | | | ≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm | 3 – 4 GHz: ≤ 12 mm<br>4 – 6 GHz: ≤ 10 mm |
| | | | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device. | |
| Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$ | | | ≤ 2 GHz: ≤ 8 mm<br>2 – 3 GHz: ≤ 5 mm* | 3 – 4 GHz: ≤ 5 mm*<br>4 – 6 GHz: ≤ 4 mm* |
| Maximum zoom scan spatial resolution, normal to phantom surface | uniform grid: $\Delta z_{Zoom}(n)$ | | ≤ 5 mm | 3 – 4 GHz: ≤ 4 mm<br>4 – 5 GHz: ≤ 3 mm<br>5 – 6 GHz: ≤ 2 mm |
| | graded grid | $\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface | ≤ 4 mm | 3 – 4 GHz: ≤ 3 mm<br>4 – 5 GHz: ≤ 2.5 mm<br>5 – 6 GHz: ≤ 2 mm |
| | | $\Delta z_{Zoom}(n>1)$: between subsequent points | $\leq 1.5\cdot\Delta z_{Zoom}(n-1)$ | |
| Minimum zoom scan volume | x, y, z | | ≥ 30 mm | 3 – 4 GHz: ≥ 28 mm<br>4 – 5 GHz: ≥ 25 mm<br>5 – 6 GHz: ≥ 22 mm |
| Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.<br>* When zoom scan is required and the *reported* SAR from the area scan based *1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz. | | | | |

## 9.3 WCDMA Measurement Procedures for SAR

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

**For Release 5 HSDPA Data Devices:**

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{hs}$ | CM/dB |
|---|---|---|---|---|---|---|
| 1 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 0.0 |
| 2 | 12/15 | 15/15 | 64 | 12/15 | 24/25 | 1.0 |
| 3 | 15/15 | 8/15 | 64 | 15/8 | 30/15 | 1.5 |
| 4 | 15/15 | 4/15 | 64 | 15/4 | 30/15 | 1.5 |

**For Release 6 HSPA Data Devices**

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{hs}$ | $\beta_{ec}$ | $\beta_{ed}$ | $\beta_{ed}$ (SF) | $\beta_{ed}$ (codes) | CM (dB) | MPR (dB) | AG Index | E-TFCI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11/15 | 15/15 | 64 | 11/15 | 22/15 | 209/225 | 1039/225 | 4 | 1 | 3.5 | 3.5 | 20 | 75 |
| 2 | 6/15 | 15/15 | 64 | 6/15 | 12/15 | 12/15 | 12/15 | 4 | 1 | 3.5 | 3.5 | 12 | 67 |
| 3 | 15/15 | 9/15 | 64 | 15/9 | 30/15 | 30/15 | $\beta_{ed1}$:47/15 $\beta_{ed2}$:47/15 | 4 | 2 | 2.5 | 2.5 | 15 | 92 |
| 4 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 4/15 | 56/75 | 4 | 1 | 3.5 | 3.5 | 17 | 71 |
| 5 | 15/15 | 15/15 | 64 | 15/15 | 24/15 | 30/15 | 134/15 | 4 | 1 | 1.5 | 1.5 | 21 | 81 |

## 9.4 Bluetooth &Wi-Fi Measurement Procedures for SAR

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

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

## 9.5 Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in Table 14.2 to Table 14.25 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

# 10 Area Scan Based 1-g SAR

## 10.1 Requirement of KDB

According to the KDB447498 D01 v05, when the implementation is based the specific polynomial fit algorithm as presented at the 29th Bioelectromagnetics Society meeting (2007) and the estimated 1-gSAR is ≤ 1.2 W/kg, a zoom scan measurement is not required provided it is also not needed for any otherpurpose; for example, if the peak SAR location required for simultaneous transmission SAR testexclusion can be determined accurately by the SAR system or manually to discriminate betweendistinctive peaks and scattered noisy SAR distributions from area scans.

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

## 10.2 Fast SAR Algorithms

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

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

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

Both algorithms are implemented in DASY software.

# 11 Conducted Output Power

## 11.1 Manufacturing tolerance

**Table 11.1: GSM Speech**

| GSM 850 | | | |
|---|---|---|---|
| Channel | Channel 251 | Channel 190 | Channel 128 |
| Target (dBm) | 32.3 | 32.3 | 32.3 |
| Tune-up(dBm) | 33.3 | 33.3 | 33.3 |
| GSM 1900 | | | |
| Channel | Channel 810 | Channel 661 | Channel 512 |
| Target (dBm) | 29.3 | 29.3 | 29.3 |
| Tune-up(dBm) | 30.3 | 30.3 | 30.3 |

**Table 11.2: GPRS and EGPRS**

| GSM 850 GPRS (GMSK) | | | | |
|---|---|---|---|---|
| Channel | | **251** | **190** | **128** |
| 1 Txslot | Target (dBm) | 32.3 | 32.3 | 32.3 |
| | Tune-up(dBm) | 33.3 | 33.3 | 33.3 |
| 2 Txslots | Target (dBm) | 30.5 | 30.5 | 30.5 |
| | Tune-up(dBm) | 31.5 | 31.5 | 31.5 |
| 3Txslots | Target (dBm) | 28.5 | 28.5 | 28.5 |
| | Tune-up(dBm) | 29.5 | 29.5 | 29.5 |
| 4 Txslots | Target (dBm) | 27.0 | 27.0 | 27.0 |
| | Tune-up(dBm) | 28.0 | 28.0 | 28.0 |
| GSM 850 EGPRS (GMSK) | | | | |
| Channel | | **251** | **190** | **128** |
| 1 Txslot | Target (dBm) | 32.3 | 32.3 | 32.3 |
| | Tune-up(dBm) | 33.3 | 33.3 | 33.3 |
| 2 Txslots | Target (dBm) | 30.5 | 30.5 | 30.5 |
| | Tune-up(dBm) | 31.5 | 31.5 | 31.5 |
| 3Txslots | Target (dBm) | 28.5 | 28.5 | 28.5 |
| | Tune-up(dBm) | 29.5 | 29.5 | 29.5 |
| 4 Txslots | Target (dBm) | 27.0 | 27.0 | 27.0 |
| | Tune-up(dBm) | 28.0 | 28.0 | 28.0 |
| GSM 1900 GPRS (GMSK) | | | | |
| Channel | | **810** | **661** | **512** |
| 1 Txslot | Target (dBm) | 29.3 | 29.3 | 29.3 |
| | Tune-up(dBm) | 30.3 | 30.3 | 30.3 |
| 2 Txslots | Target (dBm) | 27 | 27 | 27 |
| | Tune-up(dBm) | 28 | 28 | 28 |
| 3Txslots | Target (dBm) | 25 | 25 | 25 |
| | Tune-up(dBm) | 26 | 26 | 26 |
| 4 Txslots | Target (dBm) | 24 | 24 | 24 |
| | Tune-up(dBm) | 25 | 25 | 25 |

| GSM 1900 EGPRS (GMSK) | | | | |
|---|---|---|---|---|
| Channel | | **810** | **661** | **512** |
| 1 Txslot | Target (dBm) | 29.3 | 29.3 | 29.3 |
| | Tune-up(dBm) | 30.3 | 30.3 | 30.3 |
| 2 Txslots | Target (dBm) | 27 | 27 | 27 |
| | Tune-up(dBm) | 28 | 28 | 28 |
| 3Txslots | Target (dBm) | 25 | 25 | 25 |
| | Tune-up(dBm) | 26 | 26 | 26 |
| 4 Txslots | Target (dBm) | 24 | 24 | 24 |
| | Tune-up(dBm) | 25 | 25 | 25 |

**Table 11.3: WCDMA**

| WCDMA 850 CS | | | |
|---|---|---|---|
| Channel | Channel 4233 | Channel 4182 | Channel 4132 |
| Target (dBm) | 22.5 | 22.5 | 22.5 |
| Tune-up(dBm) | 23.5 | 23.5 | 23.5 |
| HSUPA (sub-test 1) | | | |
| Channel | Channel 4233 | Channel 4182 | Channel 4132 |
| Target (dBm) | 19.0 | 19.0 | 19.0 |
| Tune-up(dBm) | 20.0 | 20.0 | 20.0 |
| HSUPA (sub-test 2) | | | |
| Channel | Channel 4233 | Channel 4182 | Channel 4132 |
| Target (dBm) | 19.0 | 19.0 | 19.0 |
| Tune-up(dBm) | 20.0 | 20.0 | 20.0 |
| HSUPA (sub-test 3) | | | |
| Channel | Channel 4233 | Channel 4182 | Channel 4132 |
| Target (dBm) | 20.0 | 20.0 | 20.0 |
| Tune-up(dBm) | 21.0 | 21.0 | 21.0 |
| HSUPA (sub-test 4) | | | |
| Channel | Channel 4233 | Channel 4182 | Channel 4132 |
| Target (dBm) | 19.0 | 19.0 | 19.0 |
| Tune-up(dBm) | 20.0 | 20.0 | 20.0 |
| HSUPA (sub-test 5) | | | |
| Channel | Channel 4233 | Channel 4182 | Channel 4132 |
| Target (dBm) | 21.0 | 21.0 | 21.0 |
| Tune-up(dBm) | 22.0 | 22.0 | 22.0 |
| WCDMA 1900 CS | | | |
| Channel | Channel 9538 | Channel 9400 | Channel 9262 |
| Target (dBm) | 22.5 | 22.5 | 22.5 |
| Tune-up(dBm) | 23.5 | 23.5 | 23.5 |
| HSUPA (sub-test 1) | | | |
| Channel | Channel 9538 | Channel 9400 | Channel 9262 |
| Target (dBm) | 20.0 | 20.0 | 20.0 |
| Tune-up(dBm) | 21.0 | 21.0 | 21.0 |

| HSUPA (sub-test 2) | | | |
|---|---|---|---|
| Channel | Channel 9538 | Channel 9400 | Channel 9262 |
| Target (dBm) | 20.0 | 20.0 | 20.0 |
| Tune-up(dBm) | 21.0 | 21.0 | 21.0 |
| HSUPA (sub-test 3) | | | |
| Channel | Channel 9538 | Channel 9400 | Channel 9262 |
| Target (dBm) | 20.5 | 20.5 | 20.5 |
| Tune-up(dBm) | 21.5 | 21.5 | 21.5 |
| HSUPA (sub-test 4) | | | |
| Channel | Channel 9538 | Channel 9400 | Channel 9262 |
| Target (dBm) | 19.0 | 19.0 | 19.0 |
| Tune-up(dBm) | 20.0 | 20.0 | 20.0 |
| HSUPA (sub-test 5) | | | |
| Channel | Channel 9538 | Channel 9400 | Channel 9262 |
| Target (dBm) | 21.5 | 21.5 | 21.5 |
| Tune-up(dBm) | 22.5 | 22.5 | 22.5 |

**Table 11.4: Bluetooth**

| Mode | Target (dBm) | Tune-up(dBm) |
|---|---|---|
| GFSK | 7.0 | 8.0 |
| EDR2M-4_DQPSK | 7.0 | 8.0 |
| EDR3M-8DPSK | 7.5 | 8.5 |

**Table 11.5: WiFi**

| Mode | Target (dBm) | Tune-up(dBm) |
|---|---|---|
| 802.11 b (2.4GHz) | 17.0 | 18.0 |
| 802.11 g (2.4GHz)Channel 1 6Mbps~24Mbps | 6.5 | 7.5 |
| 802.11 g (2.4GHz)Channel 1 36Mbps~54Mbps | 5.5 | 6.5 |
| 802.11 g (2.4GHz)Channel 6 6Mbps~24Mbps | 15.0 | 16.0 |
| 802.11 g (2.4GHz)Channel 6 36Mbps~54Mbps | 14.0 | 15.0 |
| 802.11 g (2.4GHz) Channel 11 6Mbps~24Mbps | 7.0 | 8.0 |
| 802.11 g (2.4GHz) Channel 11 36Mbps~54Mbps | 6.0 | 7.0 |
| 802.11 n (2.4GHz HT20)Channel 1 MCS0-MCS4 | 6.5 | 7.5 |
| 802.11 n (2.4GHz HT20) Channel 1 MCS5-MCS7 | 4.5 | 5.5 |
| 802.11 n (2.4GHz HT20) Channel 6 MCS0-MCS4 | 12.5 | 13.5 |
| 802.11 n (2.4GHz HT20) Channel 6 MCS5-MCS7 | 11.0 | 12.0 |
| 802.11 n (2.4GHz HT20) Channel 11 MCS0-MCS3 | 7.0 | 8.0 |
| 802.11 n (2.4GHz HT20) Channel 11 MCS4-MCS7 | 6.0 | 7.0 |
| 802.11 n (2.4GHz HT40) Channel 3 MCS0-MCS2 | 6.0 | 7.0 |
| 802.11 n (2.4GHz HT40) Channel 3 MCS3-MCS7 | 4.0 | 5.0 |
| 802.11 n (2.4GHz HT40) Channel 6 MCS0-MCS2 | 11.0 | 12.0 |
| 802.11 n (2.4GHz HT40) Channel 6 MCS3-MCS7 | 9.0 | 10.0 |
| 802.11 n (2.4GHz HT40) Channel 11 MCS0-MCS3 | 6.0 | 7.0 |
| 802.11 n (2.4GHz HT40) Channel 11 MCS4-MCS7 | 4.0 | 5.0 |

## 11.2 GSM Measurement result

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

**Table 11.6: The conducted power measurement results for GSM850/1900**

| GSM 850MHz | Conducted Power (dBm) | | |
|---|---|---|---|
| | Channel 251(848.8MHz) | Channel 190(836.6MHz) | Channel 128(824.2MHz) |
| | 32.66 | 32.67 | 32.68 |
| GSM 1900MHz | Conducted Power(dBm) | | |
| | Channel 810(1909.8MHz) | Channel 661(1880MHz) | Channel 512(1850.2MHz) |
| | 29.76 | 29.51 | 29.24 |

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

| GSM 850 GPRS (GMSK) | Measured Power (dBm) | | | calculation | Averaged Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | **251** | **190** | **128** | | **251** | **190** | **128** |
| 1 Txslot | 32.66 | 32.69 | 32.70 | -9.03dB | 23.63 | 23.66 | 23.67 |
| 2 Txslots | 29.96 | 29.94 | 29.94 | -6.02dB | 23.94 | 23.92 | 23.92 |
| 3Txslots | 27.80 | 27.83 | 27.87 | -4.26dB | 23.54 | 23.57 | 23.61 |
| **4 Txslots** | 26.98 | 27.01 | 27.05 | -3.01dB | **23.97** | **24** | **24.04** |
| GSM 850 EGPRS (GMSK) | Measured Power (dBm) | | | calculation | Averaged Power (dBm) | | |
| | **251** | **190** | **128** | | **251** | **190** | **128** |
| 1 Txslot | 32.63 | 32.64 | 32.69 | -9.03dB | 23.6 | 23.61 | 23.66 |
| 2 Txslots | 29.92 | 29.90 | 29.90 | -6.02dB | 23.9 | 23.88 | 23.88 |
| 3Txslots | 27.76 | 27.80 | 27.83 | -4.26dB | 23.5 | 23.54 | 23.57 |
| **4 Txslots** | 26.94 | 26.98 | 27.02 | -3.01dB | **23.93** | **23.97** | **24.01** |
| PCS1900 GPRS (GMSK) | Measured Power (dBm) | | | calculation | Averaged Power (dBm) | | |
| | **810** | **661** | **512** | | **810** | **661** | **512** |
| 1 Txslot | 29.85 | 29.56 | 29.28 | -9.03dB | 20.82 | 20.53 | 20.25 |
| 2 Txslots | 27.58 | 27.22 | 26.87 | -6.02dB | 21.56 | 21.2 | 20.85 |
| 3Txslots | 25.61 | 25.27 | 24.90 | -4.26dB | 21.35 | 21.01 | 20.64 |
| **4 Txslots** | 24.66 | 24.32 | 24.29 | -3.01dB | **21.65** | **21.31** | **21.28** |
| PCS1900 EGPRS (GMSK) | Measured Power (dBm) | | | calculation | Averaged Power (dBm) | | |
| | **810** | **661** | **512** | | **810** | **661** | **512** |
| 1 Txslot | 29.80 | 29.56 | 29.27 | -9.03dB | 20.77 | 20.53 | 20.24 |
| 2 Txslots | 27.54 | 27.23 | 26.86 | -6.02dB | 21.52 | 21.21 | 20.84 |
| 3Txslots | 25.57 | 25.28 | 24.89 | -4.26dB | 21.31 | 21.02 | 20.63 |
| **4 Txslots** | 24.64 | 24.31 | 23.91 | -3.01dB | **21.63** | **21.3** | **20.9** |

NOTES:

1) Division Factors

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

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

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

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

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

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

**Note: According to the KDB941225 D03, "when SAR tests for EDGE or EGPRS mode is necessary, GMSK modulation should be used".**

## 11.3 WCDMA Measurement result

**Table 11.8: The conducted Power for WCDMA850/1900**

| Item | band | FDDV result | | |
|---|---|---|---|---|
| | ARFCN | 4233(846.6MHz) | 4182(836.4MHz) | 4132(826.4MHz) |
| WCDMA | \ | 23.03 | 23.07 | 23.19 |
| HSUPA | 1 | 18.59 | 19.23 | 19.23 |
| | 2 | 18.55 | 18.81 | 18.73 |
| | 3 | 19.59 | 19.83 | 19.75 |
| | 4 | 18.07 | 18.28 | 18.21 |
| | 5 | 21.45 | 21.32 | 21.66 |
| Item | band | FDDII result | | |
| | ARFCN | 9538(1907.6MHz) | 9400(1880MHz) | 9262(1852.4MHz) |
| WCDMA | \ | 22.22 | 22.08 | 21.75 |
| HSUPA | 1 | 19.01 | 18.79 | 18.49 |
| | 2 | 18.46 | 18.28 | 17.93 |
| | 3 | 19.52 | 19.31 | 19.02 |
| | 4 | 17.99 | 17.69 | 17.48 |
| | 5 | 21.49 | 21.22 | 20.92 |

## 11.4 Wi-Fi and BT Measurement result

The output power of BT antenna is as following:

| Mode | Conducted Power (dBm) | | |
|---|---|---|---|
| | Channel 0 (2402MHz) | Channel 39 (2441MHz) | Channel 78(2480MHz) |
| GFSK | 6.91 | 7.21 | 7.19 |
| EDR2M-4_DQPSK | 6.73 | 7.10 | 7.11 |
| EDR3M-8DPSK | 6.88 | 7.17 | 7.30 |

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

802.11b（dBm）

| Channel\data rate | 1Mbps | 2Mbps | 5.5Mbps | 11Mbps |
|---|---|---|---|---|
| 1 | 17.12 | / | / | / |
| 6 | 17.15 | / | / | / |
| 11 | 17.43 | 17.31 | 17.15 | 16.82 |

802.11g（dBm）

| Channel\data rate | 6Mbps | 9Mbps | 12Mbps | 18Mbps | 24Mbps | 36Mbps | 48Mbps | 54Mbps |
|---|---|---|---|---|---|---|---|---|
| 1 | 6.81 | / | / | / | / | / | / | / |
| 6 | 14.94 | 14.77 | 14.62 | 14.26 | 14.05 | 13.64 | 13.27 | 13.02 |
| 11 | 7.35 | / | / | / | / | / | / | / |

802.11n（dBm）- HT20 (2.4G)

| Channel\data rate | MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 |
|---|---|---|---|---|---|---|---|---|
| 1 | 6.85 | / | / | / | / | / | / | / |
| 6 | 13.03 | 12.53 | 12.11 | 11.82 | 11.52 | 10.83 | 10.47 | 10.27 |
| 11 | 7.12 | / | / | / | / | / | / | / |

802.11n（dBm）- HT40 (2.4G)

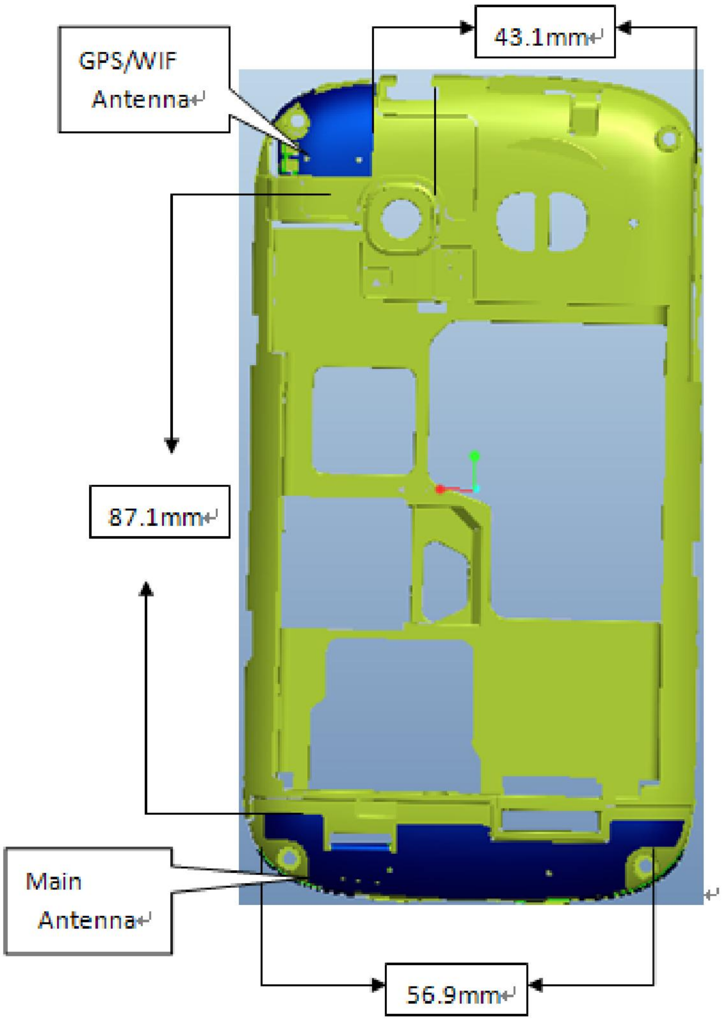
| Channel\data rate | MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 |
|---|---|---|---|---|---|---|---|---|
| 3 | 6.37 | / | / | / | / | / | / | / |
| 6 | 11.32 | 10.36 | 10.06 | 9.45 | 8.83 | 8.36 | 8.13 | 8.03 |
| 9 | 6.27 | / | / | / | / | / | / | / |

## 12 Simultaneous TX SAR Considerations

### 12.1 Introduction

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

### 12.2 Transmit Antenna Separation Distances




**Picture 12.1 Antenna Locations**

### 12.3 SAR Measurement Positions

According to the KDB941225 D06 Hot Spot SAR v01, the edges with less than 2.5 cm distance to the antennas need to be tested for SAR.

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

### 12.4 Standalone SAR Test Exclusion Considerations

Standalone 1-g head or bodySAR evaluation by measurement or numerical simulation is not required when thecorresponding SAR Exclusion Threshold condition, listed below, is satisfied.
The 1-g SAR test exclusion threshold for 100 MHz to 6 GHz at test separation distances≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

**Table 12.1: Standalone SAR test exclusion considerations**

| **Band/Mode** | **F(GHz)** | **Position** | **SAR test exclusion threshold(mW)** | **RF output power** | | **SAR test exclusion** |
|---|---|---|---|---|---|---|
| | | | | **dBm** | **mW** | |
| Bluetooth | 2.441 | Head | 9.60 | 7.3 | 5.37 | Yes |
| | | Body | 19.20 | 7.3 | 5.37 | Yes |
| 2.4GHz WLAN 802.11 b | 2.45 | Head | 9.58 | 17.43 | 55.34 | No |
| | | Body | 19.17 | 17.43 | 55.34 | No |

# 13 Evaluation of Simultaneous

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

| | Position | Main antenna | WiFi | Sum |
|---|---|---|---|---|
| **Highest reported SAR value for Head** | Left hand, Touch cheek | 1.15 | 0.21 | **1.36** |
| **Highest reported SAR value for Body** | Bottom Side | 1.25 | / | **1.25** |
| | Rear | 1.21 | 0.10 | **1.31** |

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

| | Position | Main antenna | BT* | Sum |
|---|---|---|---|---|
| **Highest reported SAR value for Head** | Left hand, Touch cheek | 1.15 | 0.29 | **1.44** |
| **Highest reported SAR value for Body** | Bottom | 1.25 | 0.15 | **1.40** |

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

**Table 13.3: Estimated SAR for Bluetooth**

| Position | F (GHz) | Distance (mm) | Upper limit of power * | | Estimated$_{1g}$ (W/kg) |
|---|---|---|---|---|---|
| | | | dBm | mW | |
| Head | 2.441 | 5 | 8.5 | 7.08 | 0.29 |
| Body | 2.441 | 10 | 8.5 | 7.08 | 0.15 |

* - Maximum possible output power declared by manufacturer

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

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

# 14 SAR Test Result

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

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

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

**Table 14.1: Duty Cycle**

| Mode | Duty Cycle |
|---|---|
| Speech for GSM850/1900 | 1:8.3 |
| GPRS&EGPRS for GSM850/PCS1900 | 1:2 |
| WCDMA850/1900 &WiFi | 1:1 |

## 14.1 The evaluation of multi-batteries

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

**Table 14.2: The evaluation of multi-batteries for Head Test**

| Frequency | | Mode/Band | Side | Test Position | Battery Type | SAR(1g) | Power |
|---|---|---|---|---|---|---|---|
| MHz | Ch. | | | | | (W/kg) | Drift(dB) |
| 1907.6 | 9538 | WCDMA1900 | Left | Touch | CAB31P0000C1 | 0.854 | -0.08 |
| 1907.6 | 9538 | WCDMA1900 | Left | Touch | CAB31P0000C2 | 0.801 | -0.06 |
| 1907.6 | 9538 | WCDMA1900 | Left | Touch | CAB31P0000C3 | 0.782 | 0.03 |

Note: According to the values in the above table, the battery, CAB31P0000C1, is the primary battery. We'll perform the head measurement with this battery and retest on highest value point with others.

**Table 14.3: The evaluation of multi-batteries for Body Test**

| Frequency | | Mode/Band | Test Position | Spacing (mm) | Battery Type | SAR(1g) | Power |
|---|---|---|---|---|---|---|---|
| MHz | Ch. | | | | | (W/kg) | Drift(dB) |
| 1852.4 | 9262 | WCDMA1900 | Bottom | 10 | CAB31P0000C1 | 0.833 | -0.01 |
| 1852.4 | 9262 | WCDMA1900 | Bottom | 10 | CAB31P0000C2 | 0.821 | -0.09 |
| 1852.4 | 9262 | WCDMA1900 | Bottom | 10 | CAB31P0000C3 | 0.801 | -0.06 |

Note: According to the values in the above table, the battery, CAB31P0000C1, is the primary battery. We'll perform the Body measurement with this battery and retest on highest value point with others.

## 14.2 SAR results for Fast SAR

**Table 14.4: SAR Values (GSM 850 MHz Band - Head)– CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Side | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 848.8 | 251 | Left | Touch | / | 32.66 | 33.3 | 0.452 | **0.52** | 0.664 | **0.77** | 0.03 |
| 836.6 | 190 | Left | Touch | Fig.1 | 32.67 | 33.3 | 0.522 | **0.60** | 0.700 | **0.81** | -0.02 |
| 824.2 | 128 | Left | Touch | / | 32.68 | 33.3 | 0.507 | **0.58** | 0.674 | **0.78** | 0.00 |
| 848.8 | 251 | Left | Tilt | / | 32.66 | 33.3 | 0.269 | **0.31** | 0.386 | **0.45** | 0.00 |
| 836.6 | 190 | Left | Tilt | / | 32.67 | 33.3 | 0.279 | **0.32** | 0.401 | **0.46** | -0.06 |
| 824.2 | 128 | Left | Tilt | / | 32.68 | 33.3 | 0.270 | **0.31** | 0.390 | **0.45** | 0.02 |
| 848.8 | 251 | Right | Touch | / | 32.66 | 33.3 | 0.417 | **0.48** | 0.510 | **0.59** | 0.06 |
| 836.6 | 190 | Right | Touch | / | 32.67 | 33.3 | 0.307 | **0.35** | 0.456 | **0.53** | -0.17 |
| 824.2 | 128 | Right | Touch | / | 32.68 | 33.3 | 0.324 | **0.37** | 0.469 | **0.54** | 0.10 |
| 848.8 | 251 | Right | Tilt | / | 32.66 | 33.3 | 0.282 | **0.33** | 0.401 | **0.46** | 0.01 |
| 836.6 | 190 | Right | Tilt | / | 32.67 | 33.3 | 0.279 | **0.32** | 0.397 | **0.46** | -0.03 |
| 824.2 | 128 | Right | Tilt | / | 32.68 | 33.3 | 0.248 | **0.29** | 0.361 | **0.42** | -0.14 |

**Table 14.5: SAR Values (GSM 850 MHz Band-Body)–CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Mode (number of timeslots) | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 836.6 | 190 | GPRS (4) | Front | / | 27.01 | 28 | 0.275 | **0.35** | 0.408 | **0.51** | -0.03 |
| 848.8 | 251 | GPRS (4) | Rear | / | 26.98 | 28 | 0.335 | **0.42** | 0.493 | **0.62** | 0.00 |
| 836.6 | 190 | GPRS (4) | Rear | / | 27.01 | 28 | 0.488 | **0.61** | 0.628 | **0.79** | -0.17 |
| 824.2 | 128 | GPRS (4) | Rear | Fig.2 | 27.05 | 28 | 0.495 | **0.62** | 0.645 | **0.80** | -0.01 |
| 836.6 | 190 | GPRS (4) | Left | / | 27.01 | 28 | 0.234 | **0.29** | 0.354 | **0.44** | -0.04 |
| 836.6 | 190 | GPRS (4) | Right | / | 27.01 | 28 | 0.222 | **0.28** | 0.355 | **0.45** | 0.03 |
| 836.6 | 190 | GPRS (4) | Bottom | / | 27.01 | 28 | 0.124 | **0.16** | 0.200 | **0.25** | 0.07 |
| 824.2 | 128 | EGPRS (4) | Rear | / | 27.02 | 28 | 0.417 | **0.52** | 0.612 | **0.77** | 0.04 |
| 824.2 | 128 | Speech | Rear Headset1 | / | 32.68 | 33.3 | 0.413 | **0.48** | 0.604 | **0.70** | -0.03 |
| 824.2 | 128 | Speech | Rear Headset2 | / | 32.68 | 33.3 | 0.417 | **0.48** | 0.609 | **0.70** | 0.00 |

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

Note2: The Headset1 is CCB3160A11C1, the Headset2 is CCB3160A11C4.

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**Table 14.6: SAR Values(GSM1900 MHz Band - Head)–CAB31P0000C1**

| Ambient Temperature: 22.5℃ Liquid Temperature: 22.0℃ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Side | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 1909.8 | 810 | Left | Touch | Fig.3 | 29.76 | 30.3 | 0.462 | **0.52** | 0.787 | **0.89** | -0.10 |
| 1880 | 661 | Left | Touch | / | 29.51 | 30.3 | 0.405 | **0.49** | 0.727 | **0.87** | -0.09 |
| 1850.2 | 512 | Left | Touch | / | 29.24 | 30.3 | 0.363 | **0.46** | 0.649 | **0.83** | 0.12 |
| 1909.8 | 810 | Left | Tilt | / | 29.76 | 30.3 | 0.166 | **0.19** | 0.290 | **0.33** | -0.01 |
| 1880 | 661 | Left | Tilt | / | 29.51 | 30.3 | 0.165 | **0.20** | 0.287 | **0.34** | -0.01 |
| 1850.2 | 512 | Left | Tilt | / | 29.24 | 30.3 | 0.152 | **0.19** | 0.264 | **0.34** | 0.01 |
| 1909.8 | 810 | Right | Touch | / | 29.76 | 30.3 | 0.435 | **0.49** | 0.723 | **0.82** | 0.11 |
| 1880 | 661 | Right | Touch | / | 29.51 | 30.3 | 0.419 | **0.50** | 0.717 | **0.86** | 0.06 |
| 1850.2 | 512 | Right | Touch | / | 29.24 | 30.3 | 0.393 | **0.50** | 0.673 | **0.86** | 0.05 |
| 1909.8 | 810 | Right | Tilt | / | 29.76 | 30.3 | 0.197 | **0.22** | 0.349 | **0.40** | -0.04 |
| 1880 | 661 | Right | Tilt | / | 29.51 | 30.3 | 0.200 | **0.24** | 0.351 | **0.42** | -0.03 |
| 1850.2 | 512 | Right | Tilt | / | 29.24 | 30.3 | 0.180 | **0.23** | 0.312 | **0.40** | 0.01 |

**Table 14.7: SAR Values (GSM 1900 MHz Band-Body)– CAB31P0000C1**

| Ambient Temperature: 22.5℃ Liquid Temperature: 22.0℃ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Mode (number of timeslots) | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 1909.8 | 810 | GPRS (4) | Front | / | 24.66 | 25 | 0.411 | **0.44** | 0.702 | **0.76** | 0.02 |
| 1880 | 661 | GPRS (4) | Front | / | 24.32 | 25 | 0.408 | **0.48** | 0.694 | **0.81** | 0.00 |
| 1850.2 | 512 | GPRS (4) | Front | / | 24.29 | 25 | 0.396 | **0.47** | 0.678 | **0.80** | 0.12 |
| 1909.8 | 810 | GPRS (4) | Rear | / | 24.66 | 25 | 0.438 | **0.47** | 0.764 | **0.83** | -0.05 |
| 1880 | 661 | GPRS (4) | Rear | / | 24.32 | 25 | 0.458 | **0.54** | 0.791 | **0.93** | 0.02 |
| 1850.2 | 512 | GPRS (4) | Rear | / | 24.29 | 25 | 0.423 | **0.50** | 0.722 | **0.85** | 0.12 |
| 1880 | 661 | GPRS (4) | Left | / | 24.32 | 25 | 0.129 | **0.15** | 0.225 | **0.26** | 0.05 |
| 1880 | 661 | GPRS (4) | Right | / | 24.32 | 25 | 0.132 | **0.15** | 0.234 | **0.27** | 0.07 |
| 1909.8 | 810 | GPRS (4) | Bottom | / | 24.66 | 25 | 0.445 | **0.48** | 0.793 | **0.86** | 0.02 |
| 1880 | 661 | GPRS (4) | Bottom | Fig.4 | 24.32 | 25 | 0.460 | **0.54** | 0.835 | **0.98** | -0.04 |
| 1850.2 | 512 | GPRS (4) | Bottom | / | 24.29 | 25 | 0.404 | **0.48** | 0.741 | **0.87** | -0.02 |
| 1880 | 661 | EGPRS (4) | Bottom | / | 24.31 | 25 | 0.438 | **0.51** | 0.812 | **0.95** | -0.05 |
| 1880 | 661 | Speech | Bottom Headset1 | / | 29.51 | 30.3 | 0.437 | **0.52** | 0.810 | **0.97** | -0.02 |
| 1880 | 661 | Speech | Bottom Headset2 | / | 29.51 | 30.3 | 0.430 | **0.52** | 0.812 | **0.97** | 0.04 |

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

Note2: The Headset1 is CCB3160A11C1, the Headset2 is CCB3160A11C4.

**Table 14.8: SAR Values(WCDMA 850 MHz Band - Head)– CAB31P0000C1**

| Ambient Temperature: 22.5℃ Liquid Temperature: 22.0℃ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Side | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 846.6 | 4233 | Left | Touch | / | 23.03 | 23.5 | 0.469 | **0.52** | 0.680 | **0.76** | -0.13 |
| 836.4 | 4182 | Left | Touch | Fig.5 | 23.07 | 23.5 | 0.617 | **0.68** | 0.823 | **0.91** | -0.18 |
| 826.4 | 4132 | Left | Touch | / | 23.19 | 23.5 | 0.448 | **0.48** | 0.645 | **0.69** | 0.04 |
| 846.6 | 4233 | Left | Tilt | / | 23.03 | 23.5 | 0.325 | **0.36** | 0.465 | **0.52** | -0.00 |
| 836.4 | 4182 | Left | Tilt | / | 23.07 | 23.5 | 0.347 | **0.38** | 0.495 | **0.55** | 0.01 |
| 826.4 | 4132 | Left | Tilt | / | 23.19 | 23.5 | 0.293 | **0.31** | 0.416 | **0.45** | 0.06 |
| 846.6 | 4233 | Right | Touch | / | 23.03 | 23.5 | 0.458 | **0.51** | 0.595 | **0.66** | 0.08 |
| 836.4 | 4182 | Right | Touch | / | 23.07 | 23.5 | 0.389 | **0.43** | 0.575 | **0.63** | 0.07 |
| 826.4 | 4132 | Right | Touch | / | 23.19 | 23.5 | 0.360 | **0.39** | 0.524 | **0.56** | 0.13 |
| 846.6 | 4233 | Right | Tilt | / | 23.03 | 23.5 | 0.335 | **0.37** | 0.478 | **0.53** | -0.01 |
| 836.4 | 4182 | Right | Tilt | / | 23.07 | 23.5 | 0.361 | **0.40** | 0.514 | **0.57** | 0.40 |
| 826.4 | 4132 | Right | Tilt | / | 23.19 | 23.5 | 0.190 | **0.20** | 0.408 | **0.44** | 0.20 |

**Table 14.9: SAR Values (WCDMA 850 MHz Band-Body) – CAB31P0000C1**

| Ambient Temperature: 22.5℃ Liquid Temperature: 22.0℃ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | |
| 846.6 | 4233 | Front | / | 23.03 | 23.5 | 0.561 | **0.63** | 0.759 | **0.85** | 0.05 |
| 836.4 | 4182 | Front | / | 23.07 | 23.5 | 0.572 | **0.63** | 0.767 | **0.85** | -0.04 |
| 826.4 | 4132 | Front | / | 23.19 | 23.5 | 0.532 | **0.57** | 0.721 | **0.77** | 0.10 |
| 846.6 | 4233 | Rear | / | 23.03 | 23.5 | 0.629 | **0.70** | 0.917 | **1.02** | -0.01 |
| 836.4 | 4182 | Rear | Fig.6 | 23.07 | 23.5 | 0.739 | **0.82** | 1.030 | **1.14** | -0.04 |
| 826.4 | 4132 | Rear | / | 23.19 | 23.5 | 0.611 | **0.66** | 0.886 | **0.95** | -0.03 |
| 836.4 | 4182 | Left | / | 23.07 | 23.5 | 0.409 | **0.45** | 0.579 | **0.64** | -0.02 |
| 836.4 | 4182 | Right | / | 23.07 | 23.5 | 0.364 | **0.40** | 0.542 | **0.60** | 0.00 |
| 836.4 | 4182 | Bottom | / | 23.07 | 23.5 | 0.082 | **0.09** | 0.128 | **0.14** | 0.10 |
| 846.6 | 4233 | Rear Headset1 | / | 23.03 | 23.5 | 0.642 | **0.72** | 0.941 | **1.05** | 0.00 |
| 836.4 | 4182 | Rear Headset1 | / | 23.07 | 23.5 | 0.698 | **0.77** | 1.020 | **1.13** | -0.03 |
| 826.4 | 4132 | Rear Headset1 | / | 23.19 | 23.5 | 0.621 | **0.67** | 0.907 | **0.97** | -0.06 |
| 846.6 | 4233 | Rear Headset2 | / | 23.03 | 23.5 | 0.629 | **0.70** | 0.922 | **1.03** | -0.03 |
| 836.4 | 4182 | Rear Headset2 | / | 23.07 | 23.5 | 0.687 | **0.76** | 1.000 | **1.10** | -0.02 |
| 826.4 | 4132 | Rear Headset2 | / | 23.19 | 23.5 | 0.604 | **0.65** | 0.881 | **0.95** | 0.00 |

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

Note2: The Headset1 is CCB3160A11C1, the Headset2 is CCB3160A11C4.

**Table 14.10: SAR Values(WCDMA1900 MHz Band - Head)– CAB31P0000C1**

| Ambient Temperature: 22.5℃ Liquid Temperature: 22.0℃ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Side | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 1907.6 | 9538 | Left | Touch | Fig.7 | 22.22 | 23.5 | 0.526 | **0.71** | 0.854 | **1.15** | -0.08 |
| 1880 | 9400 | Left | Touch | / | 22.08 | 23.5 | 0.465 | **0.64** | 0.794 | **1.10** | -0.01 |
| 1852.4 | 9262 | Left | Touch | / | 21.75 | 23.5 | 0.389 | **0.58** | 0.662 | **0.99** | -0.01 |
| 1907.6 | 9538 | Left | Tilt | / | 22.22 | 23.5 | 0.271 | **0.36** | 0.474 | **0.64** | -0.16 |
| 1880 | 9400 | Left | Tilt | / | 22.08 | 23.5 | 0.273 | **0.38** | 0.475 | **0.66** | -0.06 |
| 1852.4 | 9262 | Left | Tilt | / | 21.75 | 23.5 | 0.239 | **0.36** | 0.413 | **0.62** | -0.13 |
| 1907.6 | 9538 | Right | Touch | / | 22.22 | 23.5 | 0.493 | **0.66** | 0.816 | **1.10** | -0.17 |
| 1880 | 9400 | Right | Touch | / | 22.08 | 23.5 | 0.482 | **0.67** | 0.794 | **1.10** | -0.18 |
| 1852.4 | 9262 | Right | Touch | / | 21.75 | 23.5 | 0.418 | **0.63** | 0.688 | **1.03** | -0.09 |
| 1907.6 | 9538 | Right | Tilt | / | 22.22 | 23.5 | 0.323 | **0.43** | 0.571 | **0.77** | -0.09 |
| 1880 | 9400 | Right | Tilt | / | 22.08 | 23.5 | 0.33 | **0.46** | 0.578 | **0.80** | -0.08 |
| 1852.4 | 9262 | Right | Tilt | / | 21.75 | 23.5 | 0.284 | **0.42** | 0.496 | **0.74** | -0.09 |

**Table 14.11: SAR Values (WCDMA1900 MHz Band-Body)– CAB31P0000C1**

| Ambient Temperature: 22.5℃ Liquid Temperature: 22.0℃ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | |
| 1907.6 | 9538 | Front | / | 22.22 | 23.5 | 0.453 | **0.61** | 0.741 | **0.99** | -0.02 |
| 1880 | 9400 | Front | / | 22.08 | 23.5 | 0.447 | **0.62** | 0.739 | **1.02** | 0.06 |
| 1852.4 | 9262 | Front | / | 21.75 | 23.5 | 0.422 | **0.63** | 0.715 | **1.07** | -0.08 |
| 1907.6 | 9538 | Rear | / | 22.22 | 23.5 | 0.421 | **0.57** | 0.708 | **0.95** | -0.00 |
| 1880 | 9400 | Rear | / | 22.08 | 23.5 | 0.488 | **0.68** | 0.829 | **1.15** | -0.01 |
| 1852.4 | 9262 | Rear | / | 21.75 | 23.5 | 0.472 | **0.71** | 0.807 | **1.21** | -0.08 |
| 1880 | 9400 | Left | / | 22.08 | 23.5 | 0.111 | **0.15** | 0.191 | **0.26** | 0.08 |
| 1880 | 9400 | Right | / | 22.08 | 23.5 | 0.124 | **0.17** | 0.216 | **0.30** | -0.01 |
| 1907.6 | 9538 | Bottom | / | 22.22 | 23.5 | 0.417 | **0.56** | 0.747 | **1.00** | -0.03 |
| 1880 | 9400 | Bottom | / | 22.08 | 23.5 | 0.495 | **0.69** | 0.865 | **1.20** | -0.10 |
| 1852.4 | 9262 | Bottom | Fig.8 | 21.75 | 23.5 | 0.466 | **0.70** | 0.833 | **1.25** | -0.01 |
| 1907.6 | 9538 | Bottom Headset1 | / | 22.22 | 23.5 | 0.401 | **0.54** | 0.734 | **0.99** | 0.05 |
| 1880 | 9400 | Bottom Headset1 | / | 22.08 | 23.5 | 0.473 | **0.66** | 0.858 | **1.19** | 0.12 |
| 1852.4 | 9262 | Bottom Headset1 | / | 21.75 | 23.5 | 0.423 | **0.63** | 0.812 | **1.21** | -0.05 |
| 1907.6 | 9538 | Bottom Headset2 | / | 22.22 | 23.5 | 0.399 | **0.54** | 0.721 | **0.97** | -0.15 |
| 1880 | 9400 | Bottom Headset2 | / | 22.08 | 23.5 | 0.462 | **0.64** | 0.850 | **1.18** | 0.02 |
| 1852.4 | 9262 | Bottom Headset2 | / | 21.75 | 23.5 | 0.433 | **0.65** | 0.819 | **1.23** | 0.01 |

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

Note2: The Headset1 is CCB3160A11C1, the Headset2 is CCB3160A11C4.

**Table 14.12: SAR Values (Wi-Fi 802.11b- Head)–CAB31P0000C1**

| Ambient Temperature: 22.5℃ Liquid Temperature: 22.0℃ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Side | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 2437 | 6 | Left | Touch | Fig.9 | 17.15 | 18 | 0.089 | **0.11** | 0.172 | **0.21** | 0.10 |
| 2437 | 6 | Left | Tilt | / | 17.15 | 18 | 0.053 | **0.06** | 0.105 | **0.13** | -0.07 |
| 2437 | 6 | Right | Touch | / | 17.15 | 18 | 0.063 | **0.08** | 0.115 | **0.14** | -0.14 |
| 2437 | 6 | Right | Tilt | / | 17.15 | 18 | 0.057 | **0.07** | 0.106 | **0.13** | 0.14 |

**Table 14.13: SAR Values (Wi-Fi 802.11b - Body)–CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | |
| 2437 | 6 | Front | / | 17.15 | 18 | 0.030 | **0.04** | 0.055 | **0.07** | 0.09 |
| 2437 | 6 | Rear | Fig.10 | 17.15 | 18 | 0.047 | **0.06** | 0.081 | **0.10** | 0.18 |
| 2437 | 6 | Right | / | 17.15 | 18 | 0.020 | **0.02** | 0.040 | **0.05** | 0.11 |
| 2437 | 6 | Top | | 17.15 | 18 | 0.033 | **0.04** | 0.059 | **0.07** | 0.03 |

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

**Table 14.14: SAR Values (WCDMA1900 MHz Band - Head)– other batteries**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Side | Test Position | Battery | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 1907.6 | 9538 | Left | Touch | 1 | 22.22 | 23.5 | 0.502 | 0.67 | 0.801 | 1.08 | -0.06 |
| 1907.6 | 9538 | Left | Touch | 2 | 22.22 | 23.5 | 0.498 | 0.67 | 0.782 | 1.05 | 0.03 |

Note1: The battery 1 is CAB31P0000C2, the battery 2 is CAB31P0000C3.

**Table 14.15: SAR Values (WCDMA 1900 MHz Band-Body)– other batteries**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test Position | Battery | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | |
| 1852.4 | 9262 | Bottom | 1 | 21.75 | 23.5 | 0.444 | 0.66 | 0.821 | 1.23 | -0.09 |
| 1852.4 | 9262 | Rear | 2 | 21.75 | 23.5 | 0.421 | 0.63 | 0.801 | 1.20 | -0.06 |

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

Note2: The battery 1 is CAB31P0000C2, the battery 2 is CAB31P0000C3.

## 14.2 SAR results for Standard procedure

There is zoom scan measurement to beadded forthe highest measured SAR in each exposure configuration/band.

**Table 14.16: SAR Values (GSM 850 MHz Band - Head)– CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Side | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 836.6 | 190 | Left | Touch | Fig.1 | 32.67 | 33.3 | 0.522 | **0.60** | 0.700 | **0.81** | -0.02 |

**Table 14.17: SAR Values (GSM 850 MHz Band-Body)– CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Mode (number of timeslots) | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 824.2 | 128 | GPRS (4) | Rear | Fig.2 | 27.05 | 28 | 0.495 | **0.62** | 0.645 | **0.80** | -0.01 |

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

**Table 14.18: SAR Values (GSM 1900 MHz Band - Head)– CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Side | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 1909.8 | 810 | Left | Touch | Fig.3 | 29.76 | 30.3 | 0.462 | **0.52** | 0.787 | **0.89** | -0.10 |

**Table 14.19: SAR Values (GSM 1900 MHz Band-Body)– CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Mode (number of timeslots) | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 1880 | 661 | GPRS (4) | Bottom | Fig.4 | 24.32 | 25 | 0.460 | **0.54** | **0.835** | **0.98** | -0.04 |

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

**Table 14.20: SAR Values (WCDMA 850 MHz Band - Head)– CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Side | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 836.4 | 4182 | Left | Touch | Fig.5 | 23.07 | 23.5 | 0.617 | **0.68** | 0.823 | **0.91** | -0.18 |

**Table 14.21: SAR Values (WCDMA 850 MHz Band-Body) – CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | |
| 836.4 | 4182 | Rear | Fig.6 | 23.07 | 23.5 | 0.739 | **0.82** | 1.030 | **1.14** | -0.04 |

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

**Table 14.22: SAR Values (WCDMA1900 MHz Band - Head)– CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Side | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 1907.6 | 9538 | Left | Touch | Fig.7 | 22.22 | 23.5 | 0.526 | **0.71** | 0.854 | **1.15** | -0.08 |

**Table 14.23: SAR Values (WCDMA1900 MHz Band-Body)– CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | |
| 1852.4 | 9262 | Bottom | Fig.8 | 21.75 | 23.5 | 0.466 | **0.70** | 0.833 | **1.25** | -0.01 |

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

**Table 14.24: SAR Values (Wi-Fi 802.11b- Head)– CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Side | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | | |
| 2437 | 6 | Left | Touch | Fig.9 | 17.15 | 18 | 0.089 | **0.11** | 0.172 | **0.21** | 0.10 |

**Table 14.25: SAR Values (Wi-Fi 802.11b - Body)– CAB31P0000C1**

| Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-upPower (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| MHz | Ch. | | | | | | | | | |
| 2437 | 6 | Rear | Fig.10 | 17.15 | 18 | 0.0472 | **0.06** | 0.0814 | **0.10** | 0.18 |

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

# 15 SAR Measurement Variability

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

The following procedures are applied to determine if repeatedmeasurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps2) through 4) do not apply.

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

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

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

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

| Frequency | | Test Position | Spacing (mm) | Original SAR (W/kg) | First Repeated SAR (W/kg) | The Ratio | Second Repeated SAR (W/kg) |
|---|---|---|---|---|---|---|---|
| MHz | Ch. | | | | | | |
| 1880 | 661 | Bottom | 10 | 0.835 | 0.821 | 1.02 | / |

**Table 15.2: SAR Measurement Variability for Head WCDMA 850 (1g)**

| Frequency | | Side | Test Position | Original SAR (W/kg) | First Repeated SAR (W/kg) | The Ratio | Second Repeated SAR (W/kg) |
|---|---|---|---|---|---|---|---|
| MHz | Ch. | | | | | | |
| 836.4 | 4182 | Left | Touch | 0.823 | 0.818 | 1.01 | / |

**Table 15.3: SAR Measurement Variability for Body WCDMA 850 (1g)**

| Frequency | | Test Position | Spacing (mm) | Original SAR (W/kg) | First Repeated SAR (W/kg) | The Ratio | Second Repeated SAR (W/kg) |
|---|---|---|---|---|---|---|---|
| MHz | Ch. | | | | | | |
| 836.4 | 4182 | Rear | 10 | 1.030 | 1.12 | 1.09 | / |

**Table 15.4: SAR Measurement Variability for Head WCDMA 1900 (1g)**

| Frequency | | Side | Test Position | Original SAR (W/kg) | First Repeated SAR (W/kg) | The Ratio | Second Repeated SAR (W/kg) |
|---|---|---|---|---|---|---|---|
| MHz | Ch. | | | | | | |
| 1907.6 | 9538 | Left | Touch | 0.854 | 0.845 | 1.01 | / |

**Table 15.5: SAR Measurement Variability for Body WCDMA 1900 (1g)**

| Frequency | | Test Position | Spacing (mm) | Original SAR (W/kg) | First Repeated SAR (W/kg) | The Ratio | Second Repeated SAR (W/kg) |
|---|---|---|---|---|---|---|---|
| MHz | Ch. | | | | | | |
| 1852.4 | 9262 | Bottom | 10 | 0.833 | 0.842 | 1.01 | / |

# 16 Measurement Uncertainty

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

| No. | Error Description | Type | Uncertainty value | Probably Distribution | Div. | (Ci) 1g | (Ci) 10g | Std. Unc. (1g) | Std. Unc. (10g) | Degree of freedom |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measurement system** | | | | | | | | | | |
| 1 | Probe calibration | B | 5.5 | N | 1 | 1 | 1 | 5.5 | 5.5 | ∞ |
| 2 | Isotropy | B | 4.7 | R | $\sqrt{3}$ | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| 3 | Boundary effect | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 4 | Linearity | B | 4.7 | R | $\sqrt{3}$ | 1 | 1 | 2.7 | 2.7 | ∞ |
| 5 | Detection limit | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 6 | Readout electronics | B | 0.3 | R | $\sqrt{3}$ | 1 | 1 | 0.3 | 0.3 | ∞ |
| 7 | Response time | B | 0.8 | R | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 | ∞ |
| 8 | Integration time | B | 2.6 | R | $\sqrt{3}$ | 1 | 1 | 1.5 | 1.5 | ∞ |
| 9 | RF ambient conditions-noise | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 10 | RFambient conditions-reflection | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 11 | Probe positioned mech. restrictions | B | 0.4 | R | $\sqrt{3}$ | 1 | 1 | 0.2 | 0.2 | ∞ |
| 12 | Probe positioning with respect to phantom shell | B | 2.9 | R | $\sqrt{3}$ | 1 | 1 | 1.7 | 1.7 | ∞ |
| 13 | Post-processing | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| **Test sample related** | | | | | | | | | | |
| 14 | Test sample positioning | A | 3.3 | N | 1 | 1 | 1 | 3.3 | 3.3 | 71 |
| 15 | Device holder uncertainty | A | 3.4 | N | 1 | 1 | 1 | 3.4 | 3.4 | 5 |
| 16 | Drift of output power | B | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.9 | 2.9 | ∞ |
| **Phantom and set-up** | | | | | | | | | | |
| 17 | Phantom uncertainty | B | 4.0 | R | $\sqrt{3}$ | 1 | 1 | 2.3 | 2.3 | ∞ |
| 18 | Liquid conductivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| 19 | Liquid conductivity (meas.) | A | 2.06 | N | 1 | 0.64 | 0.43 | 1.32 | 0.89 | 43 |
| 20 | Liquid permittivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.6 | 0.49 | 1.7 | 1.4 | ∞ |
| 21 | Liquid permittivity (meas.) | A | 1.6 | N | 1 | 0.6 | 0.49 | 1.0 | 0.8 | 521 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Combined standard uncertainty | | $u_c^{'} = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$ | | | | | | 9.25 | 9.12 | 257 |
| Expanded uncertainty (confidence interval of 95 %) | | $u_e = 2u_c$ | | | | | | 18.5 | 18.2 | |

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

| No. | Error Description | Type | Uncertainty value | Probably Distribution | Div. | (Ci) 1g | (Ci) 10g | Std. Unc. (1g) | Std. Unc. (10g) | Degree of freedom |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measurement system** | | | | | | | | | | |
| 1 | Probe calibration | B | 6.5 | N | 1 | 1 | 1 | 6.5 | 6.5 | ∞ |
| 2 | Isotropy | B | 4.7 | R | $\sqrt{3}$ | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| 3 | Boundary effect | B | 2.0 | R | $\sqrt{3}$ | 1 | 1 | 1.2 | 1.2 | ∞ |
| 4 | Linearity | B | 4.7 | R | $\sqrt{3}$ | 1 | 1 | 2.7 | 2.7 | ∞ |
| 5 | Detection limit | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 6 | Readout electronics | B | 0.3 | R | $\sqrt{3}$ | 1 | 1 | 0.3 | 0.3 | ∞ |
| 7 | Response time | B | 0.8 | R | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 | ∞ |
| 8 | Integration time | B | 2.6 | R | $\sqrt{3}$ | 1 | 1 | 1.5 | 1.5 | ∞ |
| 9 | RF ambient conditions-noise | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 10 | RFambient conditions-reflection | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 11 | Probe positioned mech. restrictions | B | 0.8 | R | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 | ∞ |
| 12 | Probe positioning with respect to phantom shell | B | 6.7 | R | $\sqrt{3}$ | 1 | 1 | 3.9 | 3.9 | ∞ |
| 13 | Post-processing | B | 4.0 | R | $\sqrt{3}$ | 1 | 1 | 2.3 | 2.3 | ∞ |
| **Test sample related** | | | | | | | | | | |
| 14 | Test sample positioning | A | 3.3 | N | 1 | 1 | 1 | 3.3 | 3.3 | 71 |
| 15 | Device holder uncertainty | A | 3.4 | N | 1 | 1 | 1 | 3.4 | 3.4 | 5 |
| 16 | Drift of output power | B | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.9 | 2.9 | ∞ |
| **Phantom and set-up** | | | | | | | | | | |
| 17 | Phantom uncertainty | B | 4.0 | R | $\sqrt{3}$ | 1 | 1 | 2.3 | 2.3 | ∞ |
| 18 | Liquid conductivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| 19 | Liquid conductivity (meas.) | A | 2.06 | N | 1 | 0.64 | 0.43 | 1.32 | 0.89 | 43 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | Liquid permittivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.6 | 0.49 | 1.7 | 1.4 | ∞ |
| 21 | Liquid permittivity (meas.) | A | 1.6 | N | 1 | 0.6 | 0.49 | 1.0 | 0.8 | 521 |
| Combined standard uncertainty | | $u_c^{'} = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$ | | | | | | 10.8 | 10.7 | 257 |
| Expanded uncertainty (confidence interval of 95 %) | | $u_e = 2u_c$ | | | | | | 21.6 | 21.4 | |

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

| No. | Error Description | Type | Uncertainty value | Probably Distribution | Div. | (Ci) 1g | (Ci) 10g | Std. Unc. (1g) | Std. Unc. (10g) | Degree of freedom |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measurement system** | | | | | | | | | | |
| 1 | Probe calibration | B | 5.5 | N | 1 | 1 | 1 | 5.5 | 5.5 | ∞ |
| 2 | Isotropy | B | 4.7 | R | $\sqrt{3}$ | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| 3 | Boundary effect | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 4 | Linearity | B | 4.7 | R | $\sqrt{3}$ | 1 | 1 | 2.7 | 2.7 | ∞ |
| 5 | Detection limit | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 6 | Readout electronics | B | 0.3 | R | $\sqrt{3}$ | 1 | 1 | 0.3 | 0.3 | ∞ |
| 7 | Response time | B | 0.8 | R | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 | ∞ |
| 8 | Integration time | B | 2.6 | R | $\sqrt{3}$ | 1 | 1 | 1.5 | 1.5 | ∞ |
| 9 | RF ambient conditions-noise | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 10 | RFambient conditions-reflection | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 11 | Probe positioned mech. Restrictions | B | 0.4 | R | $\sqrt{3}$ | 1 | 1 | 0.2 | 0.2 | ∞ |
| 12 | Probe positioning with respect to phantom shell | B | 2.9 | R | $\sqrt{3}$ | 1 | 1 | 1.7 | 1.7 | ∞ |
| 13 | Post-processing | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 14 | Fast SAR z-Approximation | B | 7.0 | R | $\sqrt{3}$ | 1 | 1 | 4.0 | 4.0 | ∞ |
| **Test sample related** | | | | | | | | | | |
| 15 | Test sample positioning | A | 3.3 | N | 1 | 1 | 1 | 3.3 | 3.3 | 71 |
| 16 | Device holder uncertainty | A | 3.4 | N | 1 | 1 | 1 | 3.4 | 3.4 | 5 |
| 17 | Drift of output power | B | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.9 | 2.9 | ∞ |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Phantom and set-up** | | | | | | | | | | |
| 18 | Phantom uncertainty | B | 4.0 | R | $\sqrt{3}$ | 1 | 1 | 2.3 | 2.3 | ∞ |
| 19 | Liquid conductivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| 20 | Liquid conductivity (meas.) | A | 2.06 | N | 1 | 0.64 | 0.43 | 1.32 | 0.89 | 43 |
| 21 | Liquid permittivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.6 | 0.49 | 1.7 | 1.4 | ∞ |
| 22 | Liquid permittivity (meas.) | A | 1.6 | N | 1 | 0.6 | 0.49 | 1.0 | 0.8 | 521 |
| Combined standard uncertainty | | $u_c^{'} = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$ | | | | | | 10.1 | 9.95 | 257 |
| Expanded uncertainty (confidence interval of 95 %) | | $u_e = 2u_c$ | | | | | | 20.2 | 19.9 | |

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

| No. | Error Description | Type | Uncertainty value | Probably Distribution | Div. | (Ci) 1g | (Ci) 10g | Std. Unc. (1g) | Std. Unc. (10g) | Degree of freedom |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measurement system** | | | | | | | | | | |
| 1 | Probe calibration | B | 6.5 | N | 1 | 1 | 1 | 6.5 | 6.5 | ∞ |
| 2 | Isotropy | B | 4.7 | R | $\sqrt{3}$ | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| 3 | Boundary effect | B | 2.0 | R | $\sqrt{3}$ | 1 | 1 | 1.2 | 1.2 | ∞ |
| 4 | Linearity | B | 4.7 | R | $\sqrt{3}$ | 1 | 1 | 2.7 | 2.7 | ∞ |
| 5 | Detection limit | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 6 | Readout electronics | B | 0.3 | R | $\sqrt{3}$ | 1 | 1 | 0.3 | 0.3 | ∞ |
| 7 | Response time | B | 0.8 | R | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 | ∞ |
| 8 | Integration time | B | 2.6 | R | $\sqrt{3}$ | 1 | 1 | 1.5 | 1.5 | ∞ |
| 9 | RF ambient conditions-noise | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 10 | RFambient conditions-reflection | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 11 | Probe positioned mech. Restrictions | B | 0.8 | R | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 | ∞ |
| 12 | Probe positioning with respect to phantom shell | B | 6.7 | R | $\sqrt{3}$ | 1 | 1 | 3.9 | 3.9 | ∞ |
| 13 | Post-processing | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 14 | Fast SAR z-Approximation | B | 14.0 | R | $\sqrt{3}$ | 1 | 1 | 8.1 | 8.1 | ∞ |
| **Test sample related** | | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | Test sample positioning | A | 3.3 | N | 1 | 1 | 1 | 3.3 | 3.3 | 71 |
| 16 | Device holder uncertainty | A | 3.4 | N | 1 | 1 | 1 | 3.4 | 3.4 | 5 |
| 17 | Drift of output power | B | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.9 | 2.9 | ∞ |
| **Phantom and set-up** | | | | | | | | | | |
| 18 | Phantom uncertainty | B | 4.0 | R | $\sqrt{3}$ | 1 | 1 | 2.3 | 2.3 | ∞ |
| 19 | Liquid conductivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| 20 | Liquid conductivity (meas.) | A | 2.06 | N | 1 | 0.64 | 0.43 | 1.32 | 0.89 | 43 |
| 21 | Liquid permittivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.6 | 0.49 | 1.7 | 1.4 | ∞ |
| 22 | Liquid permittivity (meas.) | A | 1.6 | N | 1 | 0.6 | 0.49 | 1.0 | 0.8 | 521 |
| Combined standard uncertainty | | $u_c^{'} = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$ | | | | | | 13.3 | 13.2 | 257 |
| Expanded uncertainty (confidence interval of 95 %) | | $u_e = 2u_c$ | | | | | | 26.6 | 26.4 | |

## 17 MAIN TEST INSTRUMENTS

**Table 17.1: List of Main Instruments**

| No. | Name | Type | Serial Number | Calibration Date | Valid Period |
|---|---|---|---|---|---|
| 01 | Network analyzer | E5071C | MY46110673 | February15,2014 | One year |
| 02 | Power meter | NRVD | 102196 | March 15,2014 | One year |
| 03 | Power sensor | NRV-Z5 | 100596 | | |
| 04 | Signal Generator | E4438C | MY49071430 | February 08, 2014 | One Year |
| 05 | Amplifier | 60S1G4 | 0331848 | No Calibration Requested | |
| 06 | BTS | E5515C | MY50263375 | January 30, 2014 | One year |
| 07 | E-field Probe | SPEAG EX3DV4 | 3617 | August 28, 2014 | One year |
| 08 | DAE | SPEAG DAE4 | 777 | September 17, 2014 | One year |
| 09 | Dipole Validation Kit | SPEAG D835V2 | 4d069 | August 28, 2014 | One year |
| 10 | Dipole Validation Kit | SPEAG D1900V2 | 5d018 | June 18, 2014 | One year |
| 11 | Dipole Validation Kit | SPEAG D2450V2 | 869 | June 13, 2014 | One year |

***END OF REPORT BODY***

## ANNEX A Graph Results

### 850 Left Cheek Middle

Date: 2014-09-26
Electronics: DAE4 Sn777
Medium: Head 850 MHz
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.8952 S/m; $\varepsilon_r$ = 41.408; $\rho$ = 1000 $kg/m^3$
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: GSM 850 Frequency: 836.6 MHz Duty Cycle: 1:8.3
Probe: EX3DV4 - SN3617ConvF(9.67, 9.67, 9.67)

**Cheek Middle/Area Scan (61x91x1)**: Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.757 W/kg

**Cheek Middle/Zoom Scan (7x7x7)/Cube 0**: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.56 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.872 W/kg
**SAR(1 g) = 0.700 W/kg; SAR(10 g) = 0.522 W/kg**
Maximum value of SAR (measured) = 0.732 W/kg

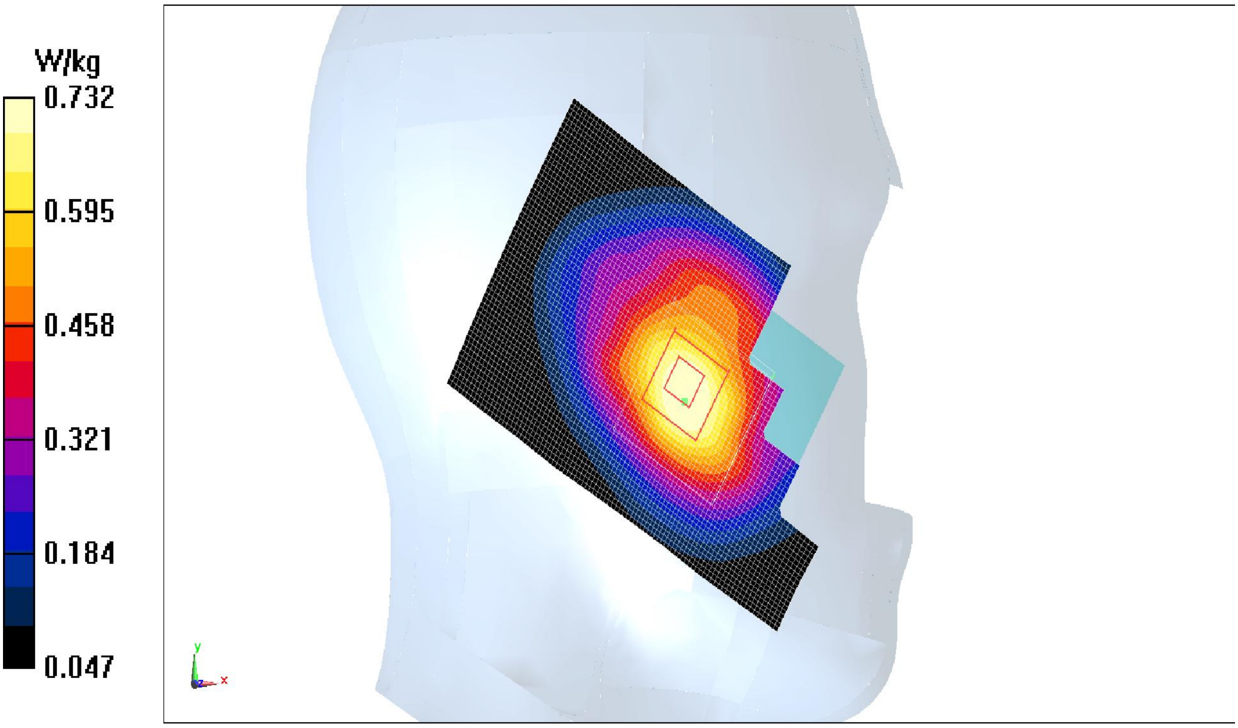



**Fig.1 850MHz 190**

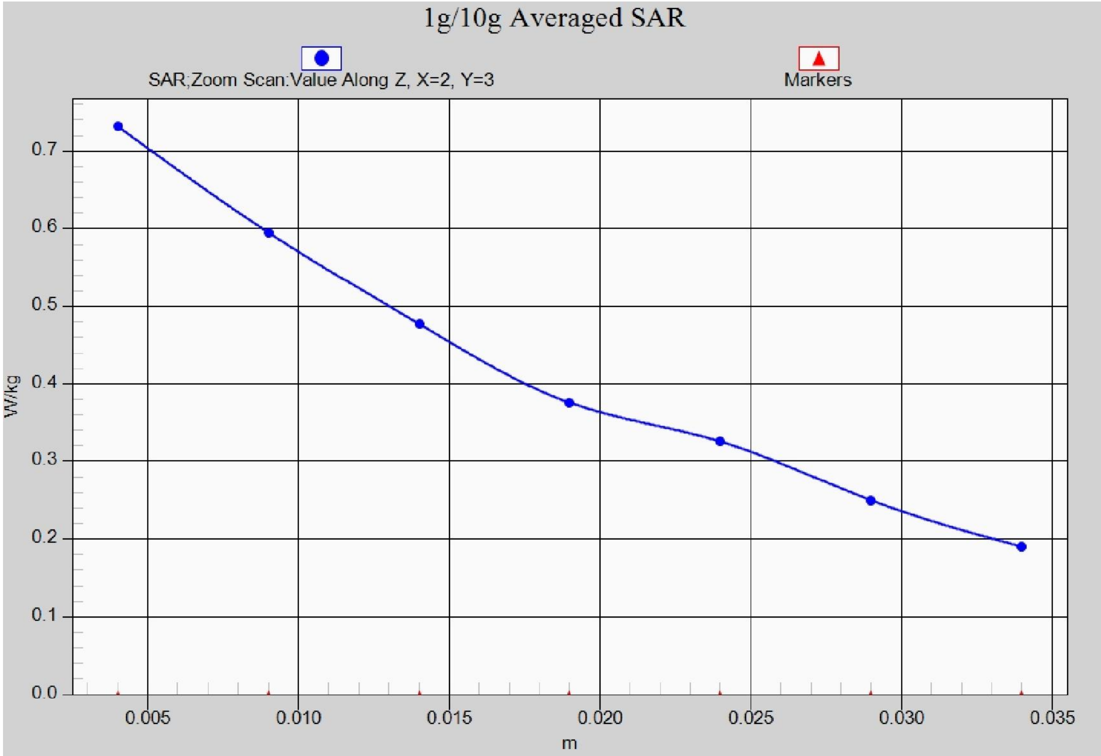



**Fig. 1-1 Z-Scan at power reference point (850 MHz CH190)**

**850 Body Rear Low**
Date: 2014-09-26
Electronics: DAE4 Sn777
Medium: Body 850 MHz
Medium parameters used: f = 825 MHz; $\sigma$ = 0.97 S/m; $\varepsilon_r$ = 54.708; $\rho$ = 1000 kg/m$^3$
Ambient Temperature: 22.5$^o$C Liquid Temperature: 22.0$^o$C
Communication System: GSM 850 GPRS Frequency: 825 MHz Duty Cycle: 1:2
Probe: EX3DV4 - SN3617ConvF(9.48, 9.48, 9.48)

**Rear Low/Area Scan (61x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.697 W/kg

**Rear Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 22.59 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.892 W/kg
**SAR(1 g) = 0.645 W/kg; SAR(10 g) = 0.495 W/kg**
Maximum value of SAR (measured) = 0.676 W/kg

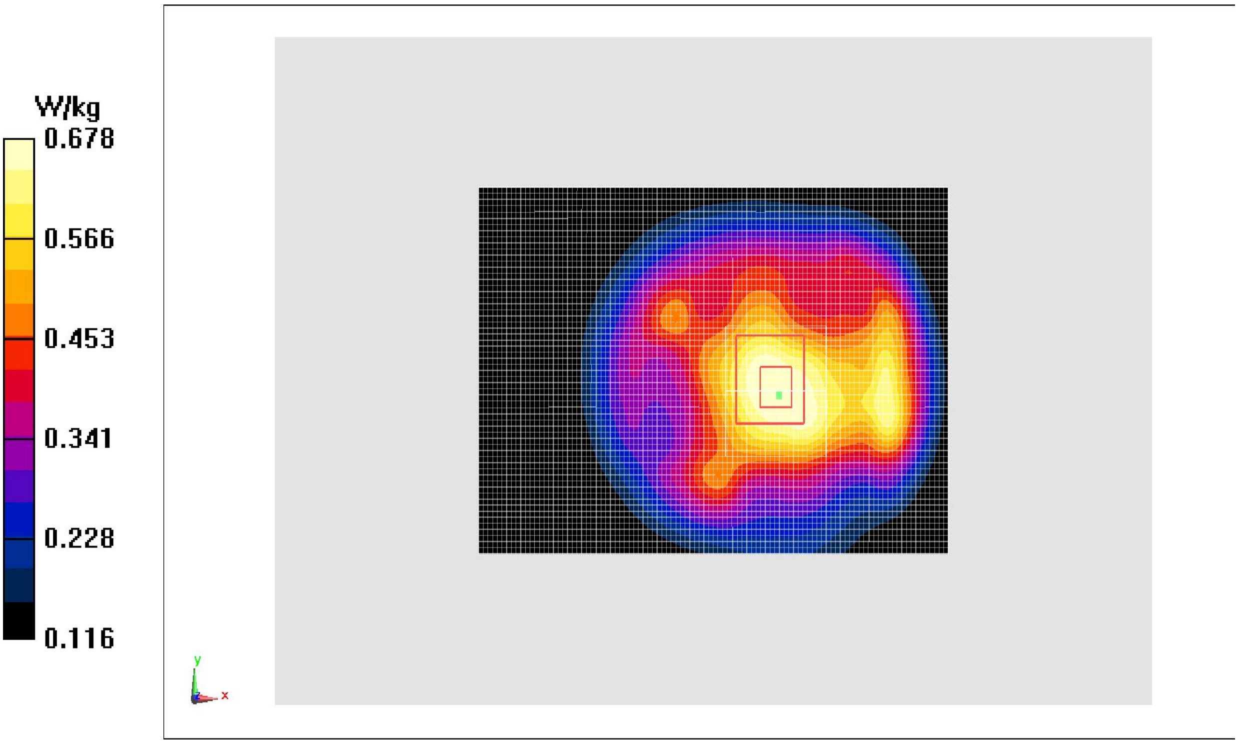



**Fig.2 850 MHz CH128**

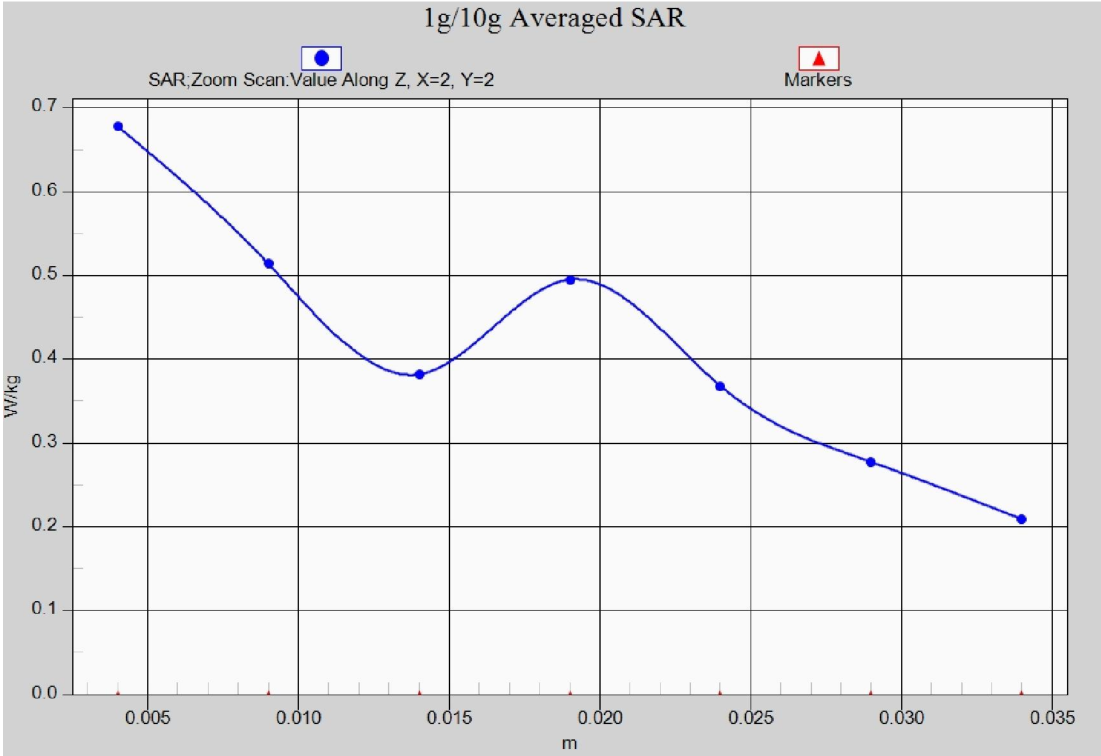



**Fig. 2-1 Z-Scan at power reference point (850 MHz CH128)**

**GSM1900 Left Cheek High**

Date: 2014-10-28

Electronics: DAE4 Sn777

Medium: Head 1900 MHz

Medium parameters used: f = 1910 MHz; $\sigma$ = 1.433 S/m; $\varepsilon_r$ = 40.604; $\rho$ = 1000 kg/$m^3$

Ambient Temperature: 22.5$^o$C Liquid Temperature: 22.0$^o$C

Communication System: GSM 1900MHz Frequency: 1910 MHz Duty Cycle: 1:8.3

Probe: EX3DV4 - SN3617ConvF(7.90, 7.90, 7.90)

**Cheek High/Area Scan (61x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.878 W/kg

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

Reference Value = 9.794 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 1.26 W/kg

**SAR(1 g) = 0.787 W/kg; SAR(10 g) = 0.462 W/kg**

Maximum value of SAR (measured) = 0.859 W/kg

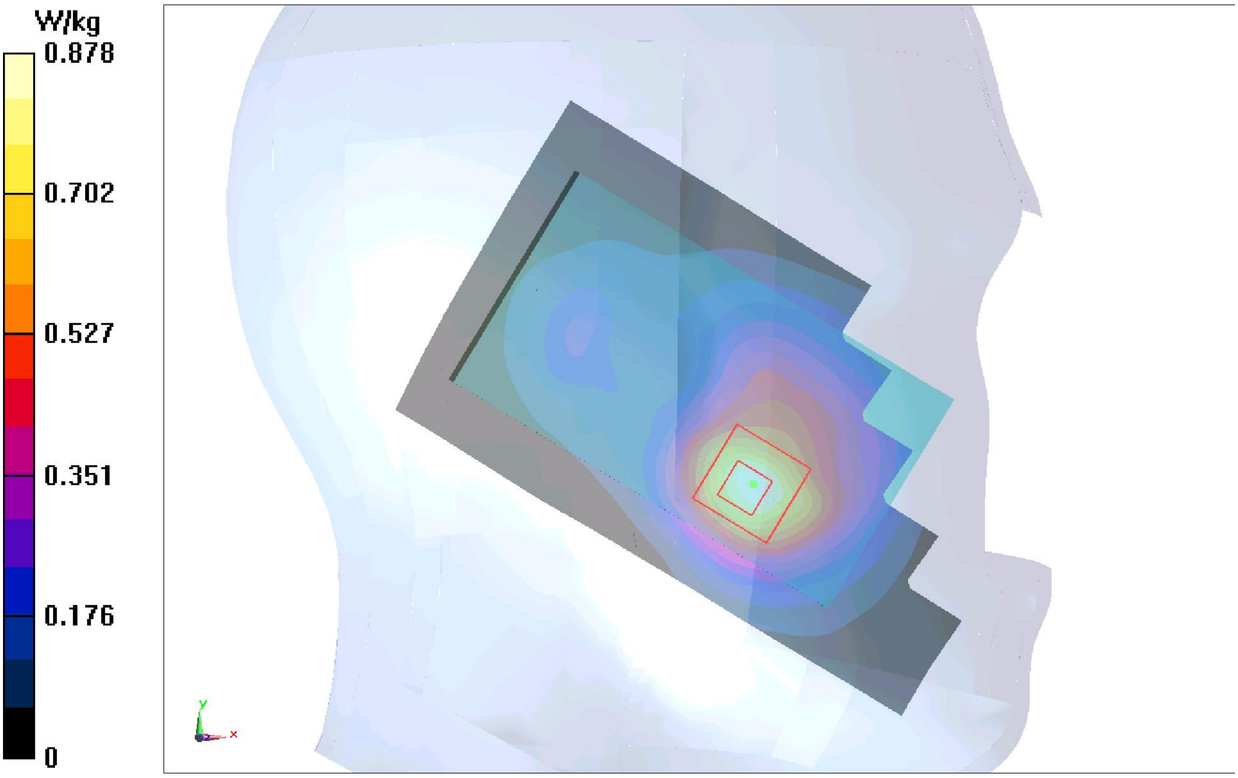



**Fig.3 1900 MHz CH810**

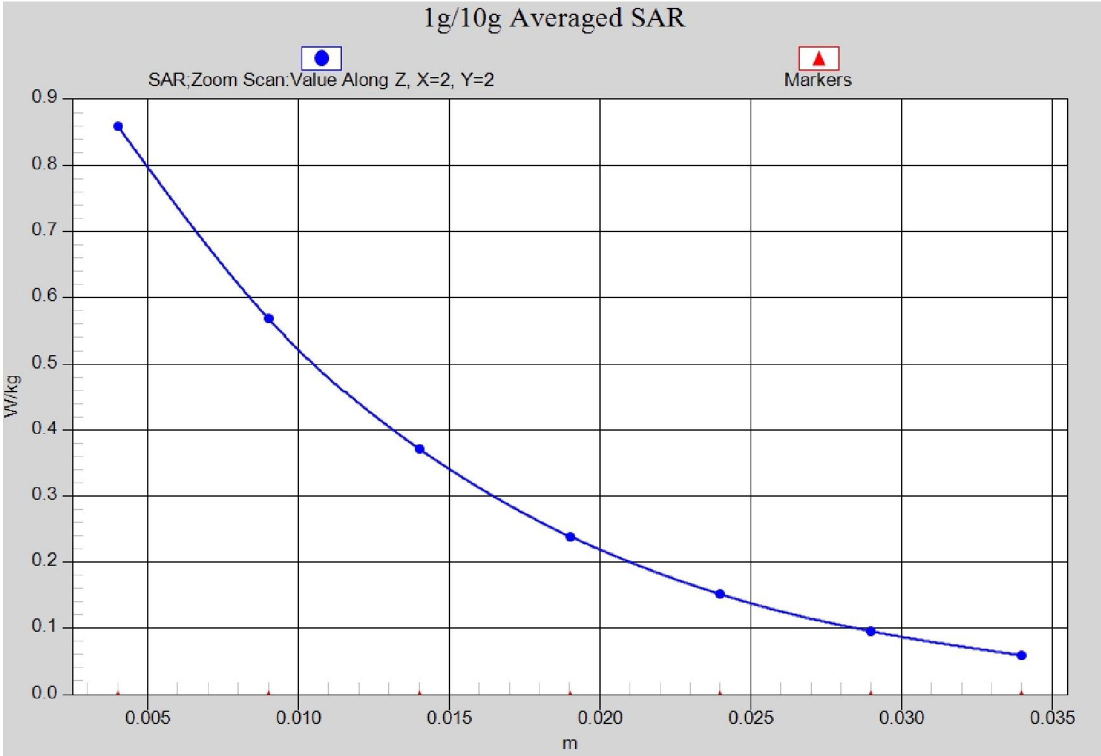



**Fig. 3-1 Z-Scan at power reference point (1900 MHz CH810)**

**GSM1900 Body Bottom Side Middle**

Date: 2014-10-28

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used: f = 1880 MHz; $\sigma$ = 1.573 S/m; $\varepsilon_r$ = 53.547; $\rho$ = 1000 kg/m$^3$

Ambient Temperature: 22.5$^o$C Liquid Temperature: 22.0$^o$C

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:2

Probe: EX3DV4 - SN3617ConvF(7.58, 7.58, 7.58)

**Bottom Side Middle/Area Scan (61x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.05 W/kg

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

Reference Value = 23.39 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 1.41 W/kg

**SAR(1 g) = 0.835 W/kg; SAR(10 g) = 0.460 W/kg**

Maximum value of SAR (measured) = 0.927 W/kg

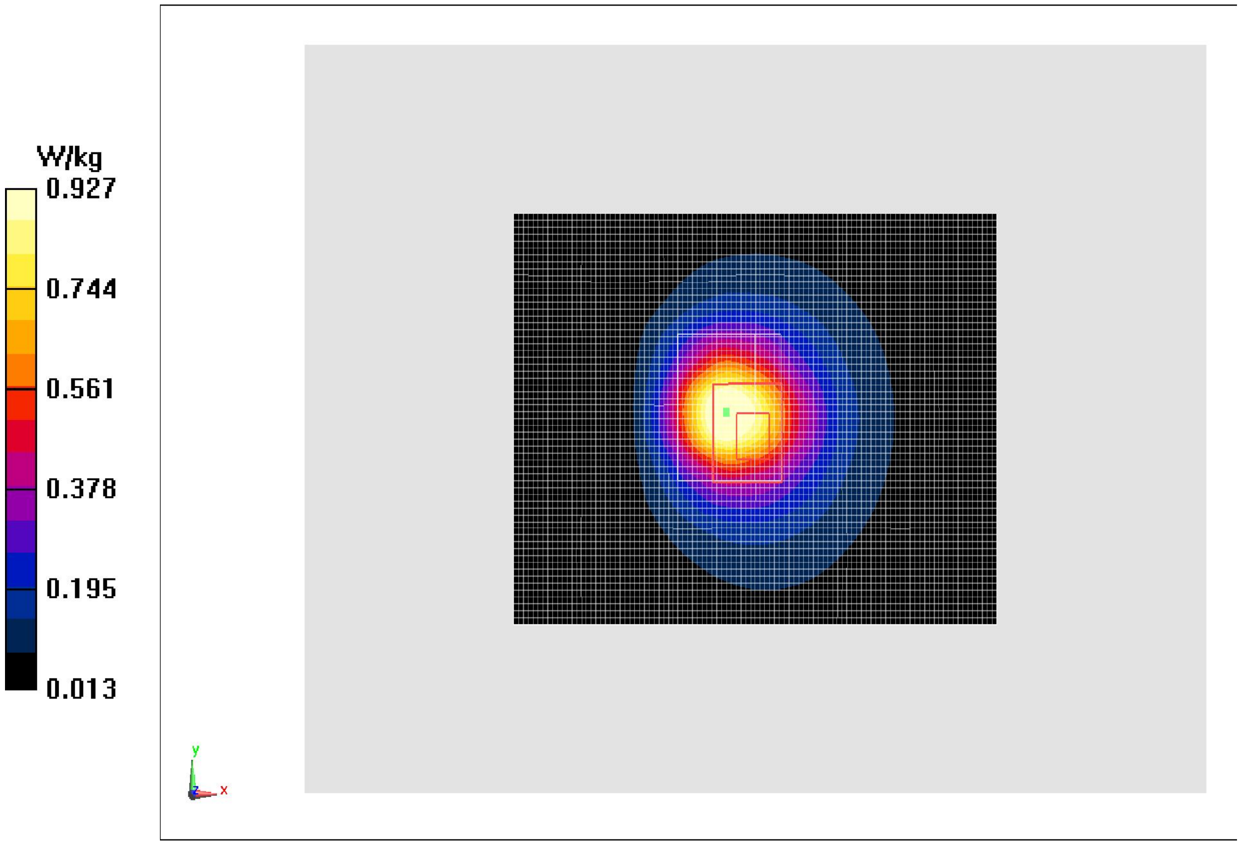



**Fig.4 1900 MHz CH661**

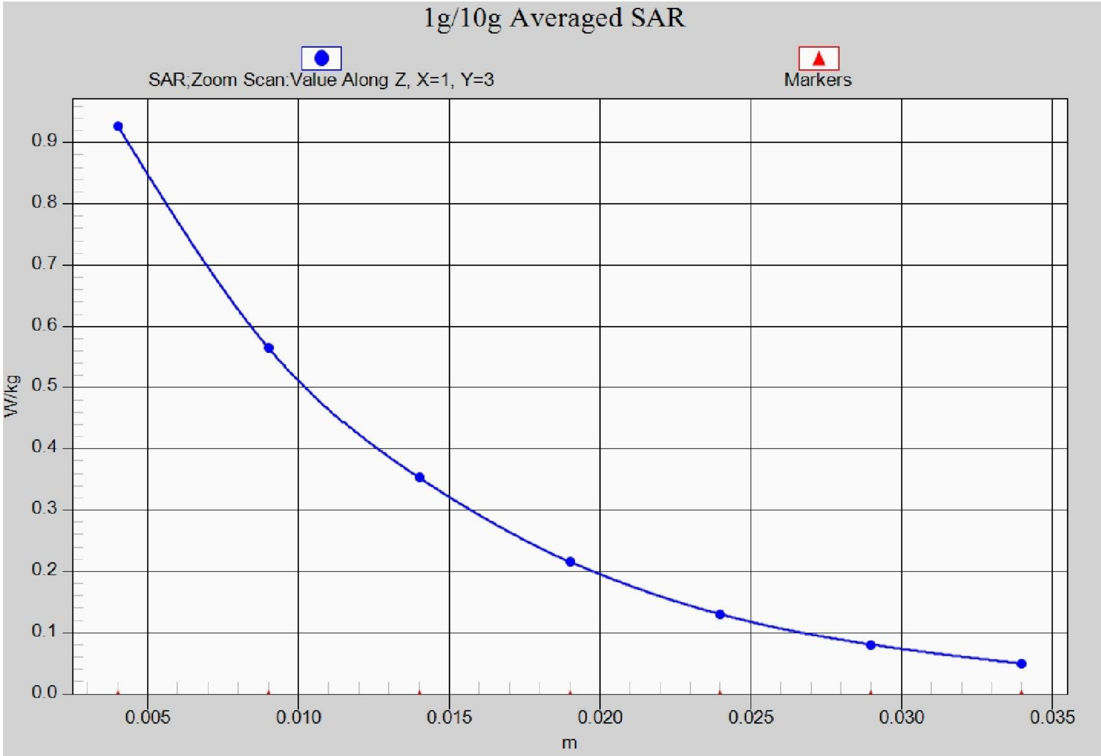



**Fig.4-1 Z-Scan at power reference point (1900 MHz CH661)**

**WCDMA 850 Left Cheek Middle**

Date: 2014-09-26
Electronics: DAE4 Sn777
Medium: Head 850 MHz
Medium parameters used (interpolated): f = 836.4 MHz; $\sigma$ = 0.958 S/m; $\varepsilon_r$ = 41.411; $\rho$ = 1000 $kg/m^3$
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: WCDMA; Frequency: 836.4 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN3617ConvF(9.67, 9.67, 9.67)

**Cheek Middle/Area Scan (61x91x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.870 W/kg

**Cheek Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.84 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 1.02 W/kg
**SAR(1 g) = 0.823 W/kg; SAR(10 g) = 0.617 W/kg**
Maximum value of SAR (measured) = 0.860 W/kg

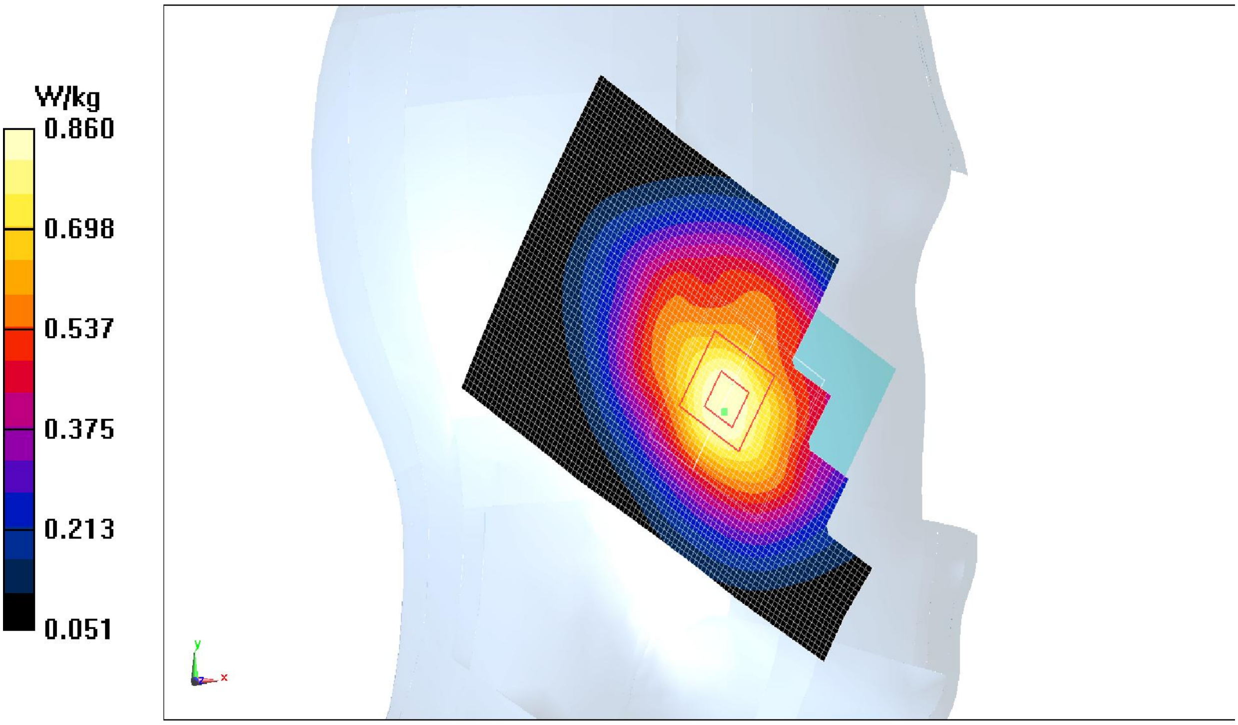



**Fig.5 WCDMA 850 CH4182**

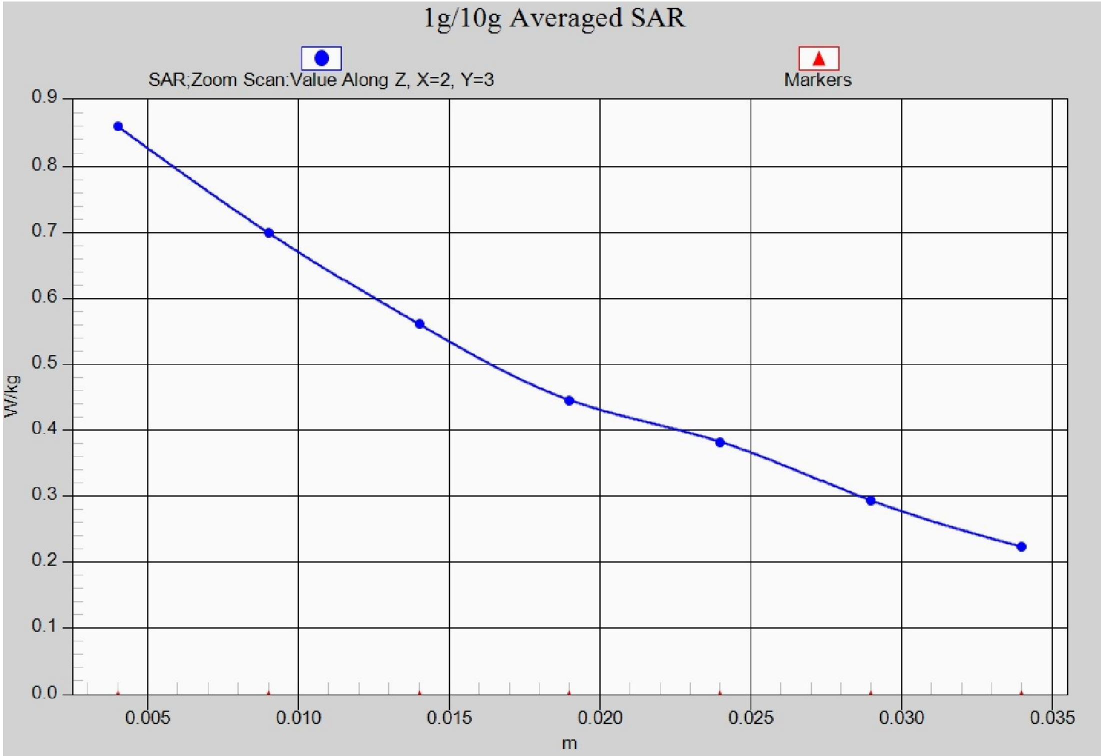



**Fig. 5-1 Z-Scan at power reference point (WCDMA 850 CH4182)**

**WCDMA 850 Body Rear Middle**

Date: 2014-09-26
Electronics: DAE4 Sn777
Medium: Body 850 MHz
Medium parameters used (interpolated): f = 836.4 MHz; $\sigma$ = 0.997 S/m; $\varepsilon_r$ = 54.543; $\rho$ = 1000 $kg/m^3$
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: WCDMA; Frequency: 836.4 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN3617ConvF(9.48, 9.48, 9.48)

**Rear Middle/Area Scan (101x61x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.07 W/kg

**Rear Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 29.32 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.36 W/kg
**SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.739 W/kg**
Maximum value of SAR (measured) = 1.09 W/kg

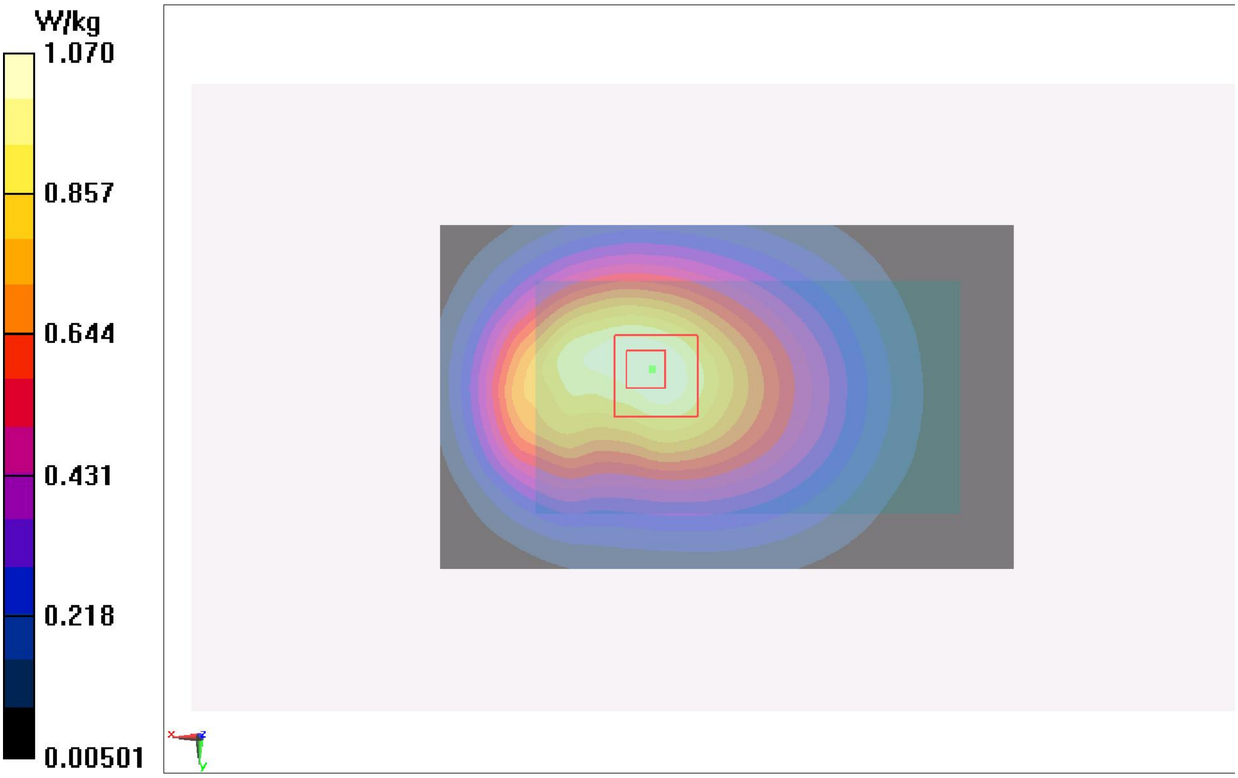



**Fig.6 WCDMA 850 CH4182**

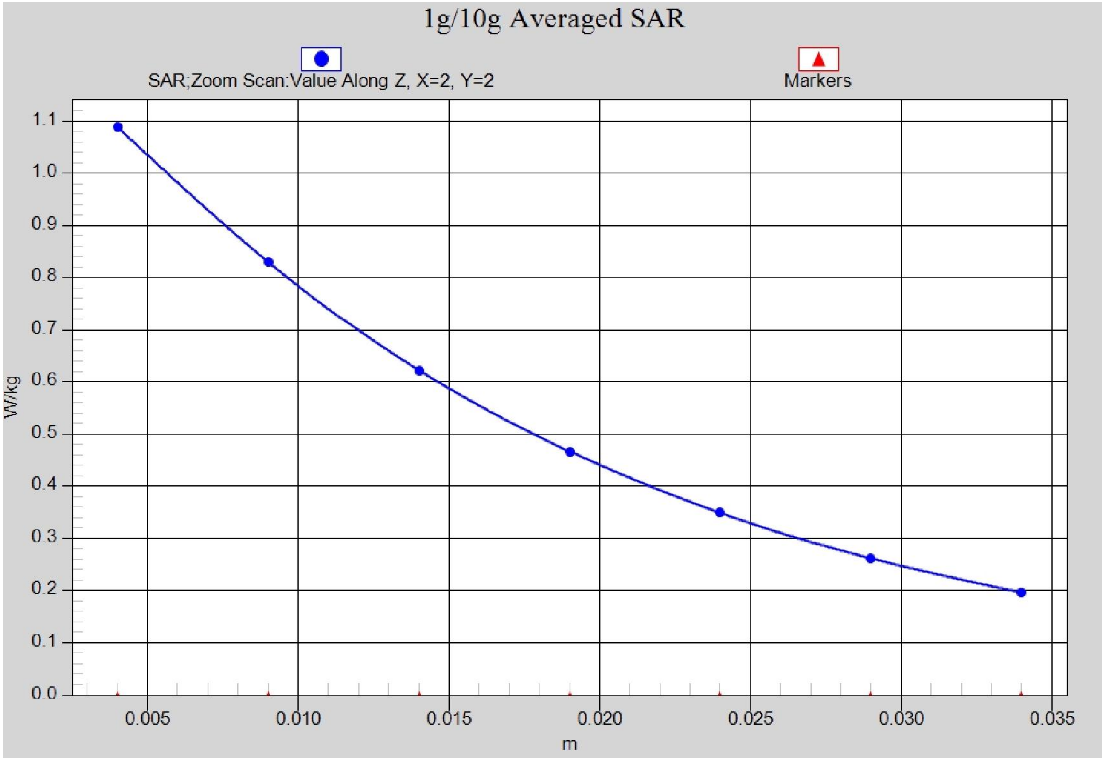



**Fig. 6-1 Z-Scan at power reference point (WCDMA850 CH4182)**

**WCDMA 1900 Left Cheek High**

Date: 2014-10-28
Electronics: DAE4 Sn777
Medium: Head 1900 MHz
Medium parameters used (interpolated): f = 1907.6 MHz; $\sigma$ = 1.35 S/m; $\varepsilon_r$ = 41.776; $\rho$ = 1000 kg/m$^3$
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: WCDMA 1900 Frequency: 1907.6 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3617ConvF(7.90, 7.90, 7.90)

**Cheek High/Area Scan (61x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.899 W/kg

**Cheek High/Zoom Scan (7x7x7)/Cube 0**: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.81 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 1.26 W/kg
**SAR(1 g) = 0.854 W/kg; SAR(10 g) = 0.526 W/kg**
Maximum value of SAR (measured) = 0.923 W/kg

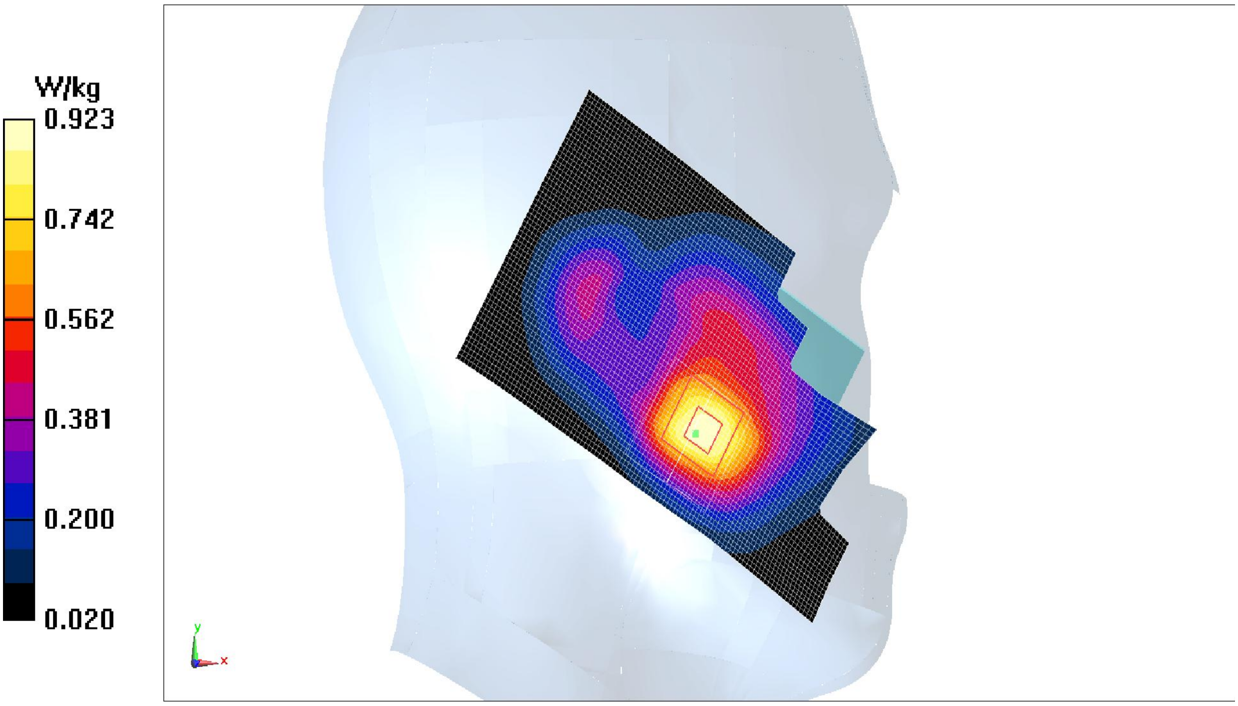



**Fig.7WCDMA1900 CH9538**

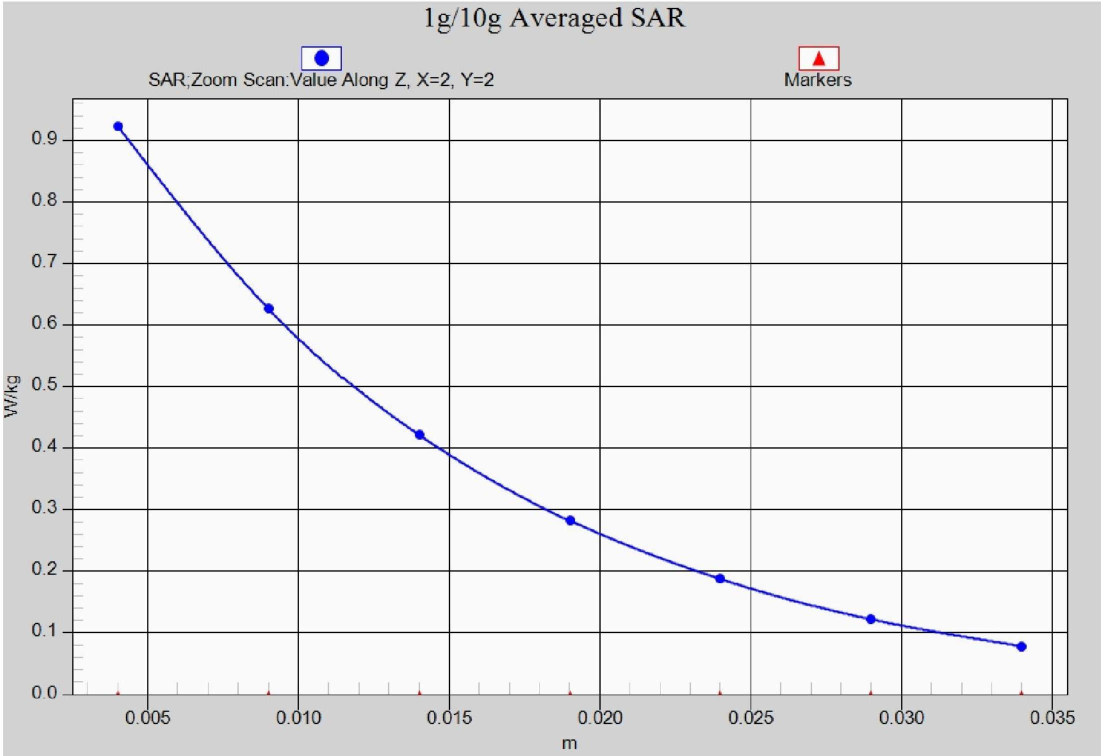



**Fig. 7-1 Z-Scan at power reference point (WCDMA1900 CH9538)**

**WCDMA 1900 Body Bottom Side Middle**

Date: 2014-10-28

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used: f = 1880 MHz; $\sigma$ = 1.573 S/m; $\varepsilon_r$ = 53.547; $\rho$ = 1000 kg/$m^3$

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

Communication System: WCDMA 1900 Frequency: 1880 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN3617ConvF(7.58, 7.58, 7.58)

**Bottom Side Middle/Area Scan (61x41x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.969 W/kg

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

Reference Value = 25.605 V/m; Power Drift = -0.20 dB

Peak SAR (extrapolated) = 1.42 W/kg

**SAR(1 g) = 0.865 W/kg; SAR(10 g) = 0.495 W/kg**

Maximum value of SAR (measured) = 0.955 W/kg

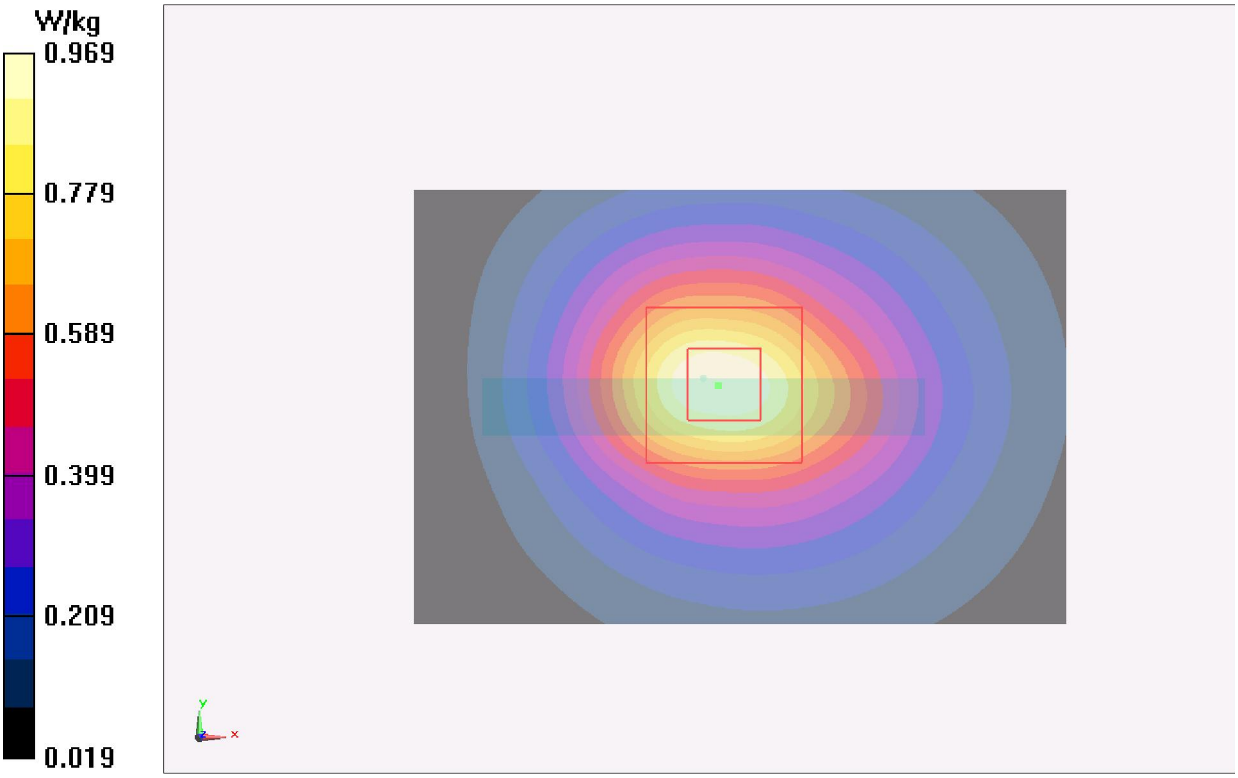



**Fig.8WCDMA1900 CH9400**

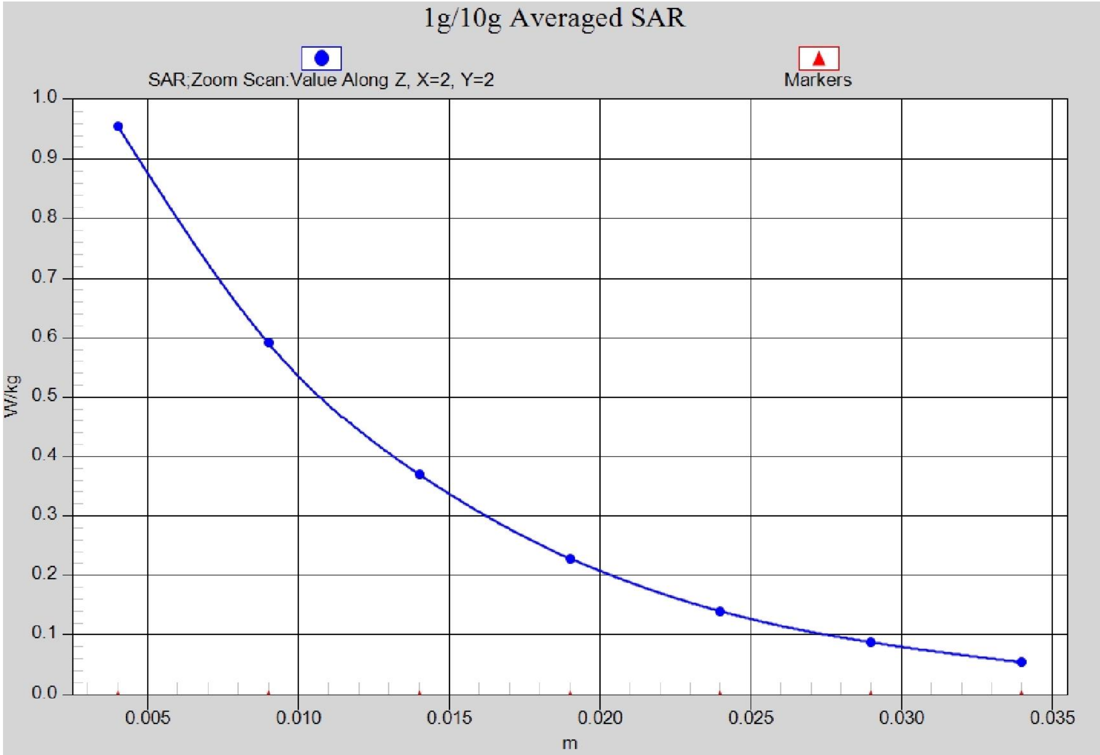



**Fig. 8-1 Z-Scan at power reference point (WCDMA1900 CH9400)**

**Wifi 802.11b Left Cheek Channel 6**

Date: 2014-12-04
Electronics: DAE4 Sn777
Medium: Head 2450 MHz
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.805 S/m; $\varepsilon_r$ = 38.792; ρ = 1000 kg/m$^3$
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: WLan 2450 Frequency: 2437 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3617ConvF(7.19, 7.19, 7.19)

**Cheek Middle/Area Scan (61x91x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.202 W/kg

**Cheek Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.693 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.401 W/kg
**SAR(1 g) = 0.172 W/kg; SAR(10 g) = 0.089 W/kg**
Maximum value of SAR (measured) = 0.192 W/kg

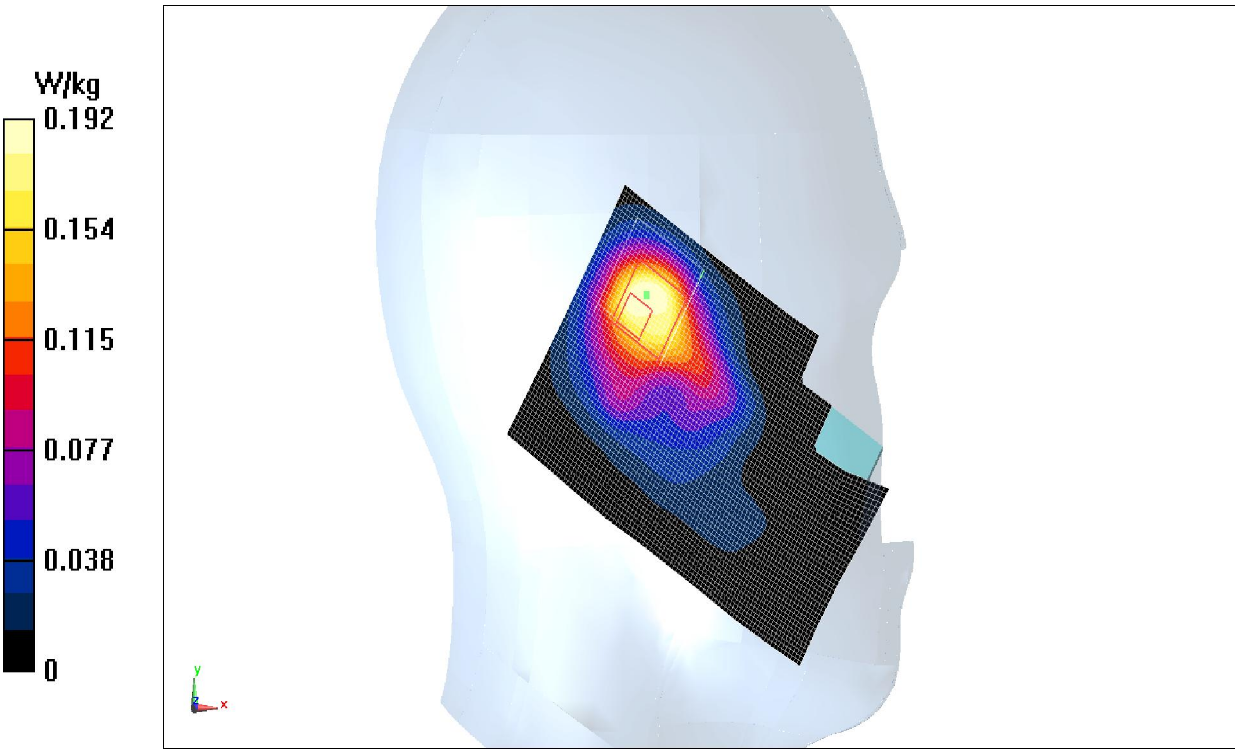



**Fig.9 2450 MHz CH6**

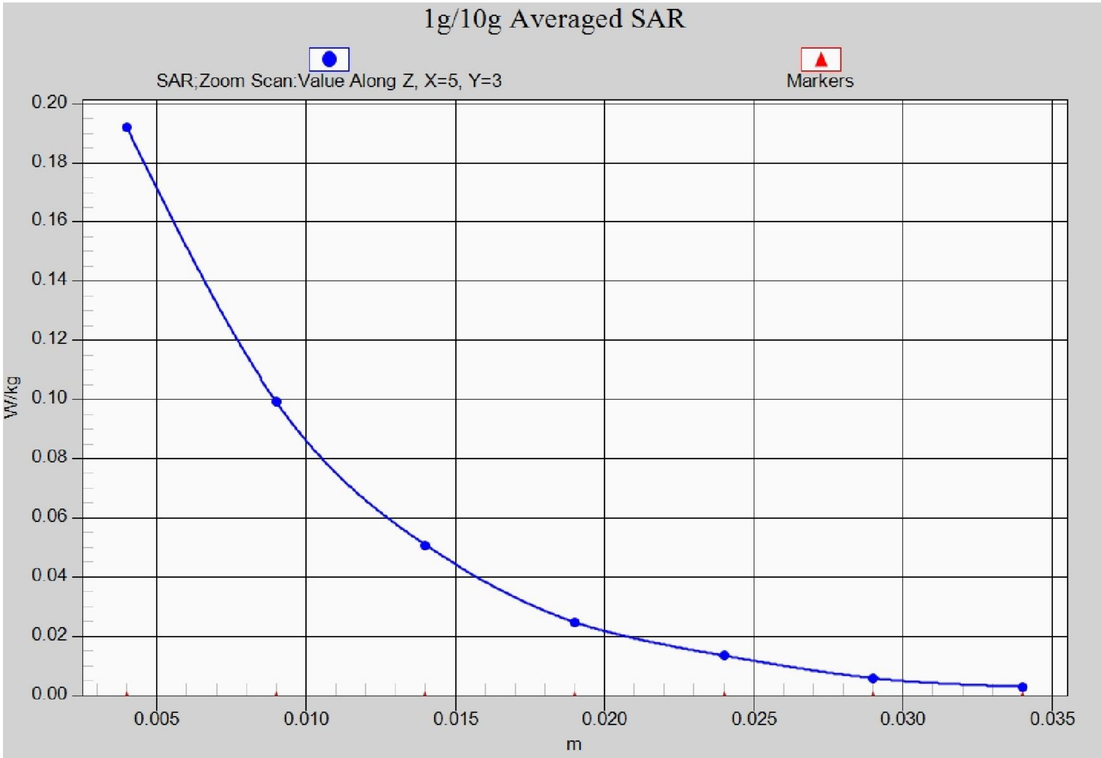



**Fig. 9-1 Z-Scan at power reference point (2450 MHz CH6)**

**Wifi 802.11b Body Rear Channel 6**
Date: 2014-12-04
Electronics: DAE4 Sn777
Medium: Body 2450 MHz
Medium parameters used (interpolated): f = 2437 MHz; $\sigma$ = 1.953 S/m; $\varepsilon_r$ = 53.404; $\rho$ = 1000 $kg/m^3$
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: WLan 2450 Frequency: 2437 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3617ConvF(7.31, 7.31, 7.31)

**Rear Middle/Area Scan (61x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.0989 W/kg

**Rear Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.852 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.139 W/kg
**SAR(1 g) = 0.0814 W/kg; SAR(10 g) = 0.0472 W/kg**
Maximum value of SAR (measured) = 0.0877 W/kg

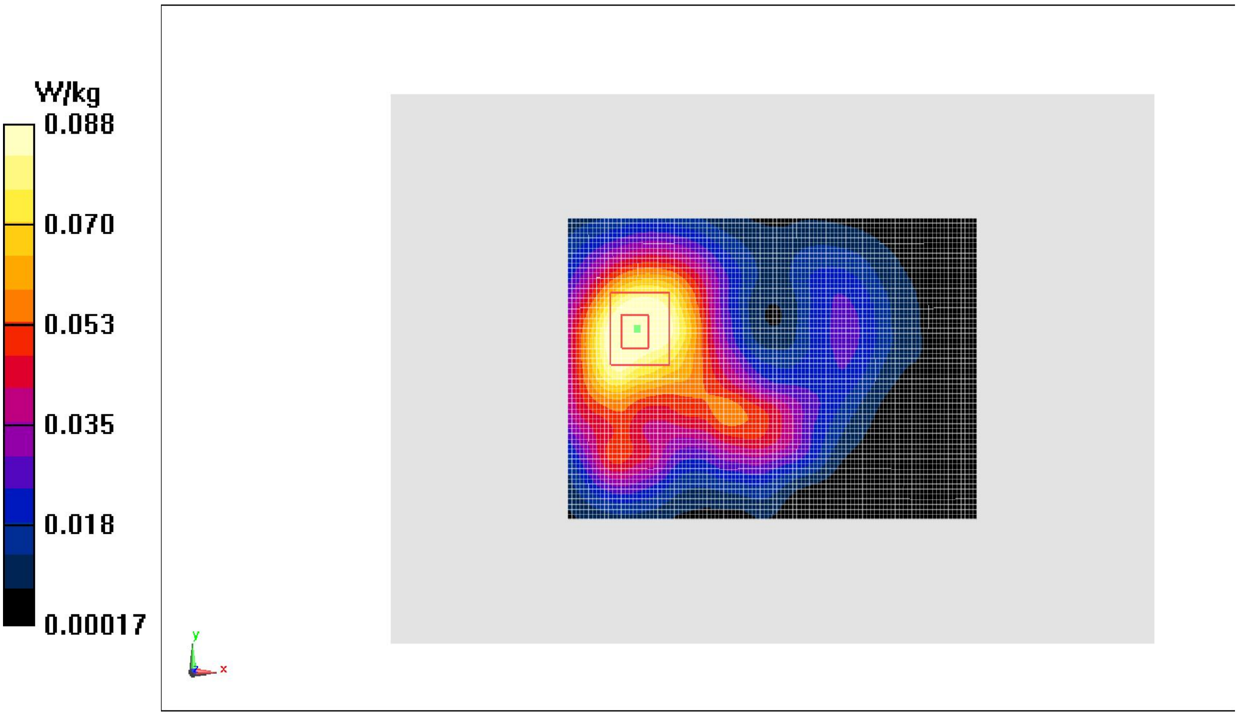



**Fig.10 2450 MHz CH6**

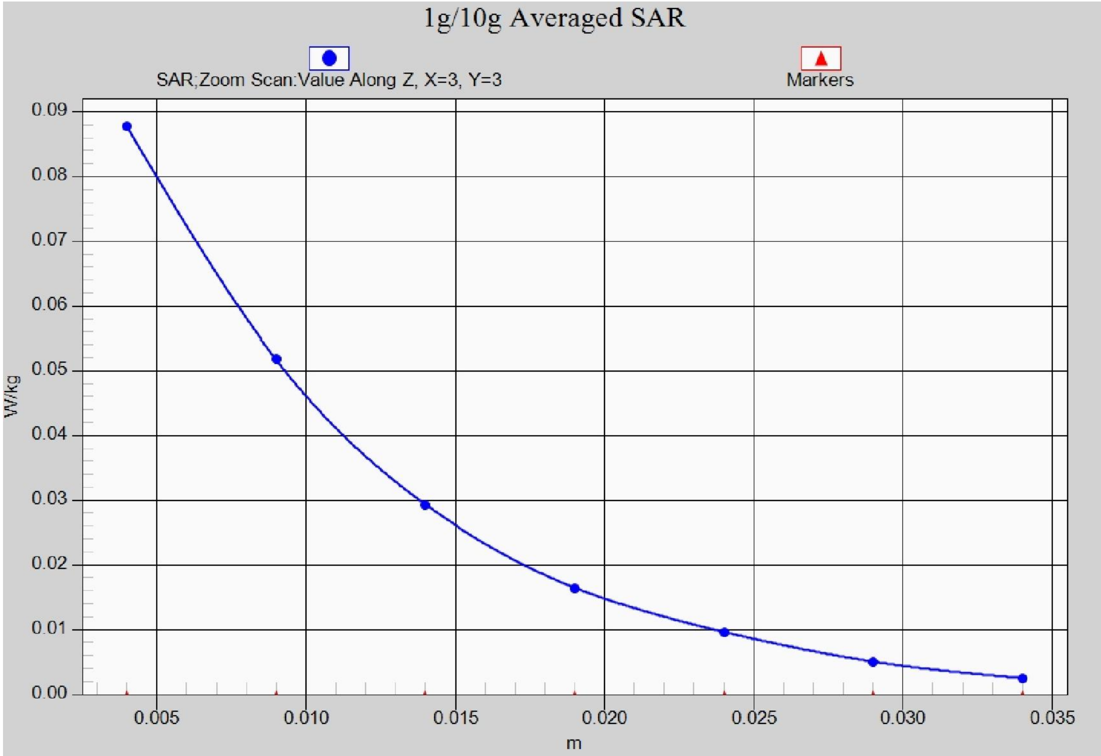



**Fig. 10-1 Z-Scan at power reference point (2450 MHz CH6)**

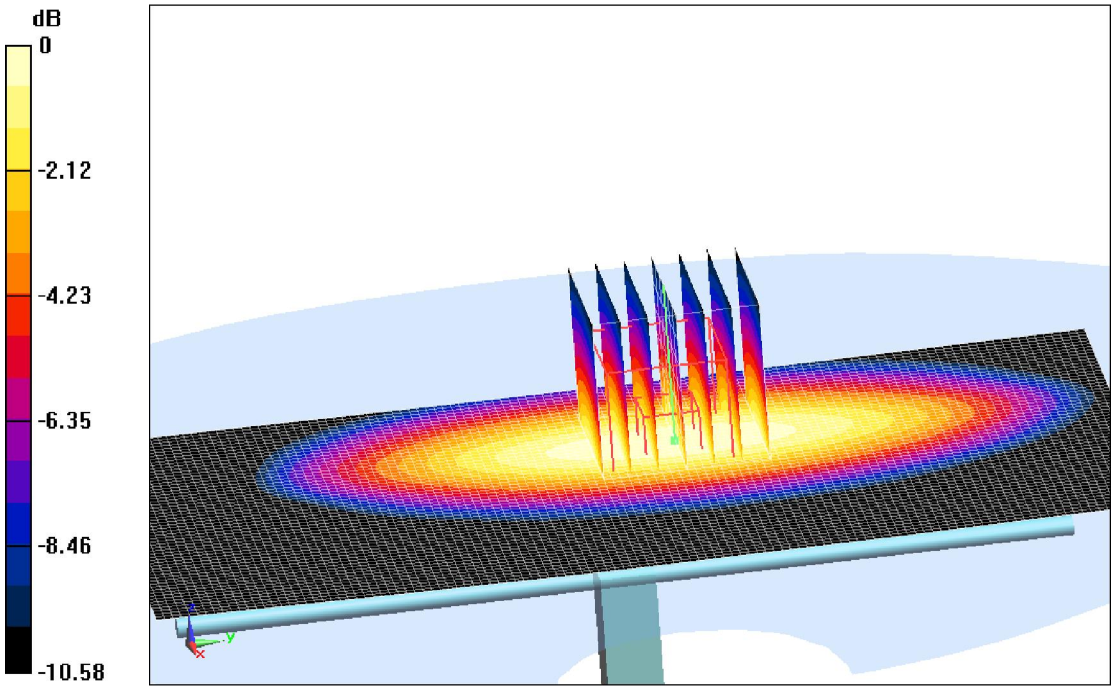
## ANNEX B SystemVerification Results

### 835MHz

Date: 2014-09-26
Electronics: DAE4 Sn777
Medium: Head 850 MHz
Medium parameters used: f = 835 MHz; $\sigma$ = 0.894S/m; $\varepsilon_r$ = 41.42; $\rho$ = 1000 kg/m$^3$
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3617ConvF(9.67, 9.67, 9.67)

**System Validation/Area Scan (61x121x1):**Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 54.763 V/m; Power Drift = -0.05 dB
**Fast SAR: SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.58 W/kg**
Maximum value of SAR (interpolated) = 2.68 W/kg

**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.763 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 3.65 W/kg
**SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.56 W/kg**
Maximum value of SAR (measured) = 2.66 W/kg




0 dB = 2.66 W/kg = 8.50 dBW/kg

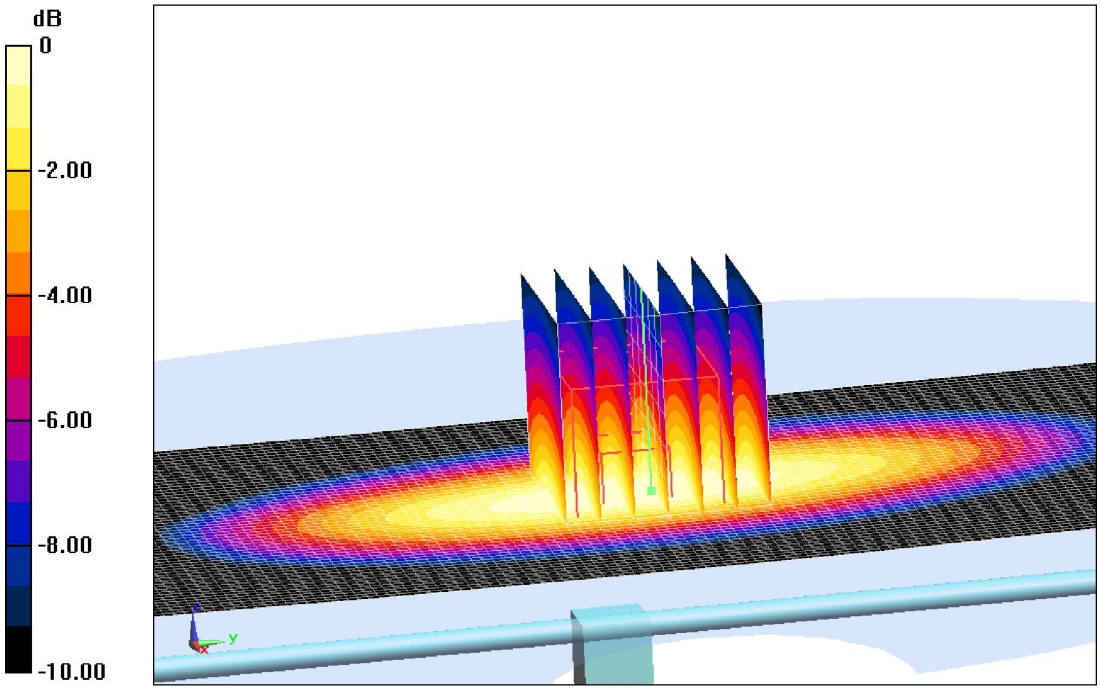
**Fig.B.1 validation 835MHz 250mW**

## 835MHz

Date: 2014-09-26
Electronics: DAE4 Sn777
Medium: Body 850 MHz
Medium parameters used: f = 835 MHz; σ = 0.981S/m; $\varepsilon_r$ = 54.63; ρ = 1000 kg/$m^3$
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3617ConvF(9.48, 9.48, 9.48)

**System Validation /Area Scan (61x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 52.530 V/m; Power Drift = 0.12 dB
**Fast SAR: SAR(1 g) = 2.33 W/kg; SAR(10 g) = 1.69 W/kg**
Maximum value of SAR (interpolated) = 2.60 W/kg

**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.530 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 3.12 W/kg
**SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.54 W/kg**
Maximum value of SAR (measured) = 2.62 W/kg




0 dB = 2.60 W/kg = 8.30 dBW/kg

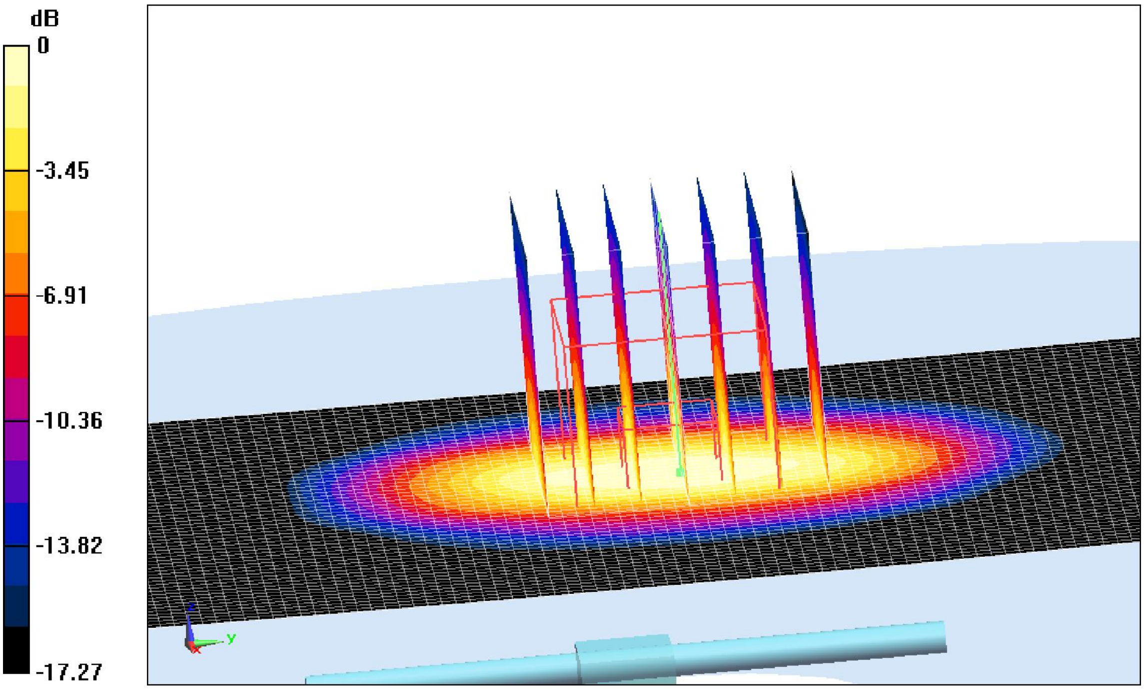
**Fig.B.2 validation 835MHz 250mW**

## 1900MHz

Date: 2014-10-28
Electronics: DAE4 Sn777
Medium: Head 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.398S/m; $\varepsilon_r$ = 39.20; ρ = 1000 kg/m$^3$
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3617ConvF(7.90, 7.90, 7.90)

**System Validation/Area Scan (81x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 97.289 V/m; Power Drift = 0.03 dB
**Fast SAR: SAR(1 g) = 9.96 W/kg; SAR(10 g) = 5.22 W/kg**
Maximum value of SAR (interpolated) = 11.74 W/kg

**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.289 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 18.43 W/kg
**SAR(1 g) = 10.12 W/kg; SAR(10 g) = 5.32 W/kg**
Maximum value of SAR (measured) = 11.92 W/kg




0 dB = 11.74W/kg = 21.39 dB W/kg

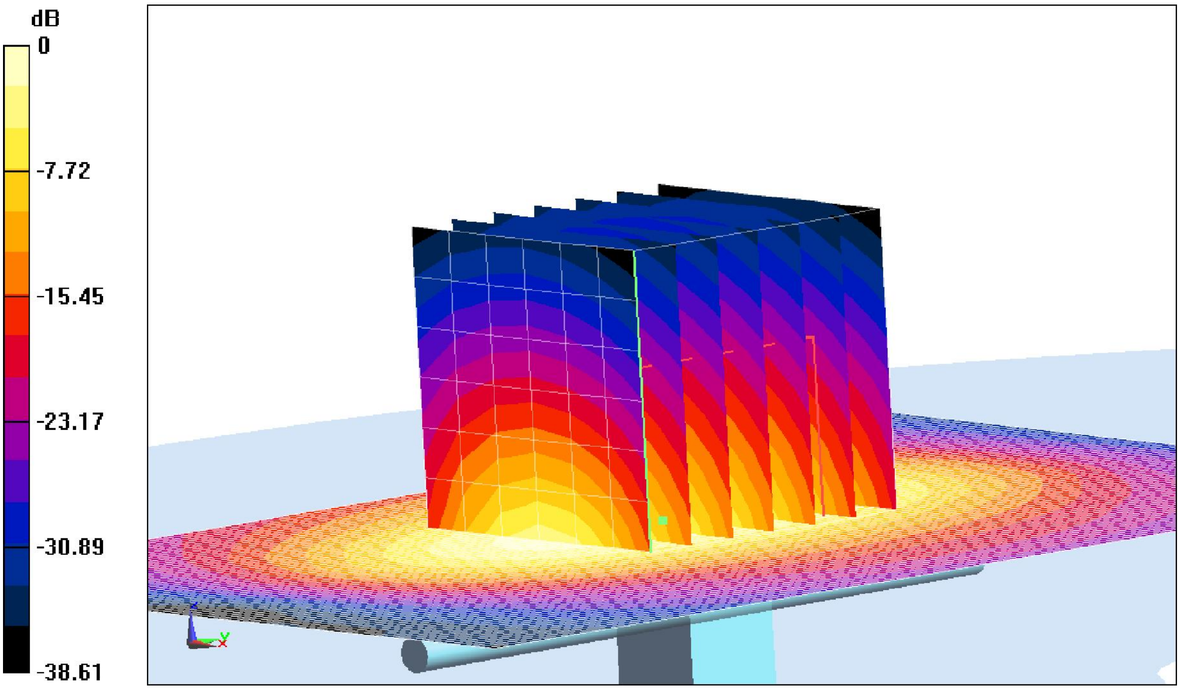
**Fig.B.3validation 1900MHz 250mW**

## 1900MHz

Date: 2014-10-28
Electronics: DAE4 Sn777
Medium: Body 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.506S/m; $\varepsilon_r$ = 53.52; $\rho$ = 1000 kg/$m^3$
Ambient Temperature: 22.5$^o$C Liquid Temperature: 22.0$^o$C
Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3617ConvF(7.58, 7.58, 7.58)

**System Validation/Area Scan (81x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 79.474 V/m; Power Drift = -0.12 dB
**Fast SAR: SAR(1 g) = 10.0 W/kg; SAR(10 g) = 5.23 W/kg**
Maximum value of SAR (interpolated) = 11.7 W/kg

**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 79.474 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 16.87 W/kg
**SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.37 W/kg**
Maximum value of SAR (measured) = 11.9 W/kg




0 dB = 11.7W/kg = 21.36 dB W/kg

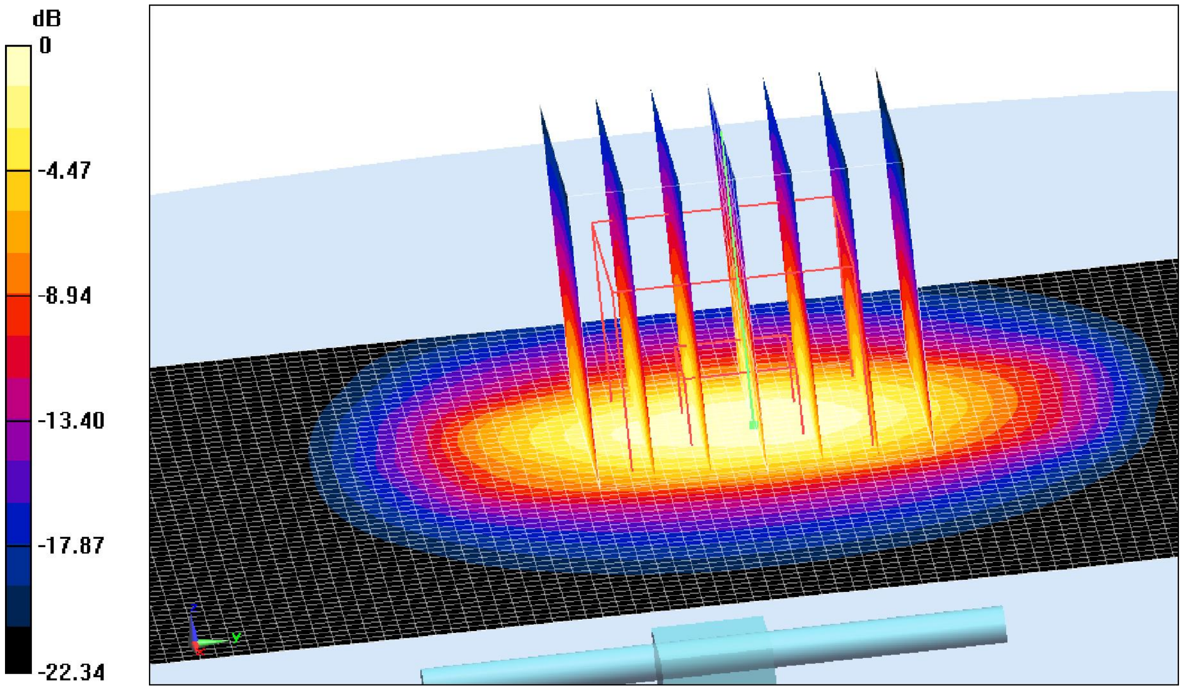
**Fig.B.4validation 1900MHz 250mW**

## 2450MHz

Date: 2014-12-04
Electronics: DAE4 Sn777
Medium: Head 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.818S/m; $\varepsilon_r$ = 38.73; ρ = 1000 kg/m$^3$
Ambient Temperature: 22.5°C          Liquid Temperature: 22.0°C
Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3617ConvF(7.19, 7.19, 7.19)

**System Validation /Area Scan (61x81x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 88.742 V/m; Power Drift = -0.04 dB
**SAR(1 g) = 13.0 W/kg; SAR(10 g) = 6.20 W/kg**
Maximum value of SAR (interpolated) = 16.9 W/kg

**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 88.742 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 27.4 W/kg
**SAR(1 g) = 12.9 W/kg; SAR(10 g) = 6.10 W/kg**
Maximum value of SAR (measured) = 16.7 W/kg




0 dB = 16.9W/kg = 12.28 dB W/kg

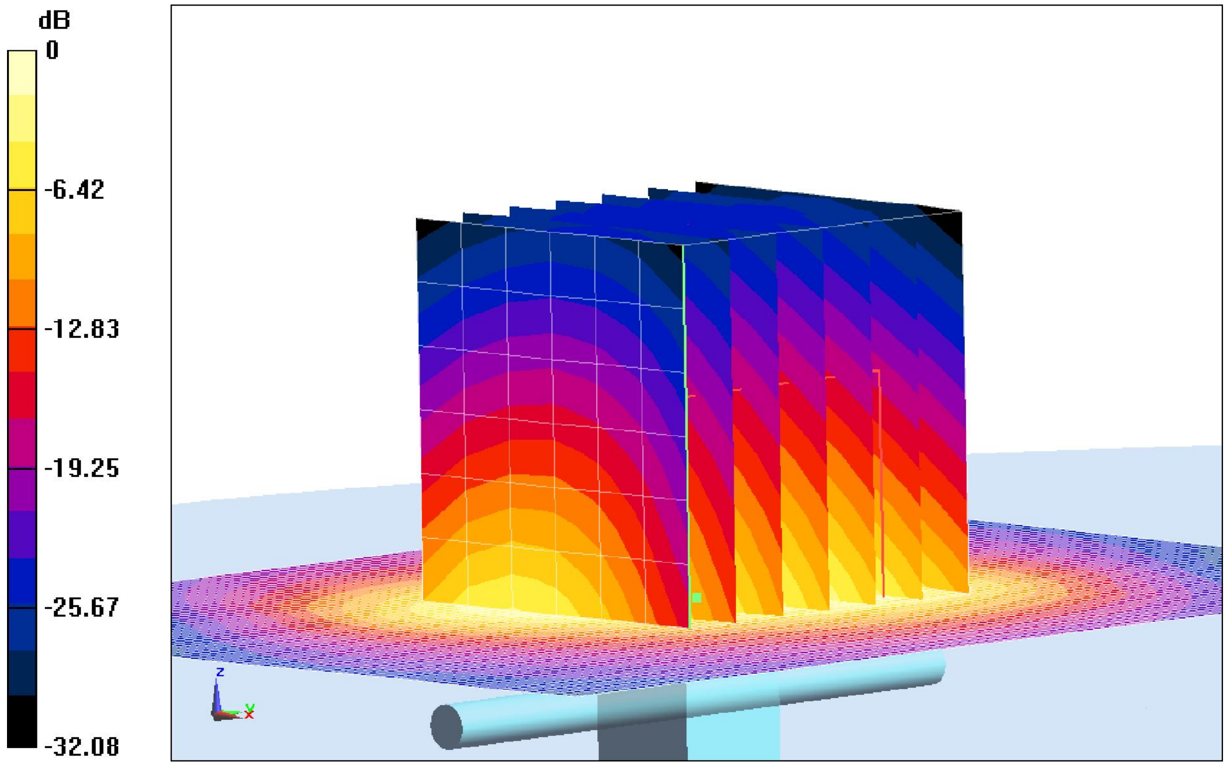
**Fig.B.5 validation 2450MHz 250mW**

## 2450MHz

Date: 2014-12-04
Electronics: DAE4 Sn777
Medium: Body 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.965S/m; $\varepsilon_r$ = 53.42; ρ = 1000 kg/m$^3$
Ambient Temperature: 22.5°C Liquid Temperature: 22.0°C
Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1
Probe: EX3DV4 - SN3617ConvF(7.31, 7.31, 7.31)

**System Validation/Area Scan (81x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 88.346 V/m; Power Drift = 0.08 dB
**SAR(1 g) = 12.1 W/kg; SAR(10 g) = 5.64 W/kg**
Maximum value of SAR (interpolated) = 14.3 W/kg

**System Validation/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 88.346 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 24.6 W/kg
**SAR(1 g) = 12.2 W/kg; SAR(10 g) = 5.67 W/kg**
Maximum value of SAR (measured) = 14.4 W/kg




0 dB = 14.3 W/kg = 11.55 dB W/kg

**Fig.B.6validation 2450MHz 250mW**

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

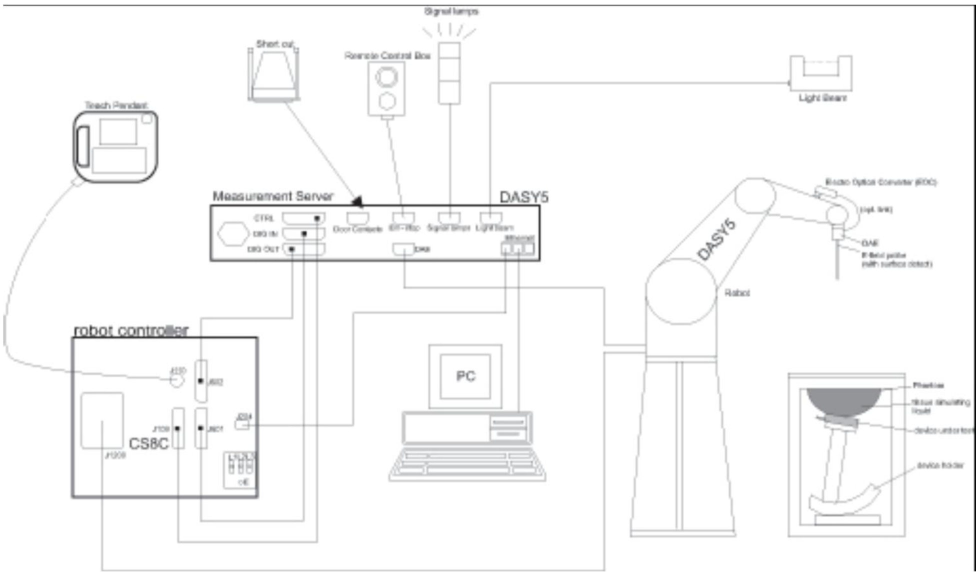
**Table B.1 Comparison between area scan and zoom scan for system verification**

| Band | Position | Area scan (1g) | Zoom scan (1g) | Drift (%) |
|---|---|---|---|---|
| 835 | Head | 2.45 | 2.42 | 1.24 |
| 835 | Body | 2.33 | 2.38 | -2.11 |
| 1900 | Head | 9.96 | 10.12 | -1.58 |
| 1900 | Body | 10.0 | 10.3 | -2.91 |
| 2450 | Head | 13.0 | 12.9 | 0.77 |
| 2450 | Body | 12.1 | 12.2 | -0.83 |

# ANNEX C    SAR Measurement Setup

## C.1 Measurement Set-up

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




**Picture C.1SAR Lab Test Measurement Set-up**

- A standard high precision 6-axis robot (StäubliTX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY4 or DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as
- warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

## C.2 Dasy4 or DASY5 E-field Probe System

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

Picture C.2Near-field Probe

**Probe Specifications:**
**Model:** ES3DV3, EX3DV4
**Frequency** 10MHz — 6.0GHz(EX3DV4)
**Range:** 10MHz — 4GHz(ES3DV3)
**Calibration:** In head and body simulating tissue at Frequencies from 835 up to 5800MHz
**Linearity:** ± 0.2dB(30 MHz to 6 GHz) for EX3DV4
**± 0.2dB(30 MHz to 4 GHz) for ES3DV3**
**DynamicRange:** 10 mW/kg — 100W/kg
**Probe Length:** 330 mm
**Probe Tip**
**Length:** 20 mm
**Body Diameter:** 12 mm
**Tip Diameter:** 2.5 mm (3.9 mm for ES3DV3)
**Tip-Center:** 1 mm (2.0mm for ES3DV3)
**Application:SAR Dosimetry Testing**
**Compliance tests ofmobile phones**
**Dosimetry in strong gradient fields**

**Picture C.3E-field Probe**

## C.3 E-field Probe Calibration

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

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and inn a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed