# SAR Evaluation Report
# for
# FCC OET Bulletin 65 Supplement C

**Report No.: 11-06-MAS-176-07**

| | |
|---|---|
| Client: | Ericsson AB |
| Product: | Cisco Cius 4G |
| Model: | CIUS-7-AT-K9 |
| FCC ID: | VV7-MBMF5521GW1-O |
| Manufacturer/supplier: | Celestica Thailand Ltd. |

| | | |
|---|---|---|
| Date test item received: | 2011/06/13 | |
| Date test campaign completed: | 2012/01/11 | |
| Date of issue: | 2012/01/11 | |
| Test Result: | ■ Compliance | ☐ Not Compliance |

Statement of Compliance:
The SAR values measured for the test sample are below the maximum recommended level of 1.6 W/kg averaged over any 1g tissue according to Industry Canada RSS-102 (Issue 4, 2010) and FCC OET Bulletin 65 Supplement C (Edition 01-01).



*Total number of pages of this test report: 163 pages*

| Test Engineer | Checked By | Approved By |
|---|---|---|
| Perry Lin | James Cheng | Winpo Tsai |

**Applicant Information**

| | | |
|---|---|---|
| **Client** | **:** | Ericsson AB |
| **Address** | **:** | Lindholmspiren 11, 417 56 Göteborg, Sweden |
| **Manufacturer** | **:** | Celestica Thailand Ltd. |
| **Address** | **:** | 49/18 Moo 5, Laem Chabang Industrial Estate, Tungsukhla Chonburi, Thailand 20230 |
| **EUT** | **:** | Cisco Cius 4G |
| **Trade Name** | **:** | Cisco Systems, Inc. |
| **Model No.** | **:** | CIUS-7-AT-K9 |
| **Standard Applied** | **:** | FCC OET 65 Supplement C (Edition 01-01, June 2001)<br>IEEE Standard 1528-2003 |
| **Test Location** | **:** | Electronics Testing Center, Taiwan (www.etc.org.tw)<br>No.8, Lane 29, Wenming RD., LeShan Tsuen, GuiShan Shiang,Taoyuan County 33383, Taiwan, R.O.C. |

**The Cisco Cius 4G is in compliance with the FCC Report and Order 93-326 and Health Canada Safety Code 6, and the tests were performed according to the FCC OET65c and RSS-102 for uncontrolled exposure.**

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## Executive Summary

The equipment under test was a Cisco Cius 4G tablet PC implemented with an Ericsson mobile broadband module FSS21GW, operating in the 850MHz and 1900 MHz frequency ranges. The measurements was conducted by ETC and carried out with the dosimetric assessment system – DASY4.

The measurements of device were conducted according to FCC OET 65 Supplement C [Reference 5] for evaluating compliance with requirements of FCC Report and Order 96-326 [Reference 3] and also according to Industry Standard RSS-102 Issue 4 [Reference 8] for evaluating compliance with requirements of Health Canada Safety Code 6[Reference 9].

The device’s frequency range is followed as:

| **GPRS 850** | | **GPRS 1900** | | **WCDMA Band V** | | **WCDMA Band II** | |
|---|---|---|---|---|---|---|---|
| 128 | 824.2 | 521 | 1850.2 | 4132 | 826.4 | 9262 | 1852.4 |
| 190 | 836.6 | 661 | 1880.0 | 4183 | 836.4 | 9400 | 1880.0 |
| 251 | 848.8 | 810 | 1909.8 | 4233 | 846.6 | 9538 | 1907.6 |

| **Summary of Stand-Alone SAR Result** | |
|---|---|
| **Transmit Band** | **Body SAR (1g W/kg)** |
| **GPRS 850** | **0.903** |
| **EDGE 850** | **0.980** |
| **GPRS 1900** | **1.090** |
| **EDGE 1900** | **0.671** |
| **WCDMA 850** | **1.040** |
| **WCDMA 1900** | **0.508** |

# 1 Euipment Under Test

| | | |
|---|---|---|
| EUT Type | The Cisco Cius 4G is a mobile tablet device containing 802.11a/b/g/n, Bluetooth, and WWAN technology. | |
| Trade Name | Cisco Systems, Inc. | |
| Model Name | CIUS-7-AT-K9 | |
| Normal Operation: | Refer to Sec 6.5, Display Orientation Capabilities for details<br>- Tablet bottom face down<br>- Primary Landscape configuration<br>- Primary Portrait configuration<br>- Secondary Portrait configuration | |
| Simultaneous transmission: | -WWAN and WLAN (2.4GHz & 5GHz) are possible for simultaneous transmission<br>-WWAN and Bluetooth are possible for simultaneous transmission<br>-WLAN(2.4GHz & 5GHz) and Bluetooth are not possible fo simultaneous transmission<br>-WWAN and WLAN and Bluetooth are not possible for simultaneous transmission | |
| Assessment for SAR evaluation of simultaneous transmission: | Refer to Sec 6.5 Simultaneous transmission analysis for details | |
| Proximity Sensor for Power Reduction | Trigger Distance: 0-10mm from back surface | |
| Tx Frequency | 824.2 MHz ~ 848.8 MHz；1850.2 ~ 1909.8 MHz | |
| Rx Frequency | 869.2 MHz ~ 893.8 MHz；1930.2 ~ 1989.8 MHz | |
| GPRS/EDGE | Multi-slot class mode 10(2 slot max) | |
| Antenna Type | multiband FPC antenna | |
| Device Category | Portable Device | |
| RF Exposure Environment | General Population / Uncontrolled | |
| Power supply | Internal battery (/ 3.7V / 4960mAh) | |
| Crest Factor | GSM:8.3, WCDMA:1 | |
| Body-Worn Operation | ☐Yes | ☒No |

# 2 Description of the Test Equipment

The measurements were performed using an automated near-field scanning system, DASY4 software, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland. The SAR extrapolation algorithm used in all measurements on the test device was the 'worst case extrapolation' algorithm.

## 2.1 Test Equipment List

| Equipment | Manufacturer | Type | S/N | Calibration Expiry |
|---|---|---|---|---|
| Robot | Staubli | RX90B L | F03/5W16A1/A/01 | (not necessary) |
| Robot Controller | Staubli | CS7MB | F03/5W16A1/C/01 | (not necessary) |
| Teach Pendant | Staubli | ------------ | D221340061 | (not necessary) |
| DAE4 | Schmid & Partner Engineering AG | ------------ | 629 | 2012-09-21 |
| E-field Probe | Schmid & Partner Engineering AG | EX3DV4 | 3555 | 2012-09-28 |
| E-field Probe | Schmid & Partner Engineering AG | EX3DV4 | 3665 | 2012-04-18 |
| Dipole Validation Kit | Schmid & Partner Engineering AG | D835V2 | 4d092 | 2012-06-21 |
| Dipole Validation Kit | Schmid & Partner Engineering AG | D1900V2 | 5d054 | 2012-09-16 |
| DIGITAL RADIO TESTER | Rohde & Schwarz | CTS 60 | 1094.0006.60 Sr.100584 | 2012-04-17 |
| Universal Radio Communication Tester | Rohde & Schwarz | CMU200 | 101006 | 2012-01-12 |
| Thermo-Hygro.meter | TFA | ------------ | ------------ | 2012-07-20 |
| Directional Coupler | Amplifier Research | DC7420 | 310569 | 2011-08-22 |
| DASY4 Software | Schmid & Partner Engineering AG | ------------ | Version 4.6B23 | To automatically control the robot and perform the SAR measurement |
| SEMCAD Software | Schmid & Partner Engineering AG | ------------ | Version 1.8B160 | Post-processing and report management |
| Signal Generator | Agilent | 83640B | 3844A01143 | 2011-10-04 |
| Amplifier | Mini-Circuits | ZHL-42W | D111704-01-02 | 2011-08-24 |
| Power Meter | BOONTON | 4532-0102 | 136601 | 2012-06-19 |
| Power Sensor | BOONTON | 51011-EMC | 32861 | 2012-06-19 |
| S-Parameter Network Analyzer | Agilent | 8753ES | MY40001340 | 2011-12-18 |
| Calibration Kit | Agilent | 85033C | 2920A03287 | (not necessary) |
| Dielectric Probe Kit | Agilent | 85070E | MY44300101 | (not necessary) |

## 2.2 DASY4 Measurement System Diagram

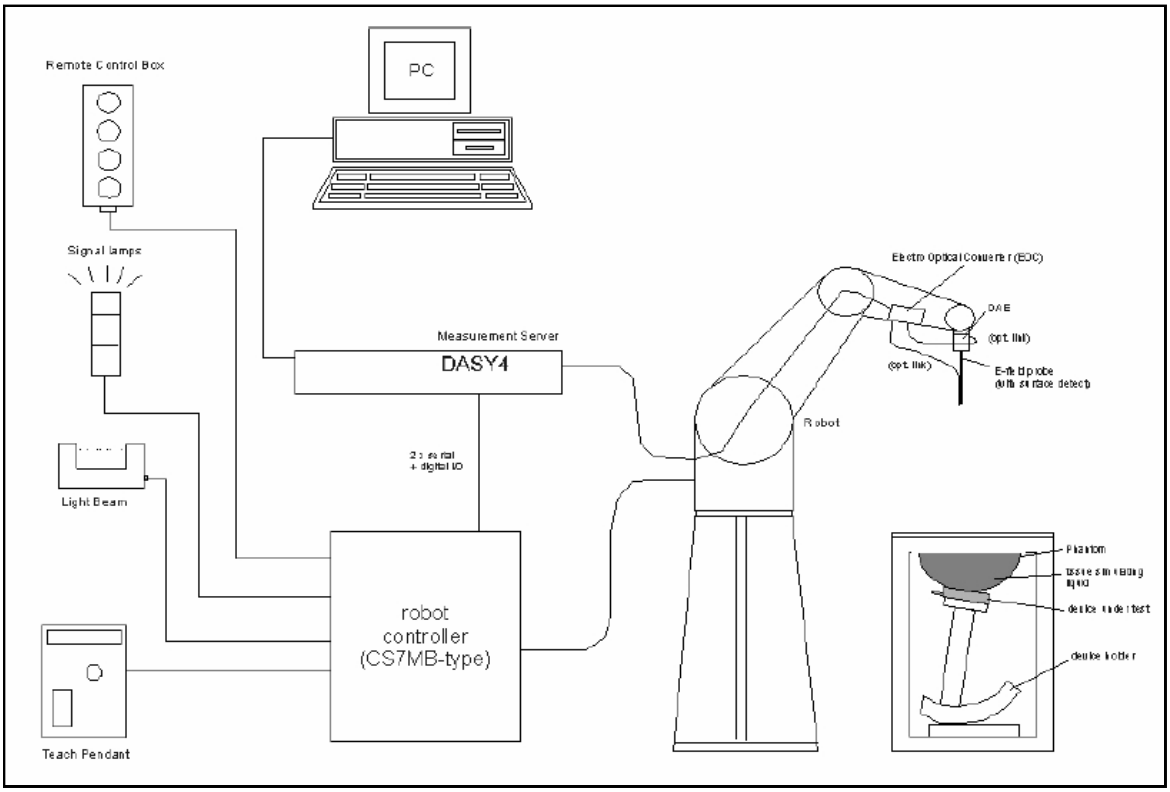



**Fig. 4 The DASY4 Measurement System**


**Fig. 5 The DASY4 System Photo**

The DASY4 system consists of the following items:

- A fixed-on-ground high precision 6-axis robot with controller and software and an arm extension for moving the Data Acquisition Electronics (DAE) and Probe.
- A dosimetric probe, an isotropic E-field probe optimized and calibrated for usage in head or body tissue simulating liquids. Some of the probes are equipped with an optical surface detector system.
- A Data Acquisition Electronic (DAE) performing the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. DAE is powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- A unit to operate the optical surface detector which is connected to Electro-Optical Coupler (EOC).
- The EOC performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY4 measurement server.
- The DASY4 measurement server performing all real-time data evaluation for field measurements and surface detection, controling robot movements and handling safety operation. A computer with operating Windows 2000 is used for server.
- DASY4 software and SEMCAD data evaluation software are installed in PC.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed well according to the given recipes.
- System validation dipoles is used to validate the proper functioning of the system

## 2.3 DASY4 Measurement Server


**Fig. 6 DASY4 Measurement Server**

The DASY4 measurement server is based on a PC/104 CPU board with a 166MHz low-power pentium, 32MB chipdisk and 64MB RAM. The necessary circuits for communication with either the DAE4 (or DAE3) electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4 I/O-board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. The PC-operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server.

## 2.4 DAE (Data Acquisition Electronics)


**Fig. 7 DAE Photo**

Some probes are equipped with an optical multifiber line, ending at the front of the probe tip. This line is connected to the EOC box on the robot arm and provides automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. If the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases during the approach, reaches a maximum and then decreases. If the probe perpendicularly touches 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 software reads the reflection during a software approach and looks for the maximum using a 2$^{nd}$ order fitting. The approach is stopped upon reaching the maximum.

The optical surface detection works in transparent liquids and on di_use reflecting surfaces with a repeatability of better than ±0.1mm. The distance of the maximum depends on the fiber and the surrounding media. It is typically 1.0mm to 2.0mm in tissue simulating mixtures. The distance can be measured with the surface check job (described in the reference guide).

## 2.5 Phantom

SAM Twin Phantom V4.0:

The phantom used for all tests i.e. for both system performance checking and device testing, was the twinheaded "SAM Twin Phantom V4.0", manufactured by SPEAG. The phantom conforms to the requirements of IEEE 1528 - 2003.

SAM Phantom ELI4:

Phantom for compliance testing of handheld and body mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209-2. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid.

**Fig. 8 SAM Twin Phantom and ELI4 Phantom**

## 2.6 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integrated part of the Dasy system.

**Fig. 9 Device holder supplied by SPEAG**

## 2.7 Specifications of Probes

The E-Field Probes ET3DV6 or EX3DV4, manufactured and calibrated annually by Schmid & Partner Engineering AG with following specification are used for the dosimetric measurements.

**ET3DV6:**

- Dynamic range: 5 μW/g ~ 100 mW/g
- Tip diameter: 6.8 mm
- Probe linearity: ± 0.2 dB (30MHz to 3 GHz)
- Axial isotropy: ± 0.2 dB
- Spherical isotropy: ± 0.4 dB
- Distance from probe tip to dipole centers: 2.7 mm
- Calibration range: 900MHz/1750MHz/1900MHz/ /2450MHz for head and body simulating liquids.

**EX3DV4:**

- Dynamic range: 10 μW/g ~ 100 mW/g
- Tip diameter: 2.5 mm
- Probe linearity: ± 0.2 dB (30MHz to 3 GHz)
- Axial isotropy: ± 0.2 dB
- Spherical isotropy: ± 0.4 dB
- Distance from probe tip to dipole centers: 1.0 mm
- Calibration range: 900MHz/1810MHz for head simulating liquid and

## 2.8 SAR Measurement Procedures in DASY4

**Step 1 Setup a Call Connection**

Establish a call in handset at the maximum power level with a base station simulator via air interface.

**Step 2 Power Reference Measurement**

To measure the local E-field value at a fixed location which value will be taken as a reference value for calculating a possible power drift.

**Step 3 Area Scan**

To measure the SAR distribution with a grid with spacing of 15 mm x 15 mm and kept with a constant distance to the inner surface of the phantom. Additional all peaks within 3 dB of the maximum SAR are searched.

**Step 4 Zoom Scan**

At these points (maximum number of SAR peaks is two), a cube of 32 mm x 32 mm x 30 mm is applied to and measured with 5 x 5 x 7 points. With these measured data, a peak spatial-average SAR value can be calculated by SEMCAD software.

**Step 5 Power Drift Measurement**

Repetition of the E-field measurement at the fixed location mentioned in Step 1 to make sure the two results differ by less than ± 0.2 dB.

## 2.9 Simulating Liquids

Liquid Recipes for this test report are as following:

**HSL 900MHz Band (Head)**

| Ingredient | % by weight |
|---|---|
| Water | 52 |
| Sugar | 46.6 |
| Salt | 1.15 |
| Preventol | 0.25 |

**1900MHz band**

| Ingredient | % by weight |
|---|---|
| Water | 55.85 |
| Diethylene Glycol Butyl Ether(DGBE) | 44.00 |
| Salt | 0.15 |

## 2.10 System Performance Check

### 2.10.1 Purpose

1. To verify the simulating liquids are valid for testing.
2. To verify the performance of testing system is valid for testing.

### 2.10.2 System Performance Check Procedure

The DASY4 installation includes predefined files with recommended procedures for measurements and the system performance check. They are read-only document files and destined as fully defined but unmeasured masks, so the finished system performance check must be saved under a different name. The system performance check document requires the SAM Twin Phantom, so this phantom must be properly installed in your system. (User defined measurement procedures can be created by opening a new document or editing an existing document file). Before you start the system performance check, you need only to tell the system with which components (probe, medium, and device) you are performing the system performance check; the system will take care of all parameters.

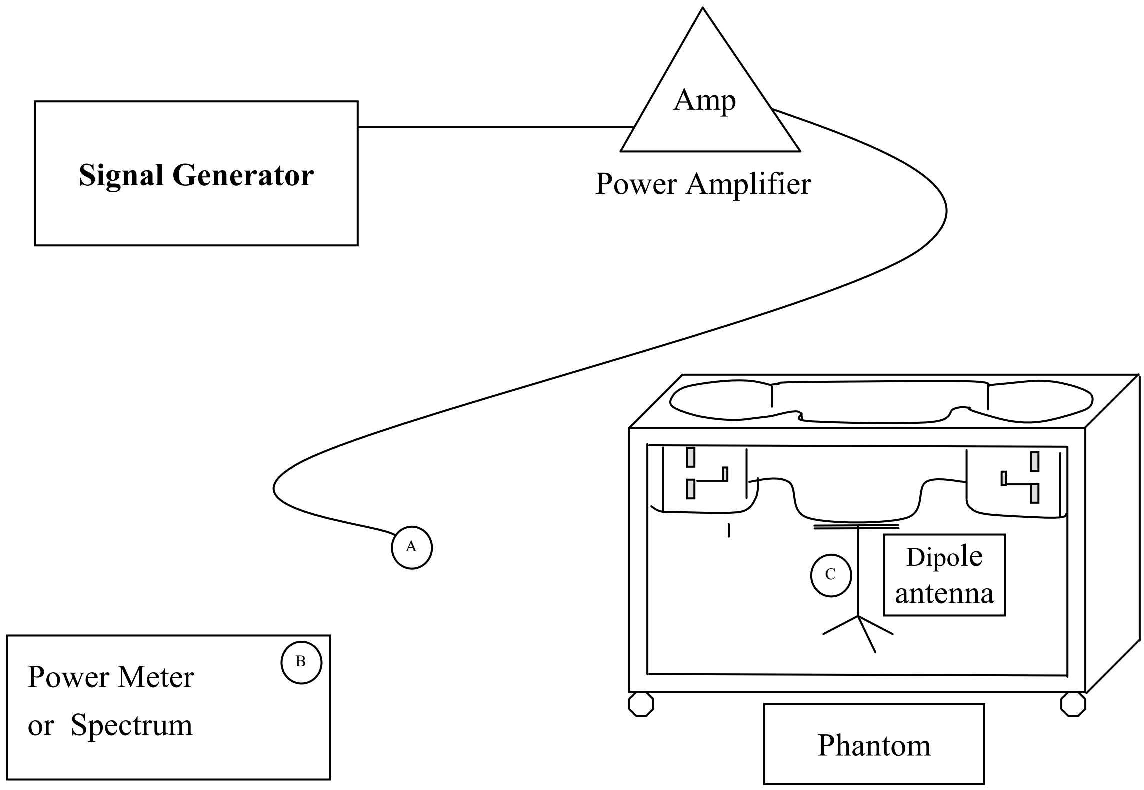
• **The Power Reference Measurement and Power Drift Measurement** jobs are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the amplifier output power. If it is too high (above ±0.1 dB), the system performance check should be repeated; some amplifiers have very high drift during warm-up. A stable amplifier gives drift results in the DASY system below ±0.02 dB.

• **The Surface Check** job tests the optical surface detection system of the DASY system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ±0.1mm). In that case it is better to abort the system performance check and stir the liquid.

• **The Area Scan** job measures the SAR above the dipole on a plane parallel to the surface. It is used to locate the approximate location of the peak SAR. The proposed scan uses large grid spacing for faster measurement; due to the symmetric field, the peak detection is reliable. Schmid & Partner Engineering AG, DASY4 Manual, February 2005 16-2 System Performance Check Application Notes If a finer graphic is desired, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result.

• **The Zoom Scan** job measures the field in a volume around the peak SAR value assessed in the previous Area Scan job (for more information see the application note on SAR evaluation). If the system performance check gives reasonable results, the SAR peak, 1 g and 10 g spatial average SAR values normalized to 1W dipole input power give reference data for comparisons. The next sections analyze the expected uncertainties of these values, as well as additional checks for further information or troubleshooting.

### 2.10.3 System Performance Check Setup




Note：

1. A connected to B is used to make sure whether the input power is 250mW for target frequency..

2. A connected to C is used to input the measured power to dipole antenna

### 2.10.4 Result of System Performance Check: Valid Result

**835MHz band - Dipole Antenna:** D835V2(S/N: 4d092) – **Probe:** 3665

| Date of Measurement And Reference Value | SAR@1g [W/kg] | Dielectric Parameters | | Temperature [℃] |
|---|---|---|---|---|
| | | ε r | σ [S/m] | |
| Body 835MHz Recommended Value | 2.47±10% [2.223~2.717] | 55.2± 5% [52.44~57.96] | 0.97± 5% [0.9215~1.185] | 22.0 ± 2 [20 ~ 24] |
| 2011-08-08 | 2.53 | 54.9 | 0.956 | 22.0 |
| 2011-08-09 | 2.51 | 54.9 | 0.956 | 22.0 |
| 2011-08-10 | 2.50 | 54.9 | 0.956 | 22.5 |
| 2012-01-11 | 2.55 | 54.9 | 0.956 | 22.5 |

**1900MHz band - Dipole Antenna:** D1900V2 (S/N: 5d054) – **Probe:** 3665

| Date of Measurement And Reference Value | SAR@1g [W/kg] | Dielectric Parameters | | Temperature [℃] |
|---|---|---|---|---|
| | | ε r | σ [S/m] | |
| Body 1900MHz Recommended Value | 10.1±10% [9.09~11.11] | 53.3 ± 5% [50.635~55.965] | 1.52 ± 5% [1.444~1.596] | 22.0 ± 2 [20 ~ 24] |
| 2011-08-03 | 9.99 | 55.5 | 1.47 | 22.0 |
| 2011-08-04 | 9.94 | 55.5 | 1.47 | 22.5 |
| 2011-08-16 | 9.93 | 55.5 | 1.47 | 22.5 |

**1900MHz band - Dipole Antenna:** D1900V2 (S/N: 5d054) – **Probe:** 3555

| Date of Measurement And Reference Value | SAR@1g [W/kg] | Dielectric Parameters | | Temperature [℃] |
|---|---|---|---|---|
| | | ε r | σ [S/m] | |
| Body 1900MHz Recommended Value | 10.1±10% [9.09~11.11] | 53.3 ± 5% [50.635~55.965] | 1.50 ± 5% [1.425~1.575] | 22.0 ± 2 [20 ~ 24] |
| 2011-12-25 | 10.3 | 55.5 | 1.52 | 22.5 |

# 3. FCC RF Exposure Limits

## 3.1 General Requirements

The test should be performance in a laboratory without influence on SAR measurements by ambient RF sources and any reflection from the environment inside. The ambient temperature should be kept in the range of 18°C to 25°C with a maximum variation within ± 2°C during the test.

## 3.2 Phantom Requirements

The phantoms used in test are simplified representations of the human head and body as a specific shaped container for the head or body simulating liquids. The physical characteristics of the phantom models should resemble the head and the body of a mobile user sice the shape is a dominant parameter for exposure. The shell of the phantom should be made of low loss and low permittivity material and the thickness tolerance should be less than 0.2 mm. In addition, the phantoms should provide simulations of both right and left hand operations.

## 3.3 Environment Conditions

| Item | Target | Measured |
|---|---|---|
| Ambient Temperature (°C) | 15 ~ 30 | 24 ± 1 |
| Temperature of Simulant (°C) | 20 ~ 24 | 24 ± 1 |
| Relative Humidity(% RH) | 30 ~ 70 | 60 ~ 70 |

## 3.4 FCC Requirements for SAR Compliance Testing

According to the FCC order "Guidelines for Evaluating the Environmental Effects of RF Radiation", for consumer products, the SAR limit is **1.6W/kg** for an uncontrolled environment and **8.0W/kg** for an occupational/controlled environment. Pursuant to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on June 29, 2001 by FCC, the equipment under test should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for intended or normal operation, incorporating normal antenna operating positions, equipment undet test peak performance frequencies and positions for maximum RF power coupling.

| | **Whole-Body** | **Partial-Body** | **Arms and Legs** |
|---|---|---|---|
| **Population/Uncontrolled Environments (W/kg)** | 0.08 | 1.6 | 4.0 |
| **Occupational/Controlled Environments (W/kg)** | 0.4 | 8.0 | 20.0 |

**Notes:**
1. Population/Uncontrolled Environments: Locations where there is the exposure of individuals who have no sense or control of their exposure.
2. Occupational/Controlled Environments: Locations where there is exposure that may be incurred by people who have knowledge of the potential for exposure.
3. Whole-Body: SAR is averaged over the entire body.
4. Partial-Body: SAR is averaged over any 1g of tissue volume as defined in specification.
5. Arms and Legs: SAR is averaged over 10g of tissue volume as defined in specification.

## 3.5 SAR Test Methodology

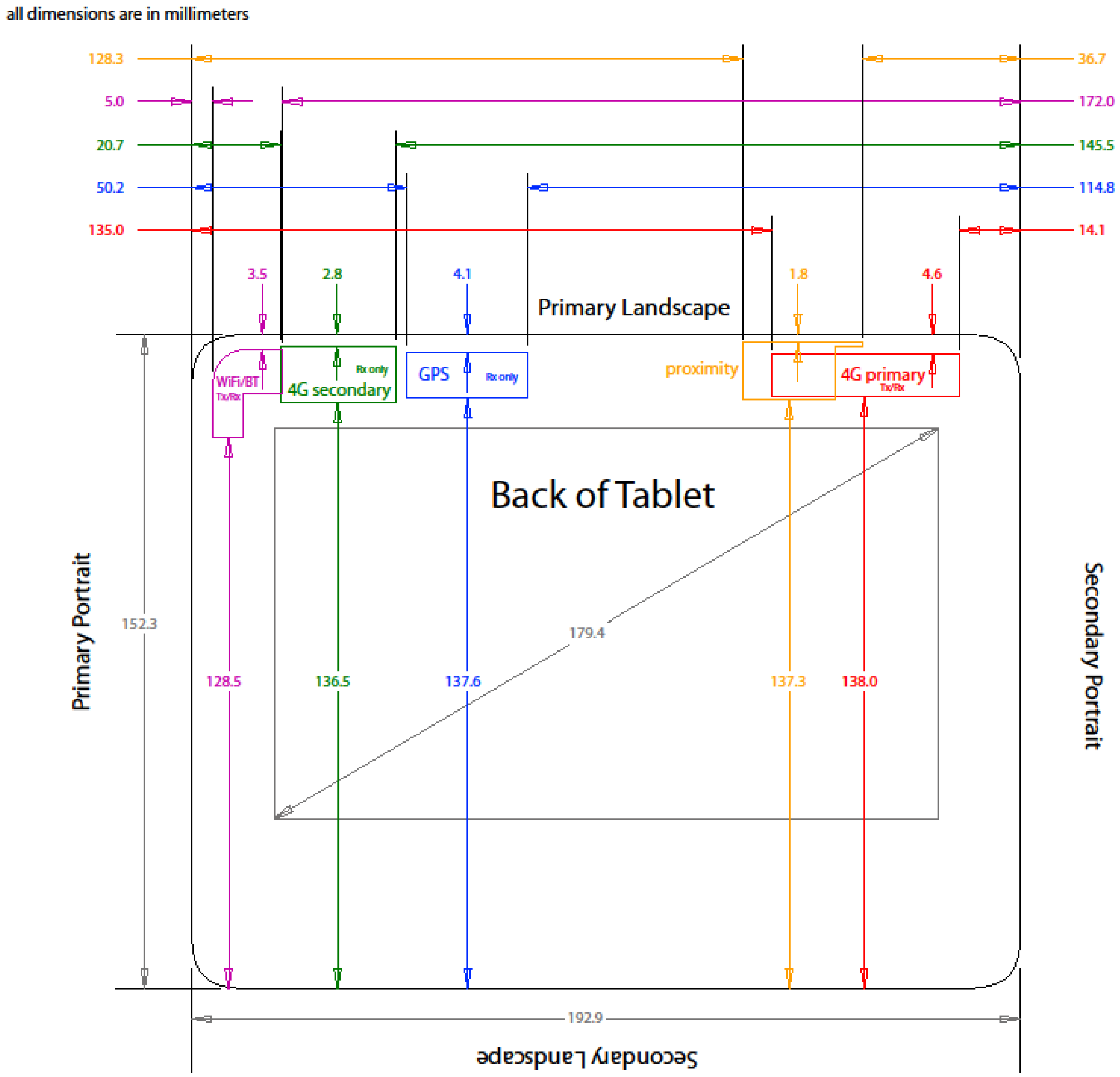
The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C 01-01, IEEE STD 1528:2003 with the following FCC Test Procedure:

KDB 941225 – SAR test for 3G device
KDB 447498 – Mobile Portable RF Exposure
KDB 450824 - SAR Probe Calibration and System Verification
At 300 MHz to 3GHz, measurements should be within +/-100 MHz of the probe calibration frequency.

# 4. Antenna and Proximity Sensor

## 4.1Antenna and Proximity Sensor Location

| | |
|---|---|
| Antenna-to-user separation distances: | Tablet – Bottom face<br>● Lap-Held: 4.8 mm from antenna-to-user<br>Tablet – Edges with the following configurations<br>● Primary landscape: 138 mm from antenna-to-user<br>● Secondary landscape: 4.6 mm from antenna-to-user<br>● Primary Portrait: 14.1 mm from antenna-to-user<br>● Secondary Portrait: 135 mm from antenna-to-user |



## 4.2 Proximity Sensor Information

The sensor is located close to the WWAN primary antenna and detects body at the back of tablet. Power reduction levels are provided in section 5

# 5. SAR Testing Considerations & FCC KDB Inquiries

SAR Testing Consideration & FCC pre-TCB testing guidance KDB inquiry 938576

## 5.1 WiFi Exclusion for power back off SAR testing

The Cius 4G does not have proximity sensor or power back-off capabilities on WiFi.

## 5.2 WWAN Additional SAR testing for Back Surface

Based on discussions with FCC, KDB inquiry 938576 requires additional SAR testing at a conservative distance from the back of the device with power back-off disabled. The WWAN secondary antenna is used for receiving only and does not concern SAR.

| Distance to Back Surface (mm) | 8.0 | 9.0 | 10.0 | 11.0 | 12.0 | 13.0 | 14.0 | 15.0 | 16.0 |
|---|---|---|---|---|---|---|---|---|---|
| Proximity Sensor Status | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF |

**Table 5-1(a). Proximity Sensor vs Distance Measured against Phantom (trigger point is from OFF to ON)**

| Distance to Back Surface (mm) | 8.0 | 9.0 | 10.0 | 11.0 | 12.0 | 13.0 | 14.0 | 15.0 | 16.0 |
|---|---|---|---|---|---|---|---|---|---|
| Proximity Sensor Status | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF |

**Table 5-1(b). Proximity Sensor vs Distance Measured against Phantom (trigger point is from ON to OFF)**

A pre-determined and fixed amount of reduction in transmit power is applied to WWAN radio transmitter when proximity sensor is triggered (ON status in above table). The amount of power back-off applied is different for different WWAN technologies. (Note: There is no proximity sensor power reduction for WLAN)

| **WWAN Mode** | **Power Reduction** |
|---|---|
| GRPS/EDGE 850 | 3 dB |
| GPRS/EDGE 1900 | 4 dB |
| UMTS 850/HSPA/HSPA+ 850 | 3dB |
| UMTS 1900/HSPA/HSPA+1900 | 3dB |

**Table 5-2. Designed power reduction value for different WWAN technologies**

Although the size of the proximity sensor does not physically overlap the entire length of the antenna, the effective sensing area does. This is illustrated in Figure below. The sensor detects/triggers at 13mm from the exterior edge of tablet when the tablet slides gradually in lateral direction towards the phantom, maintaining 8mm perpendicular separation distance between the tablet's back surface and the phantom. The proximity sensor starts triggered 13mm from the tablet's exterior edge until the tablet reaches to the position where the phantom is directly above the sensor. Since the minimum distance between the edge of WWAN antenna and tablet exterior edge is 14.1mm, the proximity sensor's coverage can be confirmed to cover the entire WWAN antenna.

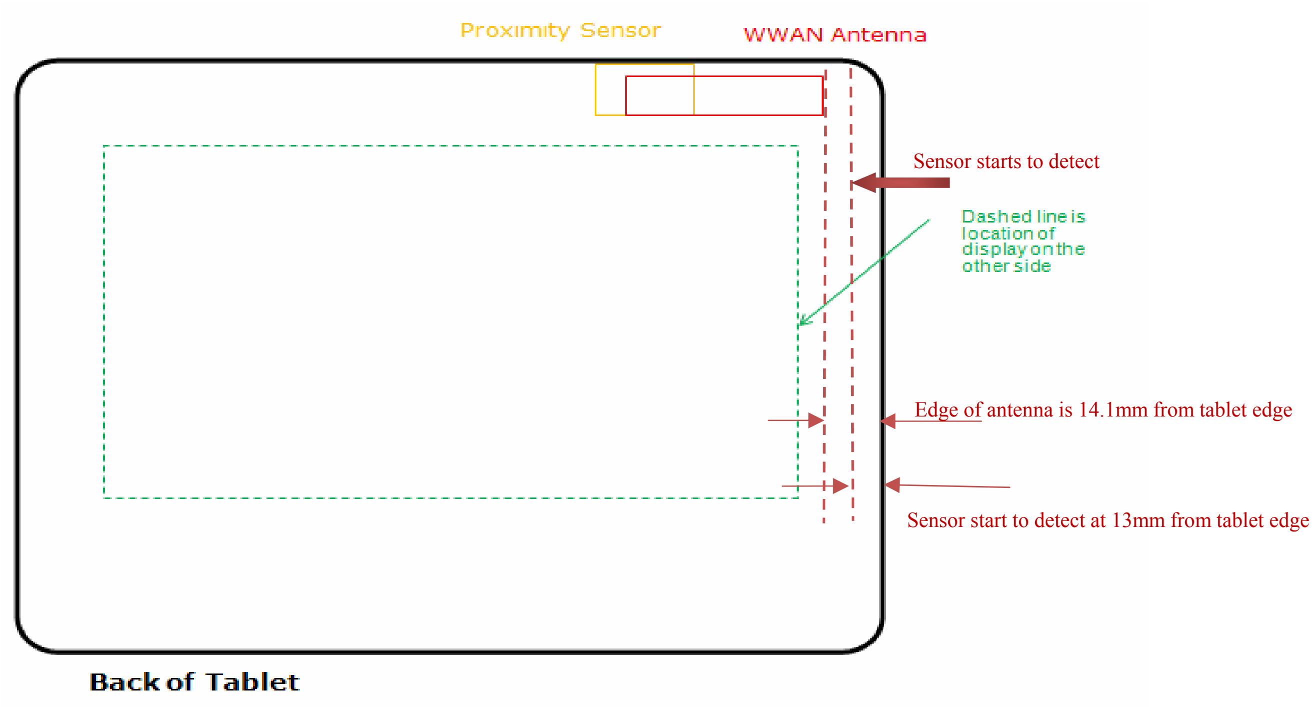



Figure : Proximity Coverage with Respect to WWAN Antenna

The following tables show the measured conducted power level for each WWAN technologies with both power back-off enabled and disabled.

GPRS Conducted Output Power:

| | | RF Conducted Power Table | | | |
|---|---|---|---|---|---|
| | | **Without** Power Back-off | | **With** Power Back-off | |
| Band | Channel | GPRS [dBm] 1Tx Slot | GPRS [dBm] 2Tx Slot | GPRS [dBm] 1Tx Slot | GPRS [dBm] 2Tx Slot |
| Cellular | 128 | 32.56 | 29.91 | 29.50 | 26.83 |
| | 190 | 32.57 | 29.90 | 29.52 | 26.85 |
| | 251 | 32.54 | 30.00 | 29.54 | 26.85 |
| PCS | 512 | 29.26 | 28.59 | 25.75 | 24.70 |
| | 661 | 29.25 | 28.52 | 25.92 | 24.94 |
| | 810 | 29.40 | 28.66 | 26.00 | 25.08 |

**EDGE Conducted Output Power:**

| | | RF Conducted Power Table | | | |
|---|---|---|---|---|---|
| | | **Without** Power Back-off | | **With** Power Back-off | |
| Band | Channel | EDGE [dBm] 1Tx Slot | EDGE [dBm] 2Tx Slot | EDGE [dBm] 1Tx Slot | EDGE [dBm] 2Tx Slot |
| Cellular | 128 | 27.19 | 27.15 | 24.20 | 24.13 |
| | 190 | 27.17 | 27.16 | 24.15 | 24.14 |
| | 251 | 27.15 | 27.13 | 24.15 | 24.11 |
| PCS | 512 | 25.79 | 25.74 | 21.98 | 21.96 |
| | 661 | 25.72 | 25.72 | 22.15 | 22.12 |
| | 810 | 25.88 | 25.86 | 22.24 | 22.20 |

**UMTS Conducted Output Power:**

| UMTS RF Conducted Power Table - **without** Power Back-off | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WCDMA Rel.99 | HSDPA Rel(5)mode | | | | HSPA(Rel 6)/HSPA+(Rel7) mode | | | | |
| Band | Channel | 12.2kbps RMC [dBm] | Subtest 1 | Subtest 2 | Subtest 3 | Subtest 4 | Subtest 1 | Subtest 2 | Subtest 3 | Subtest 4 | Subtest 5 |
| V (Cellular) | 4132 | 23.47 | 23.42 | 23.29 | 22.85 | 22.83 | 23.43 | 21.57 | 22.64 | 21.56 | 23.58 |
| | 4183 | 23.48 | 23.46 | 23.37 | 22.91 | 22.92 | 23.62 | 21.63 | 22.67 | 21.60 | 23.63 |
| | 4233 | 23.47 | 23.42 | 23.36 | 22.90 | 22.91 | 23.56 | 21.63 | 22.70 | 21.57 | 23.63 |
| II (PCS) | 9262 | 22.36 | 22.23 | 22.18 | 21.69 | 21.74 | 22.55 | 20.61 | 21.68 | 20.67 | 22.55 |
| | 9400 | 22.13 | 22.20 | 22.14 | 21.64 | 21.66 | 22.32 | 20.36 | 21.41 | 20.41 | 22.33 |
| | 9538 | 22.17 | 22.07 | 21.98 | 21.53 | 21.55 | 22.34 | 20.31 | 21.31 | 20.41 | 22.22 |

| UMTS RF Conducted Power Table - **with** Power Back-off | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WCDMA Rel.99 | HSDPA Rel(5)mode | | | | HSPA(Rel 6) /HSPA+(Rel7)mode | | | | |
| Band | Channel | 12.2kbps RMC [dBm] | Subtest 1 | Subtest 2 | Subtest 3 | Subtest 4 | Subtest 1 | Subtest 2 | Subtest 3 | Subtest 4 | Subtest 5 |
| V (Cellular) | 4132 | 20.45 | 20.41 | 20.27 | 20.45 | 20.33 | 20.52 | 20.62 | 20.61 | 20.60 | 20.53 |
| | 4183 | 20.47 | 20.45 | 20.35 | 20.61 | 20.60 | 20.57 | 20.66 | 20.66 | 20.58 | 20.56 |
| | 4233 | 20.46 | 20.40 | 20.35 | 20.60 | 20.60 | 20.55 | 20.66 | 20.65 | 20.60 | 20.54 |
| II (PCS) | 9262 | 19.42 | 19.22 | 19.20 | 19.40 | 19.24 | 19.55 | 19.61 | 19.62 | 19.55 | 19.64 |
| | 9400 | 19.12 | 19.20 | 19.14 | 19.30 | 19.16 | 19.31 | 19.32 | 19.21 | 19.31 | 19.31 |
| | 9538 | 19.17 | 19.06 | 19.30 | 19.23 | 19.05 | 19.30 | 19.34 | 19.34 | 19.32 | 19.36 |

Note:

- The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used were according to FCC/OET Bulletin 65, Supplement C
- WCDMA mode in Body SAR was tested under RMC 12.2kbps with HSPA inactive. SAR test with HSPA active were not required since the average output power of were not more than 0.25dBm high than the RMC levels and SAR was less than 1.2W/kg per KDB Publication 941225
- The power reduction only applies to the maximum rated power and not in addition to any MPR. When the sensor-triggered power reduction is implemented the output power is the lower of Nominal power-MPR or Nominal power-sensor-triggered-reduction.

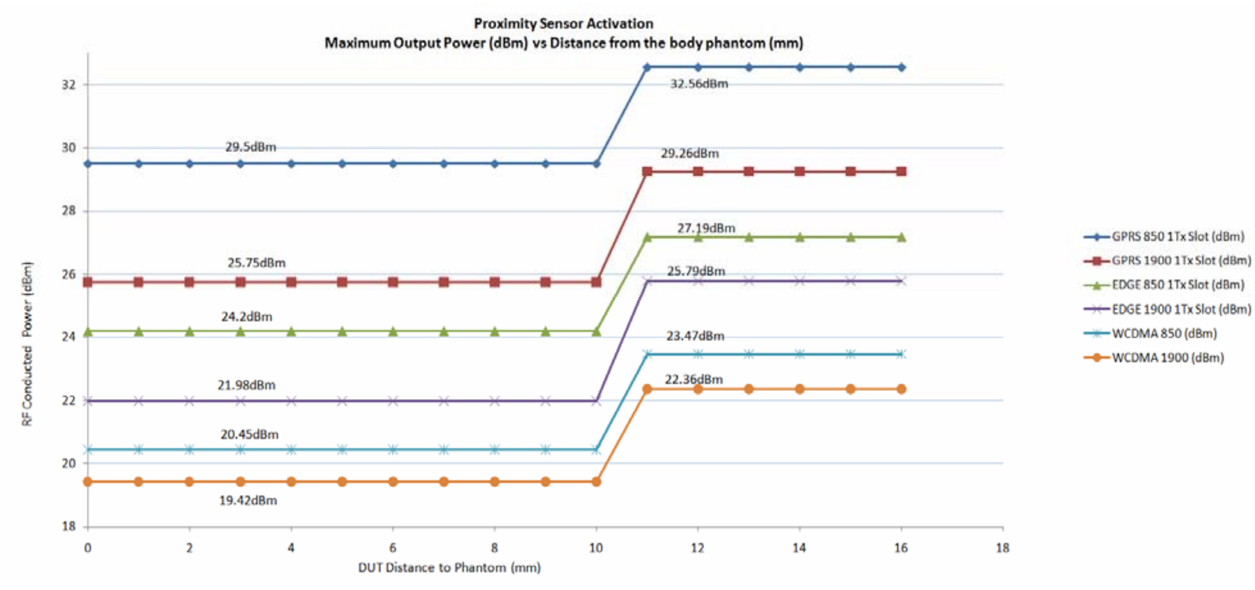



Figure 5-1 Power Back-off Reduction Graph

## 5.3 Method of SAR Measurement with and Without Power Back-off Enabled

Based on the above proximity sensor activation vs distance results, the Cius 4G was tested touching the phantom with the sensors activated and additionally at a conservative 8mm distance with the sensor de-activated (max power, no back-off) from the back side

To test SAR with power back-off enabled at zero spacing, the Cius 4G was placed in maximum power transmit mode (with back-off enabled) with a base station simulator. The device was then positioned under the tissue equivalent liquid-filled flat phantom at zero distance.

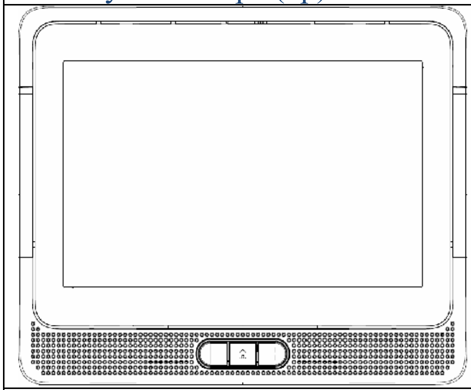
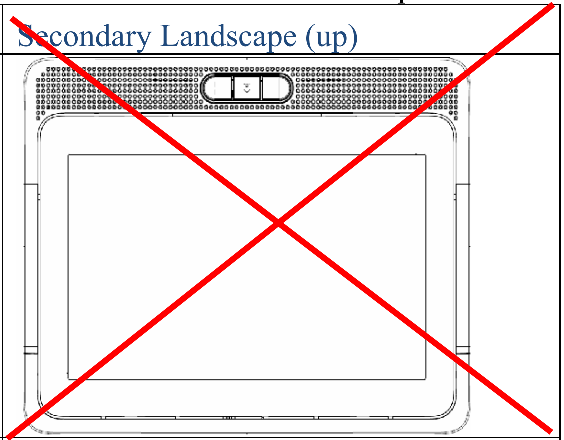
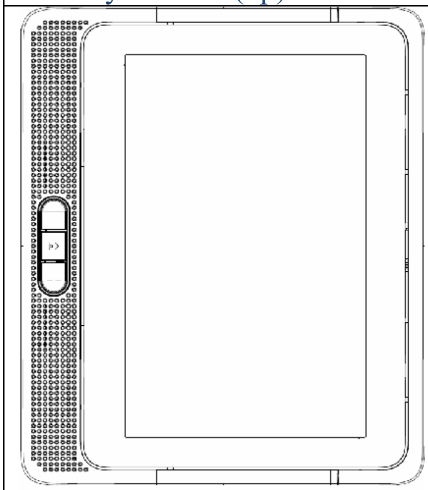
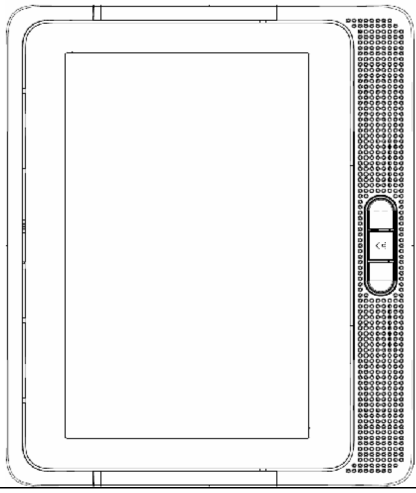
To test SAR with power back-off disabled at 8mm, the Cius 4G utilized special developed software(which is not available in the production release of software) to disable the power back-off capability. The device was placed in maximum power transmit mode with a base station simulator. The device was then positioned under the tissue equivalent liquid-filled flat phantom at a distance of 8mm.

## 5.4 HSPA Test Considerations for SAR Testing

Since the maximum average output power for WCDMA and HSPA are similar, testing in WCDMA mode is performed and it also facilitates the exclusion of HSPA testing. HSPA testing was excluded based on conducted power measurement according to KDB 941225.

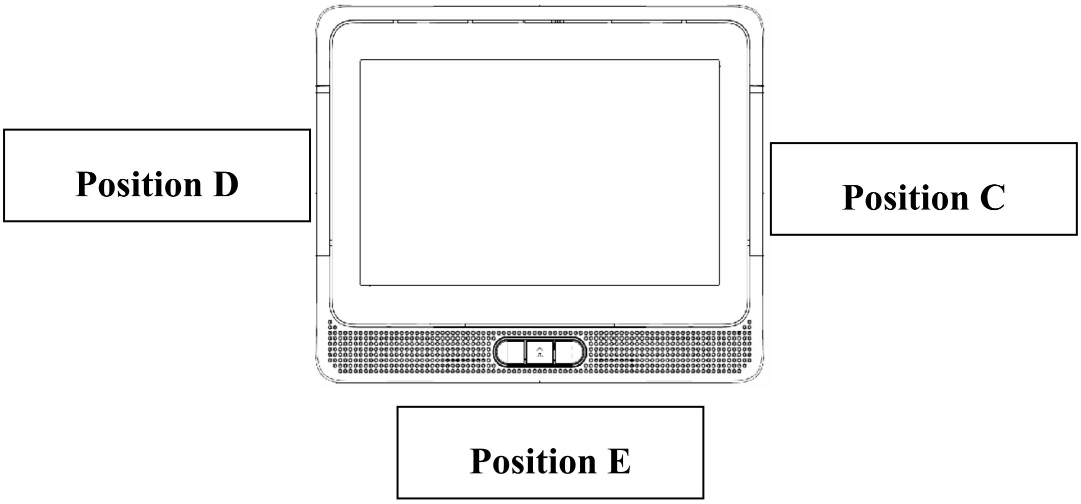
## 5.5 Display Orientation Capabilities

The automatic display rotation is restricted to only 3 orientations (Primary Landscape, Primary Portrait, and Secondary Portrait). In the secondary landscape orientation, the display will not rotate to align with user's viewing perspective. According to KDB 447498 4) b) ii) (2), for each antenna, SAR is only required for the edge with the most conservative exposure condition

| Primary Landscape (up) | Secondary Landscape (up) |
| --- | --- |
|  |  |
| Primary Portrait (up) | Secondary Portrait (up) |
|  |  |

SAR Test Positions

| Position | Description |
|---|---|
| A | The back side of the EUT is in contact with the bottom of ELI4 phantom in the lay-flat face-up position. The separation distance is 0mm and 8mm between the rear site of the EUT and the bottom of the ELI4 phantom. |
| C | The right edge of the EUT is in contact with the bottom of ELI4 phantom by the Primary Portrait position. The separation distance is 0mm between the bottom of the EUT and the bottom of the ELI4 phantom. |
| D | The left edge of the EUT is in contact with the bottom of ELI4 phantom by the Secondary Portrait of the edge. The separation distance is 0mm between the bottom of the EUT and the bottom of the ELI4 phantom. |
| E | The bottom edge of the EUT is in contact with the bottom of ELI4 phantom by the Secondary landscape of the edge. The separation distance is 0mm between the right site of the EUT and the bottom of the ELI4 phantom. |




## 5.6 WWAN measurement Procedures

The device was placed into a simulated call using a base station simulator. Such test signal offer a consistent means for testing SAR and are recommended for evaluating SAR. SAR measurements were taken with a fully charged battery. The SAR measurement software calculates a reference point at the start and end of the test to check for power drifts. If SAR deviations of more than 5% occurred, the tests were repeated.

# 6. Results

## 6.1.1 Evaluation of SAR results

Evaluate the tune-up tolerances be taken into account in scaling the SAR. The tune-up tolerance is +/-0.5dB or +/-12%.

| BAND | MODE | Worst SAR Result (mw/kg) | Scaling Percentage | Scaling of SAR result(mw/kg) | Remain Compliane (Y/N) |
|---|---|---|---|---|---|
| GPRS850 | 1-slot | 0.98 | 12% | 1.0976 | Y |
| GPRS850 | 2-slot | | | | |
| E-GPRS850 | 1-slot | | | | |
| E-GPRS580 | 2-slot | | | | |
| GPRS1900 | 1-slot | 1.09 | 12% | 1.2208 | Y |
| GPRS1900 | 2-slot | | | | |
| E-RPRS1900 | 1-slot | | | | |
| E-RPRS1900 | 2-slot | | | | |
| WCDMA BAND V | N/A | 1.04 | 12% | 1.1648 | Y |
| WCDMA BAND II | N/A | 0.508 | 12% | 0.5689 | Y |

Note:

1. The actual measured power reduction is consistent with a tune-up power tolerance of +/-0.5dB or +/-12%.
2. For all frequency band, scale the values by 12% to account for the 0.5dB below maximum reduced power at position A with 0 mm separation. The scaled SAR results remain compliant.

### 6.1.2 Summary of Test Results

| | |
|---|---|
| No deviations from the technical specification(s) were ascertained in the course of the tests performed. | ■ |
| The deviations as specified in this chapter were ascertained in the course of the tests Performed. | □ |

NOTE: In tablet test procedures detailed in KDB 447498, SAR is required only for the edge(s) with the most conservative exposure condition. For this device the edge with the most conservative exposure condition is the secondary portrait position D. Additional tests were performed for primary portrait (position C) and primary landscape (position E) to confirm that the most conservative position had been identified correctly as the position with the smallest antenna-to-phantom separation distance. This additional data is provided for reference only and has not been considered for FCC equipment certification.

## 6.2 SAR (worst case) measurement at 0mm distance.

### 6.2.1 GPRS 850

| Frequency | | | | Position | Conducted Power (dBm) | | | SAR@1g [W/kg] | Power Drift (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| Band | Mode | CH | MHz | | Before | After | Drift | | | |
| GPRS 850 | GPRS 1Slot | 190 | 836.6 | A | 29.52 | 29.50 | -0.02 | 0.826 | -0.100 | |
| | | 190 | 836.6 | D | 32.52 | 32.53 | 0.01 | 0.535 | -0.171 | |
| | | 190 | 836.6 | E | 32.54 | 32.51 | -0.03 | 0.0944 | -0.175 | |
| | GPRS 2Slot | 190 | 836.6 | A | 26.85 | 26.83 | -0.02 | 0.873 | 0.143 | Worst |
| | | 190 | 836.6 | D | 30.00 | 29.98 | -0.02 | 0.52 | -0.159 | |
| | | 190 | 836.6 | E | 30.00 | 29.99 | -0.01 | 0.161 | -0.164 | |
| EGPRS 850 | EGPRS 1Slot | 190 | 836.6 | A | 24.20 | 24.20 | 0 | 0.457 | 0.130 | |
| | | 190 | 836.6 | D | 27.15 | 27.10 | 0.05 | 0.237 | 0.235 | |
| | | 190 | 836.6 | E | 27.15 | 27.10 | 0.05 | 0.0461 | -0.093 | |
| | EGPRS 2Slot | 190 | 836.6 | A | 24.14 | 24.12 | 0.02 | 0.840 | 0.157 | |
| | | 190 | 836.6 | D | 27.13 | 27.13 | 0 | 0.664 | 0.016 | |
| | | 190 | 836.6 | E | 27.13 | 27.15 | 0.02 | 0.146 | 0.184 | |

| | |
|---|---|
| Position A | Power reduction applied |
| Position D | Full power applied |
| Position E | Full power applied |

### 6.2.2 GPRS 1900

| Frequency | | | | Position | Conducted Power (dBm) | | | SAR@1g [W/kg] | Power Drift (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| Band | Mode | CH | MHz | | Before | After | Drift | | | |
| GPRS 1900 | GPRS 1Slot | 661 | 1880.0 | A | 25.92 | 25.90 | -0.02 | 0.567 | 0.155 | |
| | | 661 | 1880.0 | D | 29.25 | 29.20 | -0.05 | 0.184 | -0.0584 | |
| | | 661 | 1880.0 | E | 29.38 | 29.40 | 0.02 | 0.051 | -0.050 | |
| | GPRS 2Slot | 661 | 1880.0 | A | 24.90 | 24.85 | -0.05 | 0.855 | -0.128 | Worst |
| | | 661 | 1880.0 | D | 28.52 | 28.47 | -0.05 | 0.295 | -0.164 | |
| | | 661 | 1880.0 | E | 28.50 | 28.60 | 0.10 | 0.089 | -0.147 | |
| EGPRS 1900 | EGPRS 1Slot | 661 | 1880.0 | A | 22.15 | 22.20 | 0.05 | 0.422 | 0.184 | |
| | | 661 | 1880.0 | D | 25.69 | 25.72 | 0.03 | 0.186 | 0.089 | |
| | | 661 | 1880.0 | E | 25.68 | 25.70 | 0.02 | 0.053 | 0.147 | |
| | EGPRS 2Slot | 661 | 1880.0 | A | 22.12 | 22.20 | 0.08 | 0.671 | 0.161 | |
| | | 661 | 1880.0 | D | 25.70 | 25.69 | -0.01 | 0.307 | 0.115 | |
| | | 661 | 1880.0 | E | 25.70 | 25.74 | 0.04 | 0.090 | -0.191 | |

| | |
|---|---|
| Position A | Power reduction applied |
| Position D | Full power applied |
| Position E | Full power applied |

### 6.2.3 WCDMA Band V

| Frequency | | | Position | Conducted Power (dBm) | | | SAR@1g [W/kg] | Power Drift (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|
| Band | CH | MHz | | Before | After | Drift | | | |
| V(Cellular) | 4183 | 836.4 | A | 20.45 | 20.40 | 0.05 | 1.04 | -0.148 | Worst |
| | 4183 | 836.4 | D | 23.45 | 23.46 | 0.01 | 0.594 | -0.110 | |
| | 4183 | 836.4 | E | 23.40 | 23.42 | 0.02 | 0.079 | 0.099 | |

### 6.2.4 WCDMA Band II

| Frequency | | | Position | Conducted Power (dBm) | | | SAR@1g [W/kg] | Power Drift (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|
| Band | CH | MHz | | Before | After | Drift | | | |
| II(PCS) | 9400 | 1880.0 | A | 19.16 | 19.17 | 0.01 | 0.508 | 0.131 | |
| | 9400 | 1880.0 | D | 22.17 | 22.15 | -0.02 | 0.095 | 0.136 | |
| | 9400 | 1880.0 | E | 22.20 | 22.23 | 0.03 | 0.040 | 0.177 | |

| | |
|---|---|
| Position A | Power reduction applied |
| Position D | Full power applied |
| Position E | Full power applied |

Note:

- The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used were according to FCC/OET Bulletin 65, Supplement C
- WCDMA mode in Body SAR was tested under RMC 12.2kbps with HSPA inactive. SAR test with HSPA active were not required since the average output power of were not more than 0.25dBm high than the RMC levels and SAR was less than 1.2W/kg per KDB Publication 941225

## 6.3 SAR (worst case) measurement at 8mm distance

### 6.3.1 GPRS 850

| Frequency | | | | Position | Conducted Power (dBm) | | | SAR@1g [W/kg] | Power Drift (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| Band | Mode | CH | MHz | | Before | After | Drift | | | |
| GPRS 850 | GPRS 1Slot | 128 | 824.2 | A | --- | --- | --- | --- | --- | |
| | | 190 | 836.6 | A | 32.54 | 32.55 | 0.01 | 0.280 | 0.108 | |
| | | 251 | 848.8 | A | --- | --- | --- | --- | --- | |
| | GPRS 2Slot | 128 | 824.2 | A | --- | --- | --- | --- | --- | |
| | | 190 | 836.6 | A | 30.00 | 29.98 | -0.02 | 0.280 | -0.017 | |
| | | 251 | 848.8 | A | --- | --- | --- | --- | --- | |
| EGPRS 850 | EGPRS 1Slot | 128 | 824.2 | A | --- | --- | --- | --- | --- | |
| | | 190 | 836.6 | A | 27.20 | 27.18 | -0.02 | 0.100 | -0.108 | |
| | | 251 | 848.8 | A | --- | --- | --- | --- | --- | |
| | EGPRS 2Slot | 128 | 824.2 | A | --- | --- | --- | --- | --- | |
| | | 190 | 836.6 | A | 27.16 | 27.13 | -0.03 | 0.253 | 0.181 | |
| | | 251 | 848.8 | A | --- | --- | --- | --- | --- | |

| | |
|---|---|
| Position A | Full power applied |

### 6.3.2 GPRS 1900

| Frequency | | | | Position | Conducted Power (dBm) | | | SAR@1g [W/kg] | Power Drift (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| Band | Mode | CH | MHz | | Before | After | Drift | | | |
| GPRS 1900 | GPRS 1Slot | 512 | 1850.2 | A | ---- | ---- | ---- | ---- | ---- | |
| | | 661 | 1880.0 | A | 29.25 | 29.30 | 0.05 | 0.201 | 0.153 | |
| | | 810 | 1909.8 | A | ---- | ---- | ---- | ---- | ---- | |
| | GPRS 2Slot | 512 | 1850.2 | A | ---- | ---- | ---- | ---- | ---- | |
| | | 661 | 1880.0 | A | 28.50 | 28.52 | 0.02 | 0.316 | 0.186 | |
| | | 810 | 1909.8 | A | ---- | ---- | ---- | ---- | ---- | |
| EGPRS 1900 | EGPRS 1Slot | 512 | 1850.2 | A | ---- | ---- | ---- | ---- | ---- | |
| | | 661 | 1880.0 | A | 25.73 | 25.72 | 0.01 | 0.203 | 0.141 | |
| | | 810 | 1909.8 | A | ---- | ---- | ---- | ---- | ---- | |
| | EGPRS 2Slot | 512 | 1850.2 | A | ---- | ---- | ---- | ---- | ---- | |
| | | 661 | 1880.0 | A | 25.74 | 25.70 | -0.04 | 0.321 | 0.164 | |
| | | 810 | 1909.8 | A | ---- | ---- | ---- | ---- | ---- | |

| | |
|---|---|
| Position A | Full power applied |

### 6.3.3 WCDMA Band V

| **Frequency** | | | **Position** | **Conducted Power (dBm)** | | | **SAR@1g [W/kg]** | **Power Drift (dB)** | **Note** |
|---|---|---|---|---|---|---|---|---|---|
| **Band** | **CH** | **MHz** | | **Before** | **After** | **Drift** | | | |
| V(Cellular) | 4132 | 826.4 | A | --- | --- | --- | --- | --- | |
| | 4183 | 836.4 | A | 23.40 | 23.45 | 0.05 | 0.459 | 0.137 | |
| | 4233 | 846.6 | A | --- | --- | --- | --- | --- | |

### 6.3.4 WCDMA Band II

| Frequency | | | Position | Conducted Power (dBm) | | | SAR@1g [W/kg] | Power Drift (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|
| Band | CH | MHz | | Before | After | Drift | | | |
| II(PCS) | 9262 | - | A | --- | --- | --- | --- | --- | |
| | 9400 | 1880.0 | A | 22.13 | 22.11 | 0.02 | 0.216 | 0.131 | |
| | 9538 | - | A | --- | --- | --- | --- | --- | |

| | |
|---|---|
| Position A | Full power applied |

Note:

- The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used were according to FCC/OET Bulletin 65, Supplement C
- WCDMA mode in Body SAR was tested under RMC 12.2kbps with HSPA inactive. SAR test with HSPA active were not required since the average output power of were not more than 0.25dBm high than the RMC levels and SAR was less than 1.2W/kg per KDB Publication 941225

## 6.4 Additional SAR verification at 0mm distance

### 6.4.1 GPRS 850

| Frequency | | | | Position | Conducted Power (dBm) | | | SAR@1g [W/kg] | Power Drift (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| Band | Mode | CH | MHz | | Before | After | Drift | | | |
| GPRS 850 | GPRS 2Slot | 128 | 824.2 | A | 26.85 | 26.85 | 0 | 0.903 | -0.057 | |
| | | 251 | 848.8 | A | 26.85 | 26.85 | 0 | 0.774 | -0.100 | |
| | | 190 | 836.6 | C | 29.88 | 29.87 | -0.01 | 0.089 | -0.100 | |
| EGPRS 850 | EGPRS 2Slot | 128 | 824.2 | A | 24.20 | 24.15 | -0.05 | 0.98 | 0.136 | Largest |
| | | 251 | 848.8 | A | 24.15 | 24.16 | 0.01 | 0.789 | 0.197 | |

**The Max Body SAR@850MHz@1g was 0.98 W/kg, less than limitation of 1.6 W/kg.**

### 6.4.2 GPRS 1900

| Frequency | | | | Position | Conducted Power (dBm) | | | SAR@1g [W/kg] | Power Drift (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| Band | Mode | CH | MHz | | Before | After | Drift | | | |
| GPRS 1900 | GPRS 2Slot | 512 | 1850.2 | A | 24.62 | 24.65 | 0.03 | 1.09 | 0.125 | Largest |
| | | 810 | 1909.8 | A | 24.70 | 24.67 | -0.03 | 0.462 | -0.171 | |
| | | 661 | 1880.0 | C | 28.52 | 28.50 | -0.02 | 0.015 | 0.159 | |

The Max Body SAR@1900 MHz@1g was 1.09 W/kg, less than limitation of 1.6W/kg.

| | |
|---|---|
| Position A | Power reduction applied |
| Position C | Full power applied |

### 6.4.3 WCDMA Band V

| Frequency | | | Position | Conducted Power (dBm) | | | SAR@1g [W/kg] | Power Drift (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|
| Band | CH | MHz | | Before | After | Drift | | | |
| V(Cellular) | 4132 | 826.4 | A | 20.43 | 20.45 | 0.02 | 0.857 | 0.131 | |
| | 4233 | 846.6 | A | 20.40 | 20.44 | 0.04 | 0.889 | 0.099 | |
| | 4183 | 836.4 | C | 23.42 | 23.41 | -0.01 | 0.003 | 0.186 | |

### 6.4.4 WCDMA Band II

| Frequency | | | Position | Conducted Power (dBm) | | | SAR@1g [W/kg] | Power Drift (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|
| Band | CH | MHz | | Before | After | Drift | | | |
| II(PCS) | 9400 | 1880.0 | C | 22.12 | 22.11 | -0.01 | 0.00837 | 0.171 | |

| | |
|---|---|
| Position A | Power reduction applied |
| Position C | Full power applied |

# 6.5 SIMULTANEOUS TRANSMISSION ANALYSIS

## 6.5.1 Simultaneous Transmission Information

This device contains multiple transmitters that may operate simultaneously and therefore, require a simultaneous transmission analysis (See Section 3.5.2)

Bluetooth and WIFI cannot transmit simultaneously since it shares the same circuit path and are switched by the radio. Bluetooth transmit power is typically less than WiFi; therefore it is determined that WiFi is the worst case for simultaneous transmission analysis. WiFi SAR results refer to WiFi SAR report (11-06-MAS-176-04).

## 6.5.2 Simultaneous Transmission Analysis

| Simult Tx | Configuration | 850 GSM SAR (W/kg) | 2.4GHz WIFI SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|
| Body SAR | A | 0.98 | 0.461 | 1.441 |
| | C | 0.089 | 0.00038 | 0.08938 |
| | D | 0.085 | 0.00263 | 0.08763 |
| | E | 0.161 | 0.097 | 0.258 |
| Simult Tx | Configuration | 850 WCDMA SAR (W/kg) | 2.4GHz WIFI SAR (W/kg) | Σ SAR (W/kg) |
| Body SAR | A | 1.04 | 0.461 | 1.501 |
| | C | 0.023 | 0.00038 | 0.02338 |
| | D | 0.594 | 0.00263 | 0.059663 |
| | E | 0.079 | 0.097 | 0.176 |

| Simult Tx | Configuration | 1900 GSM SAR (W/kg) | 2.4GHz WIFI SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|
| Body SAR | A | 1.09 | 0.461 | 1.551 |
| | C | 0.015 | 0.00038 | 0.01538 |
| | D | 0.307 | 0.00263 | 0.30963 |
| | E | 0.090 | 0.097 | 0.187 |
| Simult Tx | Configuration | 1900 WCDMA SAR (W/kg) | 2.4GHz WIFI SAR (W/kg) | Σ SAR (W/kg) |
| Body SAR | A | 0.508 | 0.461 | 0.963 |
| | C | 0.00804 | 0.00038 | 0.00842 |
| | D | 0.091 | 0.00263 | 0.09363 |
| | E | 0.039 | 0.097 | 0.136 |

| Simult Tx | Configuration | 850 GSM SAR (W/kg) | 5 GHz WIFI SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|
| Body SAR (Fig.10) | A | 0.98 | 1.08 | 2.06 |
| | C | 0.089 | 0.203 | 0.292 |
| | D | 0.085 | 0.00357 | 0.08857 |
| | E | 0.161 | 0.0028 | 0.1638 |
| Simult Tx | Configuration | 850 WCDMA SAR (W/kg) | 5 GHz WIFI SAR (W/kg) | Σ SAR (W/kg) |
| Body SAR (Fig.11) | A | 1.04 | 1.08 | 2.12 |
| | C | 0.023 | 0.203 | 0.226 |
| | D | 0.594 | 0.00357 | 0.59757 |
| | E | 0.079 | 0.0028 | 0.0818 |

| Simult Tx | Configuration | 1900 GSM SAR (W/kg) | 5 GHz WIFI SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|
| Body SAR (Fig.12) | A | 1.09 | 1.08 | 2.17 |
| | C | 0.015 | 0.203 | 0.218 |
| | D | 0.307 | 0.00357 | 0.31057 |
| | E | 0.090 | 0.0028 | 0.0928 |
| Simult Tx | Configuration | 1900 WCDMA SAR (W/kg) | 5 GHz WIFI SAR (W/kg) | Σ SAR (W/kg) |
| Body SAR (Fig.13) | A | 0.508 | 1.08 | 1.582 |
| | C | 0.00804 | 0.203 | 0.21104 |
| | D | 0.091 | 0.00357 | 0.09457 |
| | E | 0.039 | 0.0028 | 0.0418 |

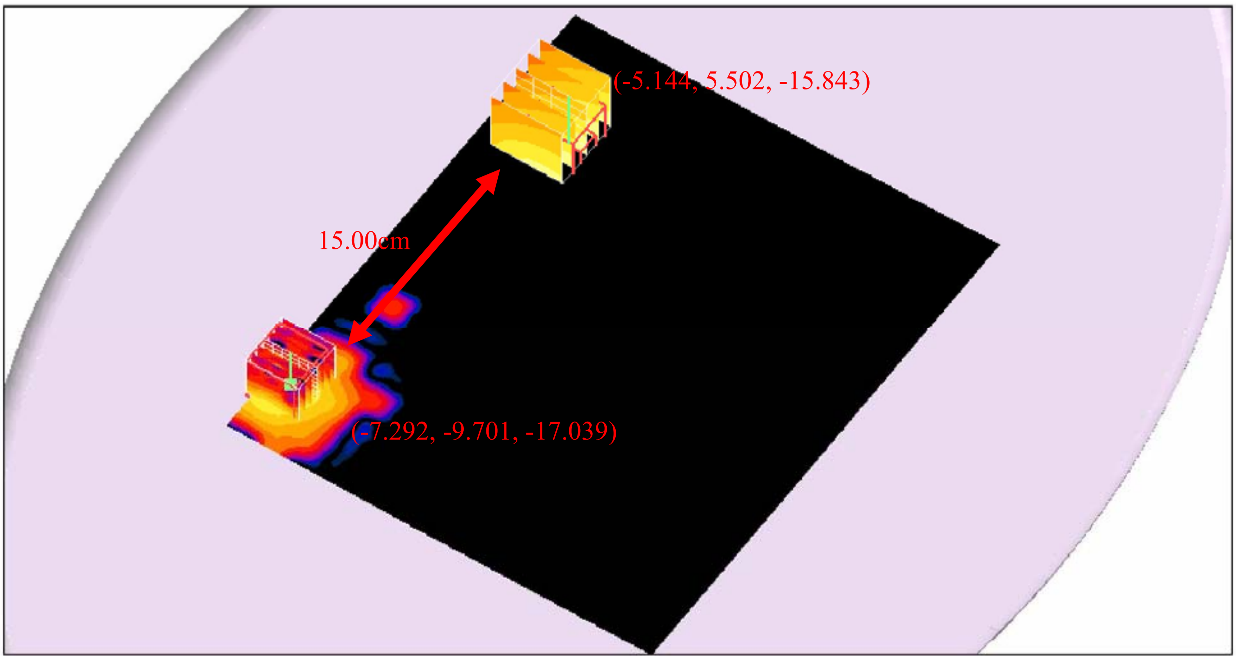



**Fig. 10 Simultaneous Peak Location Separation Ration**

$$dist = \sqrt{(-7.292+5.144)^2+(9.701+5.502)^2+(-17.039+15.843)^2} = 15.00cm$$

$$Ratio = \frac{Sum}{Distance} = \frac{2.06}{15.00} = 0.137 < 0.3$$

Note: "-" SAR results shown in the table are zero for summation purposes.The summation of the 850 GSM and 5 GHz WLAN body SAR for the position A is 0.98 W/kg + 1.08 W/kg = 2.06 W/kg, which is greater than 1.6 W/kg.

However, the distance between the peak licensed transmitter body SAR and WLAN body SAR is 15.00 cm (See Fig. 10 ). The ratio of the max SAR summation and the distance between the SAR peaks is 2.06 / 15.00 = 0.137, which is less than 0.3.

Therefore, a multi-band volumetric simultaneous SAR evaluation is not required for GSM 850 and 5 GHz WLAN transmission in body tissue.

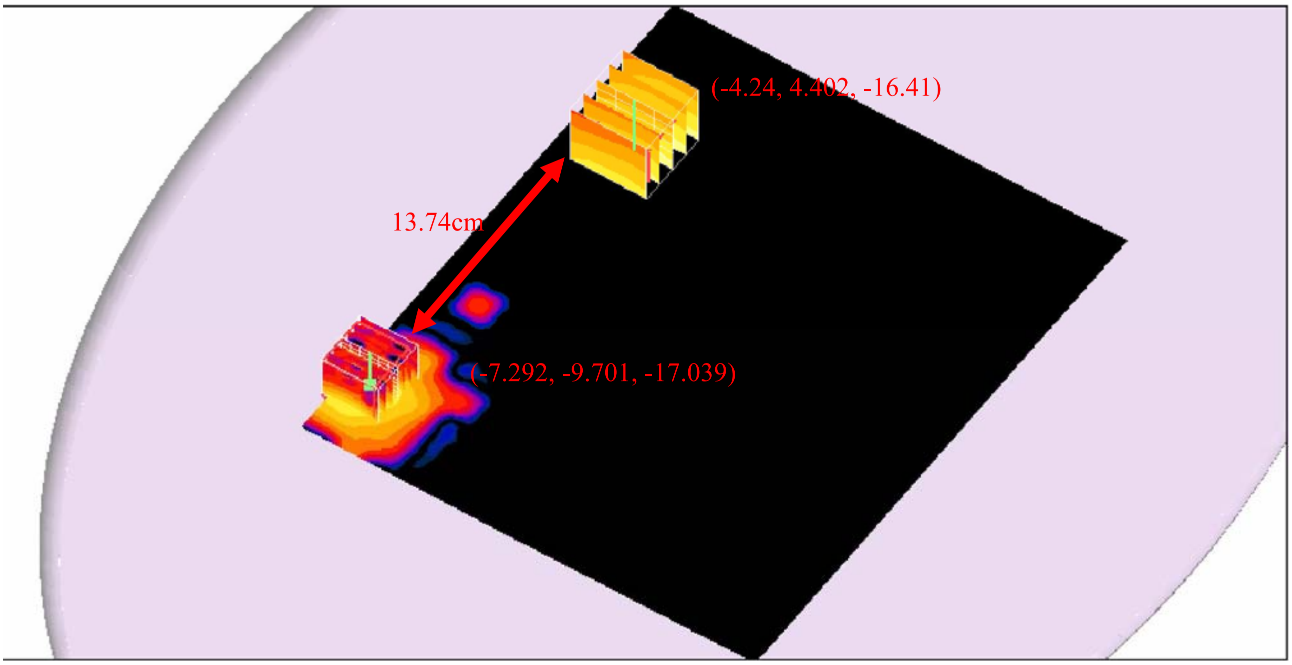



**Fig. 11 Simultaneous Peak Location Separation Ration**

$$dist = \sqrt{(-7.292+4.24)^2+(9.701+4.402)^2+(-17.039+16.41)^2} = 13.74cm$$

$$Ratio = \frac{Sum}{Distance} = \frac{2.12}{13.74} = 0.154 < 0.3$$

Note: "-" SAR results shown in the table are zero for summation purposes.The summation of the 850 WCDMA and 5 GHz WLAN body SAR for the position A is 1.04 W/kg + 1.08 W/kg = 2.12 W/kg, which is greater than 1.6 W/kg.

However, the distance between the peak licensed transmitter body SAR and WLAN body SAR is 13.74 cm (See Fig. 11 ). The ratio of the max SAR summation and the distance between the SAR peaks is 2.12 / 13.74 = 0.154, which is less than 0.3.

Therefore, a multi-band volumetric simultaneous SAR evaluation is not required for WCDMA 850 and 5 GHz WLAN transmission in body tissue.

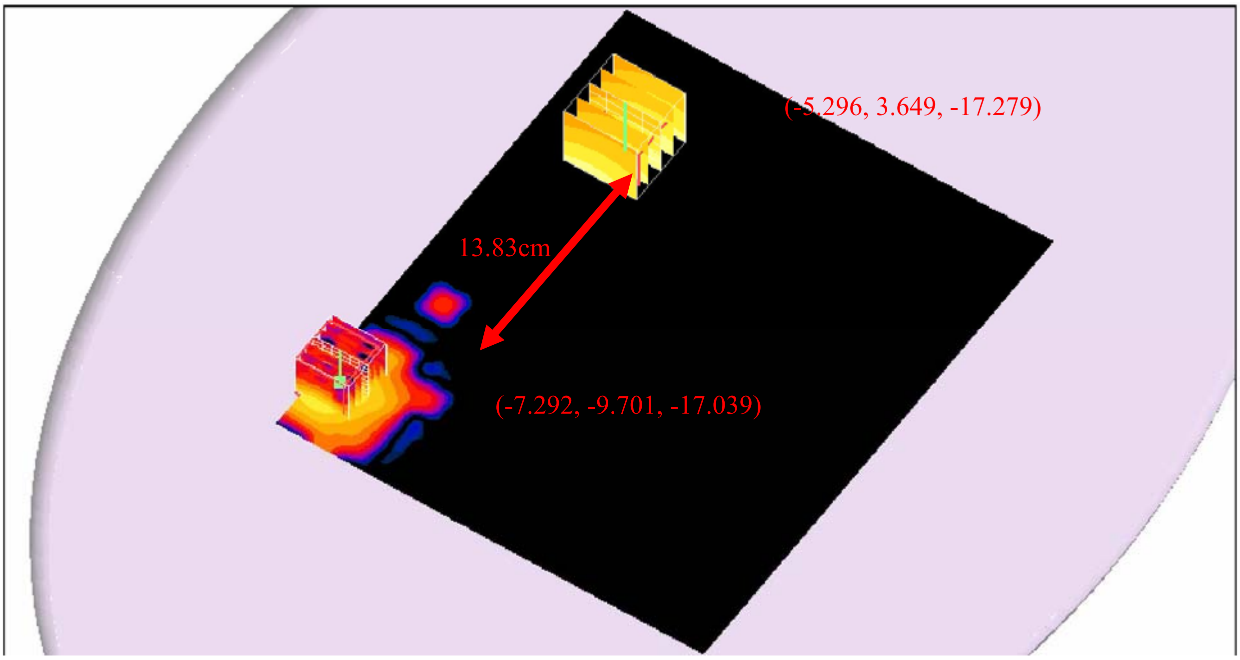



**Fig. 12 Simultaneous Peak Location Separation Ration**

$$dist = \sqrt{(-7.292+5.296)^2+(9.701+3.649)^2+(-17.039+17.279)^2} = 13.83cm$$

$$Ratio = \frac{Sum}{Distance} = \frac{2.17}{13.83} = 0.157 < 0.3$$

Note: "-" SAR results shown in the table are zero for summation purposes.The summation of the 1900 GSM and 5 GHz WLAN body SAR for the position A is 1.09 W/kg + 1.08 W/kg = 2.17 W/kg, which is greater than 1.6 W/kg.

However, the distance between the peak licensed transmitter body SAR and WLAN body SAR is 13.83 cm (See Fig. 10 ). The ratio of the max SAR summation and the distance between the SAR peaks is 2.17 / 13.83 = 0.157, which is less than 0.3.

Therefore, a multi-band volumetric simultaneous SAR evaluation is not required for GSM 1900 and 5 GHz WLAN transmission in body tissue.

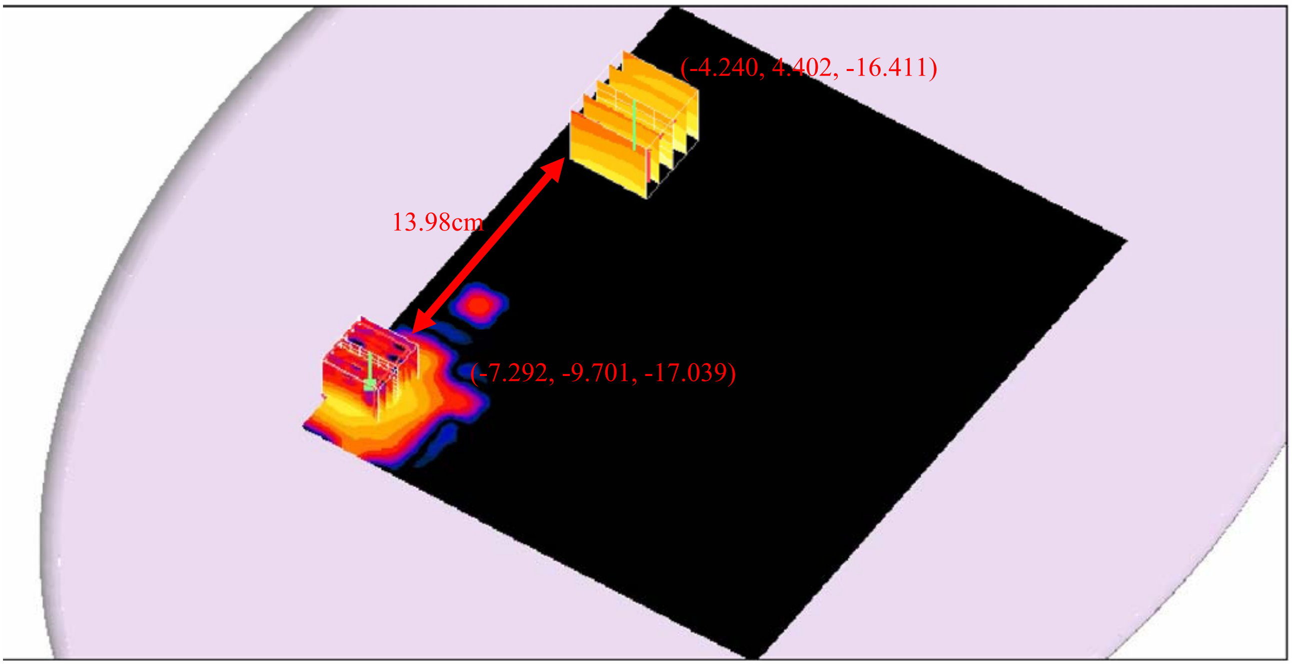



**Fig. 13 Simultaneous Peak Location Separation Ration**

$$dist = \sqrt{(-7.292 + 4.240)^2 + (9.701 + 4.402)^2 + (-17.039 + 16.411)^2} = 13.98cm$$

$$Ratio = \frac{Sum}{Distance} = \frac{1.588}{13.98} = 0.113 < 0.3$$

Note: "-" SAR results shown in the table are zero for summation purposes.The summation of the 1900 WCDMA and 5 GHz WLAN body SAR for the position A is 0.508 W/kg + 1.08 W/kg = 1.588 W/kg, which is greater than 1.6 W/kg.

However, the distance between the peak licensed transmitter body SAR and WLAN body SAR is 13.98 cm (See Fig. 13 ). The ratio of the max SAR summation and the distance between the SAR peaks is 1.588 / 13.98 = 0.113, which is less than 0.3.

Therefore, a multi-band volumetric simultaneous SAR evaluation is not required for WCDMA1900 and 5 GHz WLAN transmission in body tissue.

# 7. The Description of Test Procedure for FCC

## 7.1 Scan Procedure

First coarse scans were used for determination of the field distribution. Next a cube scan, 5x5x7 points covering a volume of 32x32x30mm was performed around the highest E-field value to determine the averaged SAR value. Drift was determined by measuring the same point at the start of the coarse scan and again at the end of the cube scan.

## 7.2 SAR Averaging Methods

The maximum SAR value was averaged over a cube of tissue using interpolation and extrapolation. The interpolation, extrapolation and maximum search routines within Dasy4 are all based on the modified Quadratic Shepard's method (Robert J. Renka, "Multivariate Interpolation Of Lagre Sets Of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).

The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighbouring points by a least-square method. For the cube scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics. In the cube scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

## 7.3 Data Storage

The DASY4 software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension .DA4. The postprocessing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of erroneous parameter settings.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [A/m] or [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

## 7.4 Data Evaluation

The DASY4 postprocessing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

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

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

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

| | | | |
|---|---|---|---|
| with $V_i$ | = compensated signal of channel i | (i = x, y, z) |
| $U_i$ | = input signal of channel i | (i = x, y, z) |
| $cf$ | = crest factor of exciting field | (DASY parameter) |
| $dcp_i$ | = diode compression point | (DASY parameter) |

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

$$\text{E} - \text{fieldprobes}: \qquad E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

$$\text{H} - \text{fieldprobes}: \qquad H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

| | | | |
|---|---|---|---|
| with | $V_i$ | = compensated signal of channel i | (i = x, y, z) |
| | $Norm_i$ | = sensor sensitivity of channel i<br>$\mu$V/(V/m)$^2$ for E-field Probes | (i = x, y, z) |
| | $ConvF$ | = sensitivity enhancement in solution | |
| | $a_{ij}$ | = sensor sensitivity factors for H-field probes | |
| | $f$ | = carrier frequency [GHz] | |
| | $E_i$ | = electric field strength of channel i in V/m | |
| | $H_i$ | = magnetic field strength of channel i in A/m | |

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

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

| | | |
|---|---|---|
| with | $SAR$ | = local specific absorption rate in mW/g |
| | $E_{tot}$ | = total field strength in V/m |
| | $\sigma$ | = conductivity in [mho/m] or [Siemens/m] |
| | $\rho$ | = equivalent tissue density in g/cm$^3$ |

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

## 7.5 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1529 standard. It can be conducted for 1 g and 10 g, as well as for user-specific masses. The DASY4 system allows evaluations that combine measured data and robot positions, such as:

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

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

**Extrapolation**

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor o_set. Several measurements at di_erent distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 5x5x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1 g and 10 g cubes.

**Boundary effect**

For measurements in the immediate vicinity of a phantom surface, the field coupling e_ects between the probe and the boundary influence the probe characteristics. Boundary effect errors of different dosimetric probe types have been analyzed by measurements and using a numerical probe model. As expected, both methods showed an enhanced sensitivity in the immediate vicinity of the boundary. The effect strongly depends on the probe dimensions and disappears with increasing distance from the boundary. The sensitivity can be approximately given as:

$$S \approx S_o + S_b exp(-\frac{z}{a}) cos(\pi \frac{z}{\lambda})$$

Since the decay of the boundary e_ect dominates for small probes (a <<_), the cos-term can be omitted. Factors Sb (parameter Alpha in the DASY4 software) and a (parameter Delta in the DASY4 software) are assessed during probe calibration and used for numerical compensation of the boundary effect. Several simulations and measurements have confirmed that the compensation is valid for different field and boundary configurations.

This simple compensation procedure can largely reduce the probe uncertainty near boundaries. It works well as long as:

- the boundary curvature is small
- the probe axis is angled less than 30_ to the boundary normal
- the distance between probe and boundary is larger than 25% of the probe diameter
- the probe is symmetric (all sensors have the same offset from the probe tip)

Since all of these requirements are fulfilled in a DASY4 system, the correction of the probe boundary effect in the vicinity of the phantom surface is performed in a fully automated manner via the measurement data extraction during postprocessing.

# 8. Measurement Uncertainty

| Error Description | Unc. value ±% | Prob. Dist. | Div. | $C_i$ (1g) | $C_i$ (10g) | Std. Unc. ±% (1g) | Std. Unc. ±% (10g) | $v_i$ ($v_{eff}$) |
|---|---|---|---|---|---|---|---|---|
| Measurement System | | | | | | | | |
| Probe Calibration | ±6.6 | N | 1 | 1 | 1 | ±6.6 | ±6.6 | ∞ |
| Axial Isotropy | ±0.3 | R | $\sqrt{3}$ | 0.7 | 0.7 | ±0.1 | ±0.1 | ∞ |
| Hemispherical Isotropy | ±1.3 | R | $\sqrt{3}$ | 0.7 | 0.7 | ±0.5 | ±0.5 | ∞ |
| Boundary Effects | ±0.5 | R | $\sqrt{3}$ | 1 | 1 | ±0.3 | ±0.3 | ∞ |
| Linearity | ±0.3 | R | $\sqrt{3}$ | 1 | 1 | ±0.2 | ±0.2 | ∞ |
| System Detection Limits | ±1.0 | R | $\sqrt{3}$ | 1 | 1 | ±0.6 | ±0.6 | ∞ |
| Readout Electronics | ±0.3 | N | 1 | 1 | 1 | ±0.3 | ±0.3 | ∞ |
| Response Time | ±0.8 | R | $\sqrt{3}$ | 1 | 1 | ±0.5 | ±0.5 | ∞ |
| Integration Time | ±2.6 | R | $\sqrt{3}$ | 1 | 1 | ±1.5 | ±1.5 | ∞ |
| RF Ambient Conditions | ±3.0 | R | $\sqrt{3}$ | 1 | 1 | ±1.7 | ±1,7 | ∞ |
| Probe Positioner | ±0.4 | R | $\sqrt{3}$ | 1 | 1 | ±0.2 | ±0.2 | ∞ |
| Probe Positioning | ±2.9 | R | $\sqrt{3}$ | 1 | 1 | ±1.7 | ±1.7 | ∞ |
| Max. SAR Evaluation | ±1.0 | R | $\sqrt{3}$ | 1 | 1 | ±0.6 | ±0.6 | ∞ |
| Test Sample Related | | | | | | | | |
| Test Sample Positioning | ±2.9 | N | 1 | 1 | 1 | ±2.9 | ±2.9 | 145 |
| Device Holder Uncertainty | ±3.6 | N | 1 | 1 | 1 | ±3.6 | ±3.6 | 5 |
| SAR Drift Measurement | ±5.0 | R | $\sqrt{3}$ | 1 | 1 | ±2.9 | ±2.9 | ∞ |
| Phantom and Setup | | | | | | | | |
| Phantom Uncertainty | ±4.0 | R | $\sqrt{3}$ | 1 | 1 | ±2.3 | ±2.3 | ∞ |
| Liquid Conductivity(target) | ±5.0 | R | $\sqrt{3}$ | 0.64 | 0.43 | ±1.8 | ±1.2 | ∞ |
| Liquid Conductivity(meas.) | ±2.5 | N | 1 | 0.64 | 0.43 | ±1.6 | ±1.1 | ∞ |
| Liquid Permittivity(target) | ±5.0 | R | $\sqrt{3}$ | 0.6 | 0.49 | ±1.7 | ±1.4 | ∞ |
| Liquid Permittivity(meas.) | ±2.5 | N | 1 | 0.6 | 0.49 | ±1.5 | ±1.2 | ∞ |
| Combined Std. Uncertainty | | | | | | ±10.0 | ±9.7 | 330 |
| Expanded STD Uncertainty （k=2） | | | | | | ±19.9 | ±19.4 | |

# 9. References

1. [IEEE Std C95.1-2005]
Safety Levels with Respect to Human Exposure to Radio Frrequency Electromagnetic Fields, 3 kHz to 300 GHz. The Institute of Electrical and Electronics Engineers, Inc. (IEEE), 2005.
2. [IEEE Std C95.3-1992]
Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave". The Institute of Electrical and Electronics Engineers, Inc. (IEEE), 1992.
3. [FCC Report and Order 96-326]
Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, 1996.
4. [FCC OET Bulletin 65]
Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. OET Bulletin 65 Edition 97-01, August 1997. Federal Communications Commission (FCC), Office of Engineering & Technology. (OET)
5. [FCC OET Bulletin 65 Supplement C]
Additional Information for Evaluating Compliance of Mobile and Portable Device with FCC Limits for Human Exposure to Radiofrequency Emissions. Supplement C (Edition 01-01) to OET Bulletin 65, June 2001. Federal Communications Commission (FCC), Office of Engineering & Technology. (OET)
6. [DASY 4]
Schmid & Partner Engineering AG: DASY 4 Manual, September 2005.
7. [IEEE 1528-2003]
IEEE Std 1528-2003: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wirless Communications Devices: Measurement Techniques. 1528-2003, 19$^{th}$ December, 2003, The Institute of Electrical and Electronics Engineers, Inc. (IEEE).
8. [RSS-102, Issue 2]
Radio Standards Specification 102, Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) sets out the requirements and measurement techniques used to evaluate radio frequency (RF) exposure compliance of radiocommunication apparatus designed to be used within the vicinity of the human body. November, 2005. Industry Canada.
9. [Health Canada Safety Code 6]
Canada's Safety Code 6: Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz (99-EHD-237)

# 10. Annex：Test Results of DASY4 (Refer to ANNEX)

# ANNEX
## Index of Annex

**ANNEX A: SAR RESULTS**

# System Performance Check

## Body

# 850MHz

Date/Time: 8/8/2011 9:01:41 AM

Test Laboratory: Electronics Testing Center, Taiwan

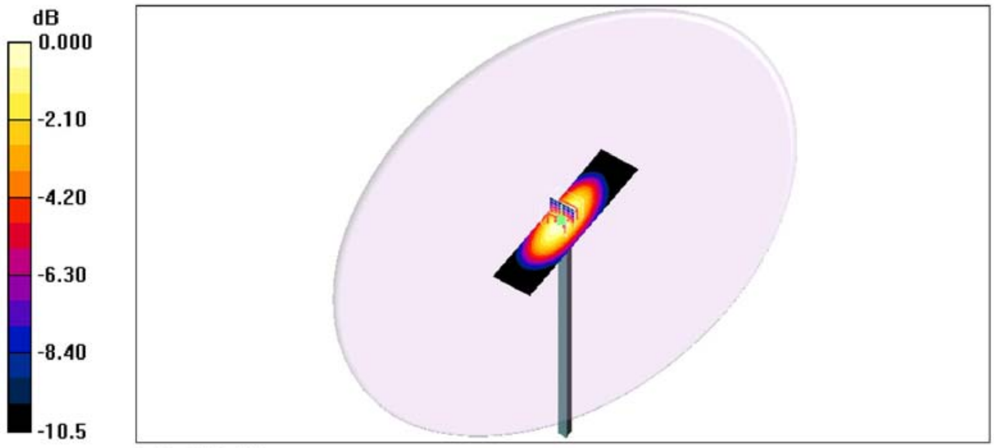
**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:1d010**

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; $\sigma$ = 0.956 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/m$^3$
Air temperature: 22degC; Liquid temperature: 22degC;
Phantom section: Flat Section

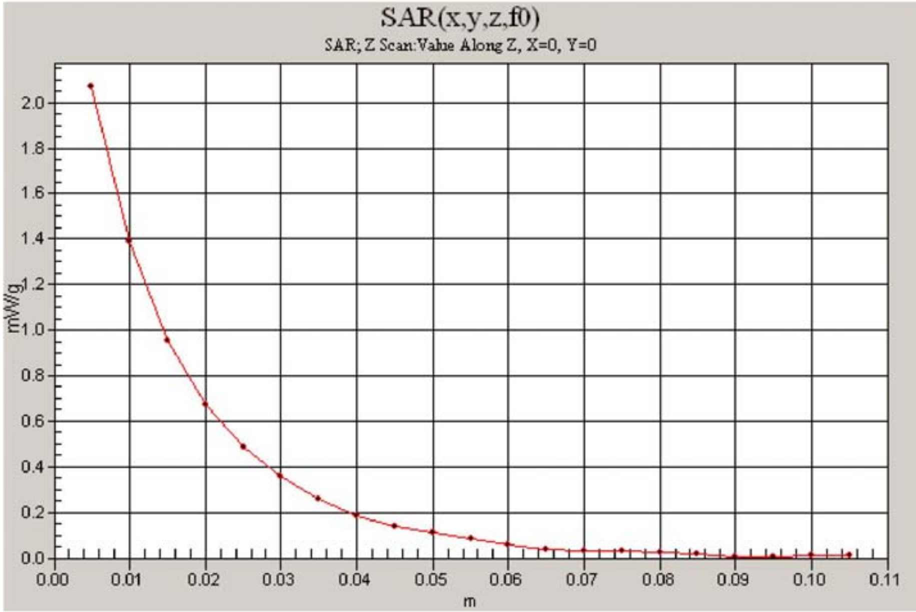
DASY4 Configuration:
- Probe: EX3DV4 - SN3665; ConvF(9.5, 9.5, 9.5); Calibrated: 4/19/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn629; Calibrated: 9/17/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1055
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**SPC/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.5 V/m; Power Drift = -0.103 dB
Peak SAR (extrapolated) = 4.00 W/kg
**SAR(1 g) = 2.53 mW/g; SAR(10 g) = 1.59 mW/g**
Maximum value of SAR (measured) = 2.75 mW/g

**SPC/Area Scan (31x131x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.70 mW/g




0 dB = 2.75mW/g


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
0.11
m

Date/Time: 8/9/2011 9:02:31 AM

Test Laboratory: Electronics Testing Center, Taiwan

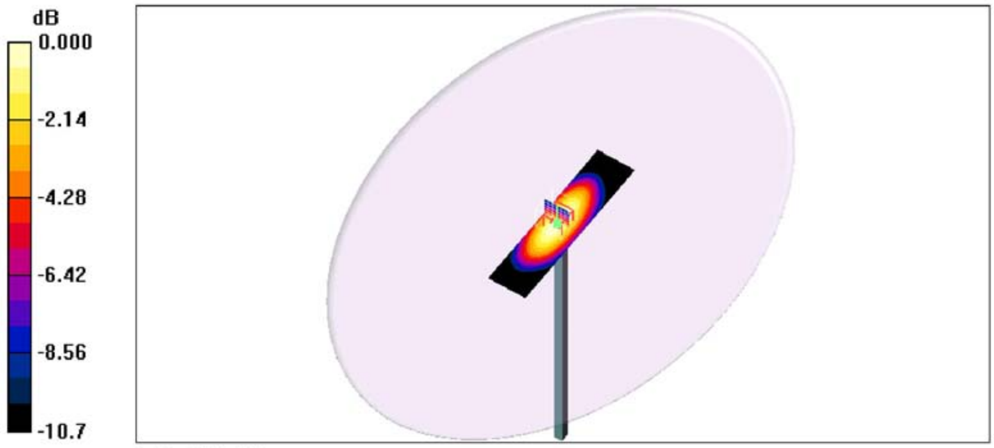
**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:1d010**

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; $\sigma$ = 0.956 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/m$^3$
Air temperature: 22.5degC; Liquid temperature: 22degC;
Phantom section: Flat Section

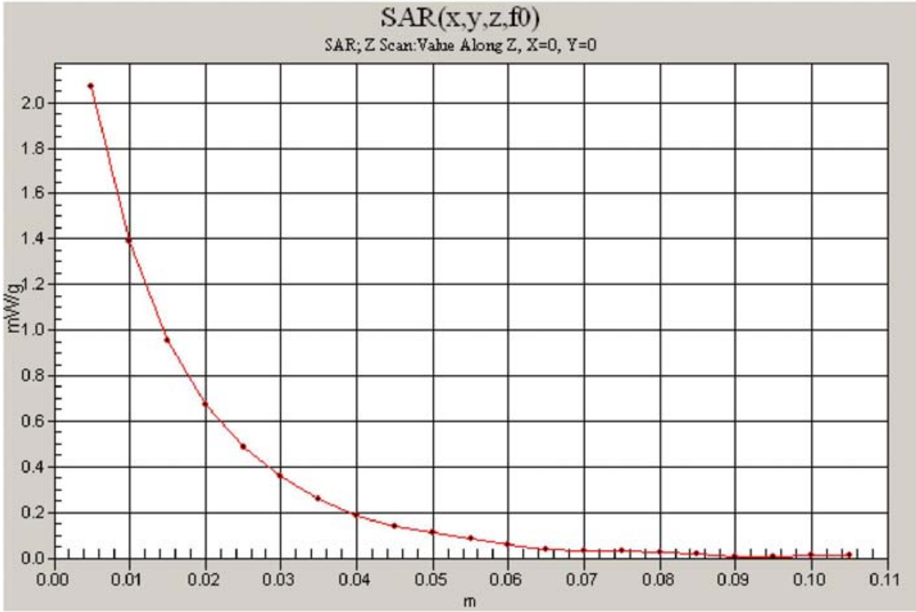
DASY4 Configuration:
- Probe: EX3DV4 - SN3665; ConvF(9.5, 9.5, 9.5); Calibrated: 4/19/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn629; Calibrated: 9/17/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1055
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**SPC/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.8 V/m; Power Drift = -0.011 dB
Peak SAR (extrapolated) = 3.97 W/kg
**SAR(1 g) = 2.51 mW/g; SAR(10 g) = 1.57 mW/g**
Maximum value of SAR (measured) = 2.72 mW/g

**SPC/Area Scan (31x131x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.66 mW/g




0 dB = 2.72mW/g


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
m
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
0.11

Date/Time: 8/10/2011 8:55:17 AM

Test Laboratory: Electronics Testing Center, Taiwan

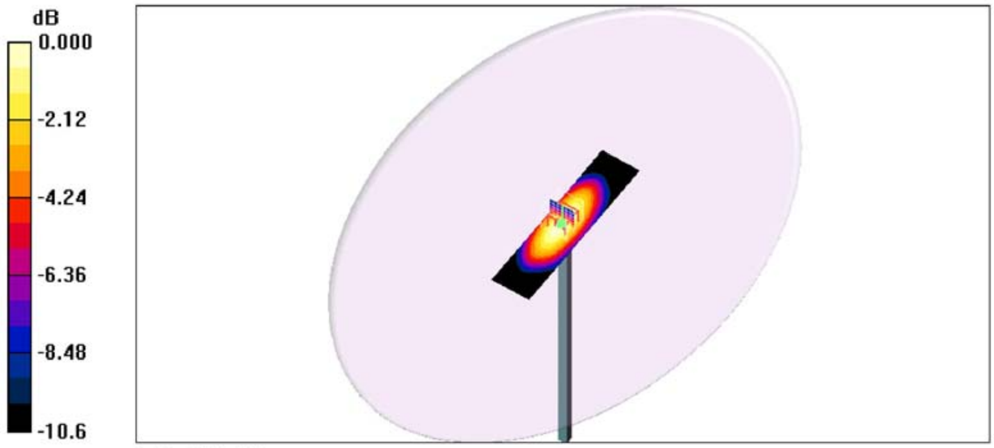
**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:1d010**

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; $\sigma$ = 0.956 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/m$^3$
Air temperature: 23degC; Liquid temperature: 22.5degC;
Phantom section: Flat Section

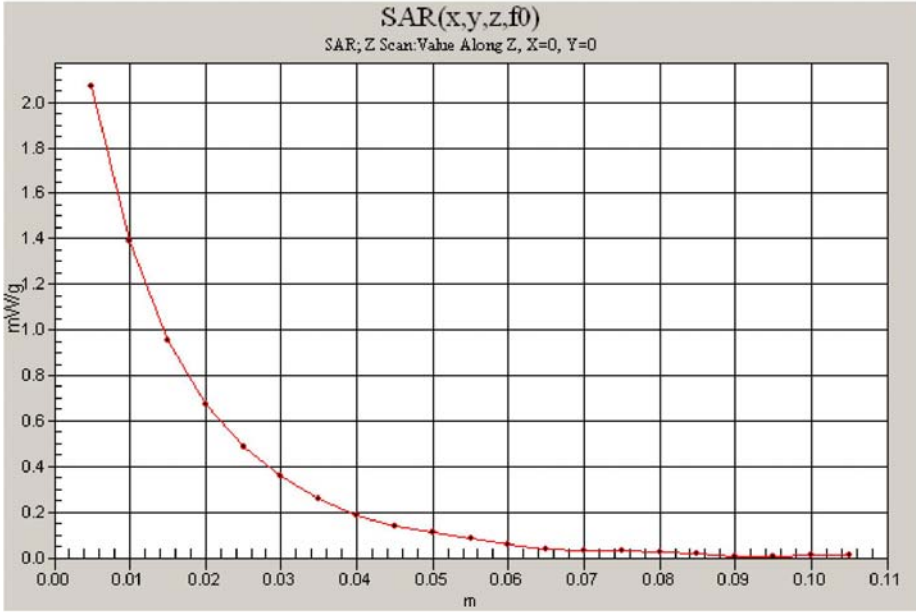
DASY4 Configuration:
- Probe: EX3DV4 - SN3665; ConvF(9.5, 9.5, 9.5); Calibrated: 4/19/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn629; Calibrated: 9/17/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1055
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**SPC/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.6 V/m; Power Drift = -0.011 dB
Peak SAR (extrapolated) = 3.96 W/kg
**SAR(1 g) = 2.5 mW/g; SAR(10 g) = 1.57 mW/g**
Maximum value of SAR (measured) = 2.72 mW/g

**SPC/Area Scan (31x131x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.64 mW/g




0 dB = 2.72mW/g


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
0.11
m

Date/Time: 1/11/2012 11:31:41 PM

Test Laboratory: Electronics Testing Center, Taiwan

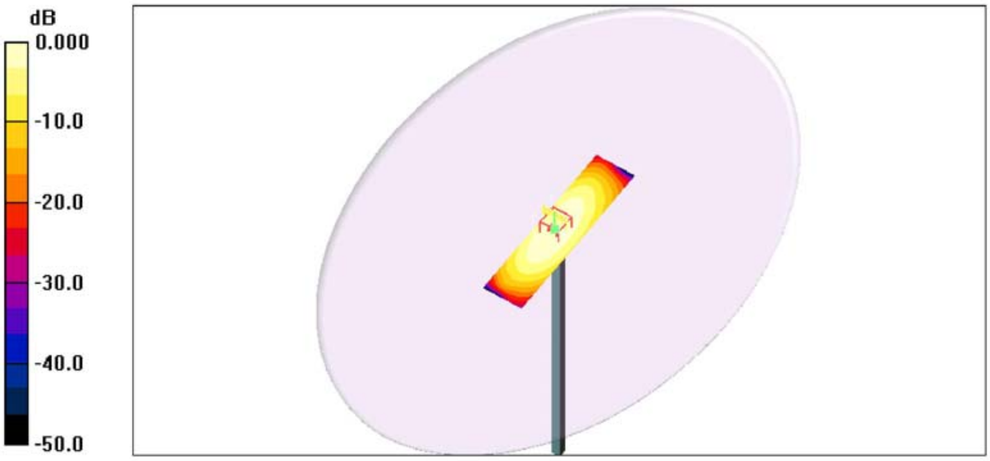
**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:xxx**

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; $\sigma$ = 0.956 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/m$^3$
Air temperature:22.5 degC; Liquid temperature:22 degC;
Phantom section: Flat Section

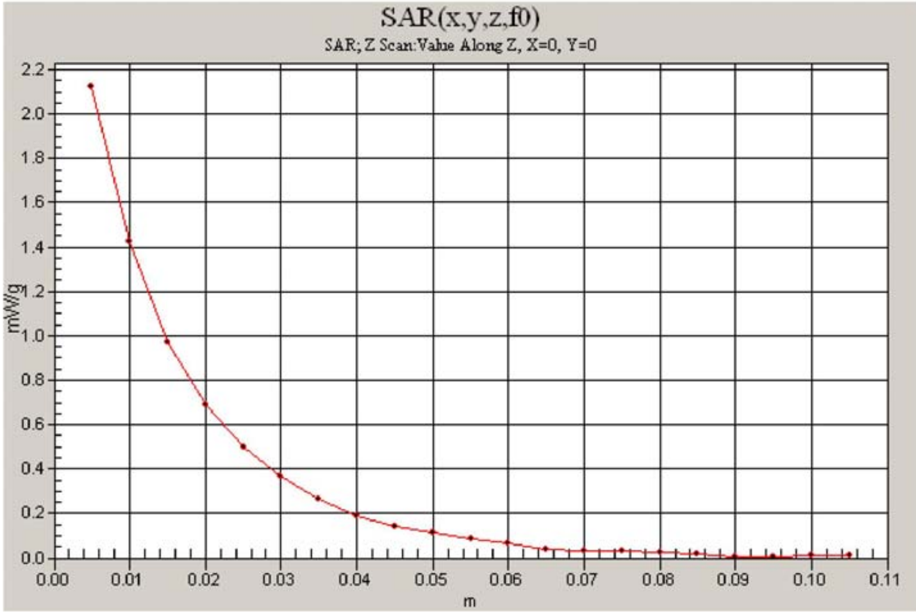
DASY4 Configuration:
- Probe: EX3DV4 - SN3555; ConvF(8.19, 8.19, 8.19); Calibrated: 9/29/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn629; Calibrated: 9/22/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1055
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**SPC/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.5 V/m; Power Drift = -0.103 dB
Peak SAR (extrapolated) = 4.00 W/kg
**SAR(1 g) = 2.55 mW/g; SAR(10 g) = 1.59 mW/g**
Maximum value of SAR (measured) = 2.75 mW/g

**SPC/Area Scan (31x131x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.70 mW/g




0 dB = 2.70mW/g


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
m
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
0.11

# 1900MHz

Date/Time: 8/3/2011 8:53:29 AM

Test Laboratory: Electronics Testing Center, Taiwan

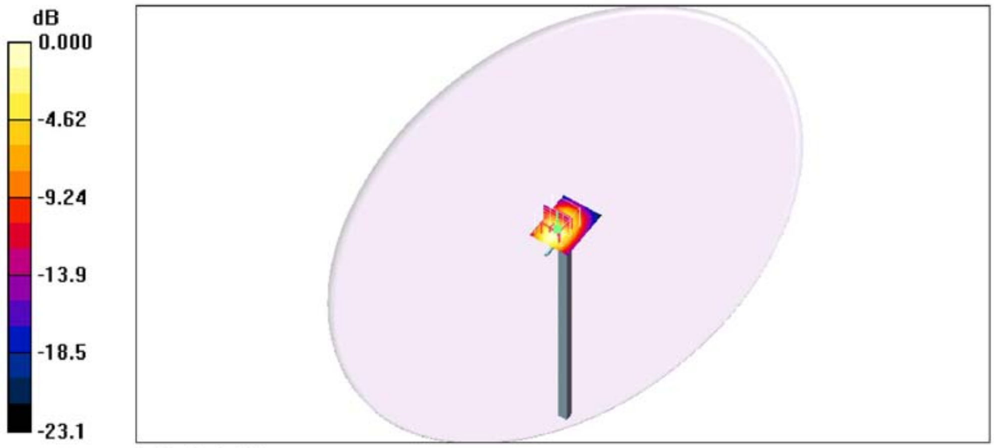
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:xxx**

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.47 mho/m; $\varepsilon_r$ = 55.5; $\rho$ = 1000 kg/m$^3$
Air temperature:22.5 degC; Liquid temperature:22 degC;
Phantom section: Flat Section

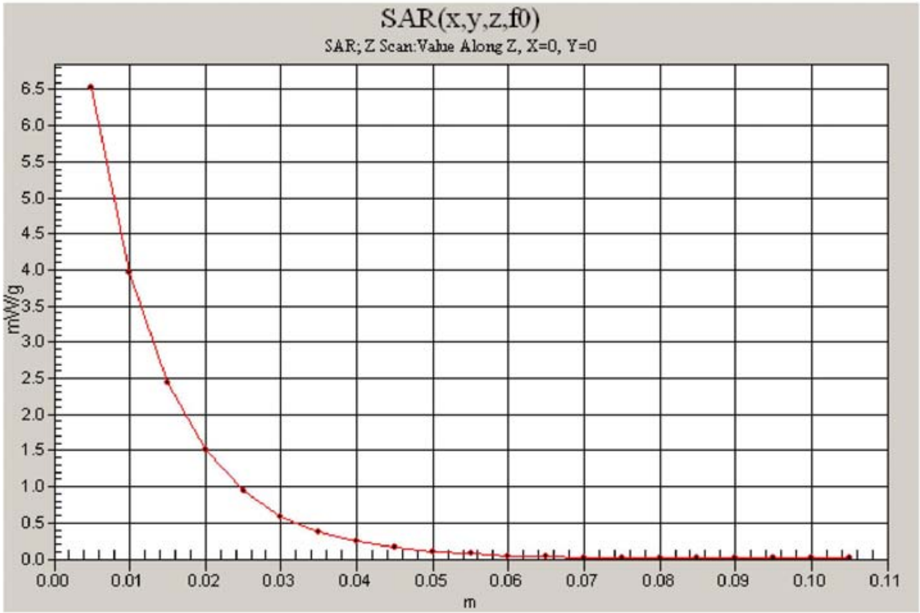
DASY4 Configuration:
- Probe: EX3DV4 - SN3665; ConvF(8.06, 8.06, 8.06); Calibrated: 4/19/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn629; Calibrated: 9/17/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1055
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**1900MHz-SPC/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 76.3 V/m; Power Drift = 0.005 dB
Peak SAR (extrapolated) = 18.1 W/kg
**SAR(1 g) = 9.99 mW/g; SAR(10 g) = 5.22 mW/g**
Maximum value of SAR (measured) = 11.1 mW/g

**1900MHz-SPC/Area Scan (31x41x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.6 mW/g




0 dB = 11.6mW/g


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
0.11
m

Date/Time: 8/4/2011 9:01:10 AM

Test Laboratory: Electronics Testing Center, Taiwan

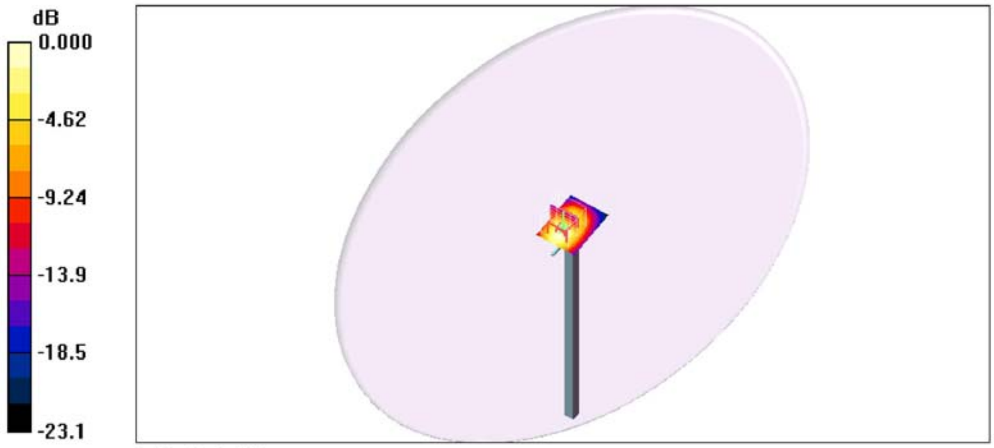
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:xxx**

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.47 mho/m; $\varepsilon_r$ = 55.5; ρ = 1000 kg/$m^3$
Air temperature:23 degC; Liquid temperature:22.5 degC;
Phantom section: Flat Section

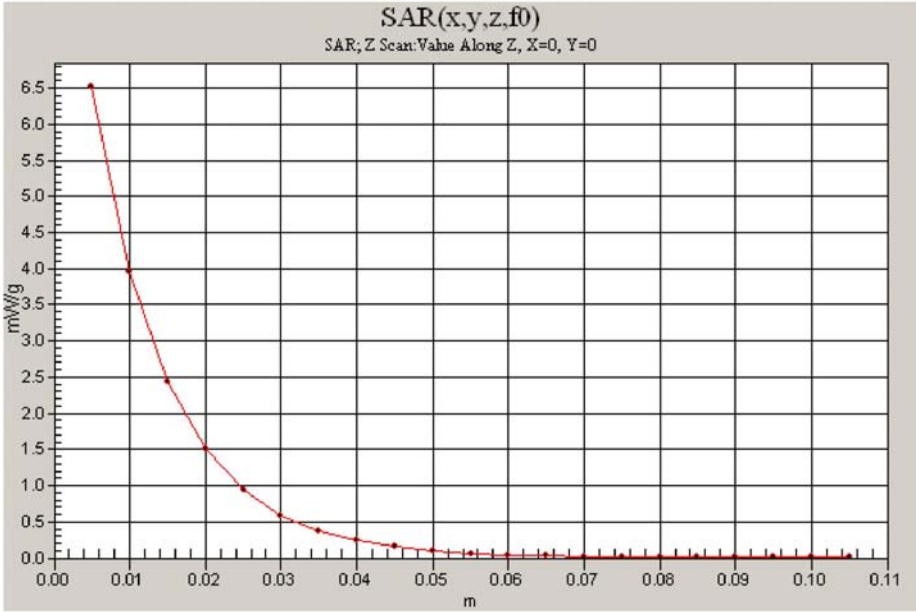
DASY4 Configuration:
- Probe: EX3DV4 - SN3665; ConvF(8.06, 8.06, 8.06); Calibrated: 4/19/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn629; Calibrated: 9/17/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1055
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**1900MHz-SPC /Area Scan (31x41x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.6 mW/g

**1900MHz-SPC /Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 76.3 V/m; Power Drift = -0.006 dB
Peak SAR (extrapolated) = 18.0 W/kg
**SAR(1 g) = 9.94 mW/g; SAR(10 g) = 5.19 mW/g**
Maximum value of SAR (measured) = 11.1 mW/g




0 dB = 11.6mW/g


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
m
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
0.11

Date/Time: 8/16/2011 8:53:19 AM

Test Laboratory: Electronics Testing Center, Taiwan

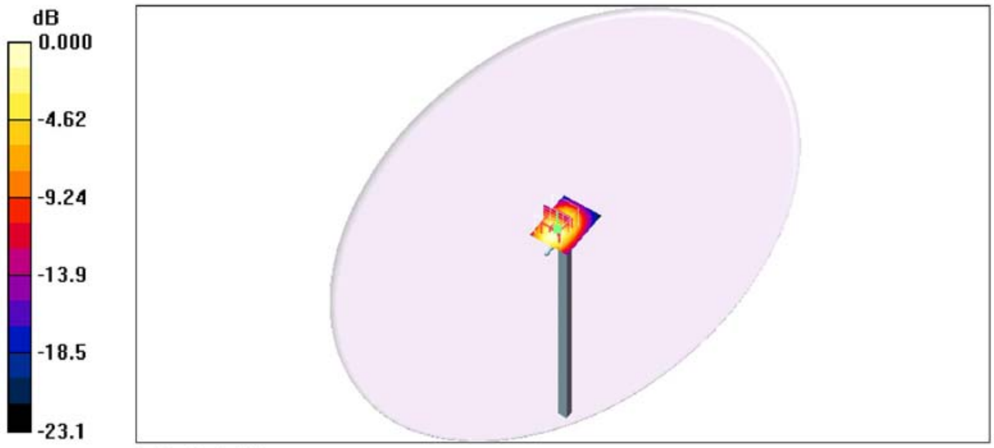
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:xxx**

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.47 mho/m; $\varepsilon_r$ = 55.5; $\rho$ = 1000 kg/m$^3$
Air temperature:22.5 degC; Liquid temperature:22 degC;
Phantom section: Flat Section

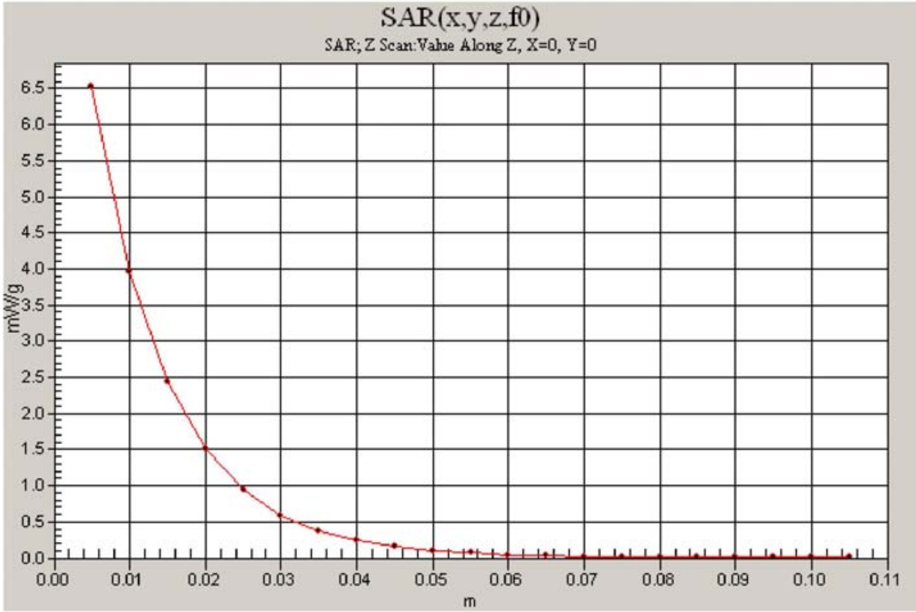
DASY4 Configuration:
- Probe: EX3DV4 - SN3665; ConvF(8.06, 8.06, 8.06); Calibrated: 4/19/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn629; Calibrated: 9/17/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1055
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**1900MHz-SPC /Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 76.1 V/m; Power Drift = 0.012 dB
Peak SAR (extrapolated) = 18.0 W/kg
**SAR(1 g) = 9.93 mW/g; SAR(10 g) = 5.19 mW/g**
Maximum value of SAR (measured) = 11.1 mW/g

**1900MHz-SPC /Area Scan (31x41x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.6 mW/g




0 dB = 11.1mW/g


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
m
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
0.11

Date/Time: 12/25/2011 9:43:30 AM

Test Laboratory: Electronics Testing Center, Taiwan

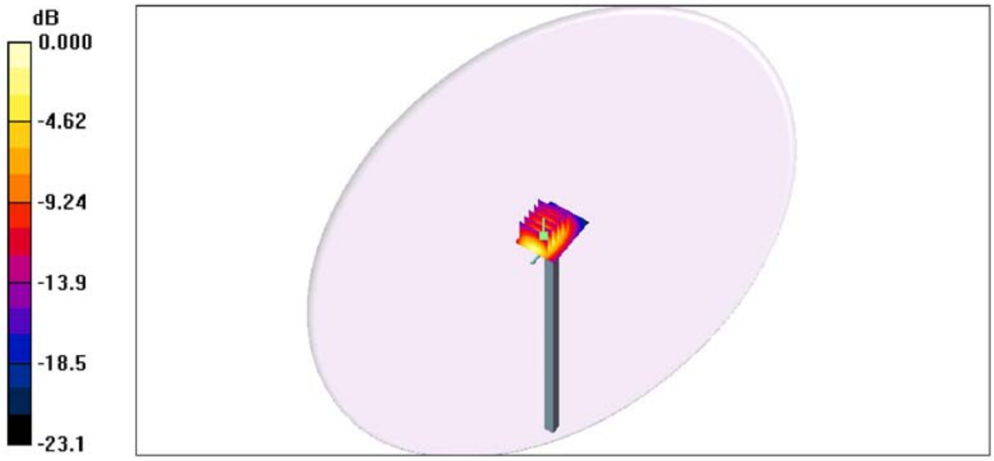
**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:xxx**

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.52 mho/m; $\varepsilon_r$ = 55.5; $\rho$ = 1000 kg/$m^3$
Air temperature: 23degC; Liquid temperature: 22.5degC;
Phantom section: Flat Section

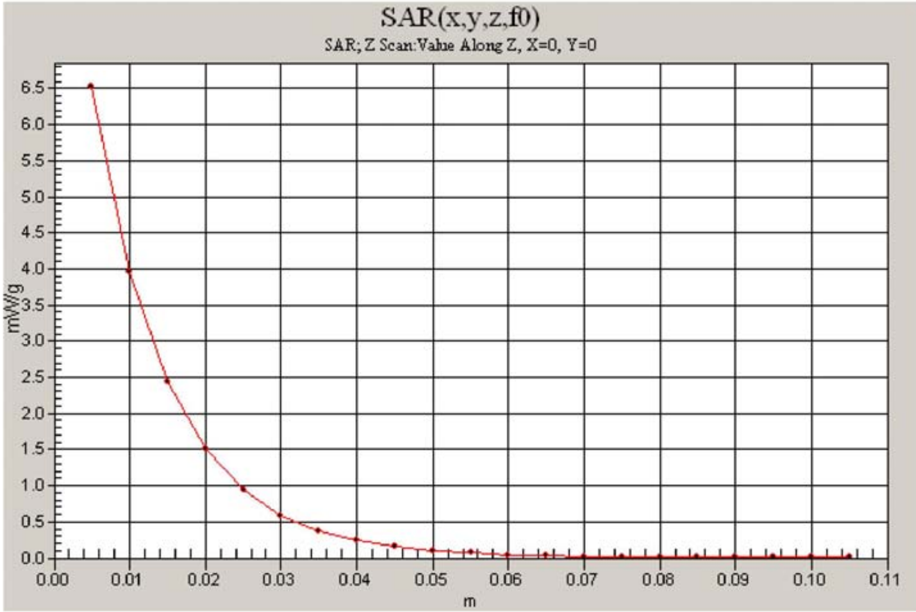
DASY4 Configuration:
- Probe: EX3DV4 - SN3555; ConvF(6.72, 6.72, 6.72); Calibrated: 9/29/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn629; Calibrated: 9/22/2011
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1055
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**1900MHz-SPC /Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 77.5 V/m; Power Drift = 0.014 dB
Peak SAR (extrapolated) = 18.7 W/kg
**SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.4 mW/g**
Maximum value of SAR (measured) = 11.5 mW/g

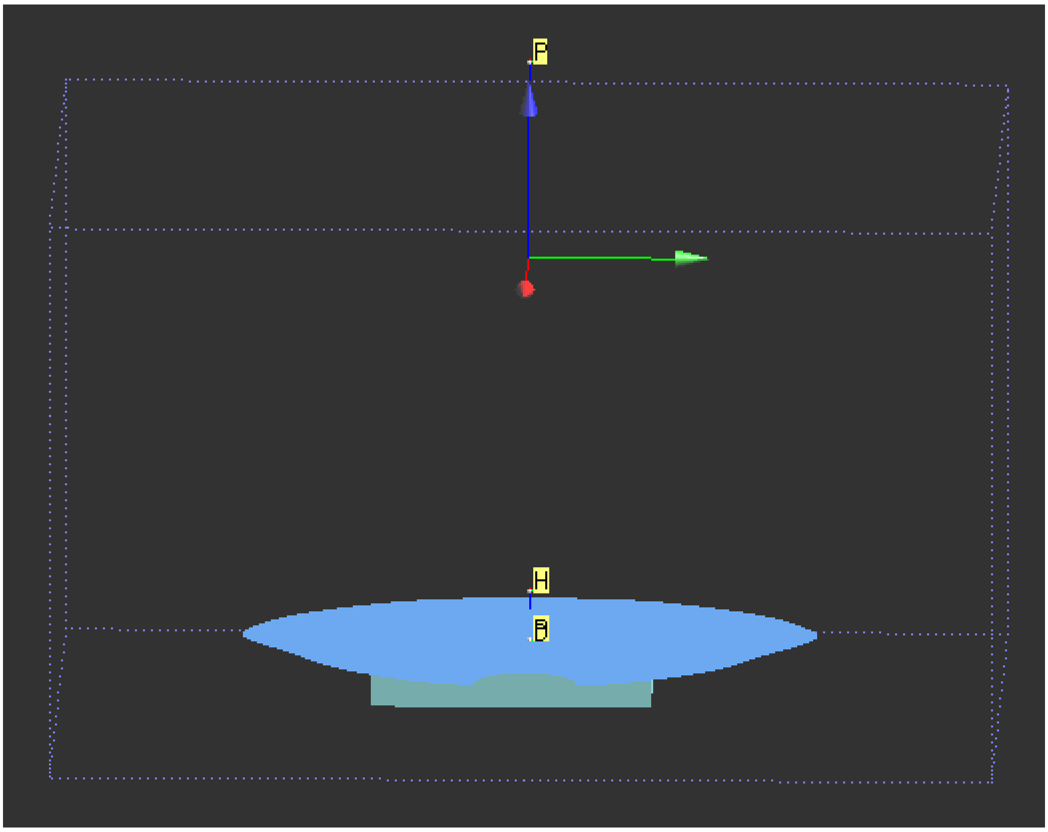
**1900MHz-SPC /Area Scan (31x41x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 12.0 mW/g




0 dB = 12.0mW/g


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
0.11
m

# Body



## GPRS 850 Distance 0mm

Date/Time: 8/8/2011 12:55:38 PM

Test Laboratory: Electronics Testing Center, Taiwan

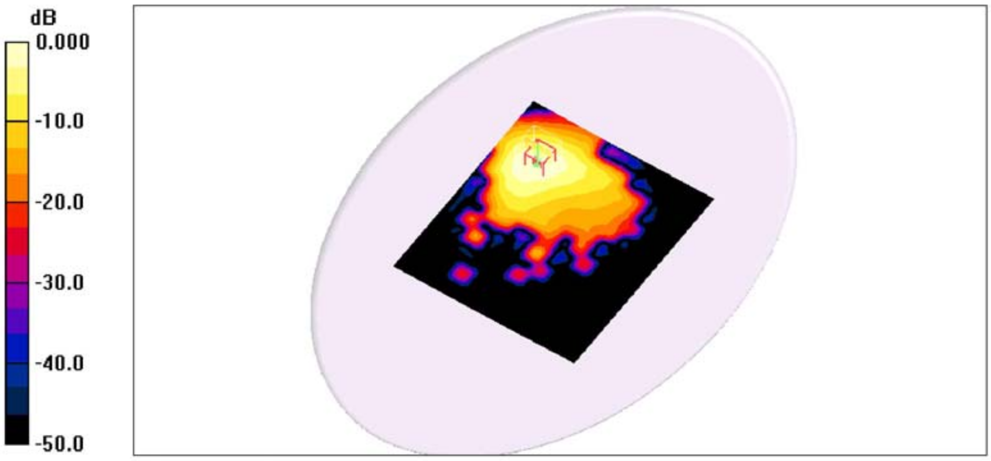
**DUT: Tablet; Type: Mobile Collaboration; Serial: N/A**

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.958 mho/m; $\varepsilon_r$ = 54.9; $\rho$ = 1000 kg/m$^3$
Air temperature:24 degC; Liquid temperature:23 degC;
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3665; ConvF(9.5, 9.5, 9.5); Calibrated: 4/19/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn629; Calibrated: 9/17/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1055
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**GSM850_1TX Slot_CH190_A_Side/Area Scan (141x161x1):** Measurement grid: dx=15mm, dy=15mm

**GSM850_1TX Slot_CH190_A_Side/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.60 V/m; Power Drift = -0.100 dB
Peak SAR (extrapolated) = 1.30 W/kg
**SAR(1 g) = 0.826 mW/g; SAR(10 g) = 0.537 mW/g**
Maximum value of SAR (measured) = 0.874 mW/g




0 dB = 0.885mW/g

Date/Time: 8/9/2011 8:14:21 PM

Test Laboratory: Electronics Testing Center, Taiwan

**DUT: Tablet; Type: Mobile Collaboration Tablet; Serial: N/A**

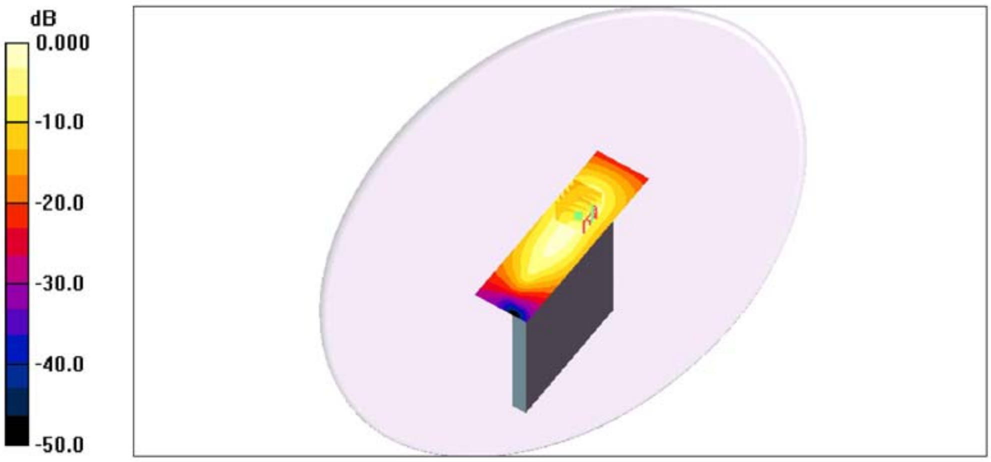
Communication System: GSM 850MHz; Frequency: 836.6 MHz;Duty Cycle: 1:8
Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.951 mho/m; $\varepsilon_r$ = 54.2; $\rho$ = 1000 kg/m$^3$
Air temperature:24 degC; Liquid temperature:23 degC;
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3665; ConvF(9.5, 9.5, 9.5); Calibrated: 4/19/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn629; Calibrated: 9/17/2010
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1055
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**GSM850_1TX Slot_CH190_D_Side/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.6 V/m; Power Drift = -0.171 dB
Peak SAR (extrapolated) = 1.06 W/kg
**SAR(1 g) = 0.535 mW/g; SAR(10 g) = 0.304 mW/g**
Maximum value of SAR (measured) = 0.715 mW/g

**GSM850_1TX Slot_CH190_D_Side/Area Scan (41x141x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.955 mW/g




0 dB = 0.955mW/g