# FCC SAR Test Report

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|---|---|
| **APPLICANT** | **: ZTE CORPORATION** |
| **EQUIPMENT** | **: CDMA 1x-EVDO Wireless data terminal** |
| **BRAND NAME** | **: ZTE** |
| **MODEL NAME** | **: AC2736** |
| **FCC ID** | **: Q78-AC2736** |
| **STANDARD** | **: 47 CFR Part 2 (2.1093)<br>IEEE C95.1-1999<br>OET Bulletin 65 Supplement C (Edition 01-01)** |

**The product sample received on Apr. 20, 2009 and completely tested on Apr. 29, 2009. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.**

**Reviewed by:**

**Roy Wu / Manager**

ilac-MRA TAF Testing Laboratory 1190

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# Revision History

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|---|---|---|---|
| FA931736-01 | Rev. 01 | Initial issue of report | Apr. 30, 2009 |
| FA931736-01 | Rev. 02 | Update FCC ID | May 06, 2009 |
| FA931736-01 | Rev. 03 | Update conducted power of RETAP 128K | May 11, 2009 |
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# 1. Statement of Compliance

The Specific Absorption Rate (SAR) maximum results found during testing for the **ZTE CORPORATION CDMA 1x-EVDO Wireless data terminal ZTE AC2736 is 1.17 W/kg for CDMA2000 Cellular band body SAR and 0.797 W/kg for CDMA2000 PCS band body SAR** with expanded uncertainty 21.9%. They are in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1999, and had been tested in accordance with the measurement methods and procedures specified in OET Bulletin 65 Supplement C (Edition 01-01).

# 2. Administration Data

## 2.1 Testing Laboratory

| | |
|---|---|
| **Test Site** | SPORTON INTERNATIONAL INC. |
| **Test Site Location** | No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,<br>Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 |
| **Test Site No.** | **Sporton Site No. :**<br>SAR02-HY |

## 2.2 Applicant

| | |
|---|---|
| **Company Name** | ZTE CORPORATION |
| **Address** | ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, P.R.China |

## 2.3 Manufacturer

| | |
|---|---|
| **Company Name** | ZTE CORPORATION |
| **Address** | ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, P.R.China |

## 2.4 Application Details

| | |
|---|---|
| **Date of Receipt of Application** | Apr. 20, 2009 |
| **Date of Start during the Test** | Apr. 29, 2009 |
| **Date of End during the Test** | Apr. 29, 2009 |

# 3. General Information

## 3.1 Description of Device Under Test (DUT)

| Product Feature & Specification | |
|---|---|
| **DUT Type** | CDMA 1x-EVDO Wireless data terminal |
| **Trade Name** | ZTE |
| **Model Name** | AC2736 |
| **FCC ID** | Q78-AC2736 |
| **Tx Frequency Range** | CDMA2000 Cellular : 824 MHz ~ 849 MHz<br>CDMA2000 PCS : 1850 MHz ~ 1910 MHz |
| **Rx Frequency Range** | CDMA2000 Cellular : 869 MHz ~ 894 MHz<br>CDMA2000 PCS : 1930 MHz ~ 1990 MHz |
| **Maximum Output Power** | CDMA2000 Cellular (1xRTT) : 22.24 dBm<br>CDMA2000 Cellular (1xEV-DO) : 21.18 dBm<br>CDMA2000 PCS (1xRTT) : 18.33 dBm<br>CDMA2000 PCS (1xEV-DO) : 18.27 dBm |
| **Type of Antenna Connector** | N/A |
| **Antenna Type** | Fixed Internal Antenna |
| **HW Version** | AC2726MD_C2 |
| **SW Version** | LU9A7170 |
| **Type of Modulation** | QPSK |
| **DUT Stage** | Production Unit |

## 3.2 Product Photos

Refer to Appendix D.

## 3.3 Applied Standards

The Specific Absorption Rate (SAR) testing specification, method and procedure for this CDMA 1x-EVDO Wireless data terminal is in accordance with the following standards:

- 47 CFR Part 2 (2.1093)
- IEEE C95.1-1999
- OET Bulletin 65 Supplement C (Edition 01-01)
- Preliminary Guidance for Reviewing Applications for Certification of 3G Device. May 2006
- KDB 447498 D02 v01
- KDB 941225 D01 v02

## 3.4 Device Category and SAR Limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

## 3.5 Test Conditions

### 3.5.1 Ambient Condition

| | |
|---|---|
| **Ambient Temperature** | 20-24℃ |
| **Humidity** | <60% |

### 3.5.2 Test Configuration

The DUT was set from the emulator to radiate maximum output power during all tests.

The device was controlled by using a base station emulator R&S CMU200. Communication between the device and the emulator was established by air link. The distance between the DUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of DUT.

Measurements were performed on the lowest, middle, and highest channel for each testing position. However, if the SAR is below 3 dB of limit, measurements were performed only on the middle channel.

For SAR testing, DUT is in CDMA2000 link mode, and its crest factor is 1.

# 4. Specific Absorption Rate (SAR)

## 4.1 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.

## 4.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density.

ρ). The equation description is as below:

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

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

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

$$\text{SAR} = C\frac{\delta T}{\delta t}$$

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

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

, where σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the rms electrical field strength.

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

# 5. SAR Measurement Setup

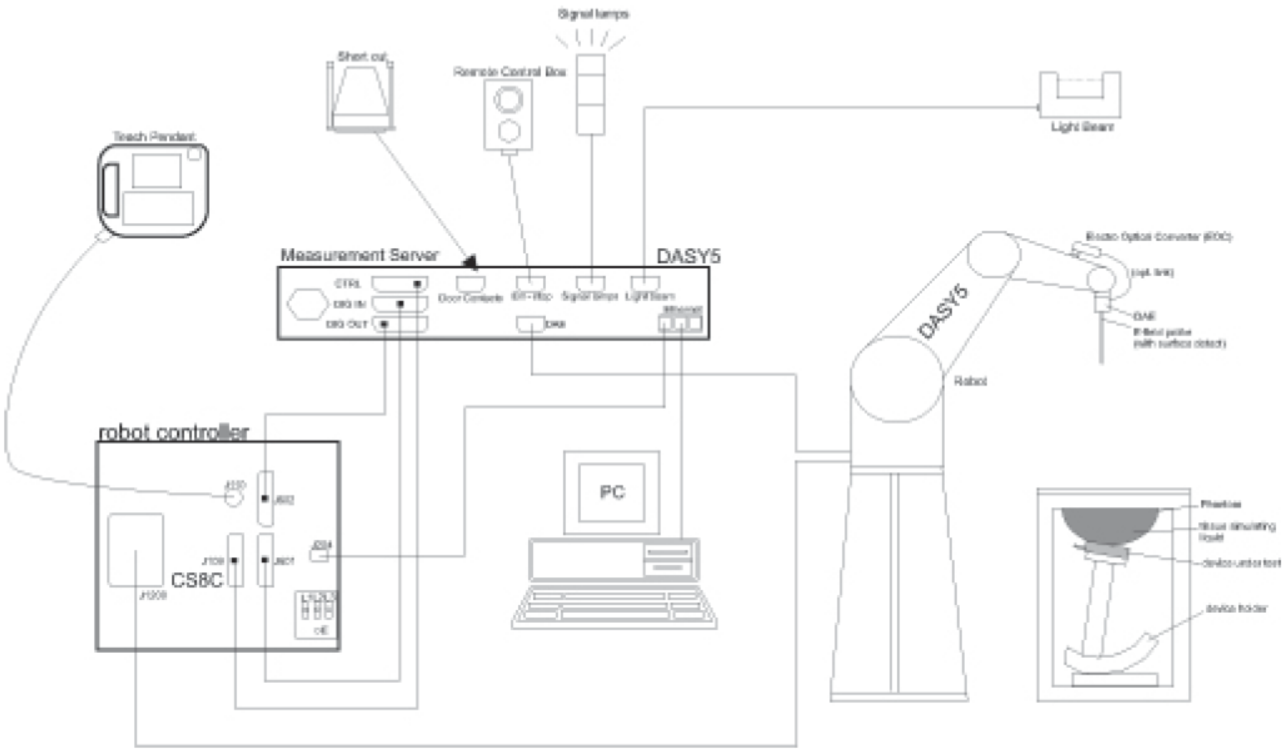



**Fig. 5.1 DASY5 System**

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

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (ECO) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY5 software
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

Some of the components are described in details in the following sub-sections.

## 5.1 DASY5 E-Field Probe System

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

### 5.1.1 *E-Field Probe Specification*

**<EX3DV3 Probe>**

| | | |
|---|---|---|
| **Construction** | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents) | |
| **Frequency** | 10 MHz to 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz) | <br>**Fig. 5.2 EX3DV3 E-field Probe** |
| **Directivity** | ± 0.3 dB in HSL (rotation around probe axis)<br>± 0.5 dB in tissue material (rotation normal to probe axis) | |
| **Dynamic Range** | 10 μW/g to 100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 μW/g) | |
| **Dimensions** | Overall length: 330 mm (Tip: 20 mm)<br>Tip diameter: 2.5 mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm | |
| **Application** | High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%. | |

### 5.1.2 *E-Field Probe Calibration*

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

| **EX3DV3 sn3514 (Cal: Jan. 21, 2009)** | | | |
|---|---|---|---|
| **Item** | **X axis** | **Y axis** | **Z axis** |
| **Sensitivity (μV)** | 0.66 | 0.70 | 0.60 |
| **Diode Compression Point (mV)** | 91 | 94 | 95 |
| **Conversion Factor (Head / Body)** | **Frequency (MHz)** | **X,Y,Z axis** | |
| | 800~1000 | 9.31 / 9.41 | |
| | 1710~1910 | 8.16 / 8.18 | |
| | 2200~2400 | 7.78 / 7.60 | |
| | 2500~2700 | 7.34 / 7.20 | |
| | 3400~3600 | 6.89 / 6.40 | |
| | 5100~5300 | 4.78 / 4.29 | |
| | 5200~5400 | 4.40 / 3.94 | |
| | 5400~5600 | 4.22 / 3.88 | |
| | 5500~5700 | 4.13 / 3.89 | |
| | 5700~5900 | 4.13 / 3.85 | |
| **Boundary Effect (Head / Body)** | **Frequency (MHz)** | **Alpha** | **Depth** |
| | 800~1000 | 0.45 / 0.42 | 0.76 / 0.76 |
| | 1710~1910 | 0.60 / 0.85 | 0.63 / 0.56 |
| | 2200~2400 | 0.53 / 0.18 | 0.63 / 4.17 |
| | 2500~2700 | 0.16 / 0.34 | 2.19 / 1.14 |
| | 3400~3600 | 0.50 / 0.53 | 0.86 / 0.81 |
| | 5100~5300 | 0.40 / 0.45 | 1.70 / 1.75 |
| | 5200~5400 | 0.40 / 0.45 | 1.70 / 1.75 |
| | 5400~5600 | 0.40 / 0.45 | 1.70 / 1.75 |
| | 5500~5700 | 0.40 / 0.45 | 1.70 / 1.75 |
| | 5700~5900 | 0.40 / 0.45 | 1.70 / 1.75 |

NOTE: The probe parameters have been calibrated by the SPEAG.

## 5.2 DATA Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of the DAE is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

## 5.3 Robot

The DASY5 system uses the high precision robots TX90 XL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASY5 system, the CS8C robot controller version from Stäubli is used. The XL robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller

## 5.4 Measurement Server

The DASY5 measurement server is based on a PC/104 CPU board with
400 MHz CPU
128 MB chipdisk and
128 MB RAM.

Communication with
the DAE electronic box
the 16-bit AD-converter system for optical detection and digital I/O interface.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

## *5.5 SAM Twin Phantom*

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas:

- Left head
- Right head
- Flat phantom

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

The phantom can be used with the following tissue simulating liquids:
*Water-sugar based liquid
*Glycol based liquids

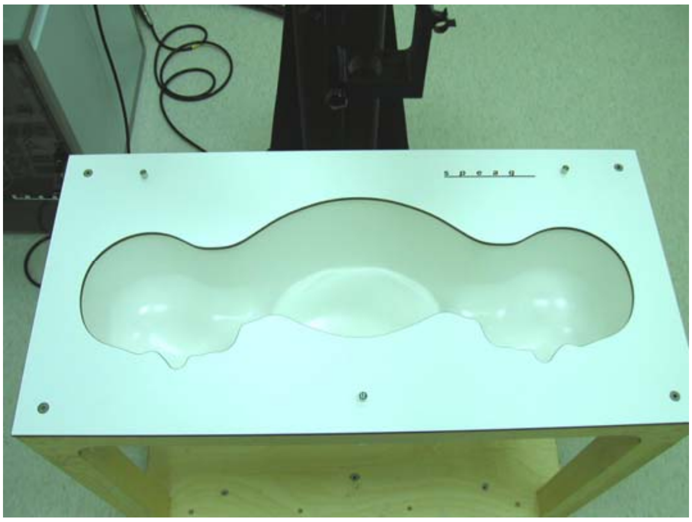


**Fig. 5.3 Top View of Twin Phantom**

**Fig. 5.4 Bottom View of Twin Phantom**

## 5.6 Device Holder for SAM Twin Phantom

The SAR in the Phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source in 5 mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ± 20%. An accurate device position is therefore crucial for accurate and repeatable measurement. The position in which the devices must be measured, are defined by the standards.

The DASY5 device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR).

Thus the device needs no repositioning when changing the angles.

The DASY5 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity $\varepsilon r$ =3 and loss tangent $\delta$ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

**Fig. 5.5 Device Holder**

## 5.7 Data Storage and Evaluation

### 5.7.1 Data Storage

The DASY5 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. The post-processing 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. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

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], [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a non-lose media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

### 5.7.2 Data Evaluation

The DASY5 post-processing 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 | σ |
| | - Density | ρ |

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multi-meter 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：

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

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：

**E-field probes**： $E_i = \sqrt{\frac{V_i}{Norm_i ConvF}}$

**H-field probes**： $H_i = \sqrt{V_i} \frac{a_{i0+} a_{i1} f + a_{i2} f^2}{f}$

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

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

$$E_{tot} = \sqrt{E_X^2 + E_Y^2 + E_Z^2}$$

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with ***SAR*** = local specific absorption rate in mW/g
***Etot*** = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = 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.

The power flow density is calculated assuming the excitation field to be a free space field.

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

with ***Ppwe*** = equivalent power density of a plane wave in mW/cm$^2$
***Etot*** = total electric field strength in V/m
***Htot*** = total magnetic field strength in A/m

## 5.8 Test Equipment List

| Manufacturer | Name of Equipment | Type/Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Cal. | Due Date |
| SPEAG | Dosimetric E-Filed Probe | ET3DV6 | 1787 | Aug. 26, 2008 | Aug. 25, 2009 |
| SPEAG | Dosimetric E-Filed Probe | ET3DV6 | 1788 | Sep. 23, 2008 | Sep. 22, 2009 |
| SPEAG | Dosimetric E-Filed Probe | EX3DV3 | 3514 | Jan. 21, 2009 | Jan. 20, 2010 |
| SPEAG | 835MHz System Validation Kit | D835V2 | 499 | Mar. 17, 2008 | Mar. 16, 2010 |
| SPEAG | 900MHz System Validation Kit | D900V2 | 190 | Jul. 16, 2007 | Jul. 15, 2009 |
| SPEAG | 1800MHz System Validation Kit | D1800V2 | 2d076 | Jul. 10, 2007 | Jul. 09, 2009 |
| SPEAG | 1900MHz System Validation Kit | D1900V2 | 5d041 | Mar. 28, 2008 | Mar. 27, 2010 |
| SPEAG | 2000MHz System Validation Kit | D2000V2 | 1010 | Sep. 17, 2008 | Sep. 16, 2010 |
| SPEAG | 2300MHz System Validation Kit | D2300V2 | 1006 | Sep. 12, 2007 | Sep. 11, 2009 |
| SPEAG | 2450MHz System Validation Kit | D2450V2 | 736 | Jul. 12, 2007 | Jul. 11, 2009 |
| SPEAG | 2600MHz System Validation Kit | D2600V2 | 1008 | Sep. 12, 2007 | Sep. 11, 2009 |
| SPEAG | 3500MHz System Validation Kit | D3500V2 | 1014 | Sep. 19, 2007 | Sep. 18, 2009 |
| SPEAG | 5GHz System Validation Kit | D5GHzV2 | 1006 | Jan. 24, 2008 | Jan. 23, 2010 |
| SPEAG | Data Acquisition Electronics | DAE3 | 577 | Nov. 12, 2008 | Nov. 11, 2009 |
| SPEAG | Data Acquisition Electronics | DAE4 | 778 | Sep. 22, 2008 | Sep. 21, 2009 |
| SPEAG | Device Holder | N/A | N/A | NCR | NCR |
| SPEAG | SAM Phantom | QD 000 P40 C | TP-1303 | NCR | NCR |
| SPEAG | SAM Phantom | QD 000 P40 C | TP-1383 | NCR | NCR |
| SPEAG | SAM Phantom | QD 000 P40 C | TP-1446 | NCR | NCR |
| SPEAG | SAM Phantom | QD 000 P40 C | TP-1477 | NCR | NCR |
| SPEAG | ELI4 Phantom | QD 0VA 001 BB | 1026 | NCR | NCR |
| SPEAG | ELI4 Phantom | QD 0VA 001 BA | 1029 | NCR | NCR |
| Agilent | ENA Series Network Analyzer | E5071C | MY46100746 | Jan. 20, 2009 | Jan. 19, 2010 |
| Agilent | Wireless Communication Test Set | E5515C | MY48360820 | Dec. 15, 2008 | Dec. 14, 2009 |
| R&S | Universal Radio Communication Tester | CMU200 | 105934 | Nov. 11, 2008 | Nov. 10, 2009 |
| Agilent | Dielectric Probe Kit | 85070D | US01440205 | NCR | NCR |
| Agilent | Dual Directional Coupler | 778D | 50422 | NCR | NCR |
| AR | Power Amplifier | 5S1G4M2 | 0328767 | NCR | NCR |
| R&S | Power Meter | NRVD | 101394 | Oct. 20, 2008 | Oct. 19, 2009 |
| R&S | Power Sensor | NRV-Z1 | 100130 | Oct. 20, 2008 | Oct. 19, 2009 |

**Table 5.1 Test Equipment List**

# 6. Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY5, the phantom must be filled with around 25 liters of homogeneous tissue simulating liquid. The liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is (head SAR) or from the flat phantom to the liquid top surface (body SAR) is 15.2cm.

The following ingredients for tissue simulating liquid are used:

- **Water:** deionized water (pure H20), resistivity ≧16MΩ- as basis for the liquid
- **Sugar:** refined sugar in crystals, as available in food shops – to reduce relative permittivity
- **Salt:** pure NaCl – to increase conductivity
- **Cellulose:** Hydroxyethyl-cellulose, medium viscosity (75-125 mPa.s, 2% in water, 20°C), CAS#54290-to increase viscosity and to keep sugar in solution.
- **Preservative:** Preventol D-7 Bayer AG, D-51368 Leverkusen, CAS#55965-84-9- to prevent the spread of bacteria and molds.
- **DGMBE:** Deithlenglycol-monobuthyl ether (DGMBE), Fluka Chemie GmbH, CAS#112-34-5 – to reduce relative permittivity.

Table 6.1 gives the recipes for tissue simulating liquid.

| Frequency (MHz) | Water (%) | Sugar (%) | Cellulose (%) | Salt (%) | Preventol (%) | DGBE (%) | Conductivity (σ) | Permittivity ($\varepsilon_r$) |
|---|---|---|---|---|---|---|---|---|
| **For Head** | | | | | | | | |
| 835 | 40.3 | 57.9 | 0.2 | 1.4 | 0.2 | 0 | 0.90 | 41.5 |
| 900 | 40.3 | 57.9 | 0.2 | 1.4 | 0.2 | 0 | 0.97 | 41.5 |
| 1800, 1900, 2000 | 55.2 | 0 | 0 | 0.3 | 0 | 44.5 | 1.40 | 40.0 |
| 2450 | 55.0 | 0 | 0 | 0 | 0 | 45.0 | 1.80 | 39.2 |
| **For Body** | | | | | | | | |
| 835 | 50.8 | 48.2 | 0 | 0.9 | 0.1 | 0 | 0.97 | 55.2 |
| 900 | 50.8 | 48.2 | 0 | 0.9 | 0.1 | 0 | 1.05 | 55.0 |
| 1800, 1900, 2000 | 70.2 | 0 | 0 | 0.4 | 0 | 29.4 | 1.52 | 53.3 |
| 2450 | 68.6 | 0 | 0 | 0 | 0 | 31.4 | 1.95 | 52.7 |

**Table 6.1 Recipes of Tissue Simulating Liquid**

Table 6.2 gives the targets for tissue simulating liquid.

| Frequency (MHz) | Liquid Type | Conductivity (σ) | ±5% Range | Permittivity ($\varepsilon_r$) | ±5% Range |
|---|---|---|---|---|---|
| 835 | Head | 0.90 | 0.86 ~ 0.95 | 41.5 | 39.4 ~ 43.6 |
| 900 | Head | 0.97 | 0.92 ~ 1.02 | 41.5 | 39.4 ~ 43.6 |
| 1800, 1900, 2000 | Head | 1.40 | 1.33 ~ 1.47 | 40.0 | 38.0 ~ 42.0 |
| 2450 | Head | 1.80 | 1.71 ~ 1.89 | 39.2 | 37.2 ~ 41.2 |
| 835 | Body | 0.97 | 0.92 ~ 1.02 | 55.2 | 52.4 ~ 58.0 |
| 900 | Body | 1.05 | 1.00 ~ 1.10 | 55.0 | 52.3 ~ 57.8 |
| 1800, 1900, 2000 | Body | 1.52 | 1.44 ~ 1.60 | 53.3 | 50.6 ~ 56.0 |
| 2450 | Body | 1.95 | 1.85 ~ 2.05 | 52.7 | 50.1 ~ 55.3 |

**Table 6.2 Targets of Tissue Simulating Liquid**

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an Agilent 85070D Dielectric Probe Kit and an Agilent Network Analyzer.

Table 6.3 shows the measuring results for simulating liquid.

| Band | Temperature (℃) | Frequency (MHz) | Conductivity (σ) | Permittivity ($\varepsilon_r$) | Measurement Date |
|---|---|---|---|---|---|
| CDMA2000 Cellular (824 ~ 849 MHz) | 21.4 | 824.70 | 0.964 | 53.0 | Apr. 29, 2009 |
| | | 836.52 | 0.977 | 52.9 | |
| | | 848.31 | 0.989 | 52.8 | |
| CDMA2000 PCS (1850 ~ 1910 MHz) | 21.3 | 1851.25 | 1.480 | 51.8 | Apr. 29, 2009 |
| | | 1880.00 | 1.510 | 51.7 | |
| | | 1908.75 | 1.540 | 51.6 | |

**Table 6.3 Measuring Results for Simulating Liquid**

# 7. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in Table 7.1

| Uncertainty Distributions | Normal | Rectangular | Triangular | U-shape |
|---|---|---|---|---|
| **Multiplying factor[(a)]** | 1/k [(b)] | 1/√3 | 1/√6 | 1/√2 |

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κ is the coverage factor

**Table 7.1 Standard Uncertainty for Assumed Distribution**

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual “root-sum-squares” (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY5 uncertainty Budget is showed in Table 7.2.

| Error Description | Uncertainty Value ± % | Probability Distribution | Divisor | Ci (1g) | Standard Unc. (1g) | vi or Veff |
|---|---|---|---|---|---|---|
| **Measurement Equipment** | | | | | | |
| Probe Calibration | ±5.9 % | Normal | 1 | 1 | ±5.9 % | ∞ |
| Axial Isotropy | ±4.7 % | Rectangular | √3 | 0.7 | ±1.9 % | ∞ |
| Hemispherical Isotropy | ±9.6 % | Rectangular | √3 | 0.7 | ±3.9 % | ∞ |
| Boundary Effects | ±1.0 % | Rectangular | √3 | 1 | ±0.6 % | ∞ |
| Linearity | ±4.7 % | Rectangular | √3 | 1 | ±2.7 % | ∞ |
| System Detection Limits | ±1.0 % | Rectangular | √3 | 1 | ±0.6 % | ∞ |
| Readout Electronics | ±0.3 % | Normal | 1 | 1 | ±0.3 % | ∞ |
| Response Time | ±0.8 % | Rectangular | √3 | 1 | ±0.5 % | ∞ |
| Integration Time | ±2.6 % | Rectangular | √3 | 1 | ±1.5 % | ∞ |
| RF Ambient Noise | ±3.0 % | Rectangular | √3 | 1 | ±1.7 % | ∞ |
| RF Ambient Reflections | ±3.0 % | Rectangular | √3 | 1 | ±1.7 % | ∞ |
| Probe Positioner | ±0.4 % | Rectangular | √3 | 1 | ±0.2 % | ∞ |
| Probe Positioning | ±2.9 % | Rectangular | √3 | 1 | ±1.7 % | ∞ |
| Max. SAR Eval. | ±1.0 % | Rectangular | √3 | 1 | ±0.6 % | ∞ |
| **Test Sample Related** | | | | | | |
| Device Positioning | ±2.9 % | Normal | 1 | 1 | ±2.9 | 145 |
| Device Holder | ±3.6 % | Normal | 1 | 1 | ±3.6 | 5 |
| Power Drift | ±5.0 % | Rectangular | √3 | 1 | ±2.9 | ∞ |
| **Phantom and Setup** | | | | | | |
| Phantom Uncertainty | ±4.0 % | Rectangular | √3 | 1 | ±2.3 | ∞ |
| Liquid Conductivity (target) | ±5.0 % | Rectangular | √3 | 0.64 | ±1.8 | ∞ |
| Liquid Conductivity (meas.) | ±2.5 % | Normal | 1 | 0.64 | ±1.6 | ∞ |
| Liquid Permittivity (target) | ±5.0 % | Rectangular | √3 | 0.6 | ±1.7 | ∞ |
| Liquid Permittivity (meas.) | ±2.5 % | Normal | 1 | 0.6 | ±1.5 | ∞ |
| **Combined Standard Uncertainty** | | | | | **±10.9** | **387** |
| **Coverage Factor for 95 %** | | **K=2** | | | | |
| **Expanded uncertainty (Coverage factor = 2)** | | | | | **±21.9** | |

**Table 7.2 Uncertainty Budget of DASY5**

# 8. SAR Measurement Evaluation

Each DASY5 system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY5 software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

## 8.1 Purpose of System Performance check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

## 8.2 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 at frequency 835 MHz and 1900 MHz. 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:

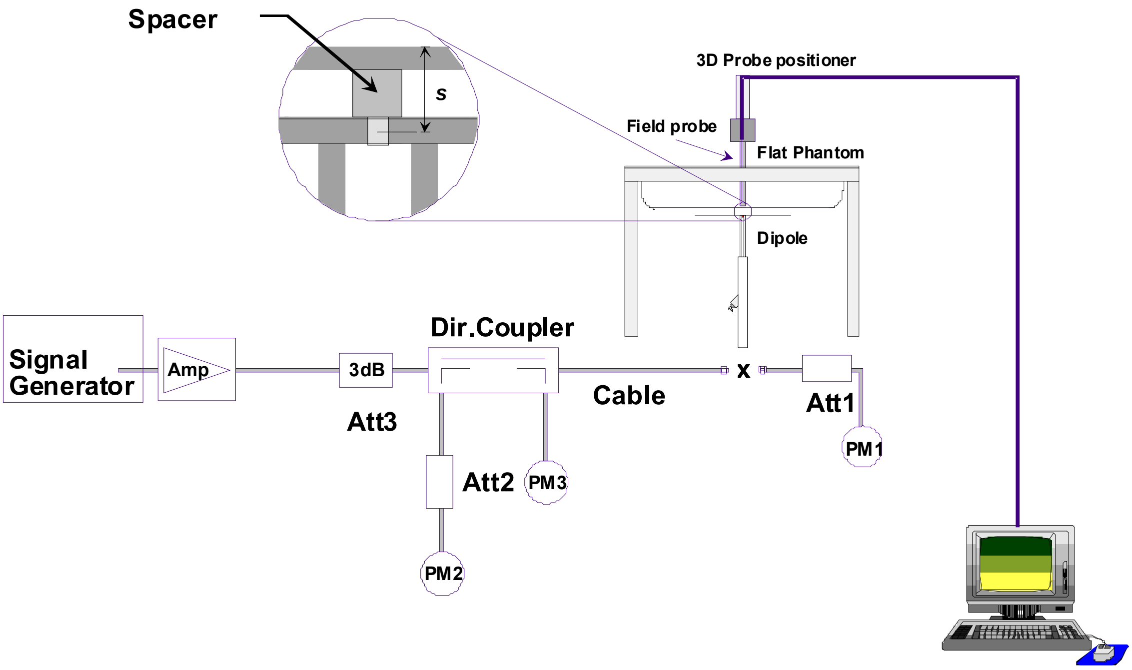



**Fig. 8.1 System Setup for System Evaluation**

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. 835 MHz or 1900 MHz Dipole

The output power on dipole port must be calibrated to 20dBm (100mW) before dipole is connected.

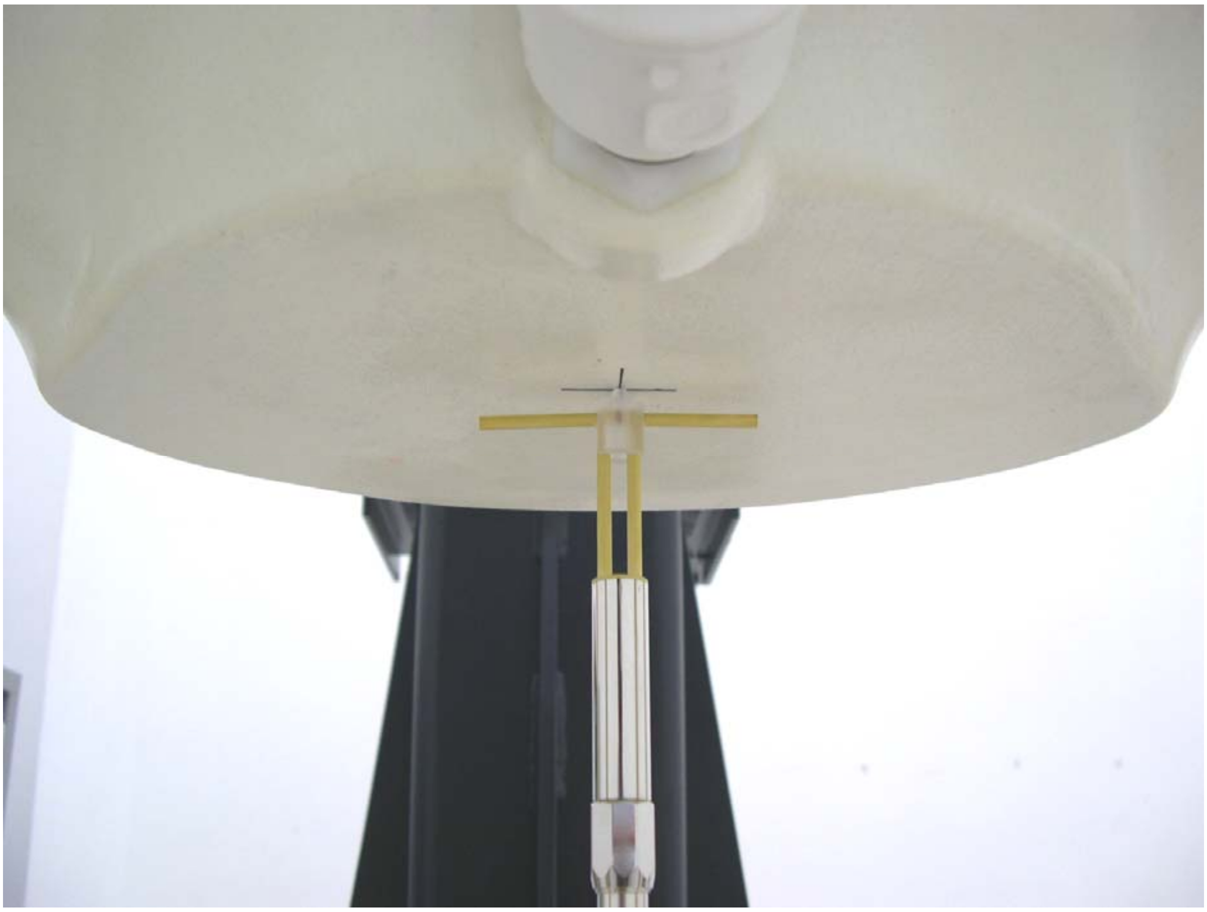


**Fig 8.2 Dipole Setup**

## 8.3 Validation Results

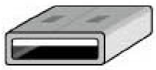
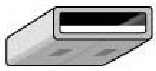
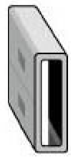
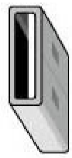
Comparing to the original SAR value provided by SPEAG, the validation data should be within its specification of 10 %. Table 8.1 shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion.

| Frequency | SAR | Target (W/kg) | Measurement data (W/kg) | Variation | Measurement Date |
|---|---|---|---|---|---|
| 835MHz | SAR (1g) | 9.52 | 9.43 | -0.9 % | Apr. 29, 2009 |
| | SAR (10g) | 6.37 | 6.13 | -3.8 % | |
| 1900MHz | SAR (1g) | 40.1 | 40.1 | 0.0 % | Apr. 29, 2009 |
| | SAR (10g) | 21.3 | 20.7 | -2.8 % | |

**Table 8.1 Target and Measurement Data Comparison**

# 9. Description for DUT Testing Position

This DUT was tested in four different USB configurations. They are “direct laptop plug-in for configuration 1” and “USB cable plug-in for configuration 2 to 4” shown as below. Both direct laptop plug-in and USB cable plug-in test configurations are tested with 5 mm separation between the particular dongle orientation and the flat phantom. Please refer to Appendix E for the test setup photos.

|  |  |  |  |
|---|---|---|---|
| **Configuration 1 (Horizontal Up)** | **Configuration 2 (Horizontal Down)** | **Configuration 3 (Vertical Front)** | **Configuration 4 (Vertical Back)** |

Remark: Please refer to Appendix F for the test setup photos.

# 10. Measurement Procedures

The measurement procedures are as follows:

- Linking DUT with base station emulator CMU200 in middle channel
- Setting CMU200 to allow DUT to radiate maximum output power
- Measuring output power through RF cable and power meter
- Placing the DUT in the positions described in the last section
- Setting scan area, grid size and other setting on the DASY5 software
- Taking data for the middle channel on each testing position
- Finding out the largest SAR result on these testing positions of each band
- Measuring output power and SAR results for the lowest and highest channels in this worst case testing position

According to the OET Bulletin 65 Supplement C standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- Power reference measurement
- Area scan
- Zoom scan
- Power reference measurement

## 10.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the OET Bulletin 65 Supplement C standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY5 software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose , the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- extraction of the measured data (grid and values) from the Zoom Scan
- calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- generation of a high-resolution mesh within the measured volume
- interpolation of all measured values form the measurement grid to the high-resolution grid
- extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- calculation of the averaged SAR within masses of 1g and 10g

## 10.2 Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 1 g.

## 10.3 SAR Averaged Methods

In DASY5, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

# 11. SAR Test Results

## 11.1 Conducted Power

| Conducted Power (dBm) | | | | | | |
|---|---|---|---|---|---|---|
| Mode / Band / Channel | CDMA2000 Cellular | | | CDMA2000 PCS | | |
| | 1013 | 384 | 777 | 25 | 600 | 1175 |
| 1xRTT RC1+SO55 | 21.63 | 21.51 | 21.96 | 18.31 | 18.04 | 18.08 |
| 1xRTT RC3+SO55 | 21.65 | 22.24 | 21.99 | 18.33 | 18.12 | 18.03 |
| 1xRTT RC3+SO32 | 21.59 | 21.62 | 21.70 | 18.15 | 18.03 | 17.92 |
| 1xEV-DO RTAP 9.6K | 20.29 | 20.72 | 20.53 | 18.16 | 18.04 | 17.94 |
| 1xEV-DO RTAP 38.4K | 21.18 | 20.28 | 20.41 | 18.10 | 17.94 | 17.89 |
| 1xEV-DO RTAP 153.6K | 20.05 | 20.42 | 20.55 | 18.11 | 17.93 | 17.88 |
| 1xEV-DO RETAP 128K | 20.18 | 20.69 | 20.77 | 18.27 | 18.24 | 18.05 |
| 1xEV-DO RETAP 2048K | 20.23 | 20.88 | 20.67 | 17.94 | 17.80 | 17.81 |
| 1xEV-DO RETAP 4096K | 20.29 | 20.19 | 20.25 | 18.00 | 17.86 | 17.70 |
| 1xEV-DO RETAP 12288K | 20.39 | 20.44 | 20.66 | 18.04 | 17.90 | 17.80 |

## 11.2 Test Records for Body SAR Test

| USB Configuration | Band | Mode | Separation | Ch. | Freq. (MHz) | Modulation Type | Measured 1g SAR (W/kg) | Limit (W/kg) | Result |
|---|---|---|---|---|---|---|---|---|---|
| 1 (Horizontal Up) (Laptop) | CDMA2000 Cellular | 1xRTT RC3+SO55 | 5 mm | 384 | 836.52 | QPSK | 0.624 | 1.6 | Pass |
| 2 (Horizontal Down) (USB Cable) | CDMA2000 Cellular | 1xRTT RC3+SO55 | 5 mm | 384 | 836.52 | QPSK | 1.04 | 1.6 | Pass |
| 3 (Vertical Front) (USB Cable) | CDMA2000 Cellular | 1xRTT RC3+SO55 | 5 mm | 384 | 836.52 | QPSK | 0.457 | 1.6 | Pass |
| 4 (Vertical Back) (USB Cable) | CDMA2000 Cellular | 1xRTT RC3+SO55 | 5 mm | 384 | 836.52 | QPSK | 0.658 | 1.6 | Pass |
| **2 (Horizontal Down) (USB Cable)** | **CDMA2000 Cellular** | **1xRTT RC3+SO55** | **5 mm** | **1013** | **824.70** | **QPSK** | **1.17** | **1.6** | **Pass** |
| 2 (Horizontal Down) (USB Cable) | CDMA2000 Cellular | 1xRTT RC3+SO55 | 5 mm | 777 | 848.31 | QPSK | 0.759 | 1.6 | Pass |
| 1 (Horizontal Up) (Laptop) | CDMA2000 PCS | 1xRTT RC3+SO55 | 5 mm | 600 | 1880.00 | QPSK | 0.75 | 1.6 | Pass |
| 2 (Horizontal Down) (USB Cable) | CDMA2000 PCS | 1xRTT RC3+SO55 | 5 mm | 600 | 1880.00 | QPSK | 0.534 | 1.6 | Pass |
| 3 (Vertical Front) (USB Cable) | CDMA2000 PCS | 1xRTT RC3+SO55 | 5 mm | 600 | 1880.00 | QPSK | 0.226 | 1.6 | Pass |
| 4 (Vertical Back) (USB Cable) | CDMA2000 PCS | 1xRTT RC3+SO55 | 5 mm | 600 | 1880.00 | QPSK | 0.306 | 1.6 | Pass |
| **1 (Horizontal Up) (Laptop)** | **CDMA2000 PCS** | **1xRTT RC3+SO55** | **5 mm** | **25** | **1851.25** | **QPSK** | **0.797** | **1.6** | **Pass** |
| 1 (Horizontal Up) (Laptop) | CDMA2000 PCS | 1xRTT RC3+SO55 | 5 mm | 1175 | 1908.75 | QPSK | 0.733 | 1.6 | Pass |

## 11.3 Test Records for Back-Off SAR Test

| USB Configuration | Band | Mode | Separation | Ch. | Freq. (MHz) | Modulation Type | Measured 1g SAR (W/kg) | Limit (W/kg) | Result |
|---|---|---|---|---|---|---|---|---|---|
| 2 (Horizontal Down) (USB Cable) | CDMA2000 Cellular | 1xRTT RC3+SO55 | 10 mm | 1013 | 824.70 | QPSK | 0.7 | 1.6 | Pass |
| 2 (Horizontal Down) (USB Cable) | CDMA2000 Cellular | 1xRTT RC3+SO55 | 15 mm | 1013 | 824.70 | QPSK | 0.404 | 1.6 | Pass |
| 1 (Horizontal Up) (Laptop) | CDMA2000 PCS | 1xRTT RC3+SO55 | 10 mm | 25 | 1851.25 | QPSK | 0.346 | 1.6 | Pass |

**Test Engineer：** A-Rod Chen

## 12. References

[1] FCC 47 CFR Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"

[2] IEEE Std. P1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", April 21, 2003

[3] Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01), "Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to RF Emissions", June 2001

[4] IEEE Std. C95.1-1999, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", 1999

[5] Robert J. Renka, "Multivariate Interpolation Of Large Sets Of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148

[6] DASY5 System Handbook

[7] KDB 941225 D01 v02, "SAR Measurement Procedures for 3G Devices – CDMA2000 / Ev-Do / WCDMA / HSDPA / HSPA", October 2007

[8] KDB 447498 D02 v01, "SAR Measurement Procedures for USB Dongle Transmitters", 12/2/08

# Appendix A - System Performance Check Data

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**System Check_Body_835MHz_090429**

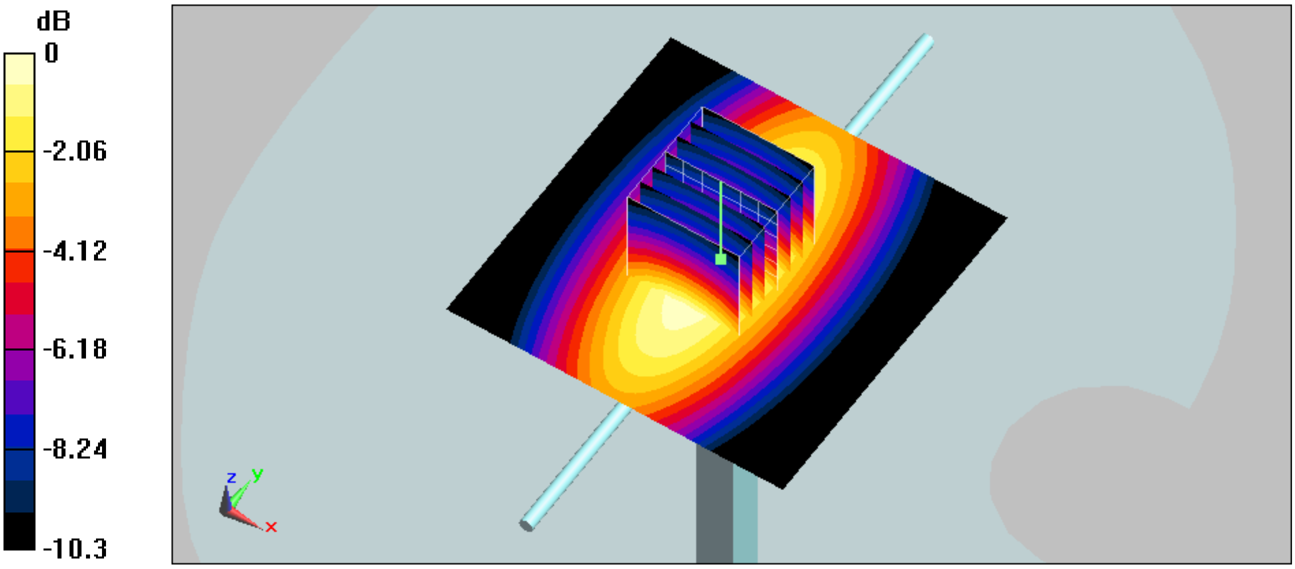
**DUT: Dipole 835 MHz**

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: MSL_850_090429 Medium parameters used: f = 835 MHz; σ = 0.975 mho/m; $\varepsilon_r$ = 52.9; ρ = 1000 kg/m$^3$
Ambient Temperature：22.5 ℃； Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(9.41, 9.41, 9.41); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: SAM-Back; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Pin=100mW/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.02 mW/g

**Pin=100mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 32.3 V/m; Power Drift = -0.00775 dB
Peak SAR (extrapolated) = 1.45 W/kg
**SAR(1 g) = 0.943 mW/g; SAR(10 g) = 0.613 mW/g**
Maximum value of SAR (measured) = 1.02 mW/g




0 dB = 1.02mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**System Check_Body_1900MHz_090429**

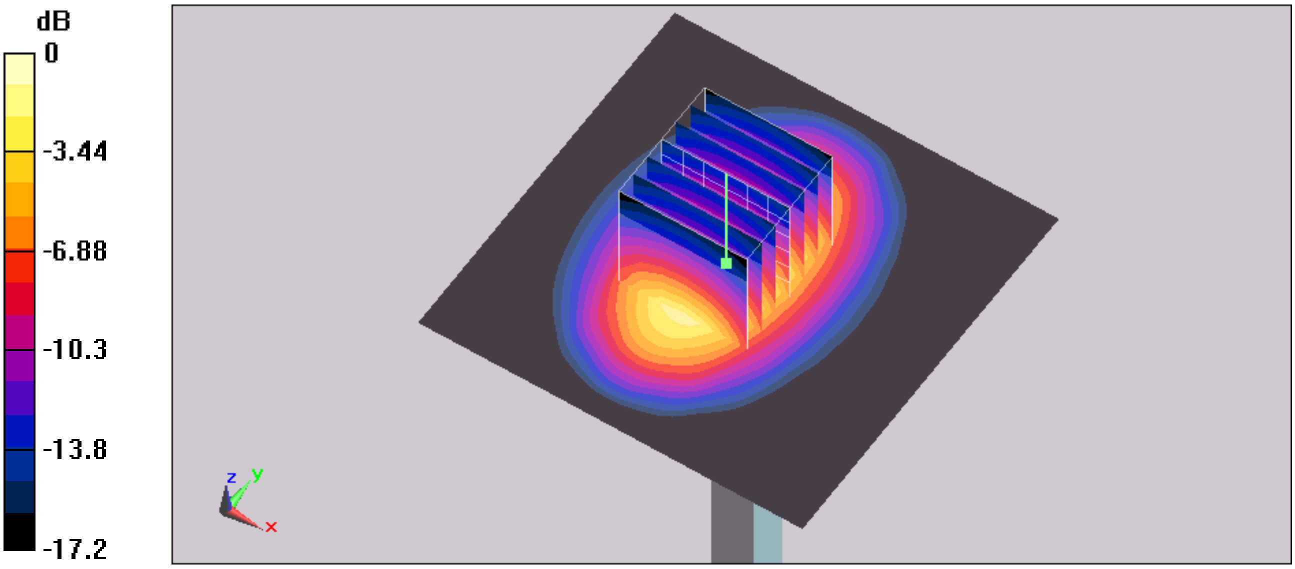
**DUT: Dipole 1900 MHz**

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900_090429 Medium parameters used: f = 1900 MHz; $\sigma$ = 1.53 mho/m; $\varepsilon_r$ = 51.6; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：22.2 ℃； Liquid Temperature：21.3 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(8.18, 8.18, 8.18); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1029
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Pin=100mW/Area Scan (91x91x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 4.63 mW/g

**Pin=100mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.9 V/m; Power Drift = 0.122 dB
Peak SAR (extrapolated) = 7.49 W/kg
**SAR(1 g) = 4.01 mW/g; SAR(10 g) = 2.07 mW/g**
Maximum value of SAR (measured) = 4.53 mW/g




0 dB = 4.53mW/g

## Appendix B - SAR Measurement Data

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#08 Body_CDMA850 Ch384_Horizontal-Up with 0.5cm Gap_RC3+SO55**

**DUT: 931736-01**

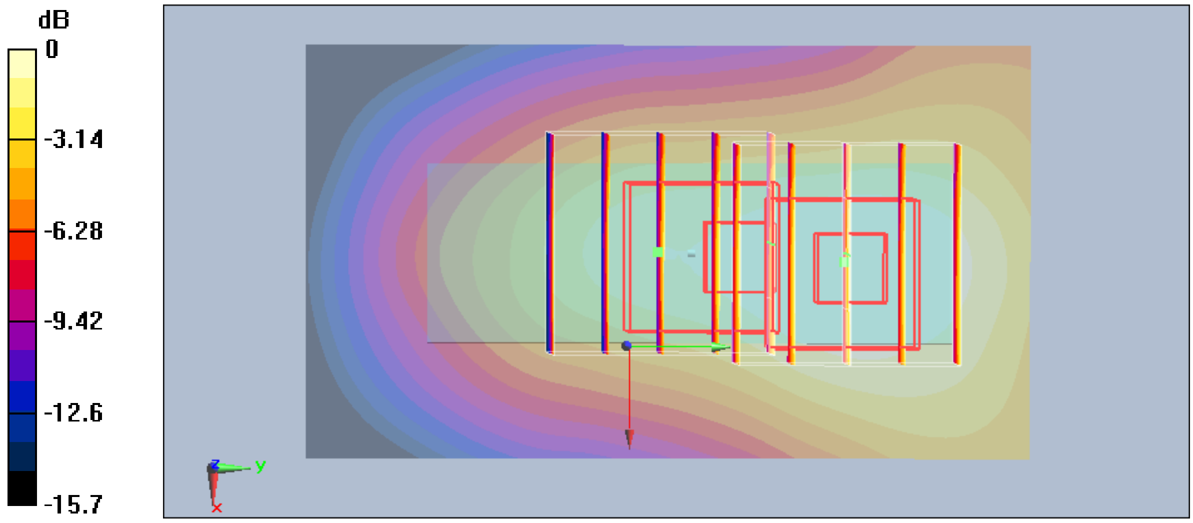
Communication System: CDMA ; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium: MSL_850_090429 Medium parameters used: f = 837 MHz; $\sigma$ = 0.977 mho/m; $\varepsilon_r$ = 52.9; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：22.4 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(9.41, 9.41, 9.41); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: SAM-Back; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH384/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.686 mW/g

**CH384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.1 V/m; Power Drift = -0.101 dB
Peak SAR (extrapolated) = 0.974 W/kg
**SAR(1 g) = 0.624 mW/g; SAR(10 g) = 0.392 mW/g**
Maximum value of SAR (measured) = 0.675 mW/g

**CH384/Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.1 V/m; Power Drift = -0.101 dB
Peak SAR (extrapolated) = 0.793 W/kg
**SAR(1 g) = 0.473 mW/g; SAR(10 g) = 0.289 mW/g**
Maximum value of SAR (measured) = 0.576 mW/g




0 dB = 0.576mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#12 Body_CDMA850 Ch1013_Horizontal-Down with 0.5cm Gap_RC3+SO55**

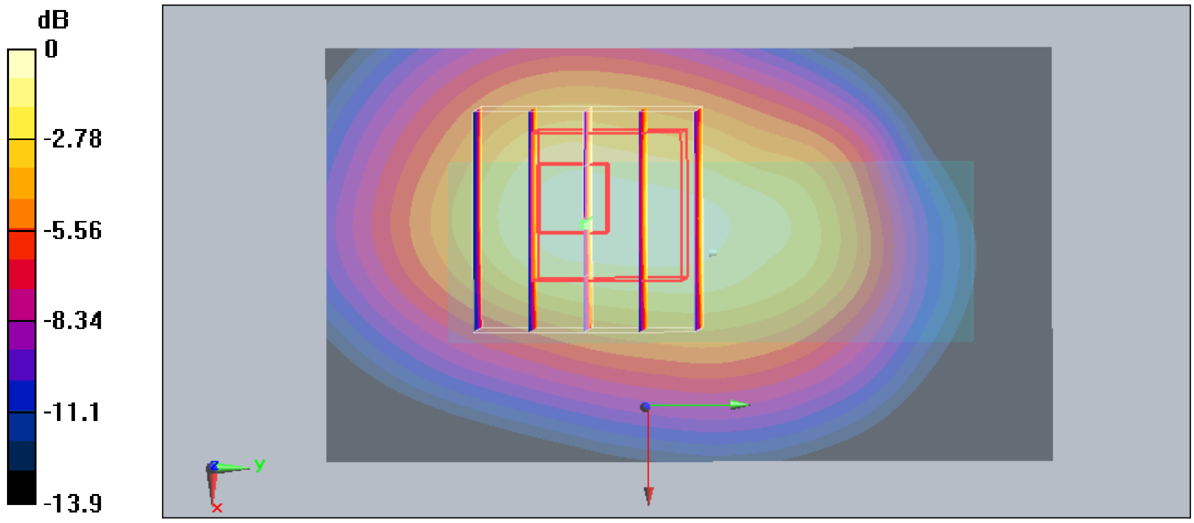
**DUT: 931736-01**

Communication System: CDMA ; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: MSL_850_090429 Medium parameters used: f = 825 MHz; $\sigma$ = 0.964 mho/m; $\varepsilon_r$ = 53; $\rho$ = 1000 kg/$m^3$
Ambient Temperature：22.5 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(9.41, 9.41, 9.41); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: SAM-Back; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH1013/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.18 mW/g

**CH1013/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.5 V/m; Power Drift = 0.146 dB
Peak SAR (extrapolated) = 2 W/kg
**SAR(1 g) = 1.17 mW/g; SAR(10 g) = 0.726 mW/g**
Maximum value of SAR (measured) = 1.23 mW/g




0 dB = 1.23mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#10 Body_CDMA850 Ch384_Vertical-Front with 0.5cm Gap_RC3+SO55**

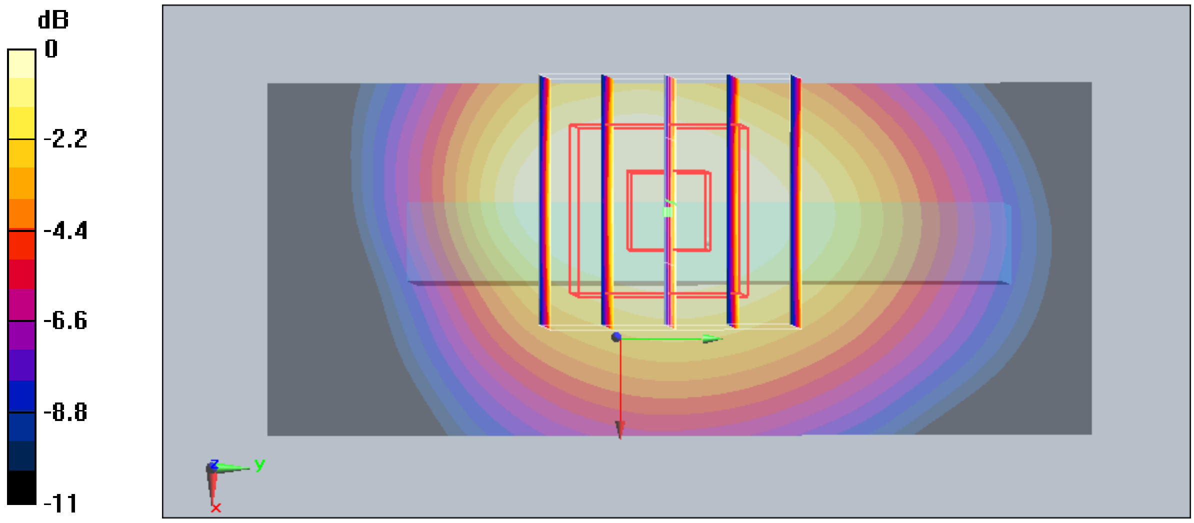
**DUT: 931736-01**

Communication System: CDMA ; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium: MSL_850_090429 Medium parameters used: f = 837 MHz; $\sigma$ = 0.977 mho/m; $\varepsilon_r$ = 52.9; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：22.5 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(9.41, 9.41, 9.41); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: SAM-Back; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH384/Area Scan (31x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.533 mW/g

**CH384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.6 V/m; Power Drift = -0.197 dB
Peak SAR (extrapolated) = 0.682 W/kg
**SAR(1 g) = 0.457 mW/g; SAR(10 g) = 0.301 mW/g**
Maximum value of SAR (measured) = 0.491 mW/g




0 dB = 0.491mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#11 Body_CDMA850 Ch384_Vertical-Back with 0.5cm Gap_RC3+SO55**

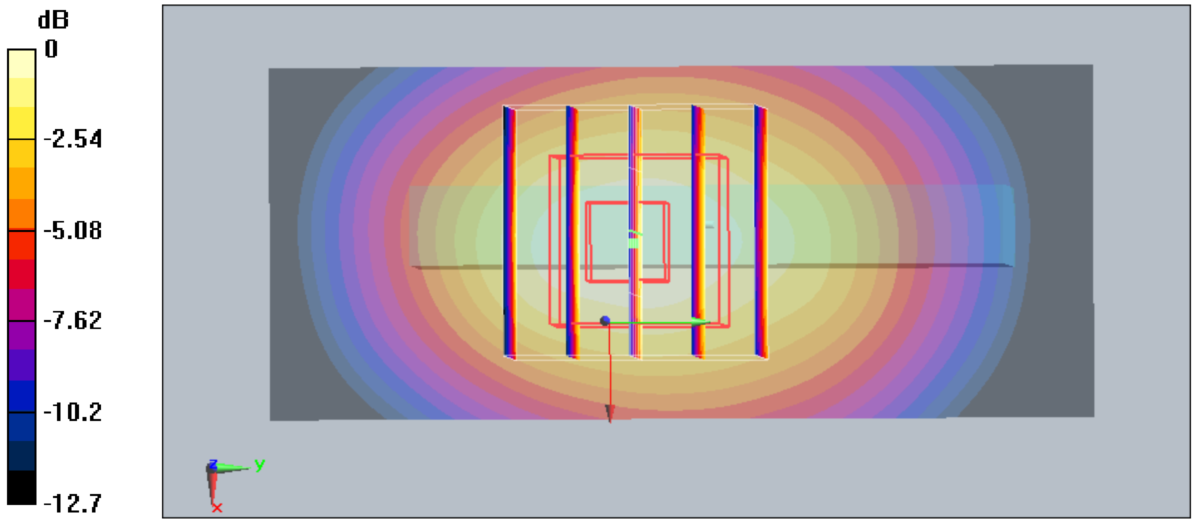
**DUT: 931736-01**

Communication System: CDMA ; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium: MSL_850_090429 Medium parameters used: f = 837 MHz; σ = 0.977 mho/m; $\varepsilon_r$ = 52.9; ρ = 1000 kg/m$^3$
Ambient Temperature：22.5 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(9.41, 9.41, 9.41); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: SAM-Back; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH384/Area Scan (31x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.727 mW/g

**CH384/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.9 V/m; Power Drift = -0.173 dB
Peak SAR (extrapolated) = 1.07 W/kg
**SAR(1 g) = 0.658 mW/g; SAR(10 g) = 0.401 mW/g**
Maximum value of SAR (measured) = 0.713 mW/g




0 dB = 0.713mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#14 Body_CDMA850 Ch1013_Horizontal-Down with 1cm Gap_RC3+SO55**

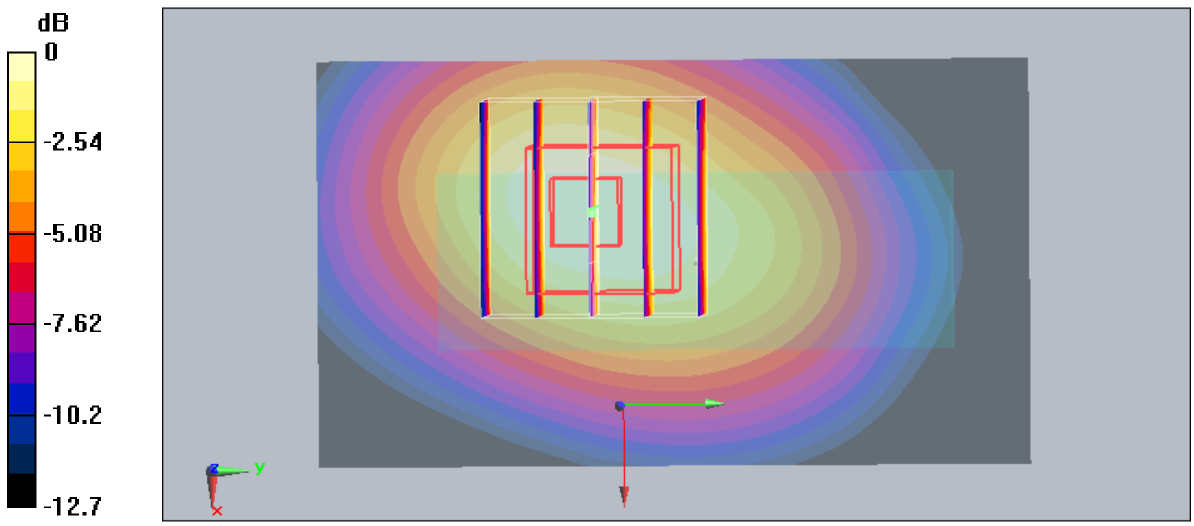
**DUT: 931736-01**

Communication System: CDMA ; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: MSL_850_090429 Medium parameters used: f = 825 MHz; $\sigma$ = 0.964 mho/m; $\varepsilon_r$ = 53; $\rho$ = 1000 kg/$m^3$
Ambient Temperature：22.4 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(9.41, 9.41, 9.41); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: SAM-Back; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH1013/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.779 mW/g

**CH1013/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.1 V/m; Power Drift = -0.175 dB
Peak SAR (extrapolated) = 1.08 W/kg
**SAR(1 g) = 0.700 mW/g; SAR(10 g) = 0.445 mW/g**
Maximum value of SAR (measured) = 0.754 mW/g




0 dB = 0.754mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#15 Body_CDMA850 Ch1013_Horizontal-Down with 1.5cm Gap_RC3+SO55**

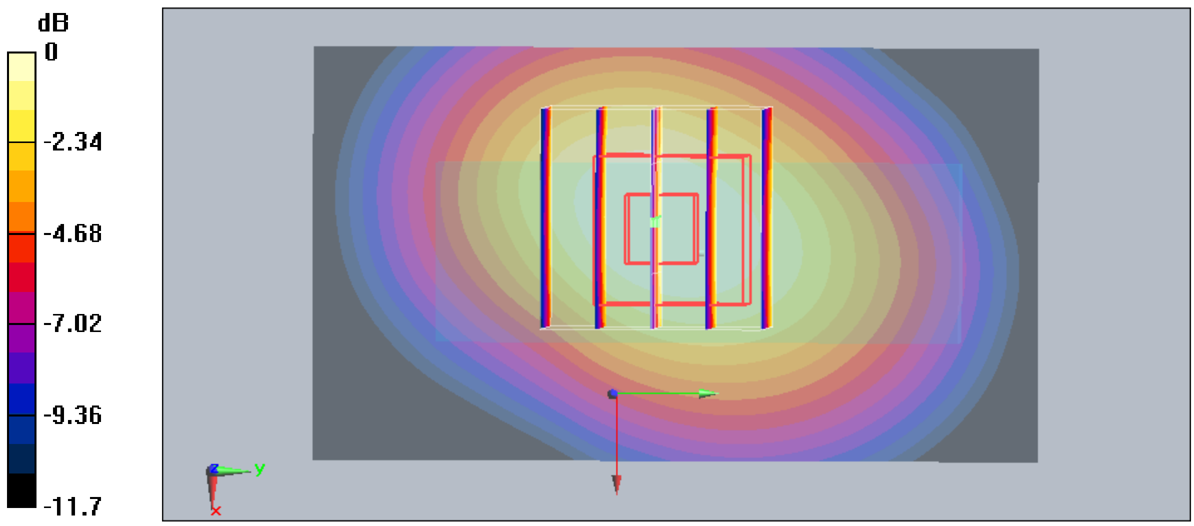
**DUT: 931736-01**

Communication System: CDMA ; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: MSL_850_090429 Medium parameters used: f = 825 MHz; $\sigma$ = 0.964 mho/m; $\varepsilon_r$ = 53; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：22.4 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(9.41, 9.41, 9.41); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: SAM-Back; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH1013/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.458 mW/g

**CH1013/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.3 V/m; Power Drift = -0.123 dB
Peak SAR (extrapolated) = 0.582 W/kg
**SAR(1 g) = 0.404 mW/g; SAR(10 g) = 0.266 mW/g**
Maximum value of SAR (measured) = 0.434 mW/g




0 dB = 0.434mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#05 Body_CDMA1900 Ch25_Horizontal-Up with 0.5cm Gap_RC3+SO55**

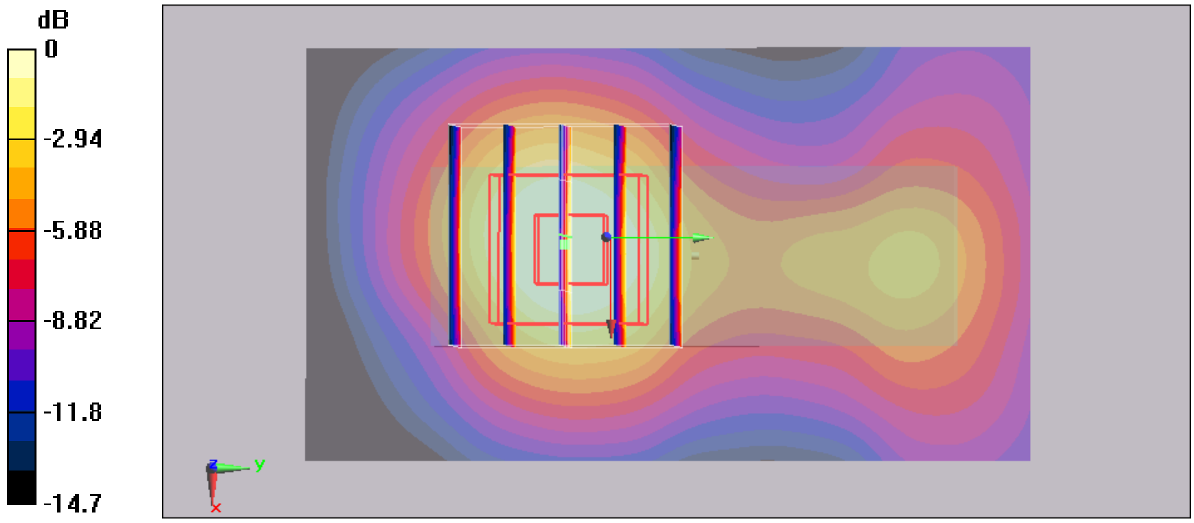
**DUT: 931736-01**

Communication System: CDMA ; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: MSL_1900_090429 Medium parameters used: f = 1851.25 MHz; σ = 1.48 mho/m; $\varepsilon_r$ = 51.8; ρ = 1000 kg/$m^3$
Ambient Temperature：22.3 ℃; Liquid Temperature：21.3 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(8.18, 8.18, 8.18); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1029
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH25/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.07 mW/g

**CH25/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.7 V/m; Power Drift = -0.117 dB
Peak SAR (extrapolated) = 1.37 W/kg
**SAR(1 g) = 0.797 mW/g; SAR(10 g) = 0.431 mW/g**
Maximum value of SAR (measured) = 0.874 mW/g




0 dB = 0.874mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#02 Body_CDMA1900 Ch600_Horizontal-Down with 0.5cm Gap_RC3+SO55**

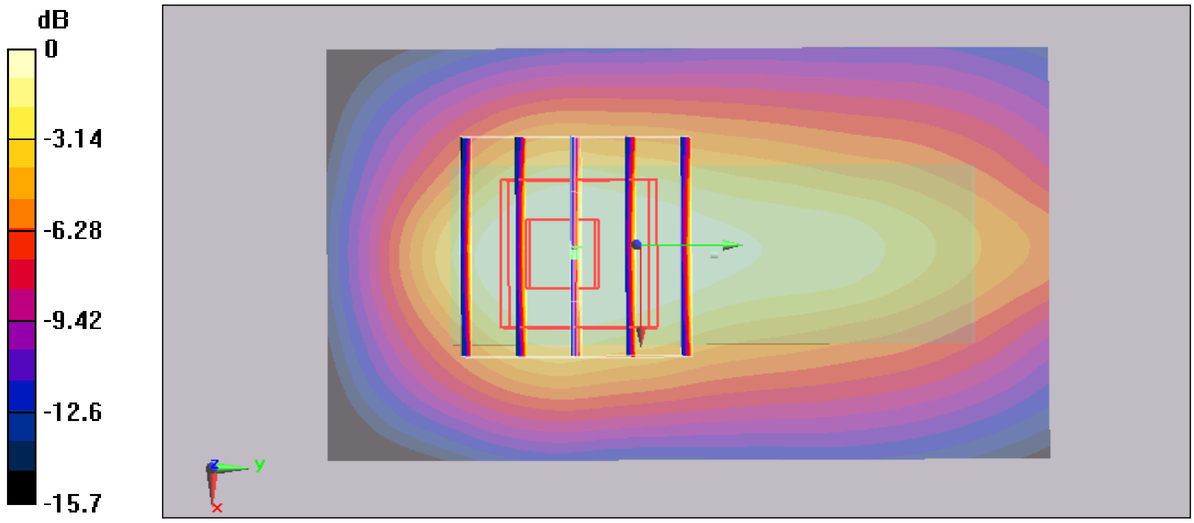
**DUT: 931736-01**

Communication System: CDMA ; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: MSL_1900_090429 Medium parameters used: f = 1880 MHz; $\sigma$ = 1.51 mho/m; $\varepsilon_r$ = 51.7; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：22.3 ℃; Liquid Temperature：21.3 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(8.18, 8.18, 8.18); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1029
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH600/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.762 mW/g

**CH600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.5 V/m; Power Drift = -0.104 dB
Peak SAR (extrapolated) = 0.945 W/kg
**SAR(1 g) = 0.534 mW/g; SAR(10 g) = 0.292 mW/g**
Maximum value of SAR (measured) = 0.580 mW/g




0 dB = 0.580mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#03 Body_CDMA1900 Ch600_Vertical-Front with 0.5cm Gap_RC3+SO55**

**DUT: 931736-01**

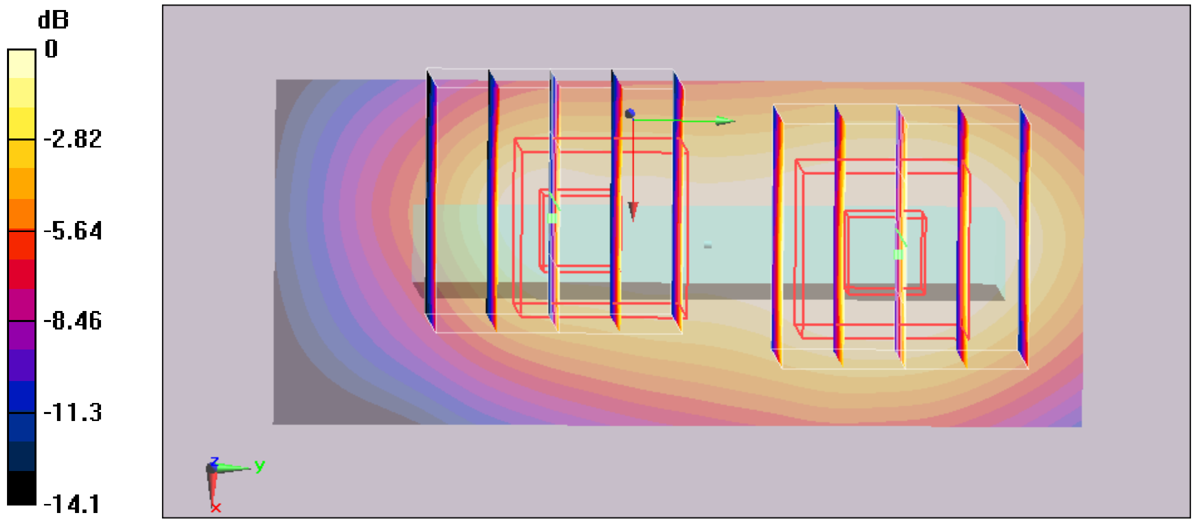
Communication System: CDMA ; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: MSL_1900_090429 Medium parameters used: f = 1880 MHz; $\sigma$ = 1.51 mho/m; $\varepsilon_r$ = 51.7; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：22.5 ℃; Liquid Temperature：21.3 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(8.18, 8.18, 8.18); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1029
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH600/Area Scan (31x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.260 mW/g

**CH600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.1 V/m; Power Drift = -0.141 dB
Peak SAR (extrapolated) = 0.373 W/kg
**SAR(1 g) = 0.226 mW/g; SAR(10 g) = 0.130 mW/g**
Maximum value of SAR (measured) = 0.248 mW/g

**CH600/Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.1 V/m; Power Drift = -0.141 dB
Peak SAR (extrapolated) = 0.333 W/kg
**SAR(1 g) = 0.174 mW/g; SAR(10 g) = 0.095 mW/g**
Maximum value of SAR (measured) = 0.187 mW/g




0 dB = 0.187mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#04 Body_CDMA1900 Ch600_Vertical-Back with 0.5cm Gap_RC3+SO55**

**DUT: 931736-01**

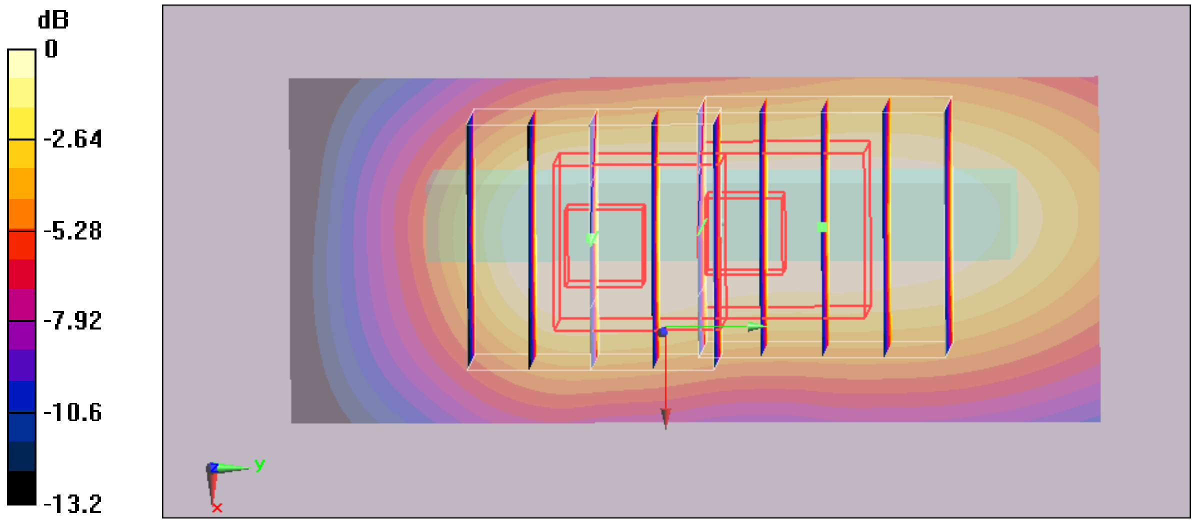
Communication System: CDMA ; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: MSL_1900_090429 Medium parameters used: f = 1880 MHz; $\sigma$ = 1.51 mho/m; $\varepsilon_r$ = 51.7; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：22.4 ℃; Liquid Temperature：21.3 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(8.18, 8.18, 8.18); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1029
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH600/Area Scan (31x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.377 mW/g

**CH600/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.3 V/m; Power Drift = -0.125 dB
Peak SAR (extrapolated) = 0.550 W/kg
**SAR(1 g) = 0.306 mW/g; SAR(10 g) = 0.170 mW/g**
Maximum value of SAR (measured) = 0.335 mW/g

**CH600/Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.3 V/m; Power Drift = -0.125 dB
Peak SAR (extrapolated) = 0.447 W/kg
**SAR(1 g) = 0.256 mW/g; SAR(10 g) = 0.150 mW/g**
Maximum value of SAR (measured) = 0.284 mW/g




0 dB = 0.284mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#07 Body_CDMA1900 Ch25_Horizontal-Up with 1cm Gap_RC3+SO55**

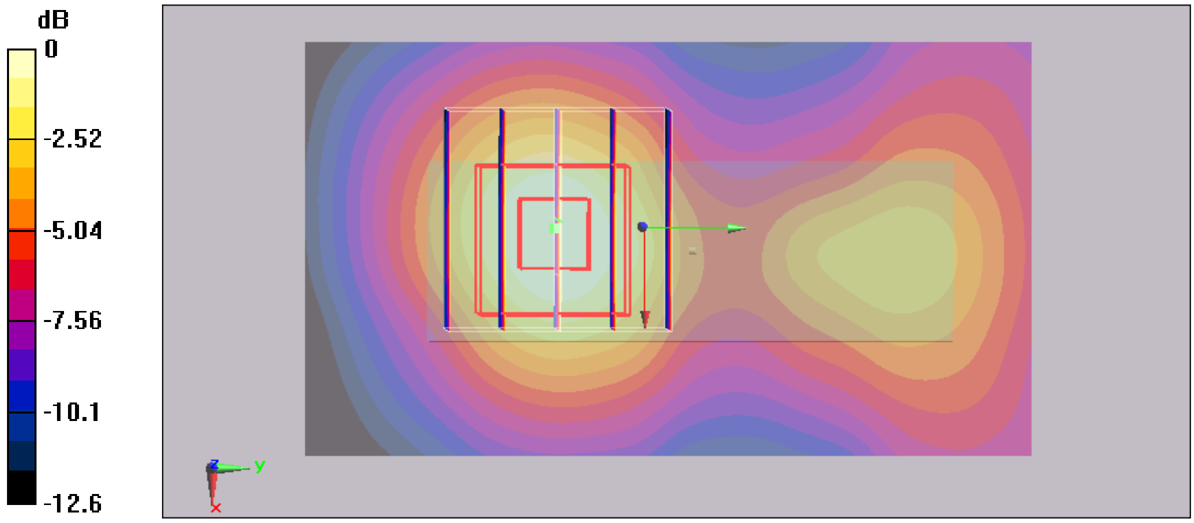
**DUT: 931736-01**

Communication System: CDMA ; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: MSL_1900_090429 Medium parameters used: f = 1851.25 MHz; $\sigma$ = 1.48 mho/m; $\varepsilon_r$ = 51.8; $\rho$ = 1000 kg/$m^3$
Ambient Temperature：22.3 ℃; Liquid Temperature：21.3 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(8.18, 8.18, 8.18); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1029
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH25/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.404 mW/g

**CH25/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.2 V/m; Power Drift = -0.015 dB
Peak SAR (extrapolated) = 0.575 W/kg
**SAR(1 g) = 0.346 mW/g; SAR(10 g) = 0.197 mW/g**
Maximum value of SAR (measured) = 0.375 mW/g




0 dB = 0.375mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#12 Body_CDMA850 Ch1013_Horizontal-Down with 0.5cm Gap_RC3+SO55_2D**

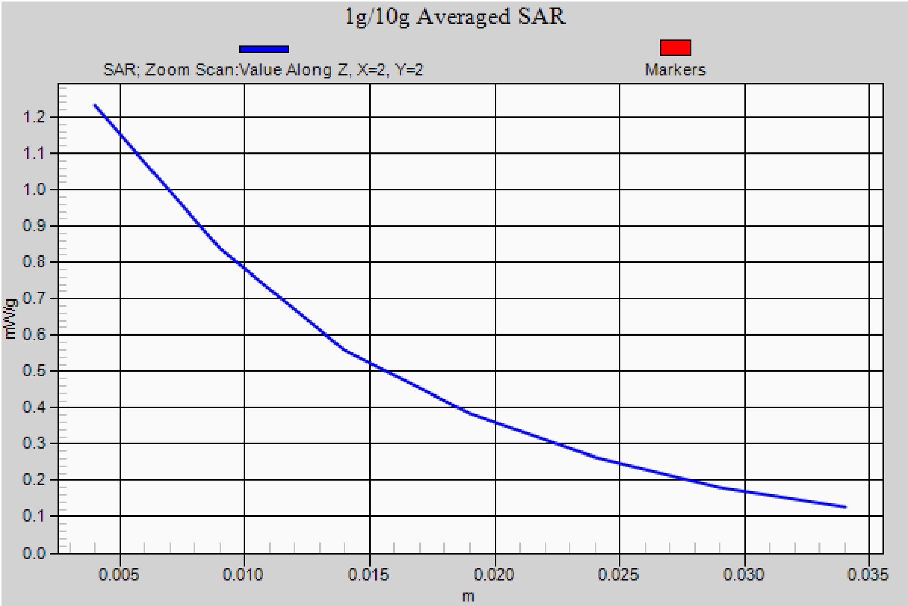
**DUT: 931736-01**

Communication System: CDMA ; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: MSL_850_090429 Medium parameters used: f = 825 MHz; $\sigma$ = 0.964 mho/m; $\varepsilon_r$ = 53; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：22.5 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(9.41, 9.41, 9.41); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: SAM-Back; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH1013/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.18 mW/g

**CH1013/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.5 V/m; Power Drift = 0.146 dB
Peak SAR (extrapolated) = 2 W/kg
**SAR(1 g) = 1.17 mW/g; SAR(10 g) = 0.726 mW/g**
Maximum value of SAR (measured) = 1.23 mW/g



Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2009/4/29

**#05 Body_CDMA1900 Ch25_Horizontal-Up with 0.5cm Gap_RC3+SO55_2D**

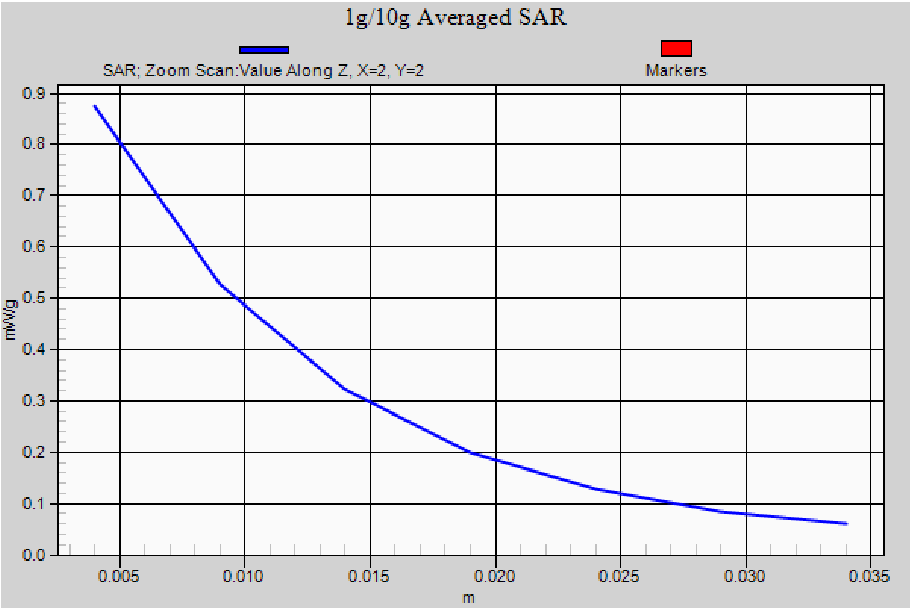
**DUT: 931736-01**

Communication System: CDMA ; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: MSL_1900_090429 Medium parameters used: f = 1851.25 MHz; $\sigma$ = 1.48 mho/m; $\varepsilon_r$ = 51.8; $\rho$ = 1000 kg/$m^3$
Ambient Temperature：22.3 ℃; Liquid Temperature：21.3 ℃

DASY5 Configuration:
- Probe: EX3DV3 - SN3514; ConvF(8.18, 8.18, 8.18); Calibrated: 2009/1/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2008/11/12
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1029
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**CH25/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.07 mW/g

**CH25/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.7 V/m; Power Drift = -0.117 dB
Peak SAR (extrapolated) = 1.37 W/kg
**SAR(1 g) = 0.797 mW/g; SAR(10 g) = 0.431 mW/g**
Maximum value of SAR (measured) = 0.874 mW/g



## Appendix C – Calibration Data

Please refer to the calibration certificates of DASY as below.