



FCC SAR Test Report

APPLICANT : ZTE CORPORATION
EQUIPMENT : cdma2000 wireless data terminal
BRAND NAME : ZTE
MODEL NAME : AC3633
FCC ID : Q78-AC3633
STANDARD : FCC 47 CFR Part 2 (2.1093)
ANSI/IEEE C95.1-1992
IEEE 1528-2003
FCC OET Bulletin 65 Supplement C (Edition 01-01)

The product was completely tested on Dec. 04, 2012. We, SPORTON INTERNATIONAL (SHENZHEN) 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 (SHENZHEN) INC., the test report shall not be reproduced except in full.

Reviewed by:

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Testing Laboratory
2353

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA2N1603	Rev. 01	Initial issue of report	Dec. 14, 2012



1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **ZTE CORPORATION**, **DUT: cdma2000 wireless data terminal, Brand Name: ZTE, Model Name: AC3633** are as follows.

Band	Position	SAR1g (W/kg)	Scaled SAR1g (W/kg)
CDMA2000 BC0	Body (0.5 cm)	1.15	1.247
WLAN 2.4G	Body (0.5 cm)	0.12	0.136

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003 and FCC OET Bulletin 65 Supplement C (Edition 01-01).



2. Administration Data

2.1 Testing Laboratory

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.
Test Site Location	No. 101, Complex Building C, Guanglong Village, Xili Town, Nanshan District, Shenzhen, Guangdong, P.R.C. TEL: +86-755-8637-9589 FAX: +86-755-8637-9595

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 Start during the Test	Dec. 03, 2012
Date of End during the Test	Dec. 04, 2012

3. General Information

3.1 Description of Device Under Test (DUT)

Product Feature & Specification	
DUT Type	cdma2000 wireless data terminal
Brand Name	ZTE
Model Name	AC3633
FCC ID	Q78-AC3633
Tx Frequency	CDMA2000 BC0: 824.70 MHz ~ 848.31 MHz 802.11b/g/n: 2412 MHz ~ 2462 MHz
Rx Frequency	CDMA2000 BC0: 869.70 MHz ~ 893.31 MHz 802.11b/g/n: 2412 MHz ~ 2462 MHz
Maximum Average Output Power to Antenna	CDMA2000 BC0: 23.17 dBm 802.11b: 12.47 dBm 802.11g: 11.63 dBm 802.11n-HT20 (2.4GHz): 11.51 dBm
Antenna Type	FPC Antenna
Uplink Modulation	CDMA2000 : QPSK CDMA2000 1xEV-DO : 8PSK 802.11b: DSSS (BPSK / QPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)
DUT Stage	Identical Prototype
Remark:	
<ol style="list-style-type: none"> The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description. GSM voice call is not supported, DTM not supported. 	



3.2 Product Photos

Please refer to Appendix D

3.3 Applied Standards

The Specific Absorption Rate (SAR) testing specification, method and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- IEEE C95.1-1991
- IEEE 1528-2003
- FCC OET Bulletin 65 Supplement C (Edition 01-01)
- FCC KDB 447498 D01 v04
- FCC KDB 447498 D02 v02
- FCC KDB 941225 D01 v02
- FCC KDB 248227 D01 v01r02

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 to 24 °C
Humidity	< 60 %

3.5.2 Test Configuration

The device was controlled by using a base station emulator. 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. The DUT was set from the emulator to radiate maximum output power during all tests.

For WLAN SAR testing, WLAN engineering testing software installed on the EUT can provide continuous transmitting RF signal.

The maximum rated power of WWAN and WLAN is listed in "Tune-Up Procedure" exhibit; the scaling factor is calculated according to the difference between measured output power and maximum tolerance power on this device.

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

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

Where: C is the specific heat capacity, δT is the temperature rise and δt is 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 System

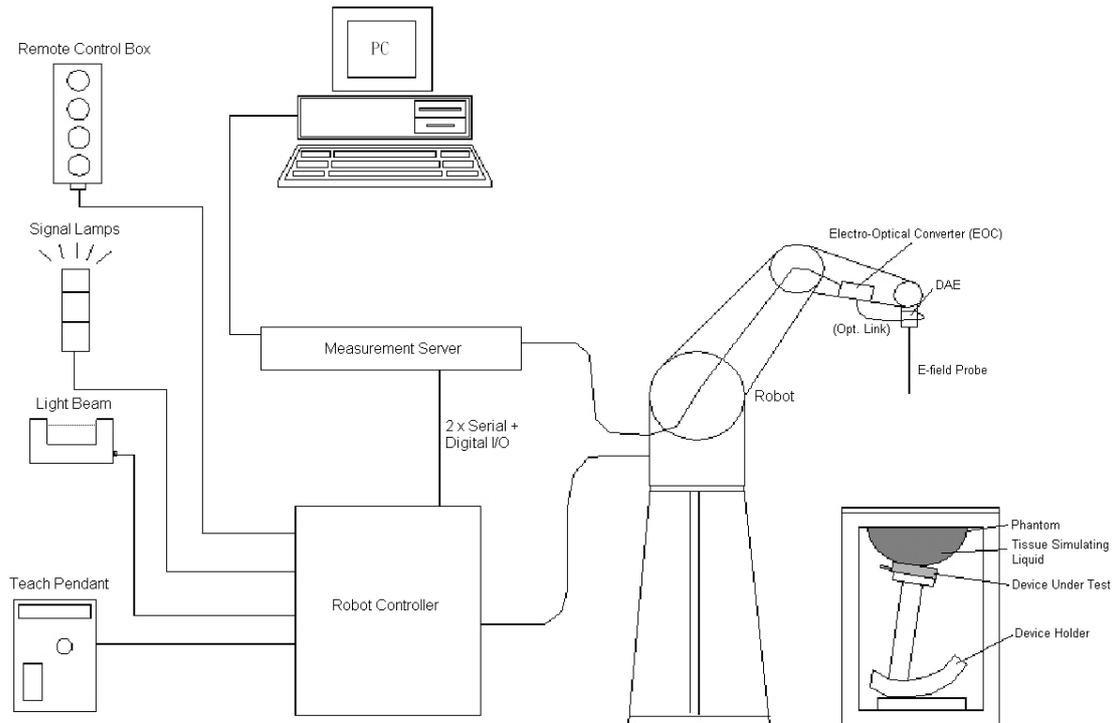


Fig 5.1 SPEAG DASY5 System Configurations

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
- Remote control with teach pendant and additional circuitry for robot safety such as warning 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 E-Field Probe

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

<EX3DV4 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to 6 GHz; Linearity: ± 0.2 dB
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μ W/g to 100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

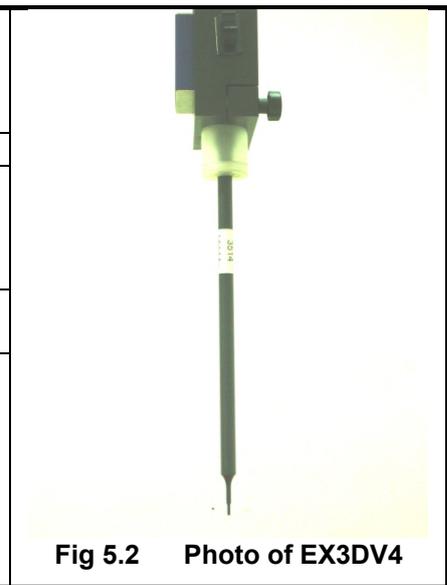


Fig 5.2 Photo of EX3DV4

5.1.2 E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy shall be evaluated and within ± 0.25 dB. 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 can be referred to appendix C of this report.

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



Fig 5.3 Photo of DAE

5.3 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX90XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ± 0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)



Fig 5.4 Photo of DASY5

5.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY5: 400 MHz, Intel Celeron), chipdisk (DASY5: 128 MB), RAM (DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

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



Fig 5.5 Photo of Server for DASY5

5.5 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom



Fig 5.6 Photo of SAM 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.

5.6 Device Holder

<Laptop Extension Kit>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

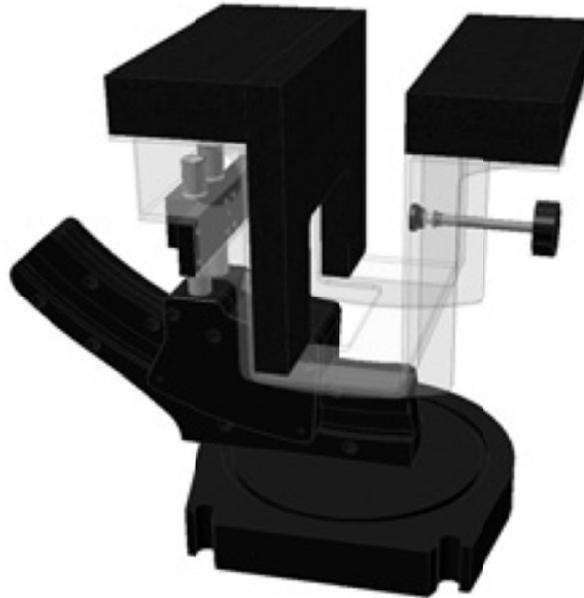


Fig 5.7 Laptop Extension Kit



5.7 Data Storage and Evaluation

5.7.1 Data Storage

The DASY 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. 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 DASY 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 DASY 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 :

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

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 :

$$\text{E-field Probes : } E_i = \sqrt{\frac{V_i}{\text{Norm}_i \cdot \text{ConvF}}}$$

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

with V_i = compensated signal of channel i, (i = x, y, z)
 Norm_i = sensor sensitivity of channel i, (i = x, y, z), $\mu\text{V}/(\text{V/m})^2$ 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) :

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

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

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

with SAR = local specific absorption rate in mW/g
 E_{tot} = 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.



5.8 Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	4d091	Nov. 17, 2012	Nov. 16, 2013
SPEAG	2450MHz System Validation Kit	D2450V2	736	Jul. 25, 2012	Jul. 24, 2013
SPEAG	Data Acquisition Electronics	DAE4	905	Jun. 21, 2012	Jun. 20, 2013
SPEAG	Dosimetric E-Field Probe	EX3DV4	3661	Jan. 27, 2012	Jan. 26, 2013
SPEAG	SAM Twin Phantom	QD 000 P40 CD	TP-1670	NCR	NCR
SPEAG	Test Arch Phantom	Par phantom	1105	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	Base Station	E5515C	MY50267224	Dec. 29, 2011	Dec. 28, 2012
Agilent	ENA Series Network Analyzer	E5071C	MY46111157	Apr. 13, 2012	Apr. 12, 2013
R&S	Signal Generator	SMR40	100455	Dec. 30, 2011	Dec. 29, 2012
Agilent	Power Meter	E4416A	MY45101555	Aug. 22, 2012	Aug. 21, 2013
Agilent	Power Sensor	E9327A	MY44421198	Aug. 22, 2012	Aug. 21, 2013
R&S	Spectrum Analyzer	FSP30	101400	Jun. 01, 2012	May 31, 2013

Table 5.1 Test Equipment List

Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. Referring to KDB 450824 D02, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole D835V2, SN: 4d091, D2450V2, SN: 736, can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

6. Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.2.



Fig 6.1 Photo of Liquid Height for Head SAR



Fig 6.2 Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquid.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ϵ_r)
For Body								
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
2450	68.6	0	0	0	0	31.4	1.95	52.7

Table 6.1 Recipes 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.

The following table shows the measuring results for simulating liquid.

Freq.	Liquid Type	Temp. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Conductivity Target (σ)	Permittivity Target (ϵ_r)	Delta (σ) (%)	Delta (ϵ_r) (%)	Limit (%)	Date
835	Body	21.4	0.976	54.36	0.97	55.2	0.62	-1.52	±5	Dec. 03, 2012
2450	Body	21.5	1.992	54.311	1.95	52.7	2.15	3.06	±5	Dec. 04, 2012

Table 6.2 Measuring Results for Simulating Liquid

7. SAR Measurement Evaluation

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY 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.

7.1 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.

7.2 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. 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:

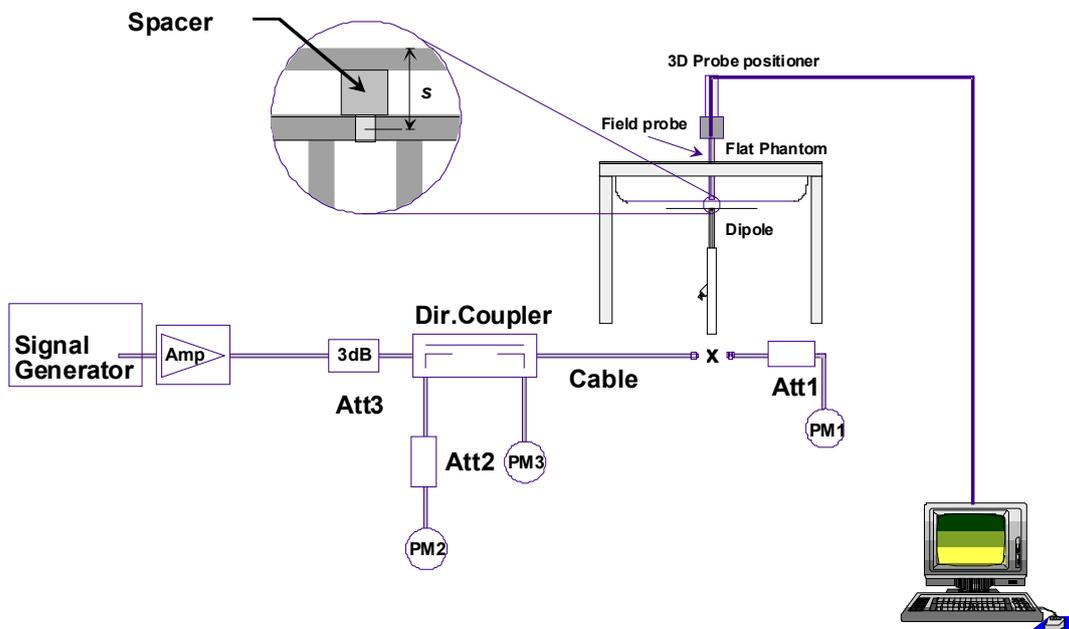


Fig 7.1 System Setup for System Evaluation

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. Calibrated Dipole

The output power on dipole port must be calibrated to 24 dBm (250 mW) before dipole is connected.



Fig 7.2 Photo of Dipole Setup

7.3 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 and the plots can be referred to Appendix A of this report.

Measurement Date	Frequency (MHz)	Liquid Type	Targeted SAR _{1g} (W/kg)	Measured SAR _{1g} (W/kg)	Normalized SAR _{1g} (W/kg)	Deviation (%)
Dec. 03, 2012	835	Body	9.42	2.4	9.60	1.91
Dec. 04, 2012	2450	Body	52.3	13.8	55.20	5.54

Table 8.1 Target and Measurement SAR after Normalized

8. DUT Testing Position

This DUT was tested in five different USB configurations. They are “direct laptop plug-in for configuration 2 and 4”, “USB cable plug-in for configuration 1 and 3 and Tip Mode (the tip of the DUT)” shown as below. Both direct laptop plug-in and USB cable plug-in test configurations are tested with 0.5 cm separation between the particular dongle orientation and the flat phantom. Please refer to Appendix E for the test setup photos.

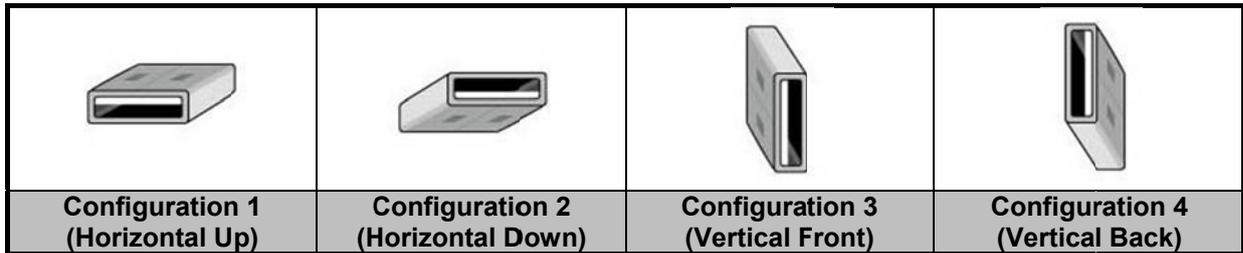


Fig 9.1 Illustration for USB Connector Orientations

<EUT Setup Photos>

Please refer to Appendix E for the test setup photos.

9. Measurement Procedures

The measurement procedures are as follows:

- (a) Use base station or engineering software (if applicable) to transmit RF power continuously (continuous Tx) in the highest power channel Set base station emulator to allow DUT to radiate maximum output power.
- (b) Measure output power through RF cable and power meter.
- (c) Place the DUT in the positions as Appendix E demonstrates.
- (d) Set scan area, grid size and other setting on the DASY software.
- (e) Measure SAR results for the highest power channel on each testing position.
- (f) Find out the largest SAR result on these testing positions of each band
- (g) Measure SAR results for other channels in worst SAR testing position if the SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- (a) Power reference measurement
- (b) Area scan
- (c) Zoom scan
- (d) Power drift measurement

9.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY 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:

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

9.2 Area & Zoom 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 for 300 MHz to 3 GHz, and 8x8x8 points with step size 4, 4 and 2.5 mm for 3 GHz to 6 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

9.3 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the DUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing (step-size is 4, 4 and 2.5 mm). When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

9.4 SAR Averaged Methods

In DASYS, 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.

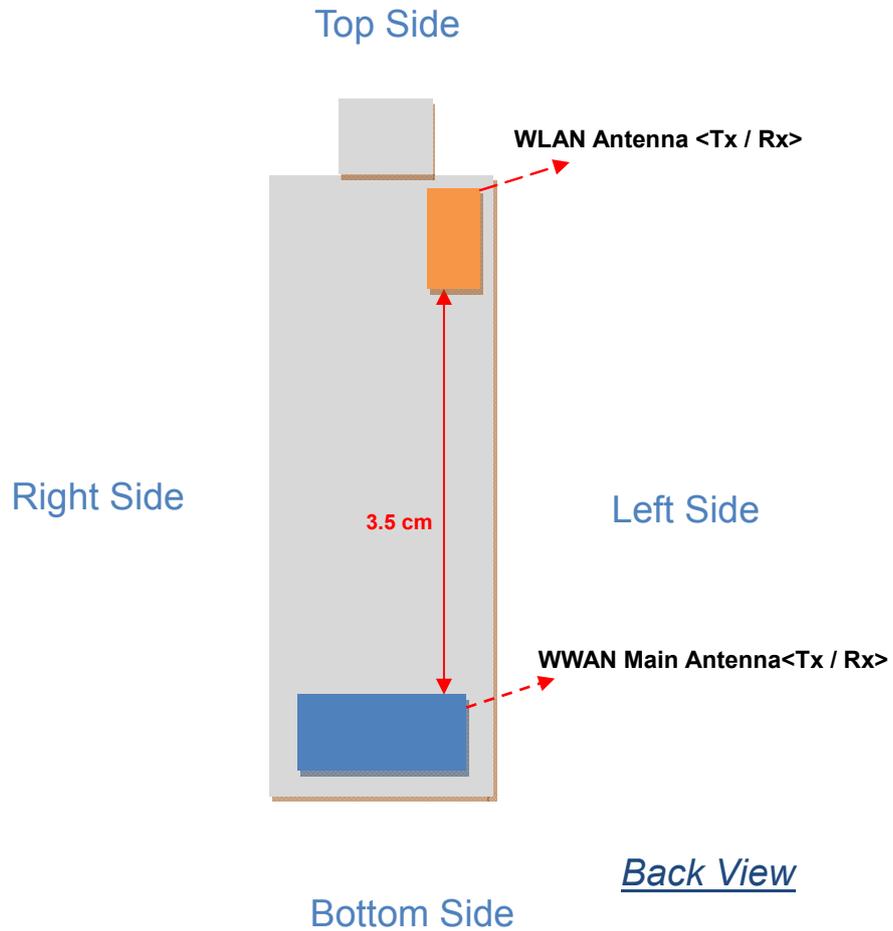
Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty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

9.5 Power Drift Monitoring

All SAR testing is under the DUT install full charged battery and transmit maximum output power. In DASYS measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of DUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drift more than 5%, the SAR will be retested.

10. SAR Test Configurations

10.1 Exposure Positions Consideration



Antennas	Wireless Interface
WWAN Main Antenna (Tx / Rx)	CDMA2000 EVDO: BC 0
WLAN Antenna (Tx / Rx)	WLAN 2.4GHz



10.2 Conducted RF Output Power (Unit: dBm)

<CDMA2000>

Band	CDMA2000 BC0		
Channel	1013	384	777
Frequency (MHz)	824.70	836.52	848.31
1xRTT RC1+SO55	23.12	23.14	23.16
1xRTT RC3+SO55	23.14	23.15	23.17
1xRTT RC3+SO32(+ F-SCH)	23.11	23.14	23.15
1xRTT RC3+SO32(+SCH)	23.12	23.12	23.14
1xEVDO RTAP 153.6	23.07	23.13	23.15
1xEVDO RETAP 4096	23.11	23.12	23.14

Note: Referring to KDB 941225 D01, DUT is treated as data device and SAR is tested with RTAP 153.6 kbps (Ev-Do). If RC3+SO32 power is less than 1/4dB higher than Ev-Do, SAR tests with RC3+SO32 setting are not necessary.

<WLAN 2.4GHz>

Mode	Channel	Frequency (MHz)	Average power (dBm)			
			Data Rate (bps)			
			1M	2M	5.5M	11M
802.11b	CH 01	2412	12.22	12.40	12.46	12.39
	CH 06	2437	11.96	12.30	12.35	12.27
	CH 11	2462	12.47	12.43	12.44	12.46

Mode	Channel	Frequency (MHz)	Average power (dBm)							
			Data Rate (bps)							
			6M	9M	12M	18M	24M	36M	48M	54M
802.11g	CH 01	2412	11.47	11.44	11.40	11.47	11.50	11.40	11.51	11.58
	CH 06	2437	11.37	11.10	11.18	11.32	11.17	11.14	11.18	11.19
	CH 11	2462	11.63	11.56	11.46	11.62	11.61	11.48	11.53	11.54

Mode	Channel	Frequency (MHz)	Average power (dBm)							
			Data Rate (bps)							
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
802.11n HT20	CH 01	2412	11.07	11.20	11.39	11.42	11.32	11.40	11.36	11.39
	CH 06	2437	11.08	11.00	11.24	11.08	11.17	11.18	11.17	11.14
	CH 11	2462	11.51	11.37	11.35	11.31	11.14	11.35	11.47	11.39

Note:

1. Per KDB 248227, 11g and 11n output power is less than 1/4 dB higher than 11b mode, thus the SAR can be excluded.
2. Per KDB 248227, choose the highest output power channel to test SAR and determine further SAR exclusion, and CH 11 is chosen here.



11. SAR Test Results

11.1 Test Records for Body SAR Test

<CDMA2000>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Output Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	SAR _{1g} (W/kg)	Scaled SAR _{1g} (W/kg)	Power Drift (dB)
1	CDMA2000 BC0	RTAP 153.6	Horizontal Up	0.5	777	23.15	23.5	1.08	0.670	0.726	-0.14
2	CDMA2000 BC0	RTAP 153.6	Horizontal Down	0.5	777	23.15	23.5	1.08	1.150	1.247	-0.06
3	CDMA2000 BC0	RTAP 153.6	Vertical Front	0.5	777	23.15	23.5	1.08	0.322	0.349	-0.01
4	CDMA2000 BC0	RTAP 153.6	Vertical Back	0.5	777	23.15	23.5	1.08	0.313	0.339	0.04
5	CDMA2000 BC0	RTAP 153.6	Tip Mode	0.5	777	23.15	23.5	1.08	0.094	0.102	-0.06
6	CDMA2000 BC0	RTAP 153.6	Horizontal Down	0.5	1013	23.07	23.5	1.10	1.040	1.148	-0.06
7	CDMA2000 BC0	RTAP 153.6	Horizontal Down	0.5	384	23.13	23.5	1.09	0.963	1.049	0.09

Note: Per KDB 447498, if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.

<WLAN>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Output Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	SAR _{1g} (W/kg)	Scaled SAR _{1g} (W/kg)	Power Drift (dB)
8	WLAN2.4G	802.11b	Horizontal Up	0.5	11	12.47	13	1.13	0.120	0.136	0.03
9	WLAN2.4G	802.11b	Horizontal Down	0.5	11	12.47	13	1.13	0.068	0.077	-0.04
10	WLAN2.4G	802.11b	Vertical Front	0.5	11	12.47	13	1.13	0.100	0.113	-0.01
11	WLAN2.4G	802.11b	Vertical Back	0.5	11	12.47	13	1.13	0.037	0.042	0.07

Note: Per KDB 248227, if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.

11.2 Simultaneous Transmission SAR Analysis

No.	Applicable Simultaneous Transmission Combination
1	CDMA2000 + WLAN 2.4G

1. Per KDB 447498 D01, WLAN output power (12.47 dBm) > P_{Ref} and the distance to WWAN transmitting antenna ≥ 2.5 cm, therefore, WLAN stand-alone SAR is required; the simultaneous transmission SAR for WWAN and WLAN was not required, because the SAR scaled summation (Body: 1.32 W/kg) is less than 1.6 W/kg.
2. If 1g-SAR scalar summation < 1.6W/kg, simultaneous SAR measurement is not necessary.
3. If 1g-SAR scalar summation > 1.6W/kg, SPLSR calculation is necessary.

Position	WWAN			WLAN		Max. SAR Sum	WWAN		WLAN		Scaled WWAN + Scaled WLAN
	WWAN Band	Plot No	Max. WWAN SAR (W/kg)	Plot No	Max. WLAN SAR (W/kg)		Plot No	Max. Scaled WWAN SAR (W/kg)	Plot No	Max. Scaled WLAN SAR (W/kg)	
Horizontal Up	CDMA2000 BC0	1	0.670	8	0.120	0.79	1	0.726	8	0.136	0.86
Horizontal Down	CDMA2000 BC0	2	1.150	9	0.068	1.22	2	1.247	9	0.077	1.32
Vertical Front	CDMA2000 BC0	3	0.322	10	0.100	0.42	3	0.349	10	0.113	0.46
Vertical Back	CDMA2000 BC0	4	0.313	11	0.037	0.35	4	0.339	11	0.042	0.38
Tip Mode	CDMA2000 BC0	5	0.094	-	-	0.094	5	0.102	-	-	0.102

Test Engineer : Krin Wu

12. Uncertainty Assessment

The component of uncertainty may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainty by the statistical analysis of a series of observations is termed a Type A 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 12.1

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying 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 12.1 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 DASY uncertainty Budget is shown in the following tables.



Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.0	Normal	1	1	1	± 6.0 %	± 6.0 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.4	Rectangular	√3	1	1	± 0.2 %	± 0.2 %
Probe Positioning	2.9	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Max. SAR Eval.	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Test Sample Related							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
Combined Standard Uncertainty						± 11.0 %	± 10.8 %
Coverage Factor for 95 %						K=2	
Expanded Uncertainty						± 22.0 %	± 21.5 %

Table 12.2 Uncertainty Budget of DASY for frequency range 300 MHz to 3 GHz



13. References

- [1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”
- [2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992
- [3] IEEE Std. 1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, December 2003
- [4] FCC OET Bulletin 65 (Edition 97-01) Supplement C (Edition 01-01), “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields”, June 2001
- [5] SPEAG DASY System Handbook
- [6] FCC KDB 248227 D01 v01r02, “SAR Measurement Procedures for 802.11 a/b/g Transmitters”, May 2007
- [7] FCC KDB 447498 D01 v04, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, November 2009
- [8] FCC KDB 941225 D01 v02, “SAR Measurement Procedures for 3G Devices – CDMA 2000 / Ev-Do / WCDMA / HSDPA / HSPA”, October 2007
- [9] FCC KDB 447498 D02 v02, “SAR Measurement Procedures for USB Dongle Transmitters”, November 2009



Appendix A. Plots of System Performance Check

The plots are shown as follows.

System Check_Body_835MHz_121203

DUT: D835V2 - SN:4d091

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: MSL_835_121203 Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.976 \text{ mho/m}$; $\epsilon_r = 54.36$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : $23.5 \text{ }^\circ\text{C}$; Liquid Temperature : $21.4 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 2.59 W/kg

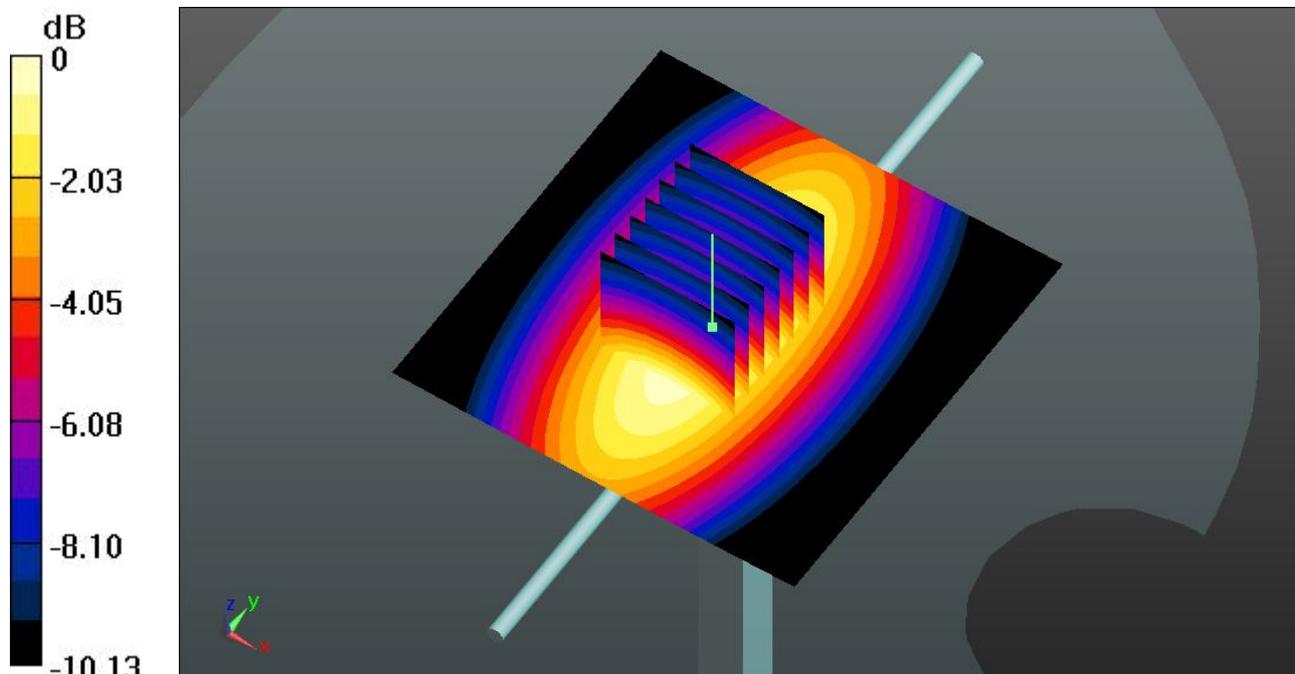
Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 51.708 V/m ; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.521 mW/g

SAR(1 g) = 2.4 mW/g ; SAR(10 g) = 1.58 mW/g

Maximum value of SAR (measured) = 2.60 W/kg



0 dB = 2.60 W/kg

System Check_Body_2450MHz_121204

DUT: D2450V2 - SN:736

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: MSL_2450_121204 Medium parameters used: $f = 2450$ MHz; $\sigma = 1.992$ mho/m; $\epsilon_r =$

54.311 ; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 21.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(7.5, 7.5, 7.5); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Pin=250mW/Area Scan (91x91x1): Interpolated grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 15.6 W/kg

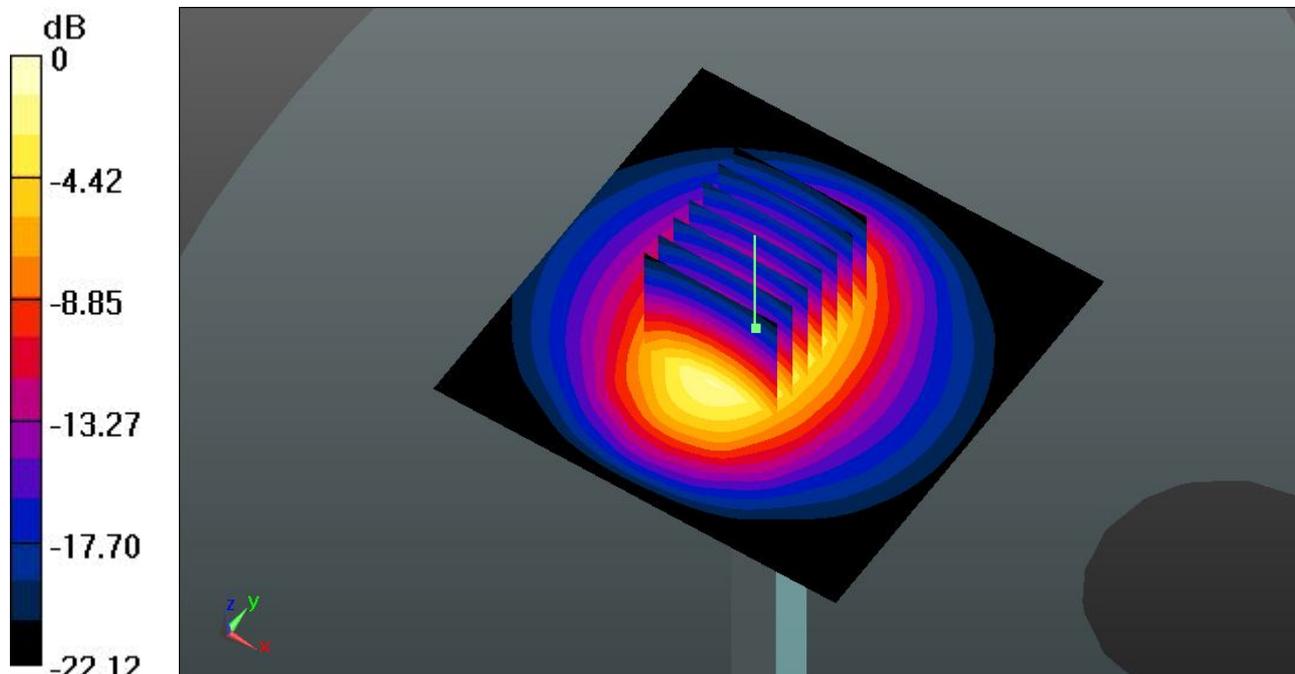
Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 85.715 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 30.292 mW/g

SAR(1 g) = 13.8 mW/g; SAR(10 g) = 6.55 mW/g

Maximum value of SAR (measured) = 15.3 W/kg



0 dB = 15.3 W/kg



Appendix B. Plots of SAR Measurement

The plots are shown as follows.

01 CDMA2000 BC0_RTAP 153.6_Horizontal Up_0.5cm_Ch777

DUT: 2N1603

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1
 Medium: MSL_835_121203 Medium parameters used: $f = 848.31 \text{ MHz}$; $\sigma = 0.988 \text{ mho/m}$; $\epsilon_r = 54.245$; $\rho = 1000 \text{ kg/m}^3$
 Ambient Temperature : $23.5 \text{ }^\circ\text{C}$; Liquid Temperature : $21.4 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch777/Area Scan (31x71x1): Interpolated grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Ch777/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 32.583 V/m ; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 1.148 mW/g

SAR(1 g) = 0.670 mW/g ; SAR(10 g) = 0.391 mW/g

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

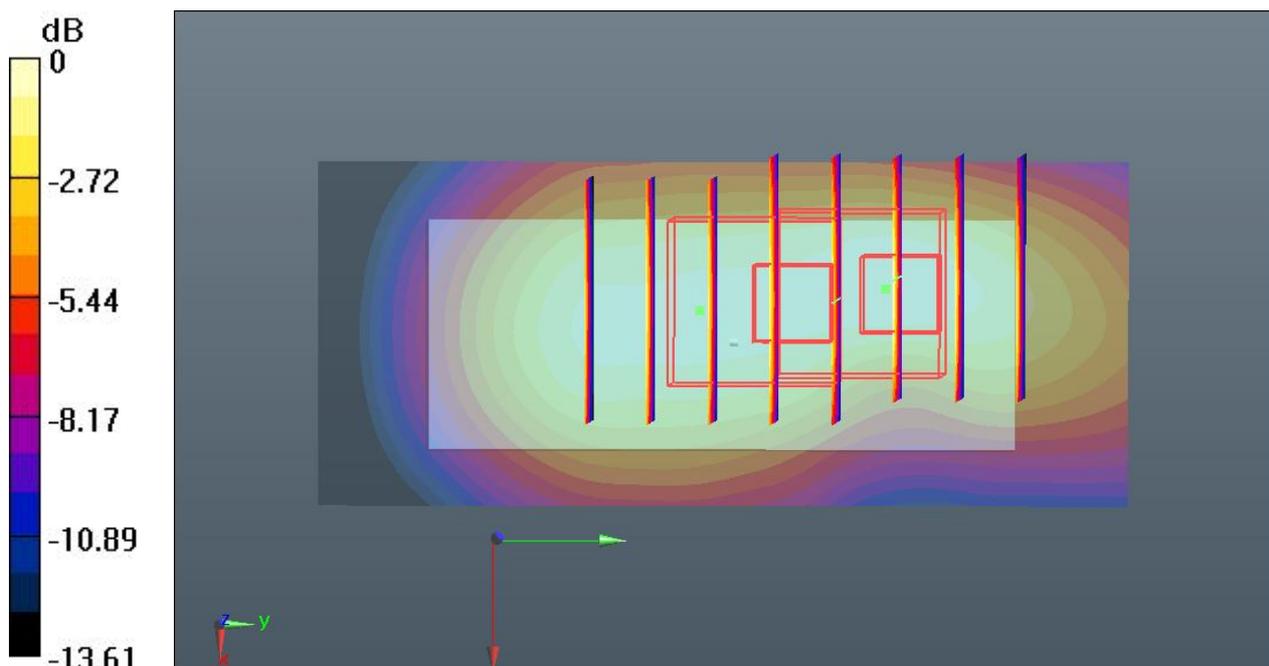
Ch777/Zoom Scan (5x5x7)/Cube 1: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 32.583 V/m ; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.925 mW/g

SAR(1 g) = 0.576 mW/g ; SAR(10 g) = 0.368 mW/g

Maximum value of SAR (measured) = 0.788 W/kg



0 dB = 0.788 W/kg

02 CDMA2000 BC0_RTAP 153.6_Horizontal Down_0.5cm_Ch777

DUT: 2N1603

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium: MSL_835_121203 Medium parameters used: $f = 848.31 \text{ MHz}$; $\sigma = 0.988 \text{ mho/m}$; $\epsilon_r =$

54.245 ; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : $23.5 \text{ }^\circ\text{C}$; Liquid Temperature : $21.4 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch777/Area Scan (31x71x1): Interpolated grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 1.53 W/kg

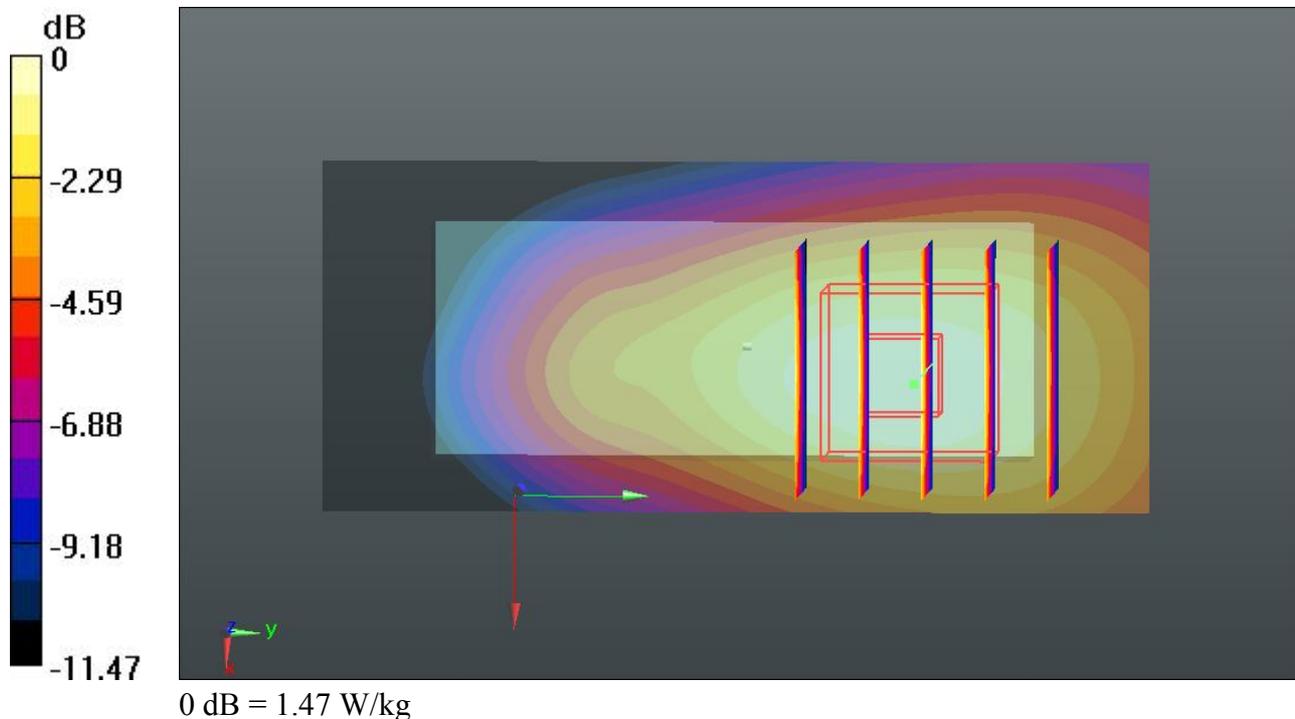
Ch777/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 40.254 V/m ; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.748 mW/g

SAR(1 g) = 1.150 mW/g ; SAR(10 g) = 0.734 mW/g

Maximum value of SAR (measured) = 1.47 W/kg



02 CDMA2000 BC0_RTAP 153.6_Horizontal Down_0.5cm_Ch777_2D

DUT: 2N1603

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium: MSL_835_121203 Medium parameters used: $f = 848.31 \text{ MHz}$; $\sigma = 0.988 \text{ mho/m}$; $\epsilon_r =$

54.245 ; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : $23.5 \text{ }^\circ\text{C}$; Liquid Temperature : $21.4 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch777/Area Scan (31x71x1): Interpolated grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 1.53 W/kg

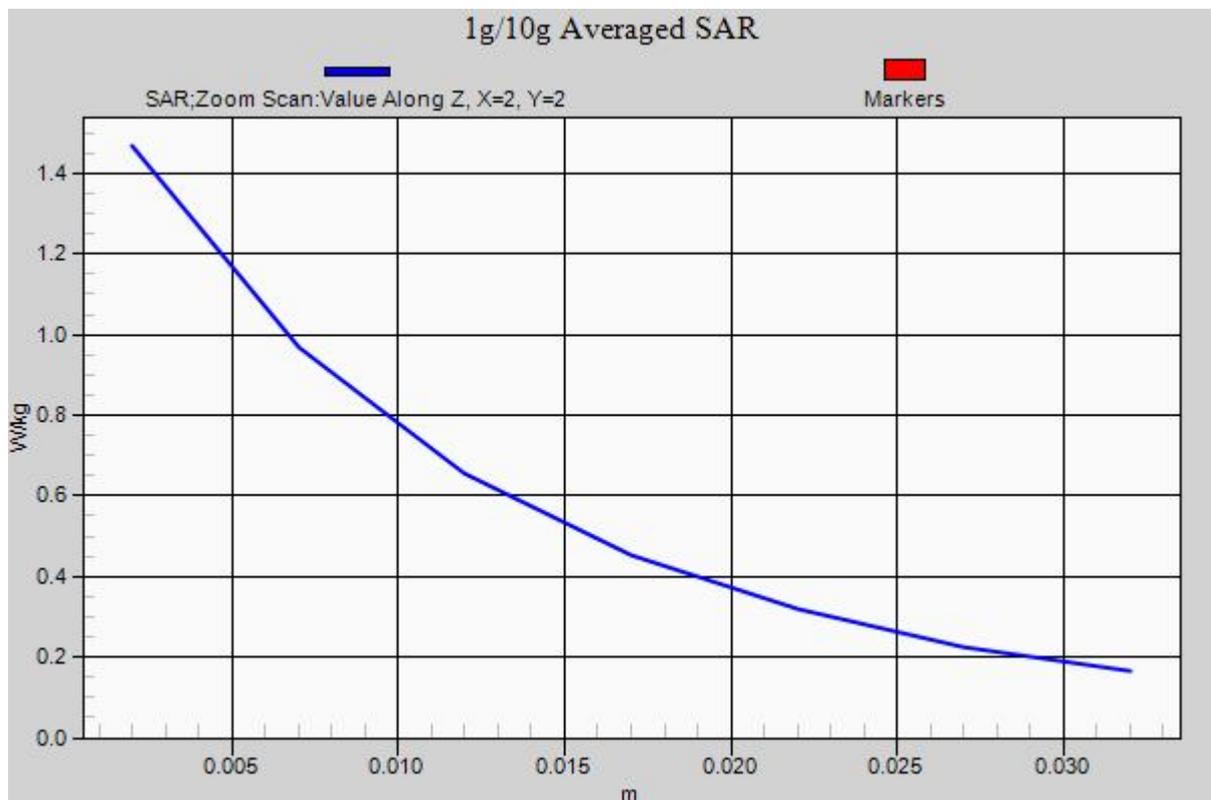
Ch777/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 40.254 V/m ; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.748 mW/g

SAR(1 g) = 1.150 mW/g ; SAR(10 g) = 0.734 mW/g

Maximum value of SAR (measured) = 1.47 W/kg



03 CDMA2000 BC0_RTAP 153.6_Veritical Front_0.5cm_Ch777

DUT: 2N1603

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium: MSL_835_121203 Medium parameters used: $f = 848.31 \text{ MHz}$; $\sigma = 0.988 \text{ mho/m}$; $\epsilon_r =$

54.245 ; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : $23.5 \text{ }^\circ\text{C}$; Liquid Temperature : $21.4 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch777/Area Scan (31x71x1): Interpolated grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.420 W/kg

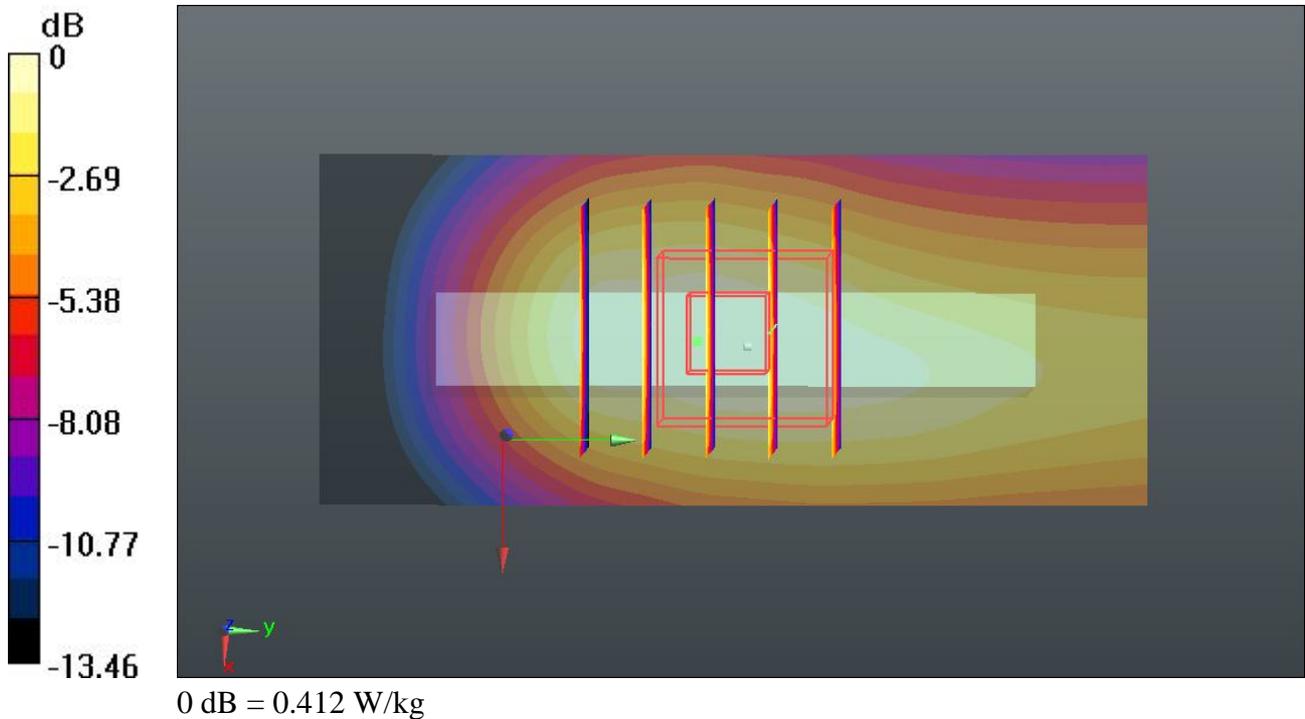
Ch777/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 20.794 V/m ; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.489 mW/g

SAR(1 g) = 0.322 mW/g ; SAR(10 g) = 0.207 mW/g

Maximum value of SAR (measured) = 0.412 W/kg



04 CDMA2000 BC0_RTAP 153.6_Verical Back_0.5cm_Ch777

DUT: 2N1603

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium: MSL_835_121203 Medium parameters used: $f = 848.31 \text{ MHz}$; $\sigma = 0.988 \text{ mho/m}$; $\epsilon_r =$

54.245 ; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : $23.5 \text{ }^\circ\text{C}$; Liquid Temperature : $21.4 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch777/Area Scan (31x71x1): Interpolated grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.434 W/kg

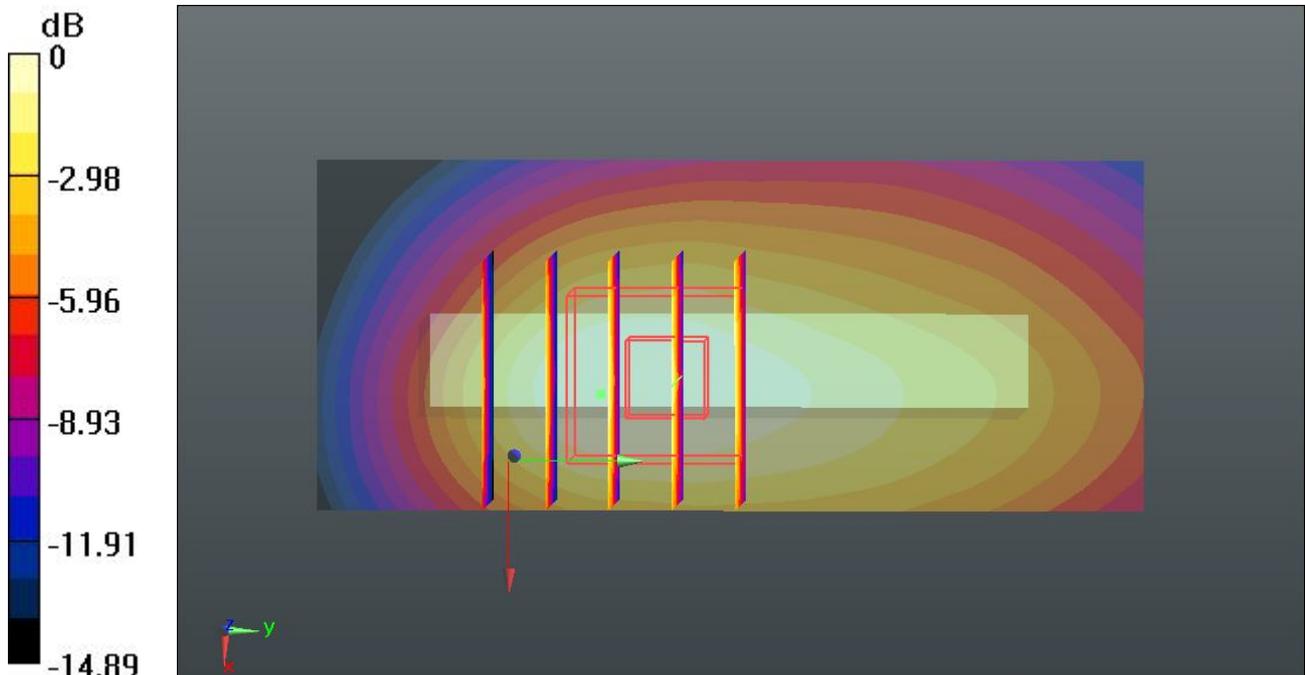
Ch777/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 19.932 V/m ; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.479 mW/g

SAR(1 g) = 0.313 mW/g ; SAR(10 g) = 0.196 mW/g

Maximum value of SAR (measured) = 0.402 W/kg



0 dB = 0.402 W/kg

05 CDMA2000 BC0_RTAP 153.6_Tip Mode_0.5cm_Ch777

DUT: 2N1603

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium: MSL_835_121203 Medium parameters used: $f = 848.31 \text{ MHz}$; $\sigma = 0.988 \text{ mho/m}$; $\epsilon_r =$

54.245 ; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : $23.5 \text{ }^\circ\text{C}$; Liquid Temperature : $21.4 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch777/Area Scan (51x31x1): Interpolated grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.149 W/kg

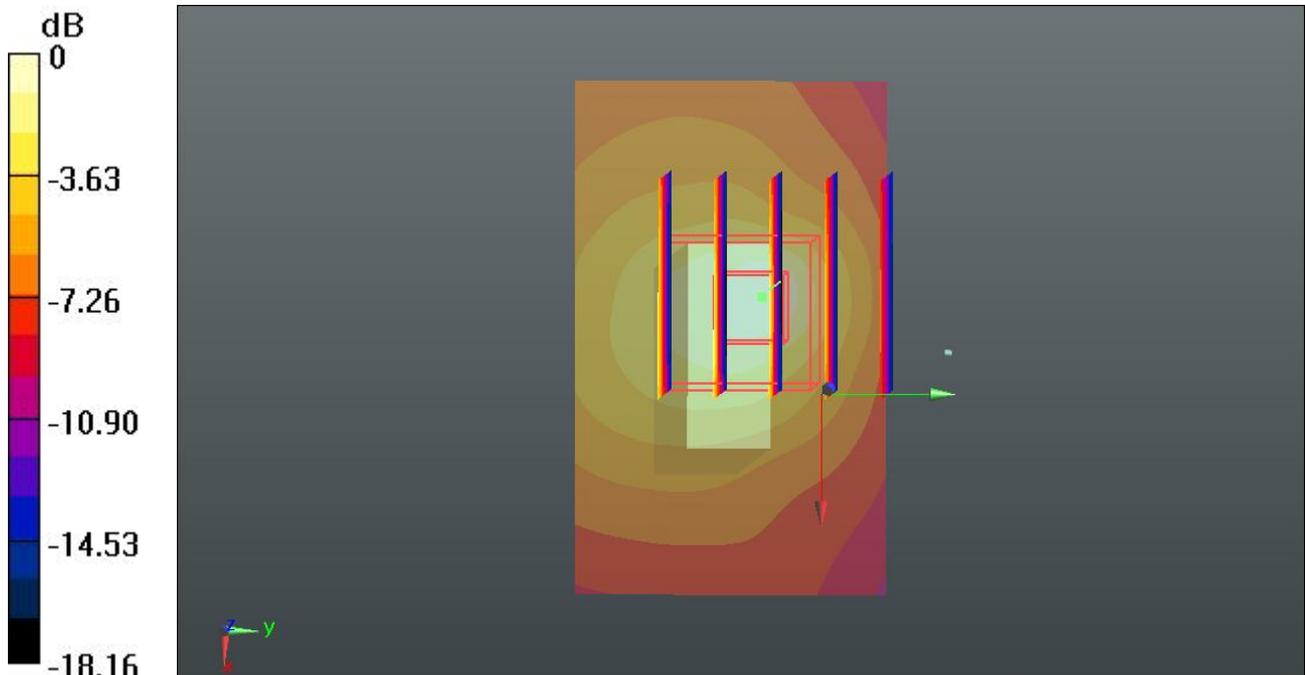
Ch777/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 12.913 V/m ; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.234 mW/g

SAR(1 g) = 0.094 mW/g ; SAR(10 g) = 0.046 mW/g

Maximum value of SAR (measured) = 0.148 W/kg



0 dB = 0.148 W/kg

06 CDMA2000 BC0_RTAP 153.6_Horizontal Down_0.5cm_Ch1013

DUT: 2N1603

Communication System: CDMA2000; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium: MSL_835_121203 Medium parameters used: $f = 825$ MHz; $\sigma = 0.966$ mho/m; $\epsilon_r = 54.431$;

$\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 21.4 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch1013/Area Scan (31x71x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.37 W/kg

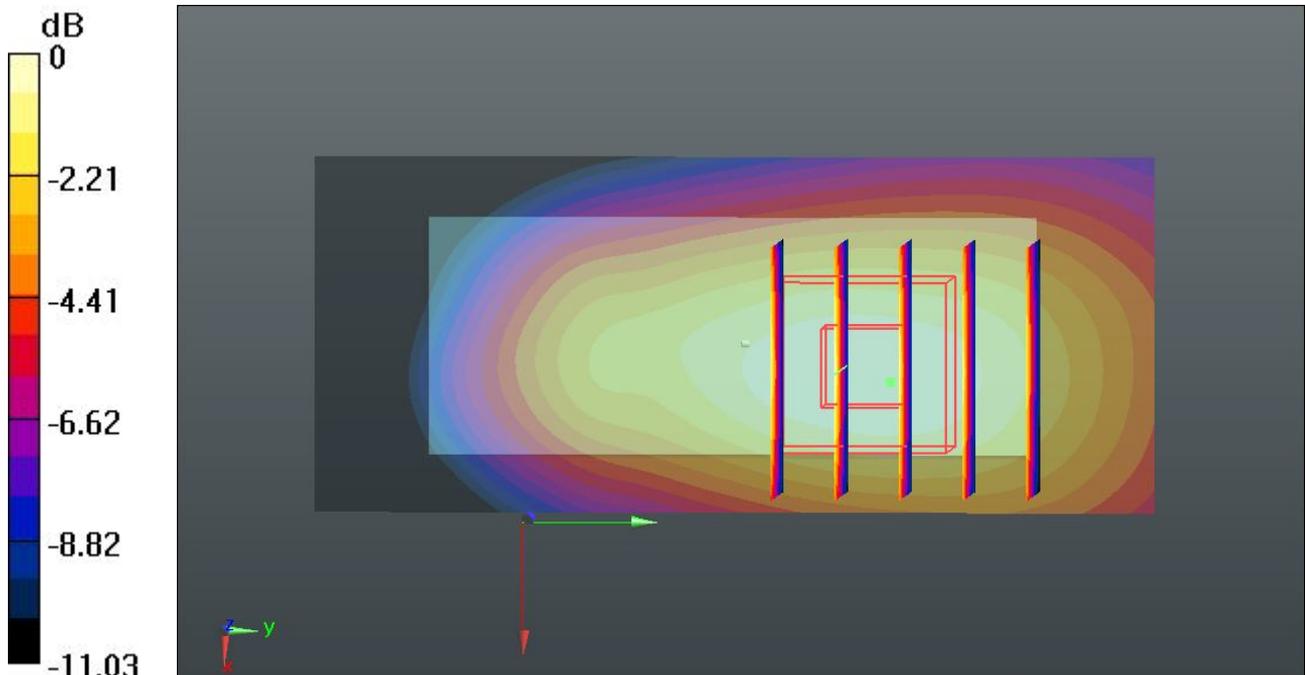
Ch1013/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 38.122 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.593 mW/g

SAR(1 g) = 1.040 mW/g; SAR(10 g) = 0.665 mW/g

Maximum value of SAR (measured) = 1.32 W/kg



0 dB = 1.32 W/kg

07 CDMA2000 BC0_RTAP 153.6_Horizontal Down_0.5cm_Ch384

DUT: 2N1603

Communication System: CDMA2000; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: MSL_835_121203 Medium parameters used: $f = 837$ MHz; $\sigma = 0.978$ mho/m; $\epsilon_r = 54.343$;

$\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 21.4 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch384/Area Scan (31x71x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.25 W/kg

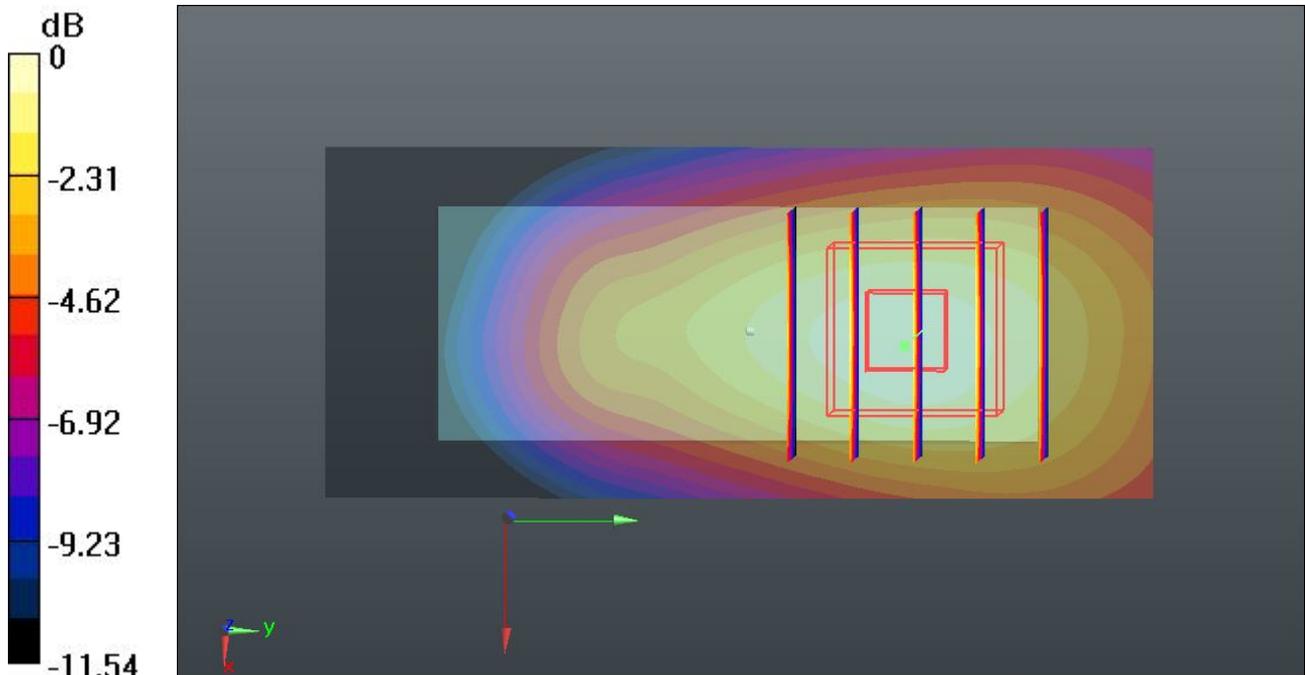
Ch384/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 35.979 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 1.489 mW/g

SAR(1 g) = 0.963 mW/g; SAR(10 g) = 0.612 mW/g

Maximum value of SAR (measured) = 1.26 W/kg



0 dB = 1.26 W/kg

08 802.11b_Horizontal Up_0.5cm_Ch11

DUT: 2N1603

Communication System: WIFI; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: MSL_2450_121204 Medium parameters used: $f = 2462$ MHz; $\sigma = 2.015$ mho/m; $\epsilon_r = 54.25$;

$\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 21.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(7.5, 7.5, 7.5); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch11/Area Scan (31x71x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.182 W/kg

Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.213 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.247 mW/g

SAR(1 g) = 0.120 mW/g; SAR(10 g) = 0.058 mW/g

Maximum value of SAR (measured) = 0.176 W/kg

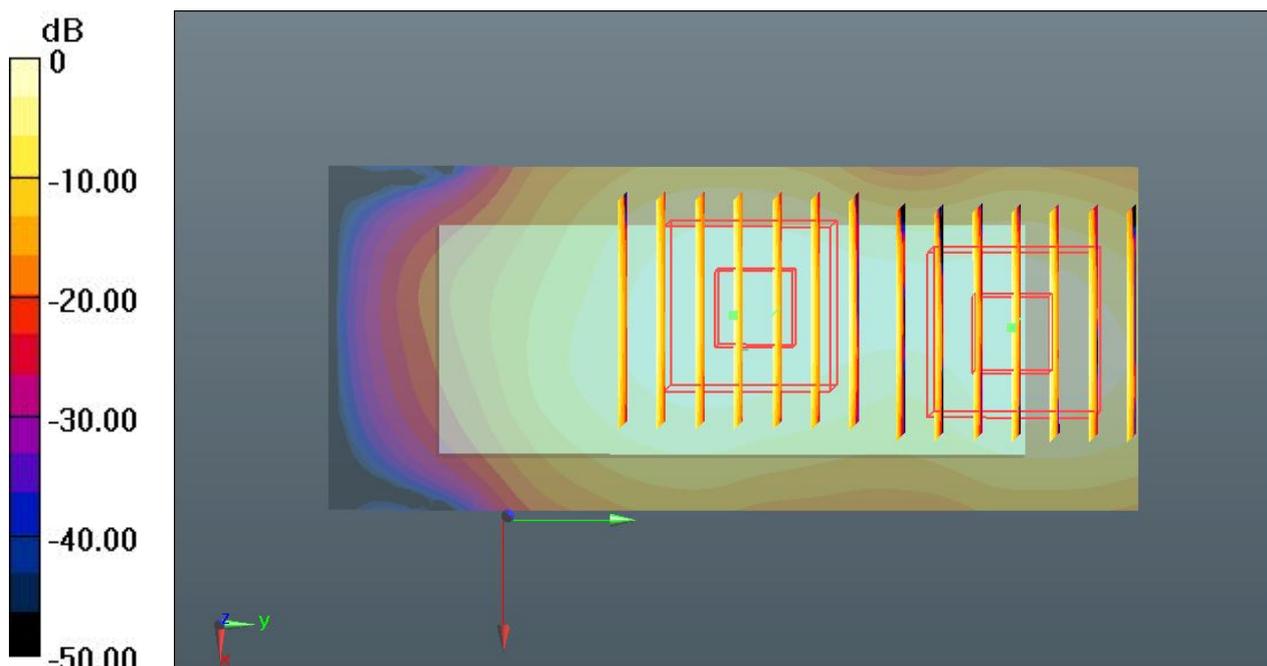
Ch11/Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.213 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.229 mW/g

SAR(1 g) = 0.108 mW/g; SAR(10 g) = 0.049 mW/g

Maximum value of SAR (measured) = 0.166 W/kg



0 dB = 0.166 W/kg

08 802.11b_Horizontal Up_0.5cm_Ch11_2D

DUT: 2N1603

Communication System: WIFI; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: MSL_2450_121204 Medium parameters used: $f = 2462$ MHz; $\sigma = 2.015$ mho/m; $\epsilon_r = 54.25$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 21.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(7.5, 7.5, 7.5); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch11/Area Scan (31x71x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.182 W/kg

Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.213 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.247 mW/g

SAR(1 g) = 0.120 mW/g; SAR(10 g) = 0.058 mW/g

Maximum value of SAR (measured) = 0.176 W/kg

Ch11/Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm

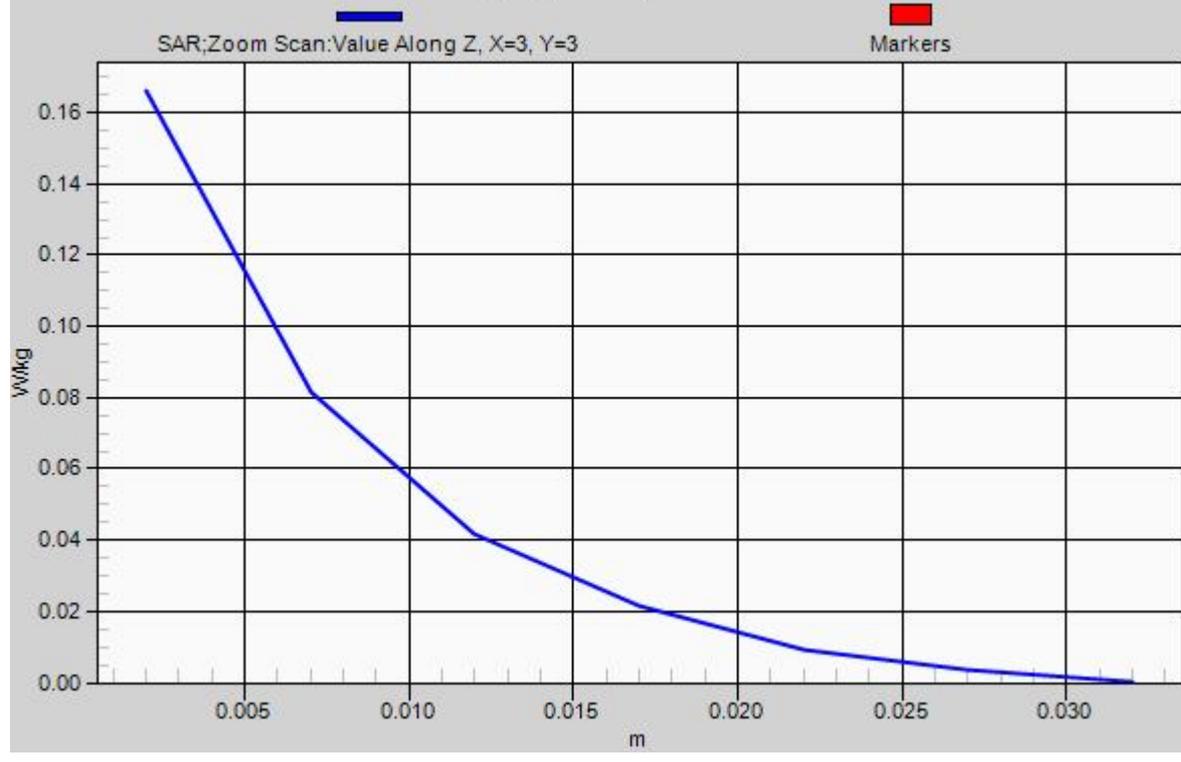
Reference Value = 9.213 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.229 mW/g

SAR(1 g) = 0.108 mW/g; SAR(10 g) = 0.049 mW/g

Maximum value of SAR (measured) = 0.166 W/kg

1g/10g Averaged SAR



09 802.11b_Horizontal Down_0.5cm_Ch11

DUT: 2N1603

Communication System: WIFI; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: MSL_2450_121204 Medium parameters used: $f = 2462 \text{ MHz}$; $\sigma = 2.015 \text{ mho/m}$; $\epsilon_r = 54.25$;

$\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : $23.5 \text{ }^\circ\text{C}$; Liquid Temperature : $21.5 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(7.5, 7.5, 7.5); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch11/Area Scan (31x71x1): Interpolated grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.128 W/kg

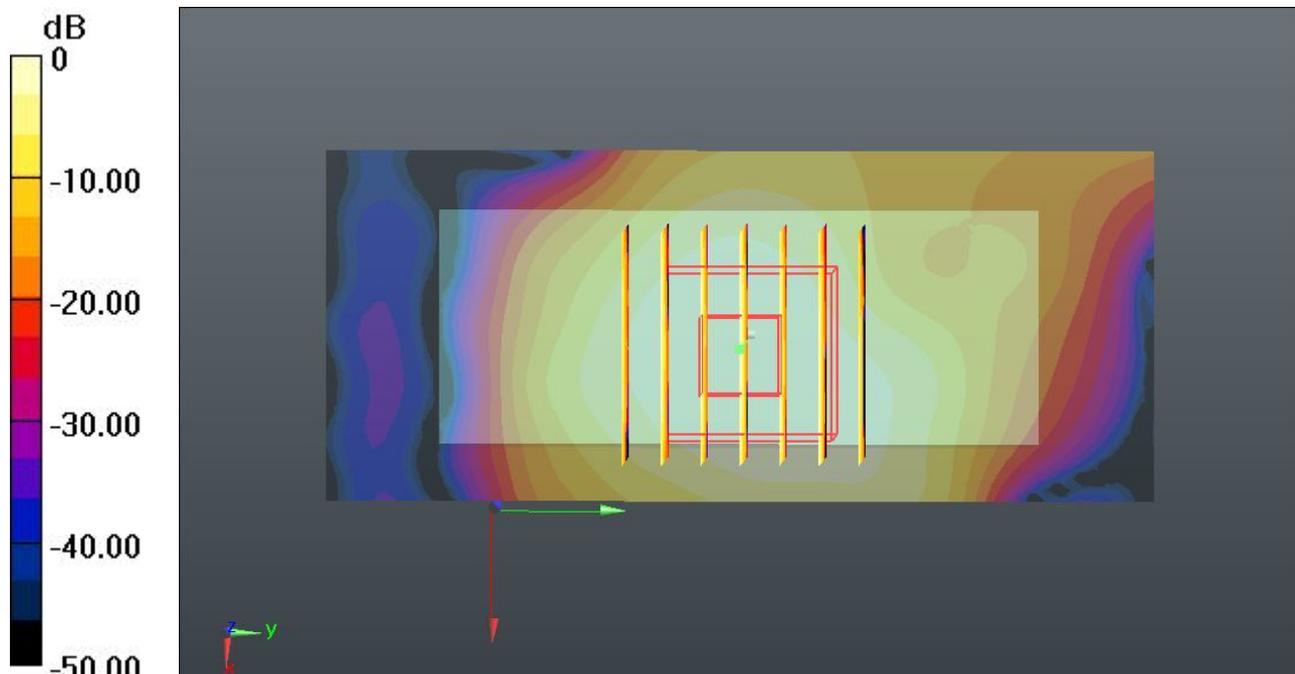
Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 7.052 V/m ; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.131 mW/g

SAR(1 g) = 0.068 mW/g ; SAR(10 g) = 0.034 mW/g

Maximum value of SAR (measured) = 0.0986 W/kg



0 dB = 0.0986 W/kg

10 802.11b_Vertical Front_0.5cm_Ch11

DUT: 2N1603

Communication System: WIFI; Frequency: 2462 MHz;Duty Cycle: 1:1

Medium: MSL_2450_121204 Medium parameters used: $f = 2462$ MHz; $\sigma = 2.015$ mho/m; $\epsilon_r = 54.25$;

$\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 21.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(7.5, 7.5, 7.5); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch11/Area Scan (31x71x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.144 W/kg

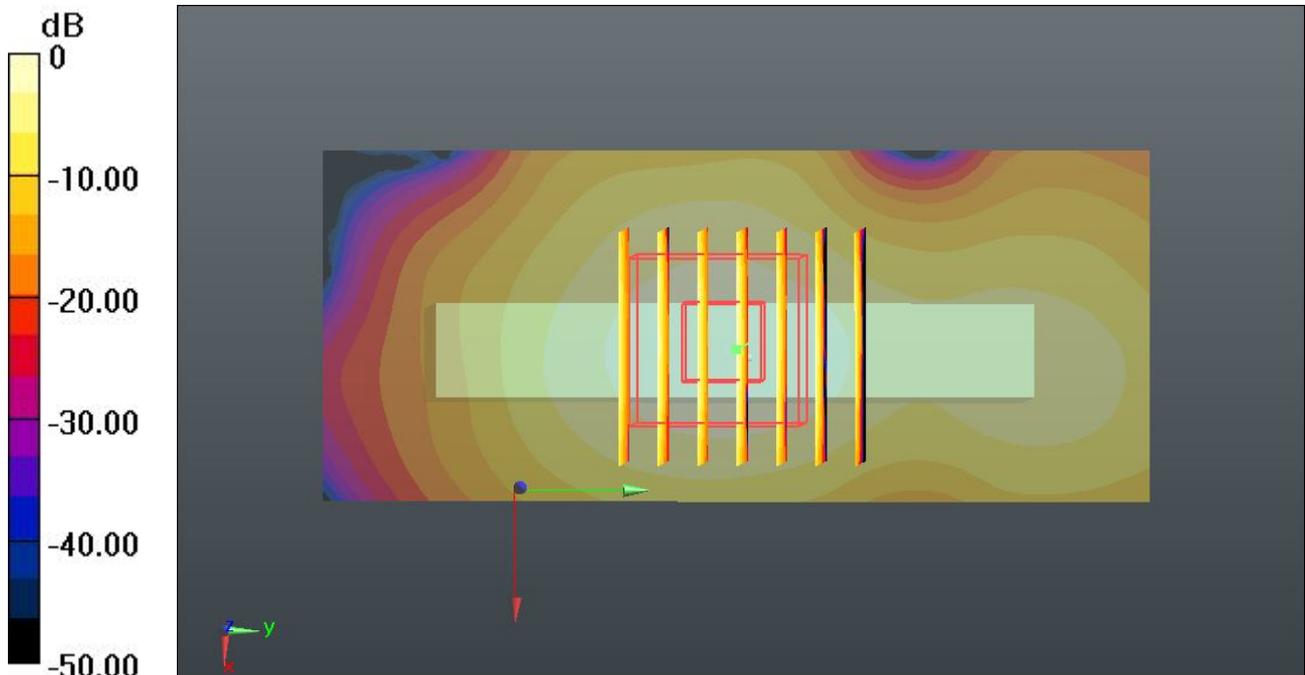
Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.626 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.200 mW/g

SAR(1 g) = 0.100 mW/g; SAR(10 g) = 0.047 mW/g

Maximum value of SAR (measured) = 0.149 W/kg



0 dB = 0.149 W/kg

11 802.11b_Vertical Back_0.5cm_Ch11

DUT: 2N1603

Communication System: WIFI; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: MSL_2450_121204 Medium parameters used: $f = 2462$ MHz; $\sigma = 2.015$ mho/m; $\epsilon_r = 54.25$;

$\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C ; Liquid Temperature : 21.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(7.5, 7.5, 7.5); Calibrated: 27.01.2012;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 21.06.2012
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Ch11/Area Scan (31x71x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.0978 W/kg

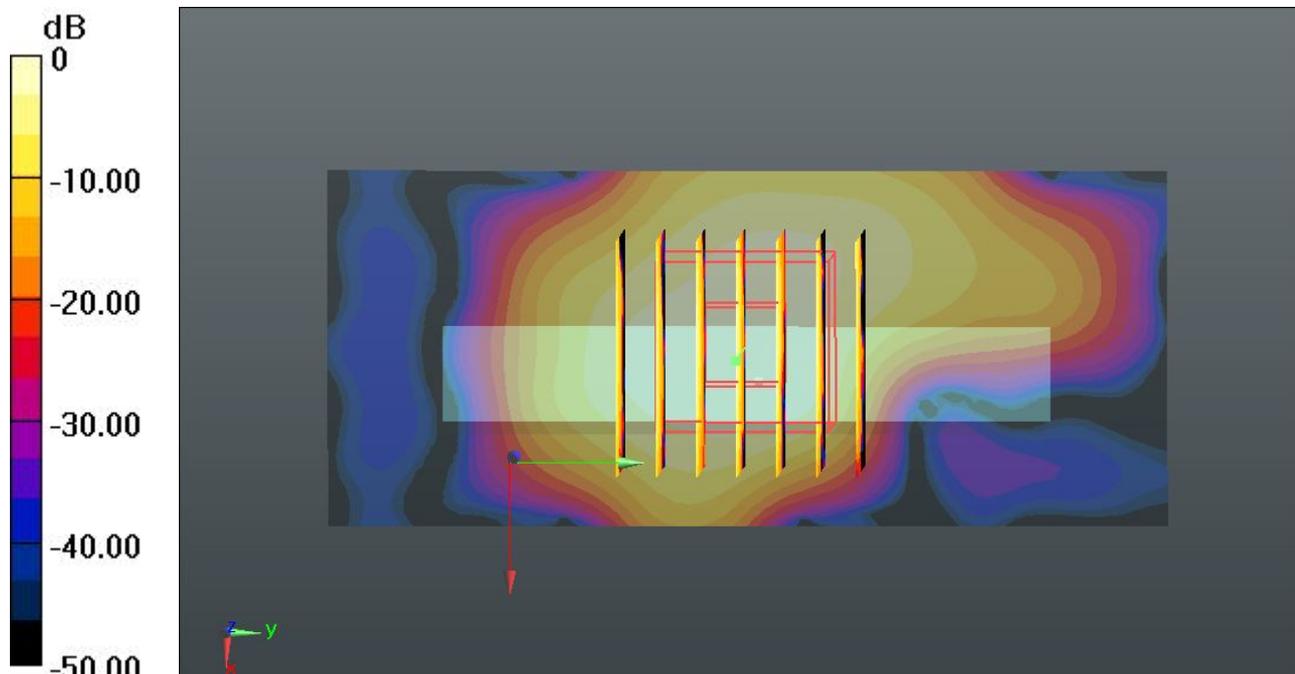
Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.301 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.077 mW/g

SAR(1 g) = 0.037 mW/g; SAR(10 g) = 0.017 mW/g

Maximum value of SAR (measured) = 0.0550 W/kg



0 dB = 0.0550 W/kg