



Report No.: RZA1012-2019SAR



OET 65


TEST REPORT

Product Name	PocketBook eReader
Model	PocketBook 903
FCC ID	YDUERD100
Client	ADVANCED MULTI TECH PTE. LTD

TA Technology (Shanghai) Co., Ltd.



GENERAL SUMMARY

Product Name	PocketBook eReader	Model	PocketBook 903
FCC ID	YDUERD100	Report No.	RZA1012-2019SAR
Client	ADVANCED MULTI TECH PTE. LTD		
Manufacturer	ADVANCED MULTI TECH PTE. LTD		
Standard(s)	<p>IEEE Std C95.1, 1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radiofrequency Electromagnetic Fields, 3 KHz to 300 GHz.</p> <p>OET Bulletin 65 supplement C, published June 2001 including DA 02-1438, published June 2002: Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits. Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65.</p> <p>KDB 616217 D03 SAR Supp Note and Netbook Laptop v01: SAR Evaluation Considerations for Laptop/Notebook/Netbook and Tablet Computers - supplement to KDB 616217.</p> <p>KDB 447498 D01 Mobile Portable RF Exposure v04: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies</p>		
Conclusion	<p>This portable wireless equipment has been measured in all cases requested by the relevant standards. Test results in Chapter 7 of this test report are below limits specified in the relevant standards.</p> <p>General Judgment:</p> <p style="text-align: center;">Pass</p> <p style="text-align: right;">(Stamp) Date of issue: January 31st, 2011</p> 		
Comment	The test result only responds to the measured sample.		

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TABLE OF CONTENT

1.	General Information	5
1.1.	Notes of the test report	5
1.2.	Testing laboratory	5
1.3.	Applicant Information	6
1.4.	Manufacturer Information	6
1.5.	Information of EUT	7
1.6.	The Maximum SAR _{1g} Values and Conducted Power of each tested band	8
1.7.	Test Date	8
2.	Operational Conditions during Test	9
2.1.	General description of test procedures	9
2.2.	Information for the Measurement of CDMA 1x Devices	9
2.2.1.	Output Power Verification	9
2.2.2.	Body SAR Measurement	9
2.3.	Information for the Measurement of CDMA 1x EV-DO Release A Devices	10
2.3.1.	Output Power Verification for EV-DO	10
2.3.2.	SAR Measurement	10
2.4.	Position of module in Portable devices	11
3.	SAR Measurements System Configuration	12
3.1.	SAR Measurement Set-up	12
3.2.	DASY5 E-field Probe System	13
3.2.1.	EX3DV4 Probe Specification	13
3.2.2.	E-field Probe Calibration	14
3.3.	Other Test Equipment	14
3.3.1.	Device Holder for Transmitters	14
3.3.2.	Phantom	15
3.4.	Scanning procedure	15
3.5.	Data Storage and Evaluation	17
3.5.1.	Data Storage	17
3.5.2.	Data Evaluation by SEMCAD	17
3.6.	System check	20
3.7.	Equivalent Tissues	21
4.	Laboratory Environment	21
5.	Characteristics of the Test	22
5.1.	Applicable Limit Regulations	22
5.2.	Applicable Measurement Standards	22
6.	Conducted Output Power Measurement	23
6.1.	Summary	23
6.2.	Conducted Power Results	23
7.	Test Results	25
7.1.	Dielectric Performance	25

TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 4 of 93

7.2.	System Check.....	25
7.3.	Summary of Measurement Results.....	26
7.3.1.	CDMA Cellular (CDMA/EVDO)	26
7.3.2.	CDMA PCS (CDMA/EVDO).....	28
8.	Measurement Uncertainty	30
9.	Main Test Instruments	31
ANNEX A: Test Layout		32
ANNEX B: System Check Results		34
ANNEX C: Graph Results		36
ANNEX D: Probe Calibration Certificate		56
ANNEX E: D835V2 Dipole Calibration Certificate		67
ANNEX F: D1900V2 Dipole Calibration Certificate		76
ANNEX G: DAE4 Calibration Certificate.....		85
ANNEX H: The EUT Appearances		90

1. General Information

1.1. Notes of the test report

TA Technology (Shanghai) Co., Ltd. guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

TA Technology (Shanghai) Co., Ltd. is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. This report only refers to the item that has undergone the test.

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If the electrical report is inconsistent with the printed one, it should be subject to the latter.

1.2. Testing laboratory

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TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 6 of 93

1.3. Applicant Information

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1.4. Manufacturer Information

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TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 7 of 93

1.5. Information of EUT

General information

Device Type:	Portable Device		
Exposure Category:	Uncontrolled Environment / General Population		
Product Name:	PocketBook eReader		
Antenna Type:	Internal Antenna		
Device Operating Configurations :			
Supporting Mode(s):	CDMA Cellular; (tested) CDMA PCS; (tested)		
Test Channel: (Low - Middle - High)	1013 - 384 - 777 25 - 600 - 1175	(CDMA Cellular) (CDMA PCS)	(tested) (tested)
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	CDMA Cellular	824.7 ~ 848.31	869.7 ~ 893.31
	CDMA PCS	1851.25 ~ 1908.75	1931.25 ~ 1988.75

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 8 of 93

Auxiliary equipment details

AE1: Battery

Model: PocketBook Pro
Manufacturer: /
S/N: /

The EUT is a PocketBook eReader, under Model name: PocketBook 903, the device has an internal antenna for Tx/Rx. SAR is tested for CDMA Cellular and CDMA PCS.

The sample under test was selected by the Client.

Components list please refer to documents of the manufacturer.

1.6. The Maximum SAR_{1g} Values and Conducted Power of each tested band

Body Worn Configuration -(SAR Values already used UBTDF:29.66% correct)

Band	Channel	Position	SAR _{1g} (W/kg)
CDMA Cellular	High/777	Back Side	0.973(3.280)
CDMA PCS	High/1175	Back Side	1.151(3.880)

The Maximum Power

Band	Maximum Power (dBm)	
	Peak	Average
CDMA Cellular	29.84	25.42
CDMA PCS	29.33	24.88

Note: The detail Power refers to Table 3 (Power Measurement Results).

1.7. Test Date

The test is performed on January 30, 2011.

2. Operational Conditions during Test

2.1. General description of test procedures

A communication link is set up with a System Simulator (SS) by air link, and a call is established. The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 1013, 384 and 777 respectively in the case of CDMA Cellular, to 25, 600 and 1175 respectively in the case of CDMA PCS. The EUT is commanded to operate at maximum transmitting power.

Connection to the EUT is established via air interface with E5515C, and the EUT is set to maximum output power by E5515C. Using the E5515C Power control is set "All Up Bits" in SAR of CDMA. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. The antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the EUT by at least 30 dB.

2.2. Information for the Measurement of CDMA 1x Devices

2.2.1. Output Power Verification

Test Parameter setup for maximum RF output power according to section 4.4.5 of 3GPP2

Parameter	Units	Value
I or	dBm/1.23MHz	-104
PilotE c /I or	dB	-7
TrafficE c /I or	dB	-7.4

For SAR test, the maximum power output is very important and essential; it is identical under the measurement uncertainty. It is proper to use typical Test Mode 3 (FW RC3, RVS RC3, SO55) as the worst case for SAR test.

2.2.2. Body SAR Measurement

SAR is measured in RC3 with the EUT configured to transmit at full rate using TDSO/SO32, transmit at full rate on FCH with all other code channels disabled. SAR for multiple code channels (FCH+SCHn) is not required when the maximum average output of each RF channel is less than 0.25dB higher than measured with FCH only.

Body SAR in RC1 is not required because the maximum average output of each channel is less than 0.25 dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate using the body exposure configuration that results in the highest SAR for that channel in RC3.

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 10 of 93

Test communication setup meet as followings:

Communication standard between mobile station and base station simulator	3GPP2 C.S0011-B
Radio configuration	RC3 (Supporting CDMA 1X)
Spreading Rate	SR1
Data Rate	9600bps
Service Options	SO55 (loop back mode)
Service Options	SO32 (test data service mode)
Multiplex Options	The mobile station does not support this service.

2.3. Information for the Measurement of CDMA 1x EV-DO Release A Devices

2.3.1. Output Power Verification for EV-DO

Maximum output power is verified on the High, Middle, Low channel according to procedures in section 3.1.1.3.4 of 3GPP2 C.S0033-0/TIA-866 for Rev.0 and section 4.3.4 of 3GPP2 C.S0033-A for Rev. A. For Rev. A, maximum output power for both Subtype 0/1 and Subtype 2 Physical Layer configurations should be measured.

2.3.2. SAR Measurement

SAR is measured using FTAP/RTAP and FETAP/RETAP respectively for Rev.0 and Rev. A devices. The AT is tested with a Reverse Data Channel rate of 153.6kbps IN Subtype 0/1 Physical Layer configurations; and a Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots in Subtype 2 Physical Layer configurations. Both FTAP and FETAP are configured with a Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2kbps with the ACK Channel transmitting in all slots. AT power control should be in "All Bits Up" conditions for TAP/ETAP.

Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev.0. SAR for Subtype 2 Physical Layer configurations is not required for Rev. A when the maximum average output of each RF channels is less than that measured in Subtype 0/1 Physical Layer configurations. Otherwise, SAR is measured on the maximum output channel for Rev. A using the exposure configuration that results in the highest SAR for that RF channels in Rev.0.

For Ev-Do devices that also support 1x RTT voice and/or data operations, SAR is not required for 1x RTT when the maximum average output of each channel is less than ¼ dB higher than that measured in Subtype 0/1 Physical Layer configurations for Rev. 0. Otherwise, the 'Body SAR Measurements' procedures in the 'CDMA-2000 1x Handsets' section should be applied.

2.4. Position of module in Portable devices

According to KDB 447498 D01 Mobile Portable RF Exposure v04 SAR is required for both back and edge with the most conservative exposure conditions, the EUT is tested at the following 5 test positions:

- Test Position 1: The back side of the EUT towards and directed tightly to touch the bottom of the flat phantom. (ANNEX H Picture 5) 0 cm from CDMA antenna-to-user (Please see ANNEX H Picture 4)
- Test Position 2: The top side of the EUT towards and directed tightly to touch the bottom of the flat phantom. (ANNEX H Picture 6) 0.5cm from CDMA antenna-to-user (Please see ANNEX H Picture 4)
- Test Position 3: The bottom side of the EUT towards and directed tightly to touch the bottom of the flat phantom. (ANNEX H Picture 7) 24.7cm from CDMA antenna-to-user (Please see ANNEX H Picture 4)
(This is not the most conservative antenna - to - user distance at edge mode. According to KDB 447498 4) ii) (2) –SAR is required only the edge with the most conservative exposure conditions, No SAR)
- Test Position 4: The left side of the EUT towards and directed tightly to touch the bottom of the flat phantom. (ANNEX H Picture 8) 8.1cm from CDMA antenna-to-user (Please see ANNEX H Picture 4)
(This is not the most conservative antenna - to - user distance at edge mode. According to KDB 447498 4) ii) (2) –SAR is required only the edge with the most conservative exposure conditions, No SAR)
- Test Position 5: The right side of the EUT towards and directed tightly to touch the bottom of the flat phantom. (ANNEX H Picture 9) 6.3cm from CDMA antenna-to-user (Please see ANNEX H Picture 4)

3. SAR Measurements System Configuration

3.1. SAR Measurement Set-up

The DASY5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- A unit to operate the optical surface detector which is connected to the EOC.
- The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
- The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003
- DASY5 software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System validation dipoles allowing to validate the proper functioning of the system.

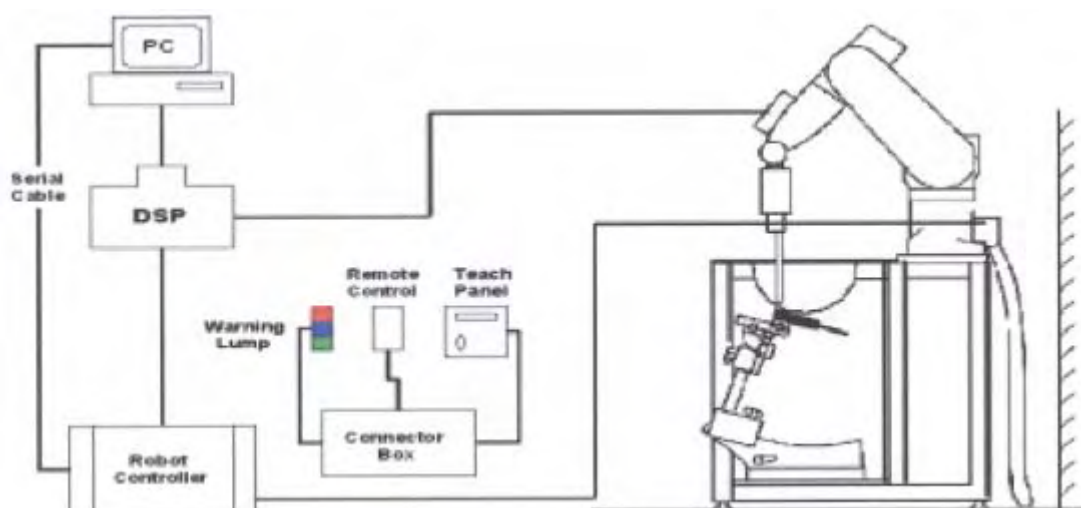


Figure 1 SAR Lab Test Measurement Set-up

3.2. DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

3.2.1. EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC17025 calibration service available
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 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
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.



Figure 2. EX3DV4 E-field Probe



Figure 3. EX3DV4 E-field probe

3.2.2. E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy was evaluated and found to be better than $\pm 0.25\text{dB}$. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

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

Where: Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

Or

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

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

3.3. Other Test Equipment

3.3.1. Device Holder for Transmitters

Construction: Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.) It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI4 and SAM v6.0 Phantoms.

Material: POM, Acrylic glass, Foam

3.3.2. Phantom

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (Oval Flat) phantom defined in IEEE 1528-2003, CENELEC 50361 and IEC 62209. It enables the dosimetric evaluation of wireless portable device usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.

Shell Thickness 2 ± 0.2 mm

Filling Volume Approx. 30 liters

Dimensions 190×600×400 mm (H×L×W)

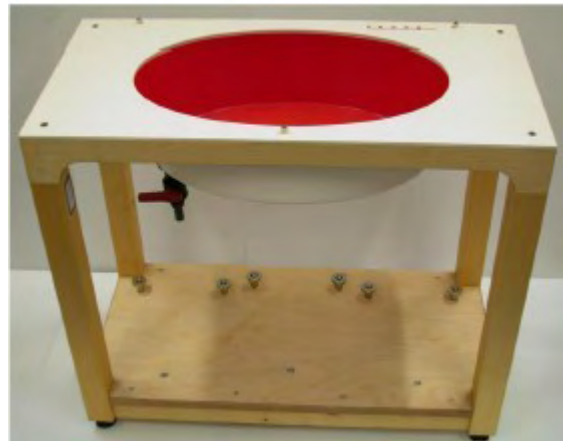


Figure 4.ELI4 Phantom

3.4. Scanning procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

- The "reference" and "drift" measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT's output power and should vary max. $\pm 5\%$.
- The "surface check" measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1 mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within $\pm 30^\circ$.)
- Area Scan
The Area Scan is used as a fast scan in two dimensions to find the area of high field values

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 16 of 93

before running a detailed measurement around the hot spot. Before starting the area scan a grid spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged.

After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

- Zoom Scan

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

- Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY5 system allows evaluations that combine measured data and robot positions, such as:

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

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

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

- A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

3.5. Data Storage and Evaluation

3.5.1. Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

3.5.2. Data Evaluation by SEMCAD

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

Probe parameters:	- Sensitivity	Normi, a_{i0} , a_{i1} , a_{i2}
	- Conversion factor	ConvF _i
	- Diode compression point	Dcp _i
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	
	- Density	

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 18 of 93

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:

$$V_i = U_i + U_i^2 \cdot c f / d c p_i$$

With V_i = compensated signal of channel i (i = x, y, z)

U_i = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

dcp_i = diode compression point (DASY parameter)

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

E-field probes: $E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$

H-field probes: $H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1}f + a_{i2}f^2) / f$

With V_i = compensated signal of channel i (i = x, y, z)

$Norm_i$ = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)²] for E-field Probes

$ConvF$ = sensitivity enhancement in solution

a_{ij} = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

H_i = magnetic field strength of channel i in A/m

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

$$E_{tot} = (E_x^2 + E_y^2 + E_z^2)^{1/2}$$

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

$$SAR = (E_{tot}^2 \cdot \rho) / (\cdot 1000)$$

TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 19 of 93

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/cm³

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

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

with **P_{pwe}** = equivalent power density of a plane wave in mW/cm²

E_{tot} = total electric field strength in V/m

H_{tot} = total magnetic field strength in A/m

3.6. System check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulates, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the Table 5.

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system ($\pm 10\%$).

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.

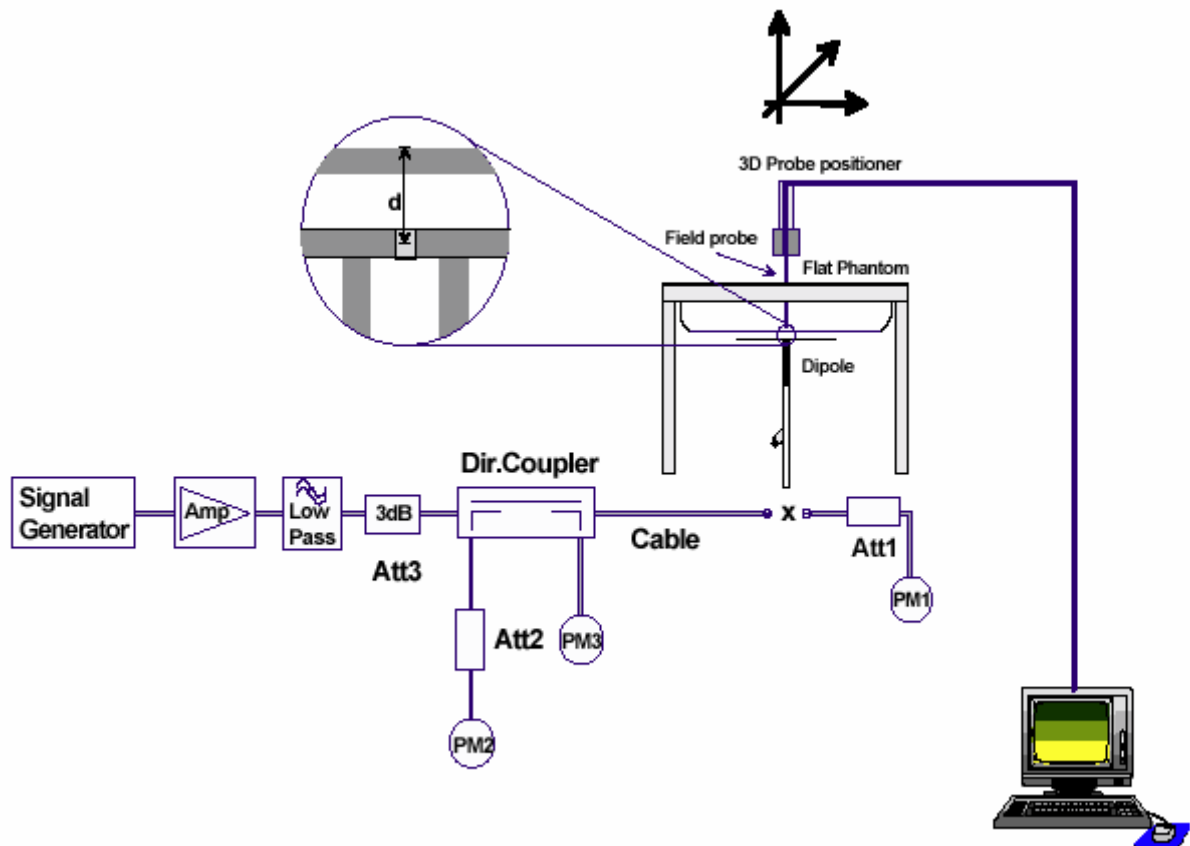


Figure 5 System Check Set-up

3.7. Equivalent Tissues

The liquid is consisted of water, salt and Glycol. The liquid has previously been proven to be suited for worst-case. The Table 1 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the OET 65.

Table 1: Composition of the Body Tissue Equivalent Matter

MIXTURE%	FREQUENCY(Body) 835MHz
Water	52.5
Sugar	45
Salt	1.4
Preventol	0.1
Cellulose	1.0
Dielectric Parameters Target Value	f=835MHz $\epsilon=55.2$ $\sigma=0.97$

MIXTURE%	FREQUENCY (Body) 1900MHz
Water	69.91
Glycol monobutyl	29.96
Salt	0.13
Dielectric Parameters Target Value	f=1900MHz $\epsilon=53.3$ $\sigma=1.52$

4. Laboratory Environment

Table 2: The Ambient Conditions during Test

Temperature	Min. = 20°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

5. Characteristics of the Test

5.1. Applicable Limit Regulations

IEEE Std C95.1, 1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radiofrequency Electromagnetic Fields, 3 KHz to 300 GHz.

5.2. Applicable Measurement Standards

OET Bulletin 65 supplement C, published June 2001 including DA 02-1438, published June 2002: Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits. Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65.

KDB 616217 D03 SAR Supp Note and Netbook Laptop v01: SAR Evaluation Considerations for Laptop/Notebook/Netbook and Tablet Computers – Supplement to KDB 616217

KDB 447498 D01 Mobile Portable RF Exposure v04: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

6. Conducted Output Power Measurement

6.1. Summary

The DUT is tested using an E5515C communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted power.

Conducted output power was measured using an integrated RF connector and attached RF cable.

This result contains conducted output power for the EUT.

6.2. Conducted Power Results

Table 3: Conducted Power Measurement Results

CDMA Cellular (RC3)	Conducted Power(dBm)					
	Channel 1013		Channel 384		Channel 777	
	Peak	Average	Peak	Average	Peak	Average
Before test	28.69	24.70	28.67	24.86	28.23	24.45
After test	28.65	24.68	28.64	24.85	28.22	24.43
CDMA Cellular (RC1)	Conducted Power(dBm)					
	Channel 1013		Channel 384		Channel 777	
	Peak	Average	Peak	Average	Peak	Average
Before test	29.10	24.75	28.99	24.86	28.60	24.50
After test	29.07	24.74	28.97	24.85	28.57	24.46
CDMA Cellular EVDO (Rev.0)	Conducted Power(dBm)					
	Channel 1013		Channel 384		Channel 777	
	Peak	Average	Peak	Average	Peak	Average
Before test	27.84	24.72	28.73	23.88	28.13	24.18
After test	27.85	24.71	28.72	23.89	28.15	24.19
CDMA Cellular EVDO (Rev.A)	Conducted Power(dBm)					
	Channel 1013		Channel 384		Channel 777	
	Peak	Average	Peak	Average	Peak	Average
Before test	29.84	25.42	29.73	24.88	28.73	24.58
After test	29.83	25.41	29.74	24.87	28.72	24.55
CDMA PCS EVDO (RC3)	Conducted Power(dBm)					
	Channel 25		Channel 600		Channel 1175	
	Peak	Average	Peak	Average	Peak	Average
Before test	27.85	24.20	28.26	24.60	28.25	24.64
After test	27.88	24.23	28.27	24.62	28.26	24.65

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 24 of 93

CDMA PCS EVDO (RC1)	Conducted Power(dBm)					
	Channel 25		Channel 600		Channel 1175	
	Peak	Average	Peak	Average	Peak	Average
Before test	28.00	24.20	28.57	24.56	28.48	24.65
After test	28.03	24.24	28.58	24.55	28.47	24.64
CDMA PCS EVDO (Rev.0)	Conducted Power(dBm)					
	Channel 25		Channel 600		Channel 1175	
	Peak	Average	Peak	Average	Peak	Average
Before test	27.78	24.49	28.23	24.52	27.91	24.68
After test	27.75	24.47	28.22	24.50	27.90	24.66
CDMA PCS EVDO (Rev.A)	Conducted Power(dBm)					
	Channel 25		Channel 600		Channel 1175	
	Peak	Average	Peak	Average	Peak	Average
Before test	28.32	24.76	29.33	24.88	28.83	24.58
After test	28.30	24.75	29.31	24.86	28.81	24.56

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 25 of 93

7. Test Results

7.1. Dielectric Performance

Table 4: Dielectric Performance of Body Tissue Simulating Liquid

Frequency	Description	Dielectric Parameters		Temp ℃
		ϵ_r	$\sigma(\text{s/m})$	
835MHz (body)	Target value $\pm 5\%$ window	55.20 52.44 — 57.96	0.97 0.92 — 1.02	/
	Measurement value 2011-1-30	56.24	0.96	22.5
1900MHz (body)	Target value $\pm 5\%$ window	53.3 50.64 — 55.97	1.52 1.44 — 1.60	/
	Measurement value 2011-1-30	52.33	1.52	21.8

7.2. System Check

Table 5: System Check for Body Tissue simulating liquid

Frequency	Description	SAR(W/kg)		Dielectric Parameters		Temp ℃
		10g	1g	ϵ_r	$\sigma(\text{s/m})$	
835MHz	Recommended value $\pm 10\%$ window	1.63 1.47 — 1.79	2.49 2.24 — 2.74	54.6	0.98	/
	Measurement value 2011-1-30	1.58	2.40	56.24	0.96	22.5
1900 MHz	Recommended value $\pm 10\%$ window	5.52 4.97 — 6.57	10.30 9.27 — 11.33	53.5	1.54	/
	Measurement value 2011-1-30	5.17	9.73	52.33	1.52	21.8

Note: 1. The graph results see ANNEX B.

2. Recommended Values used derive from the calibration certificate and 250 mW is used as feeding power to the calibrated dipole.

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 26 of 93

7.3. Summary of Measurement Results

7.3.1. CDMA Cellular (CDMA/EVDO)

Table 6: SAR Values [CDMA Cellular (CDMA/EVDO)]

Limit of SAR		10 g Average	1 g Average	Power Drift	Graph Results
		2.0 W/kg	1.6 W/kg	± 0.21 dB	
Different Test Position	Channel	Measurement Result(W/kg)		Power Drift (dB)	
		10 g Average	1 g Average		
Test Position of EVDO Rev.0					
Test Position 1	High/777	1.770	3.280	0.022	Figure 8
	Middle/384	1.450	2.670	-0.004	Figure 9
	Low/1013	1.020	1.690	-0.001	Figure 10
Test Position 2	High/777	1.600	2.710	0.046	Figure 11
	Middle/384	1.250	2.120	0.095	Figure 12
	Low/1013	1.010	1.830	0.036	Figure 13
Test Position 3	/	/	/	/	/
Test Position 4	/	/	/	/	/
Test Position 5	Middle/384	0.172	0.326	0.020	Figure 14
Worst case of EVDO Rev.0 with Rev.A					
Test Position 1	High/777	1.560	3.250	0.083	Figure 15
Worst case of EVDO Rev.0 with 1xRTT					
Test Position 1	High/777	1.610	3.250	0.051	Figure 16

Note: 1. The value with blue color is the maximum SAR Value of each test band.

2. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB (< 0.8W/kg) lower than the SAR limit, testing at the high and low channels is optional.
3. Upper and lower frequencies were measured at the worst case.

TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 27 of 93

Table 7: SAR Values are scaled for the power drift

Limit of SAR		1 g Average		Power Drift	+ Power Drift 10^(dB/10)	SAR 1g (W/kg) (include + power drift)	
		1.6 W/kg		± 0.21 dB			
Test Case Of Body		Duty Cycle		Power		Duty Cycle	
Test Position	Channel	100%	29.66%	Drift (dB)	100%	29.66%	
Test Position of Body with EVDO Rev.0							
Test Position 1	High/777	3.280	0.973	0.022	1.005	3.296	0.978
	Middle/384	2.670	0.792	0.004	1.001	2.673	0.793
	Low/1013	1.690	0.501	0.001	1.000	1.69	0.501
Test Position 2	High/777	2.710	0.804	110.046	1.011	2.740	0.813
	Middle/384	2.120	0.629	0.095	1.022	2.167	0.643
	Low/1013	1.830	0.543	0.036	1.008	1.845	0.547
Test Position 3	/	/	/	/	/	/	/
Test Position 4	/	/	/	/	/	/	/
Test Position 5	Middle/384	0.326	0.097	0.02000	1.005	0.328	0.097
Test Case Of Body		Duty Cycle		Power Drift (dB)	+ Power Drift 10^(dB/10)	Duty Cycle	
Test Position	Channel	100%	29.66%			100%	29.66%
Worst case of EVDO Rev.0 with Rev.A							
Test Position 1	High/777	3.250	0.964	0.083	1.019	3.312	0.982
Test Case Of Body		Duty Cycle		Power Drift (dB)	+ Power Drift 10^(dB/10)	Duty Cycle	
Test Position	Channel	100%	29.66%			100%	29.66%
Worst case of EVDO Rev.0 with 1xRTT							
Test Position 1	High/777	3.250	0.964	0.051	1.012	3.289	0.976

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 28 of 93

7.3.2. CDMA PCS (CDMA/EVDO)

Table 8: SAR Values [CDMA PCS (CDMA/EVDO)]

Limit of SAR		10 g Average	1 g Average	Power Drift	Graph Results
		2.0 W/kg	1.6 W/kg	± 0.21 dB	
Different Test Position	Channel	Measurement Result(W/kg)		Power Drift (dB)	
		10 g Average	1 g Average		
Test Position of EVDO Rev.0					
Test Position 1	High/1175	0.910	3.220	0.018	Figure 17
	Middle/600	0.780	2.560	0.075	Figure 18
	Low/25	0.730	2.310	0.075	Figure 19
Test Position 2	High/1175	0.430	1.370	-0.039	Figure 20
	Middle/600	0.370	1.050	-0.019	Figure 21
	Low/25	0.210	0.920	-0.093	Figure 22
Test Position 3	/	/	/	/	/
Test Position 4	/	/	/	/	/
Test Position 5	Middle/600	0.190	0.396	0.017	Figure 23
Worst case of EVDO Rev.0 with Rev.A					
Test Position 1	High/1175	1.120	3.670	0.140	Figure 24
Worst case of EVDO Rev.0 with 1xRTT					
Test Position 1	High/1175	1.200	3.880	0.018	Figure 25

Note: 1. The value with blue color is the maximum SAR Value of each test band.

- The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB (< 0.8W/kg) lower than the SAR limit, testing at the high and low channels is optional.
- Upper and lower frequencies were measured at the worst case.

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 29 of 93

Table 9: SAR Values are scaled for the power drift

Limit of SAR		1 g Average		Power Drift	+ Power Drift 10^(dB/10)	SAR 1g (W/kg) (include + power drift)	
		1.6 W/kg		± 0.21 dB			
Test Case Of Body		Duty Cycle		Power		Duty Cycle	
Test Position	Channel	100%	29.66%	Drift (dB)	100%	29.66%	
Test Position of Body with EVDO Rev.0							
Test Position 1	High/1175	3.22	0.955	0.018	1.004	3.233	0.959
	Middle/600	2.56	0.759	0.075	1.017	2.604	0.772
	Low/25	2.31	0.685	0.075	1.017	2.345	0.696
Test Position 2	High/1175	1.37	0.406	0.039	1.009	1.382	0.410
	Middle/600	1.05	0.311	0.019	1.004	1.054	0.313
	Low/25	0.92	0.273	0.093	1.022	0.940	0.279
Test Position 3	/	/	/	/	/	/	/
Test Position 4	/	/	/	/	/	/	/
Test Position 5	Middle/600	0.396	0.117	0.017	1.004	0.398	0.118
Test Case Of Body		Duty Cycle		Power Drift (dB)	+ Power Drift 10^(dB/10)	Duty Cycle	
Test Position	Channel	100%	29.66%			100%	29.66%
Worst case of EVDO Rev.0 with Rev.A							
Test Position 1	High/1175	3.670	1.089	0.1400	1.033	3.791	1.124
Test Case Of Body		Duty Cycle		Power Drift (dB)	+ Power Drift 10^(dB/10)	Duty Cycle	
Test Position	Channel	100%	29.66%			100%	29.66%
Worst case of EVDO Rev.0 with 1xRTT							
Test Position 1	High/1175	3.880	1.151	0.018	1.004	3.896	1.155

No.	source	Type	Uncertainty Value (%)	Probability Distribution	k	c_i	Standard uncertainty u_i (%)	Degree of freedom V_{eff} or v_i
1	System repetivity	A	0.5	N	1	1	0.5	9
Measurement system								
2	probe calibration	B	5.9	N	1	1	5.9	∞
3	axial isotropy of the probe	B	4.7	R	$\sqrt{3}$	$\sqrt{0.5}$	1.9	∞
4	Hemispherical isotropy of the probe	B	9.4	R	$\sqrt{3}$	$\sqrt{0.5}$	3.9	∞
6	boundary effect	B	1.9	R	$\sqrt{3}$	1	1.1	∞
7	probe linearity	B	4.7	R	$\sqrt{3}$	1	2.7	∞
8	System detection limits	B	1.0	R	$\sqrt{3}$	1	0.6	∞
9	readout Electronics	B	1.0	N	1	1	1.0	∞
10	response time	B	0	R	$\sqrt{3}$	1	0	∞
11	integration time	B	4.32	R	$\sqrt{3}$	1	2.5	∞
12	noise	B	0	R	$\sqrt{3}$	1	0	∞
13	RF Ambient Conditions	B	3	R	$\sqrt{3}$	1	1.73	∞
14	Probe Positioner Mechanical Tolerance	B	0.4	R	$\sqrt{3}$	1	0.2	∞
15	Probe Positioning with respect to Phantom Shell	B	2.9	R	$\sqrt{3}$	1	1.7	∞
16	Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	B	3.9	R	$\sqrt{3}$	1	2.3	∞
Test sample Related								
17	-Test Sample Positioning	A	2.9	N	1	1	2.9	5
18	-Device Holder Uncertainty	A	4.1	N	1	1	4.1	5
19	-Output Power Variation - SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.9	∞
Physical parameter								

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 31 of 93

20	-phantom	B	4.0	R	$\sqrt{3}$	1	2.3	∞
21	-liquid conductivity (deviation from target)	B	5.0	R	$\sqrt{3}$	0.6 4	1.8	∞
22	-liquid conductivity (measurement uncertainty)	B	5.0	N	1	0.6 4	3.2	∞
23	-liquid permittivity (deviation from target)	B	5.0	R	$\sqrt{3}$	0.6	1.7	∞
24	-liquid permittivity (measurement uncertainty)	B	5.0	N	1	0.6	3.0	∞
Combined standard uncertainty		$u_c' = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$					12.0	
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$		N	k=2		24.0	

9. Main Test Instruments

Table 10: List of Main Instruments

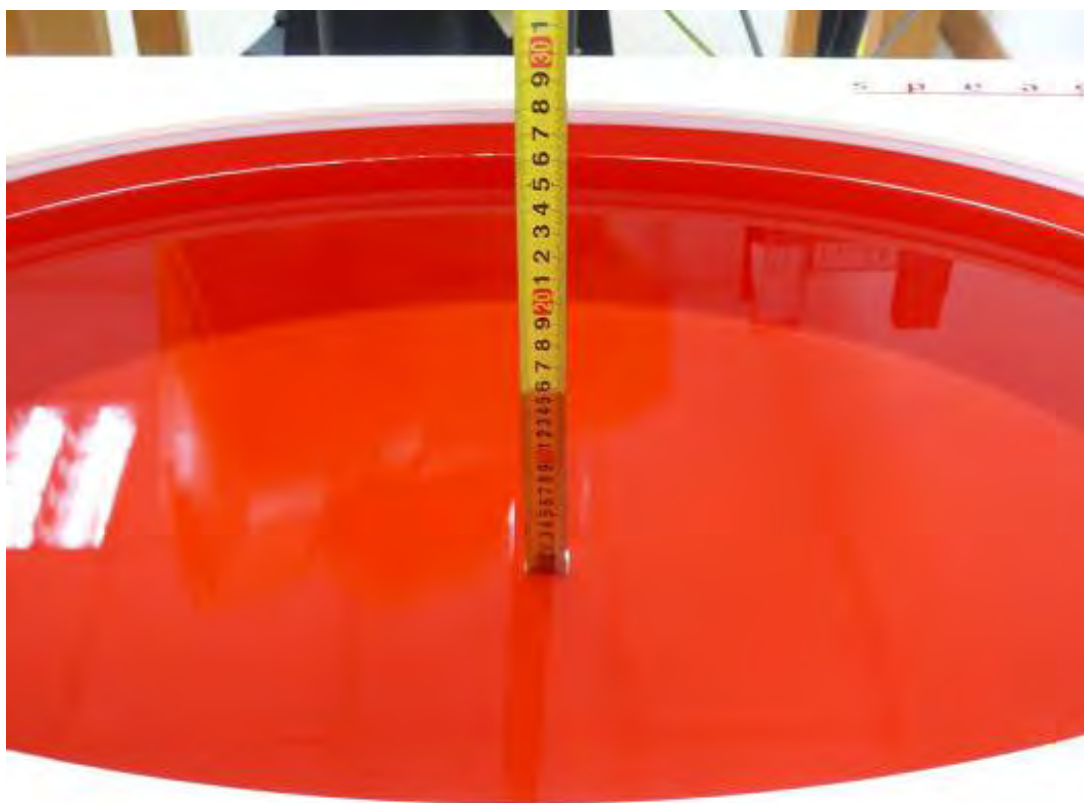
No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	Agilent 8753E	US37390326	September 13, 2010	One year
02	Dielectric Probe Kit	Agilent 85070E	US44020115	No Calibration Requested	
03	Power meter	Agilent E4417A	GB41291714	March 13, 2010	One year
04	Power sensor	Agilent N8481H	MY50350004	September 26, 2010	One year
05	Signal Generator	HP 8341B	2730A00804	September 13, 2010	One year
06	Amplifier	IXA-020	0401	No Calibration Requested	
07	E-field Probe	EX3DV4	3677	November 24, 2010	One year
08	DAE	DAE4	871	November 18, 2010	One year
09	Validation Kit 835MHz	D835V2	4d092	January 14, 2010	Two years
10	Validation Kit 1900MHz	D1900V2	5d018	June 15, 2010	Two years

*****END OF REPORT BODY*****

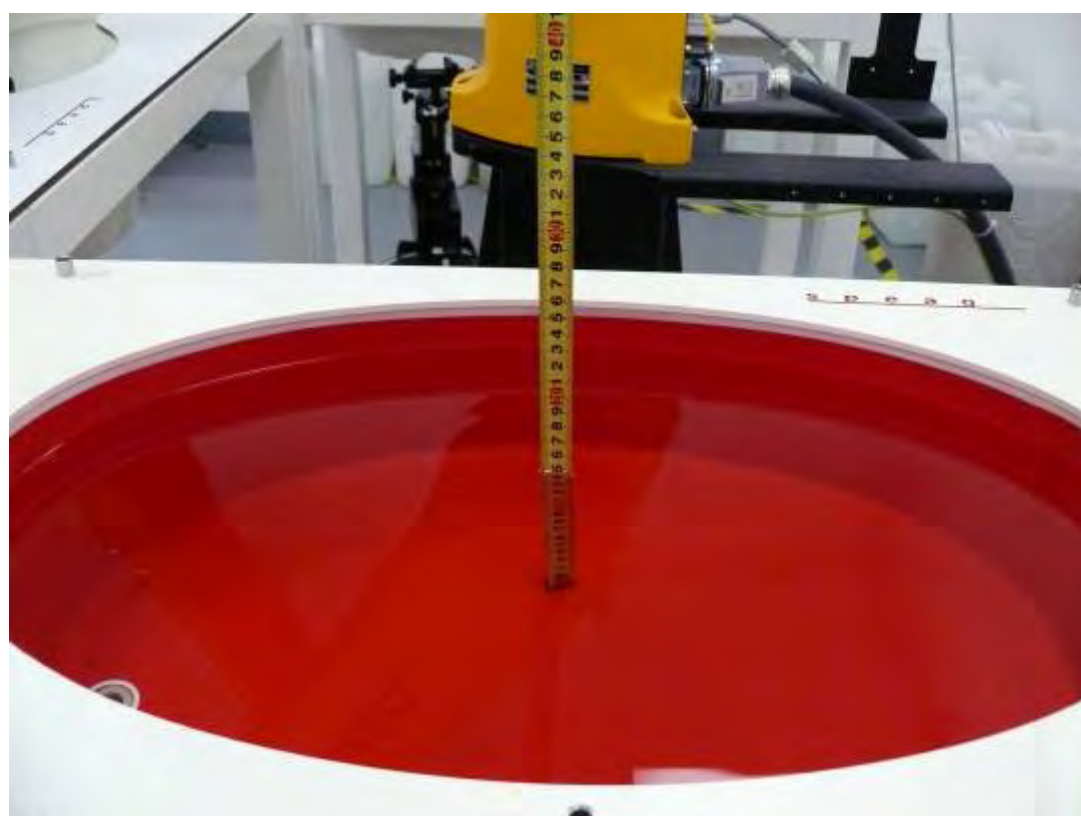
ANNEX A: Test Layout



Picture 1: Specific Absorption Rate Test Layout



Picture 2: Liquid depth in the flat Phantom (835 MHz)
(15.3cm depth)



Picture 3: Liquid depth in the flat Phantom (1900 MHz)
(15.2cm depth)

ANNEX B: System Check Results

System Performance Check at 835 MHz Body TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d092

Date/Time: 1/30/2011 8:05:49 AM

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.96 \text{ mho/m}$; $\epsilon_r = 56.24$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C

Liquid Temperature: 22.5°C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(10.33, 10.33, 10.33); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: SAM1; Type: SAM;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

d=15mm, Pin=250mW/Area Scan (101x121x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.93 mW/g

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

Reference Value = 55.7 V/m ; Power Drift = -0.017 dB

Peak SAR (extrapolated) = 3.59 W/kg

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

Maximum value of SAR (measured) = 2.92 mW/g

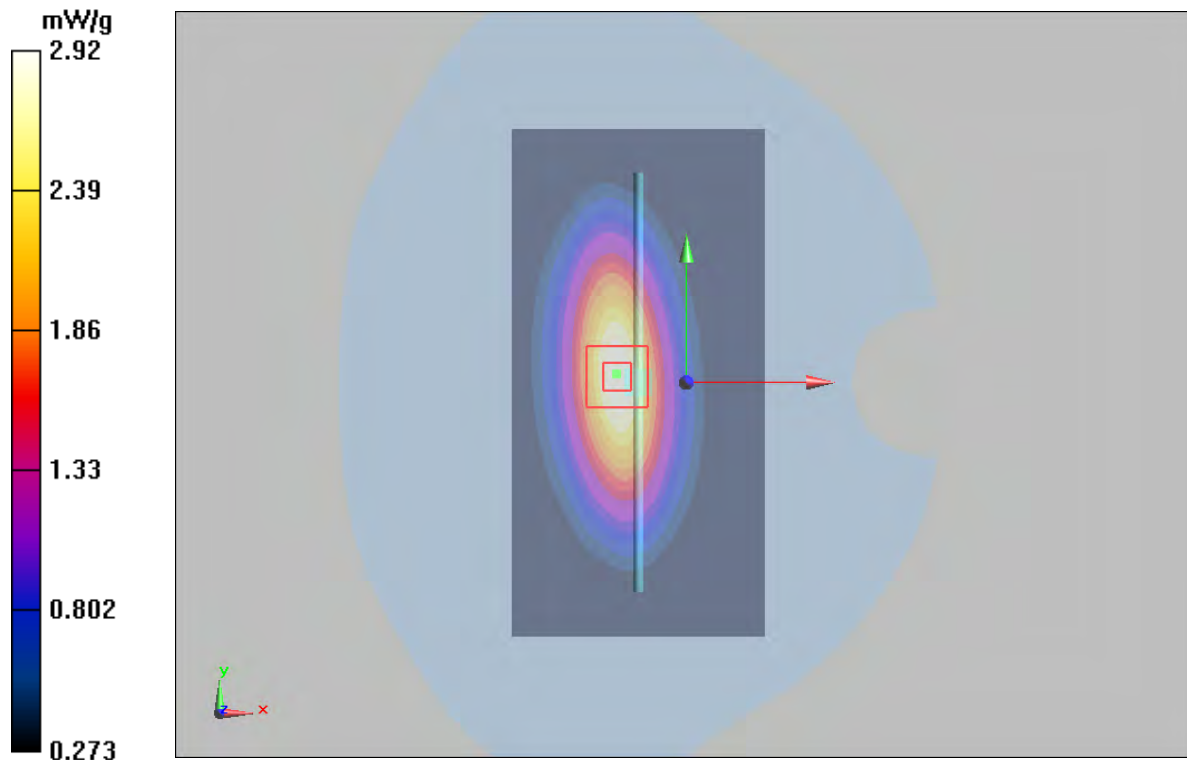


Figure 6 System Performance Check 835MHz 250mW

System Performance Check at 1900 MHz Body TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d018

Date/Time: 1/30/2011 3:59:19 PM

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.52 \text{ mho/m}$; $\epsilon_r = 52.33$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.8°C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.77, 7.77, 7.77); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: SAM2; Type: SAM;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 12.5 mW/g

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

Reference Value = 75.9 V/m; Power Drift = 0.051 dB

Peak SAR (extrapolated) = 16.8 W/kg

SAR(1 g) = 9.73 mW/g; SAR(10 g) = 5.17 mW/g

Maximum value of SAR (measured) = 11 mW/g

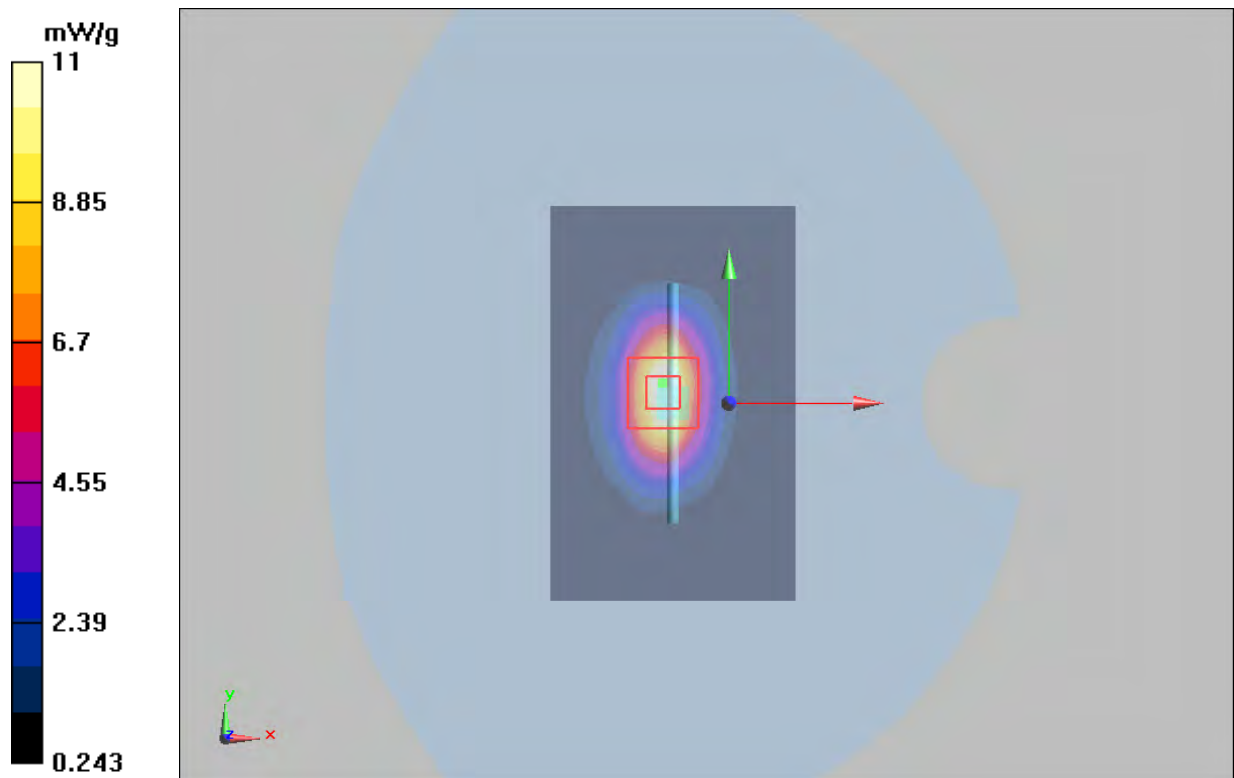


Figure 7 System Performance Check 1900MHz 250mW

ANNEX C: Graph Results

CDMA Cellular EVDO Rev.0 Test Position 1 High

Date/Time: 1/30/2011 10:34:23 AM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 848.31$ MHz; $\sigma = 0.978$ mho/m; $\epsilon_r = 56.1$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(10.33, 10.33, 10.33); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 High/Area Scan (111x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 3.04 mW/g

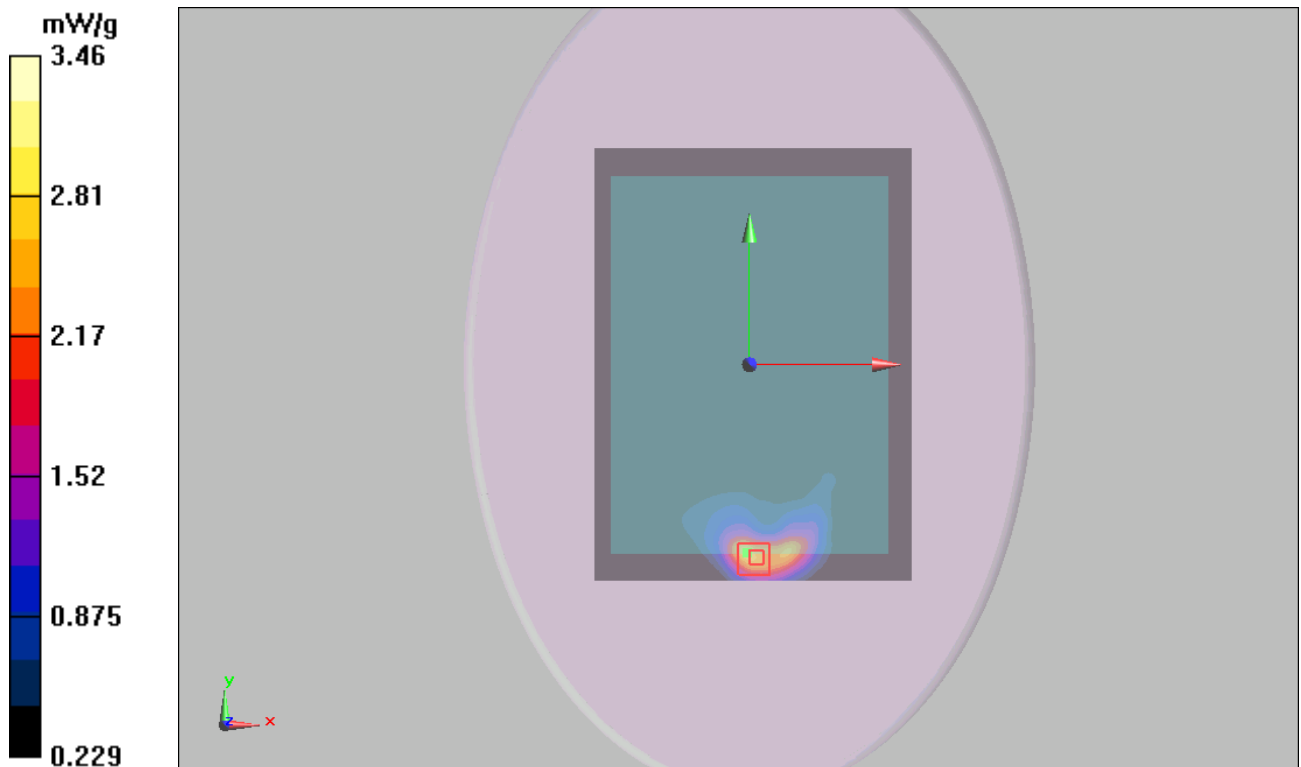
Test Position 1 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.19 V/m; Power Drift = 0.022 dB

Peak SAR (extrapolated) = 9.03 W/kg

SAR(1 g) = 3.28 mW/g; SAR(10 g) = 1.77 mW/g

Maximum value of SAR (measured) = 3.46 mW/g



TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 37 of 93

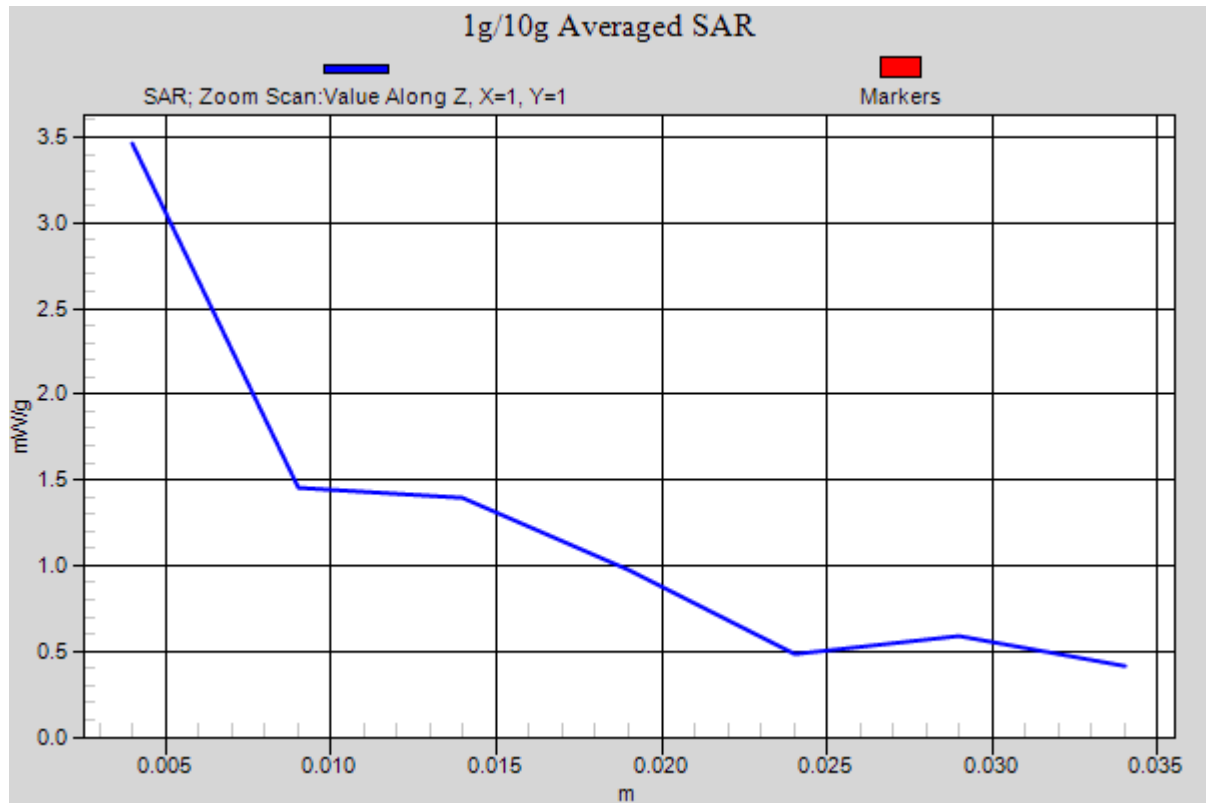


Figure 8 CDMA Cellular EVDO Rev.0 Test Position 1 Channel 777

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 38 of 93

CDMA Cellular EVDO Rev.0 Test Position 1 Middle

Date/Time: 1/30/2011 9:26:21 AM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 837$ MHz; $\sigma = 0.967$ mho/m; $\epsilon_r = 56.2$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(10.33, 10.33, 10.33); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 Middle/Area Scan (111x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.6 mW/g

Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.35 V/m; Power Drift = -0.004 dB

Peak SAR (extrapolated) = 5.07 W/kg

SAR(1 g) = 2.67 mW/g; SAR(10 g) = 1.45 mW/g

Maximum value of SAR (measured) = 3.01 mW/g

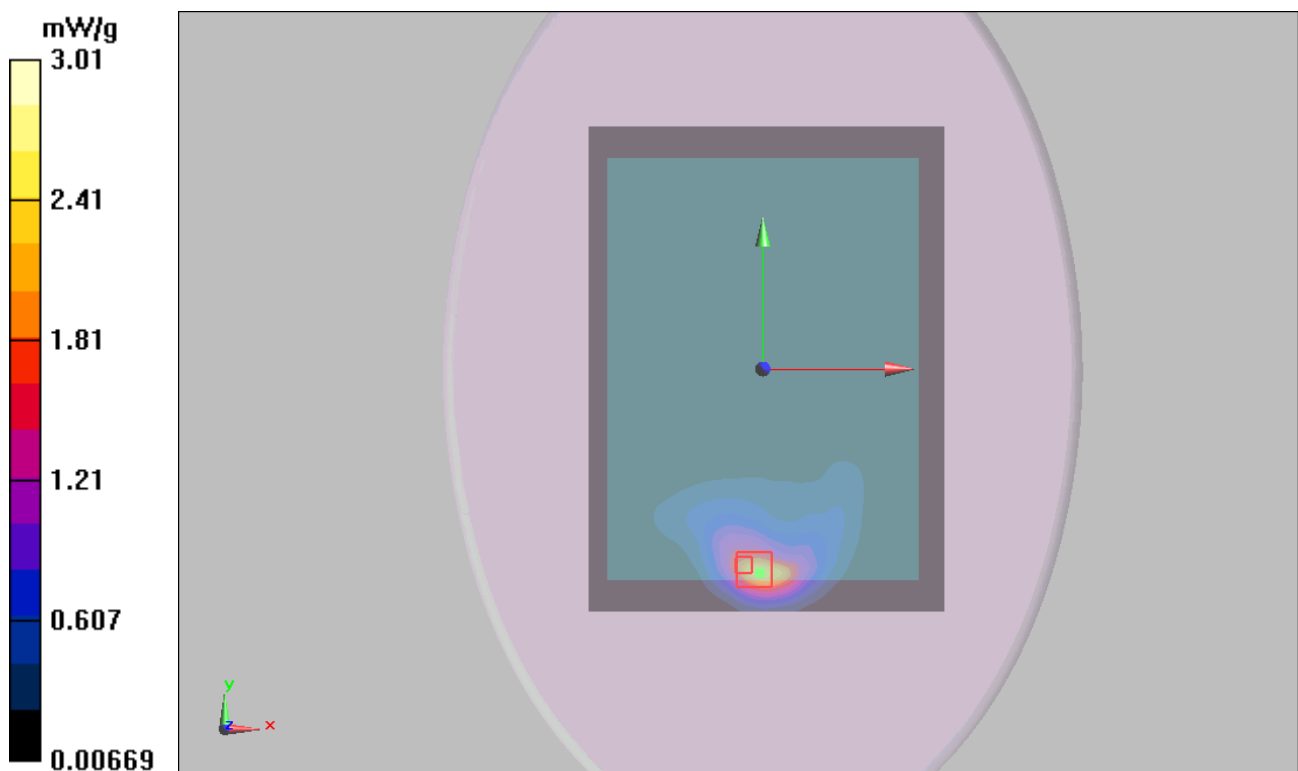


Figure 9 CDMA Cellular EVDO Rev.0 Test Position 1 Channel 384

CDMA Cellular EVDO Rev.0 Test Position 1 Low

Date/Time: 1/30/2011 11:04:43 AM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 825 \text{ MHz}$; $\sigma = 0.957 \text{ mho/m}$; $\epsilon_r = 56.4$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(10.33, 10.33, 10.33); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 Low/Area Scan (111x151x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 1.9 mW/g

Test Position 1 Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 2.43 V/m ; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 2.94 W/kg

SAR(1 g) = 1.69 mW/g ; SAR(10 g) = 1.02 mW/g

Maximum value of SAR (measured) = 1.89 mW/g

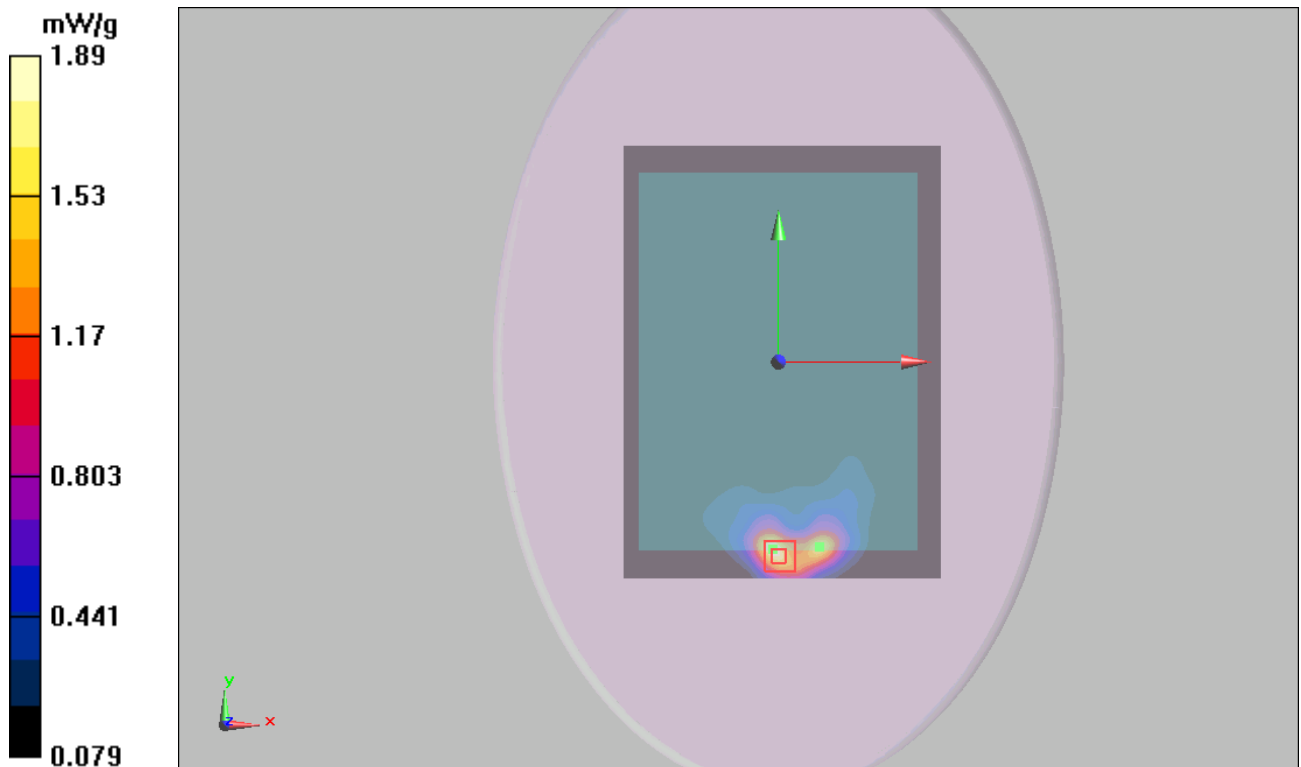


Figure 10 CDMA Cellular EVDO Rev.0 Test Position 1 Channel 1013

CDMA Cellular EVDO Rev.0 Test Position 2 High

Date/Time: 1/30/2011 12:11:55 PM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 848.31$ MHz; $\sigma = 0.978$ mho/m; $\epsilon_r = 56.1$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(10.33, 10.33, 10.33); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 2 High/Area Scan (31x121x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.8 mW/g

Test Position 2 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 45.5 V/m; Power Drift = 0.046 dB

Peak SAR (extrapolated) = 4.55 W/kg

SAR(1 g) = 2.71 mW/g; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 3.11 mW/g

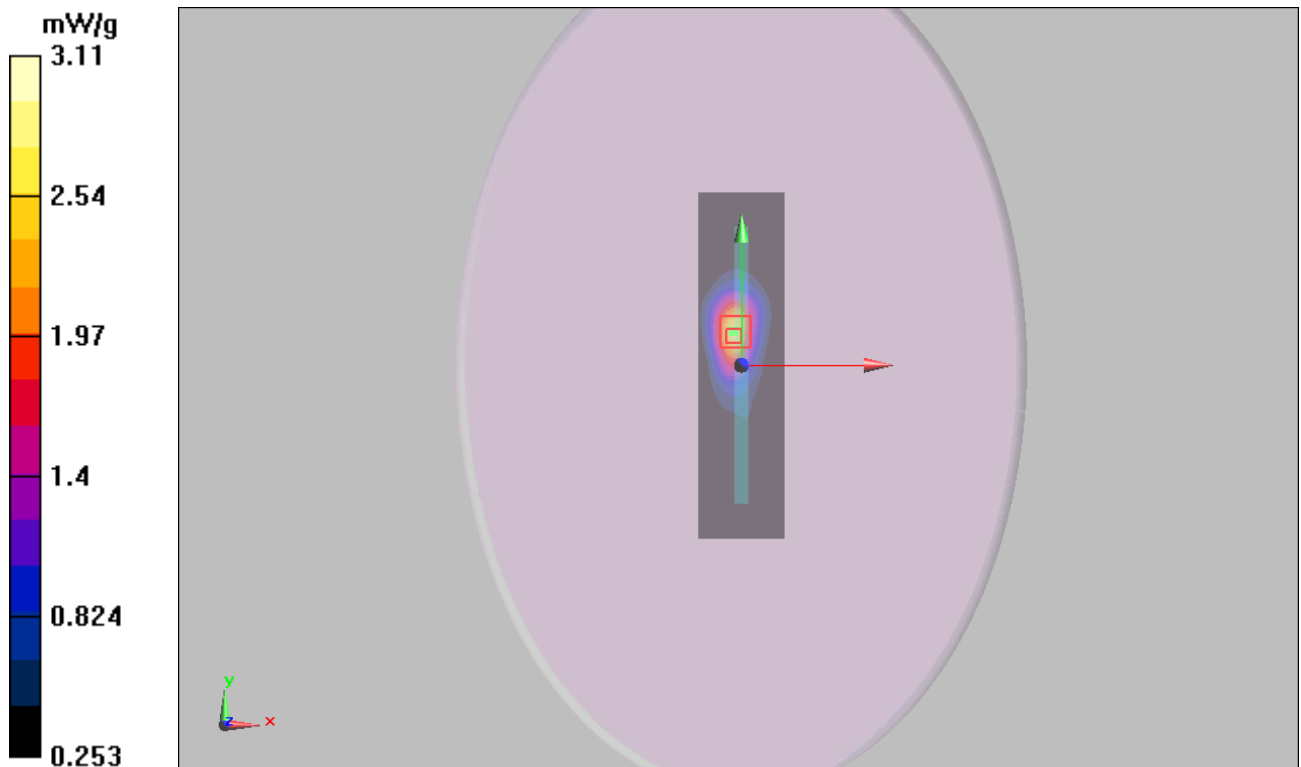


Figure 11 CDMA Cellular EVDO Rev.0 Test Position 2 Channel 777

CDMA Cellular EVDO Rev.0 Test Position 2 Middle

Date/Time: 1/30/2011 11:43:27 AM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 0.967 \text{ mho/m}$; $\epsilon_r = 56.2$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(10.33, 10.33, 10.33); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 2 Middle/Area Scan (31x121x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 2.13 mW/g

Test Position 2 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$,
 $dz=5\text{mm}$

Reference Value = 39.7 V/m ; Power Drift = 0.095 dB

Peak SAR (extrapolated) = 4.45 W/kg

SAR(1 g) = 2.12 mW/g ; SAR(10 g) = 1.25 mW/g

Maximum value of SAR (measured) = 2.4 mW/g

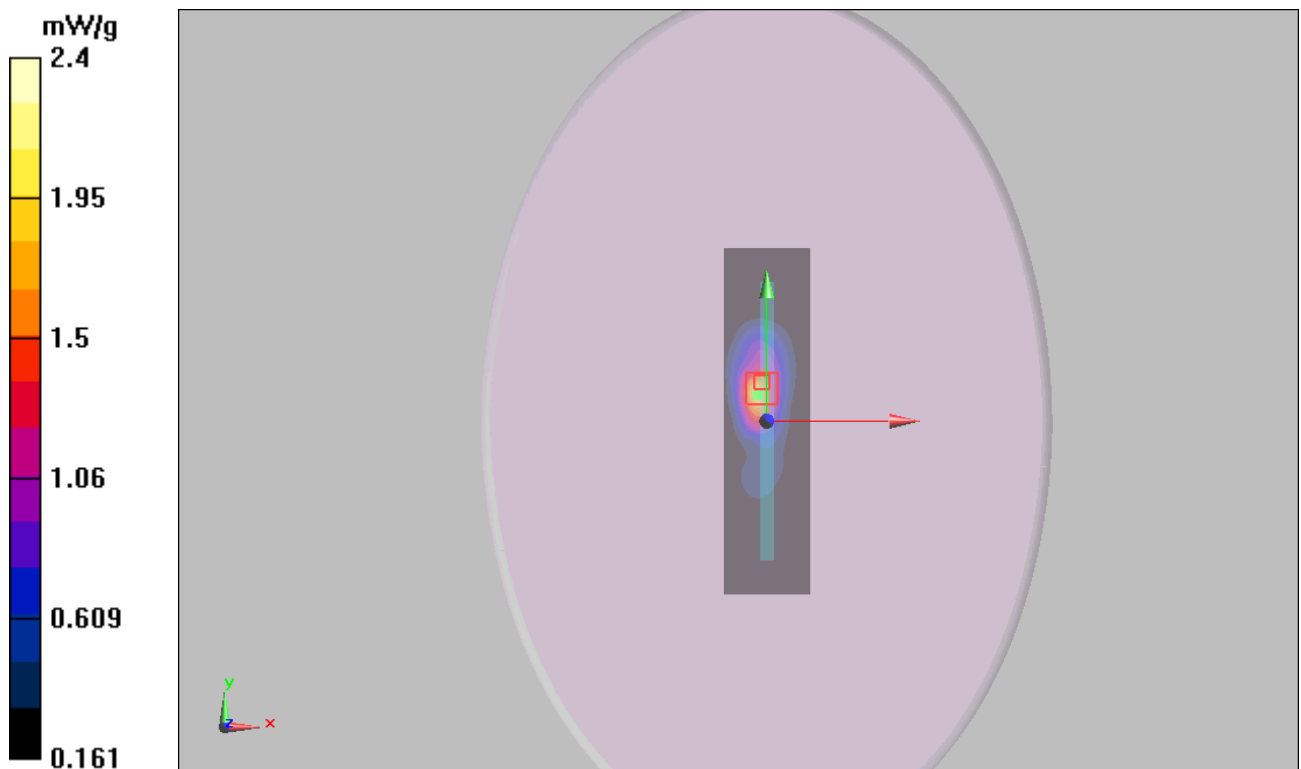


Figure 12 CDMA Cellular EVDO Rev.0 Test Position 2 Channel 384

CDMA Cellular EVDO Rev.0 Test Position 2 Low

Date/Time: 1/30/2011 11:57:57 AM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 825 \text{ MHz}$; $\sigma = 0.957 \text{ mho/m}$; $\epsilon_r = 56.4$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(10.33, 10.33, 10.33); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 2 Low/Area Scan (31x121x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 1.75 mW/g

Test Position 2 Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 36.1 V/m ; Power Drift = 0.036 dB

Peak SAR (extrapolated) = 3.17 W/kg

SAR(1 g) = 1.83 mW/g ; SAR(10 g) = 1.01 mW/g

Maximum value of SAR (measured) = 2.27 mW/g

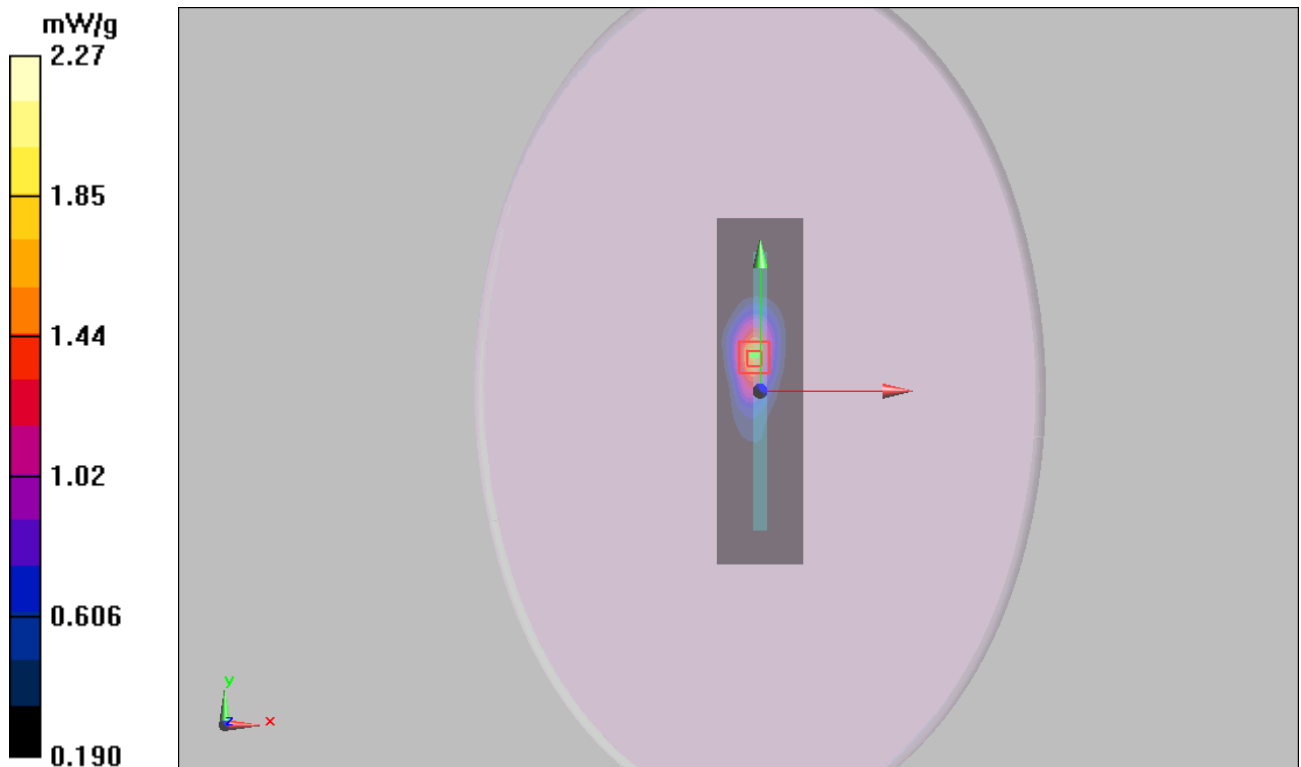


Figure 13 CDMA Cellular EVDO Rev.0 Test Position 2 Channel 1013

CDMA Cellular EVDO Rev.0 Test Position 5 Middle

Date/Time: 1/30/2011 12:57:41 PM

Communication System: CDMA Cellular EVDO Re.0; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 0.967 \text{ mho/m}$; $\epsilon_r = 56.2$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(10.33, 10.33, 10.33); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 5 Middle/Area Scan (31x151x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.328 mW/g

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

Reference Value = 6.91 V/m ; Power Drift = 0.020 dB

Peak SAR (extrapolated) = 0.652 W/kg

SAR(1 g) = 0.326 mW/g ; SAR(10 g) = 0.172 mW/g

Maximum value of SAR (measured) = 0.373 mW/g

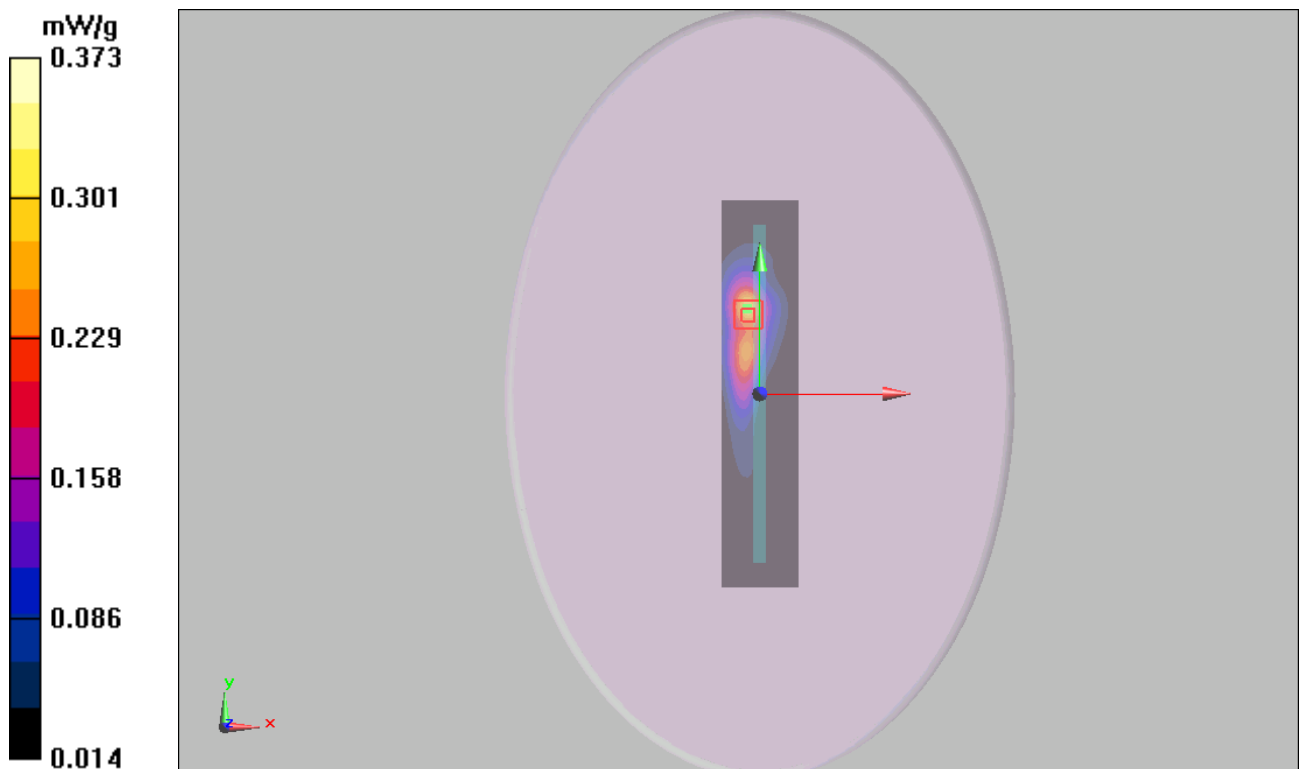


Figure 14 CDMA Cellular EVDO Rev.0 Test Position 5 Channel 384

CDMA Cellular EVDO Rev.A Test Position 1 High

Date/Time: 1/30/2011 1:41:51 PM

Communication System: CDMA Cellular EVDO Re.A; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 848.31$ MHz; $\sigma = 0.978$ mho/m; $\epsilon_r = 56.1$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(10.33, 10.33, 10.33); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 High/Area Scan (111x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 3.52 mW/g

Test Position 1 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.97 V/m; Power Drift = 0.083 dB

Peak SAR (extrapolated) = 9.91 W/kg

SAR(1 g) = 3.25 mW/g; SAR(10 g) = 1.56 mW/g

Maximum value of SAR (measured) = 3.53 mW/g

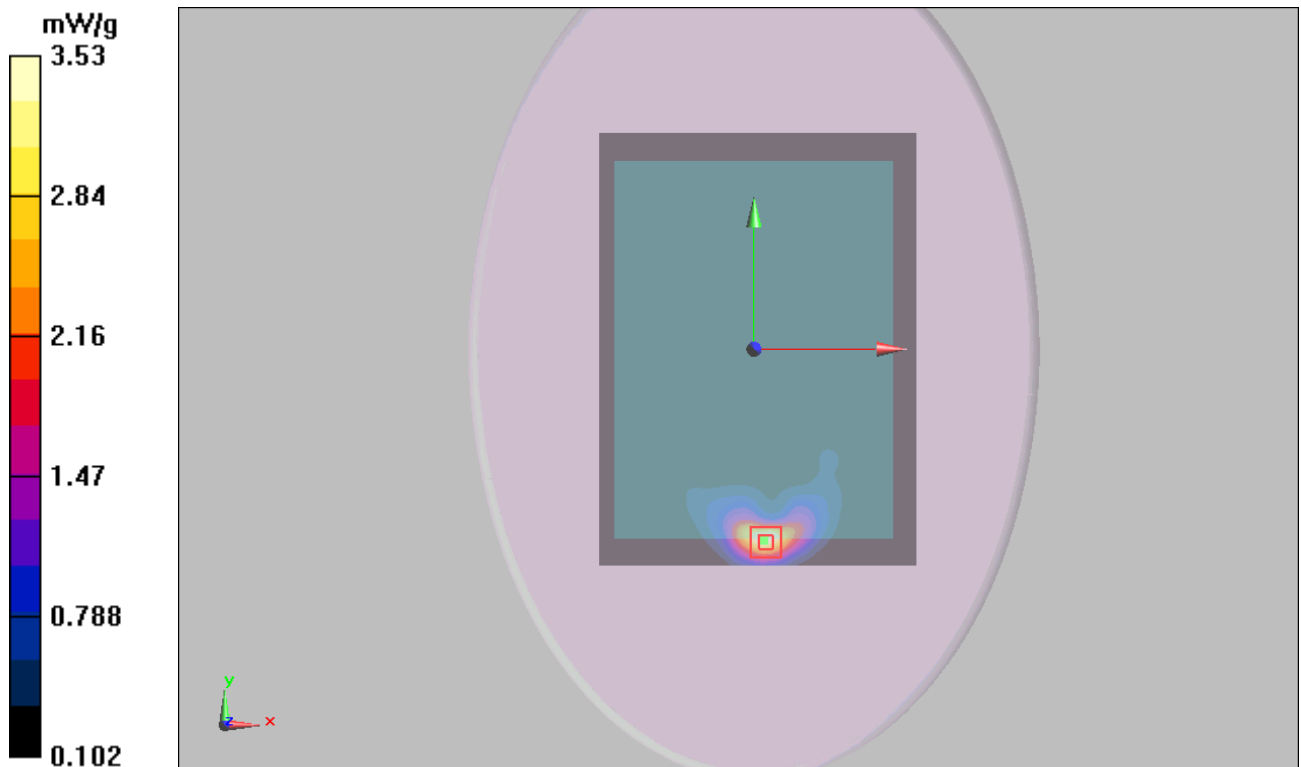


Figure 15 CDMA Cellular EVDO Rev.A Test Position 1 Channel 777

CDMA Cellular 1xRTT Test Position 1 High

Date/Time: 1/30/2011 3:45:05 PM

Communication System: CDMA Cellular; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 848.31$ MHz; $\sigma = 0.978$ mho/m; $\epsilon_r = 56.1$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(10.33, 10.33, 10.33); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 High/Area Scan (111x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 4.37 mW/g

Test Position 1 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.21 V/m; Power Drift = 0.051 dB

Peak SAR (extrapolated) = 8.28 W/kg

SAR(1 g) = 3.25 mW/g; SAR(10 g) = 1.61 mW/g

Maximum value of SAR (measured) = 3.37 mW/g

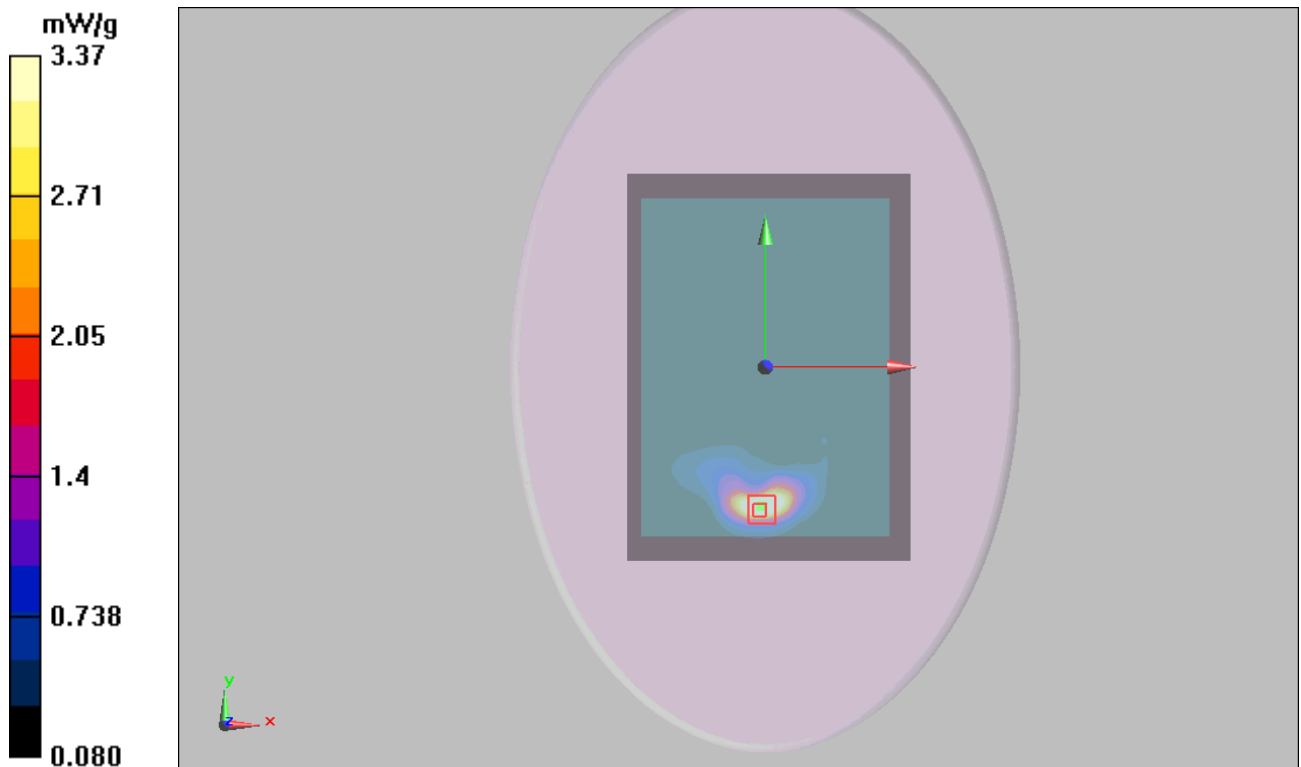


Figure 16 CDMA Cellular 1xRTT Test Position 1 Channel 777

CDMA PCS EVDO Rev.0 Test Position 1 High

Date/Time: 1/30/2011 7:48:02 PM

Communication System: CDMA PCS EVDO Re.0; Frequency: 1908.75 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1908.75$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 53$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.77, 7.77, 7.77); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 High/Area Scan (111x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 3.46 mW/g

Test Position 1 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.3 V/m; Power Drift = 0.018 dB

Peak SAR (extrapolated) = 7.9 W/kg

SAR(1 g) = 3.22 mW/g; SAR(10 g) = 0.91 mW/g

Maximum value of SAR (measured) = 3.53 mW/g

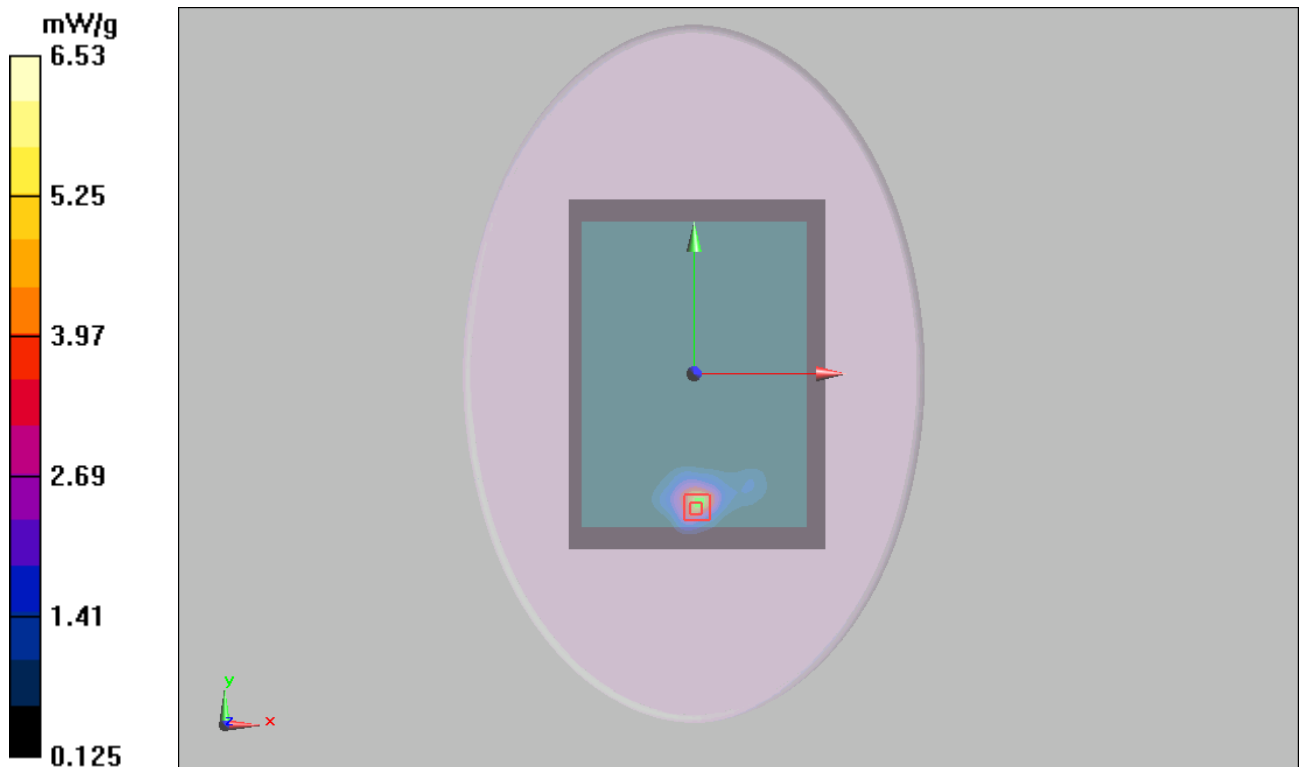


Figure 17 CDMA PCS EVDO Rev.0 Test Position 1 Channel 1175

CDMA PCS EVDO Rev.0 Test Position 1 Middle

Date/Time: 1/30/2011 7:18:11 PM

Communication System: CDMA PCS EVDO Re.0; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.49 \text{ mho/m}$; $\epsilon_r = 53.1$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.77, 7.77, 7.77); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 Middle/Area Scan (111x151x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 2.51 mW/g

Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$,
 $dz=5\text{mm}$

Reference Value = 3.04 V/m ; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 6.9 W/kg

SAR(1 g) = 2.56 mW/g ; SAR(10 g) = 0.78 mW/g

Maximum value of SAR (measured) = 2.74 mW/g

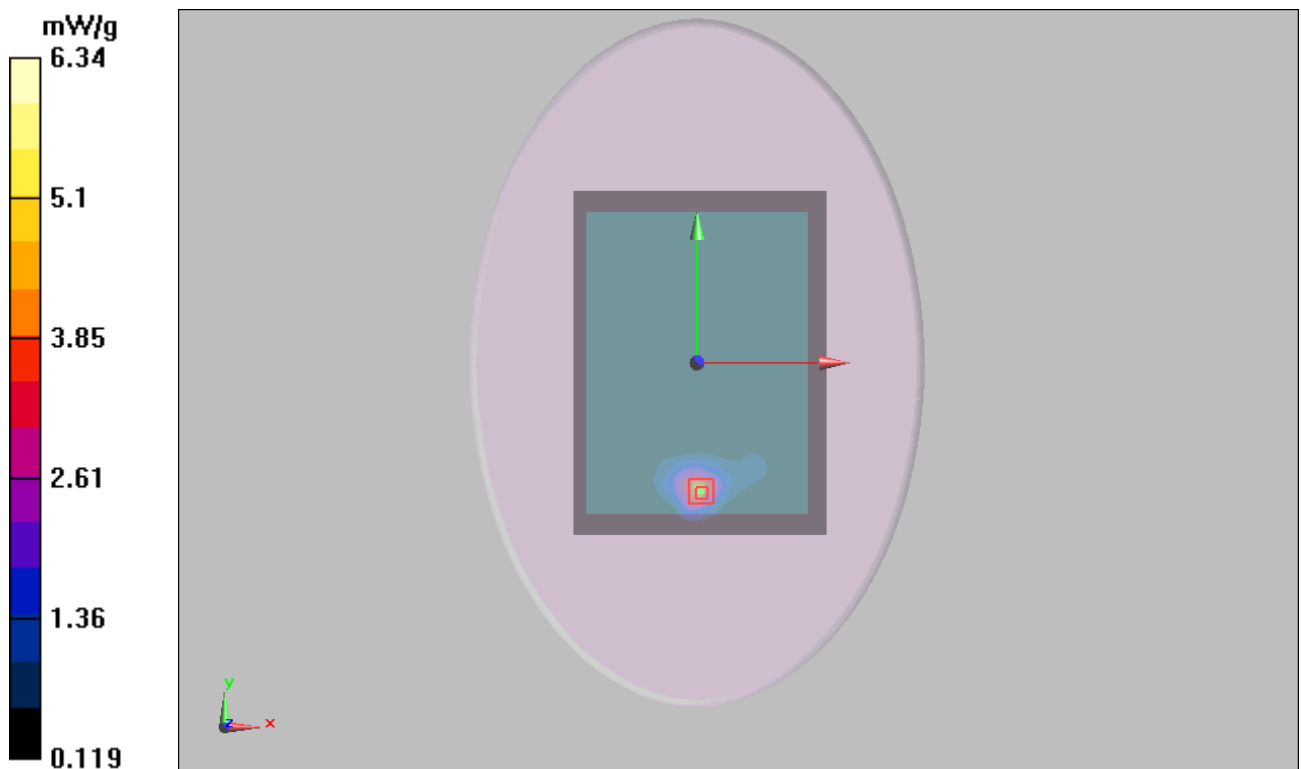


Figure 18 CDMA PCS EVDO Rev.0 Test Position 1 Channel 600

CDMA PCS EVDO Rev.0 Test Position 1 Low

Date/Time: 1/30/2011 8:17:41 PM

Communication System: CDMA PCS EVDO Re.0; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1852 \text{ MHz}$; $\sigma = 1.47 \text{ mho/m}$; $\epsilon_r = 53.2$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.77, 7.77, 7.77); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 Low/Area Scan (111x151x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 2.33 mW/g

Test Position 1 Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.35 V/m ; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 7.3 W/kg

SAR(1 g) = 2.31 mW/g ; SAR(10 g) = 0.730 mW/g

Maximum value of SAR (measured) = 2.45 mW/g

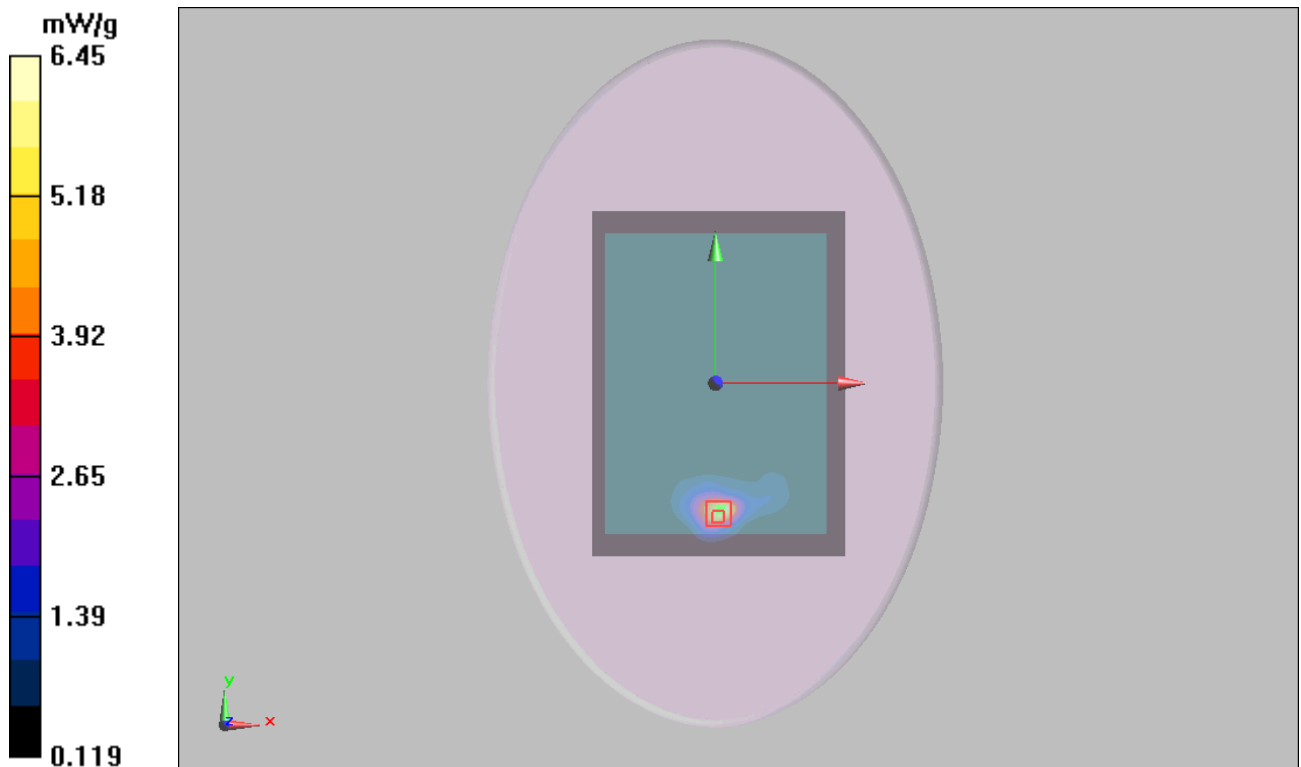


Figure 19 CDMA PCS EVDO Rev.0 Test Position 1 Channel 25

CDMA PCS EVDO Rev.0 Test Position 2 High

Date/Time: 1/30/2011 6:05:22 PM

Communication System: CDMA PCS EVDO Re.0; Frequency: 1908.75 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1908.75$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 53$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.77, 7.77, 7.77); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 2 High/Area Scan (31x121x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.14 mW/g

Test Position 2 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 27.1 V/m; Power Drift = -0.039 dB

Peak SAR (extrapolated) = 4.48 W/kg

SAR(1 g) = 1.37 mW/g; SAR(10 g) = 0.43 mW/g

Maximum value of SAR (measured) = 2.03 mW/g

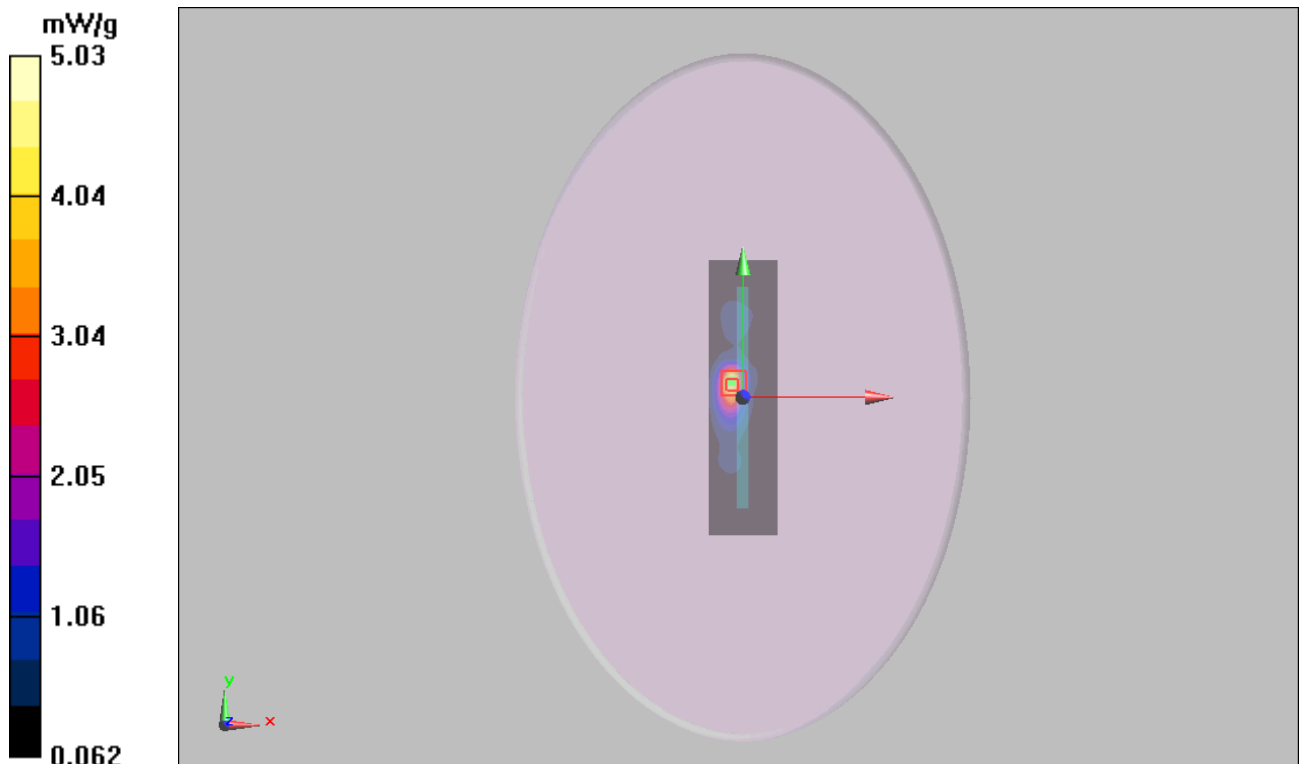


Figure 20 CDMA PCS EVDO Rev.0 Test Position 2 Channel 1175

CDMA PCS EVDO Rev.0 Test Position 2 Middle

Date/Time: 1/30/2011 5:18:30 PM

Communication System: CDMA PCS EVDO Re.0; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.49 \text{ mho/m}$; $\epsilon_r = 53.1$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.77, 7.77, 7.77); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 2 Middle/Area Scan (31x121x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 1.53 mW/g

Test Position 2 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$,
 $dz=5\text{mm}$

Reference Value = 24.8 V/m ; Power Drift = -0.019 dB

Peak SAR (extrapolated) = 3.78 W/kg

SAR(1 g) = 1.05 mW/g ; SAR(10 g) = 0.37 mW/g

Maximum value of SAR (measured) = 1.83 mW/g

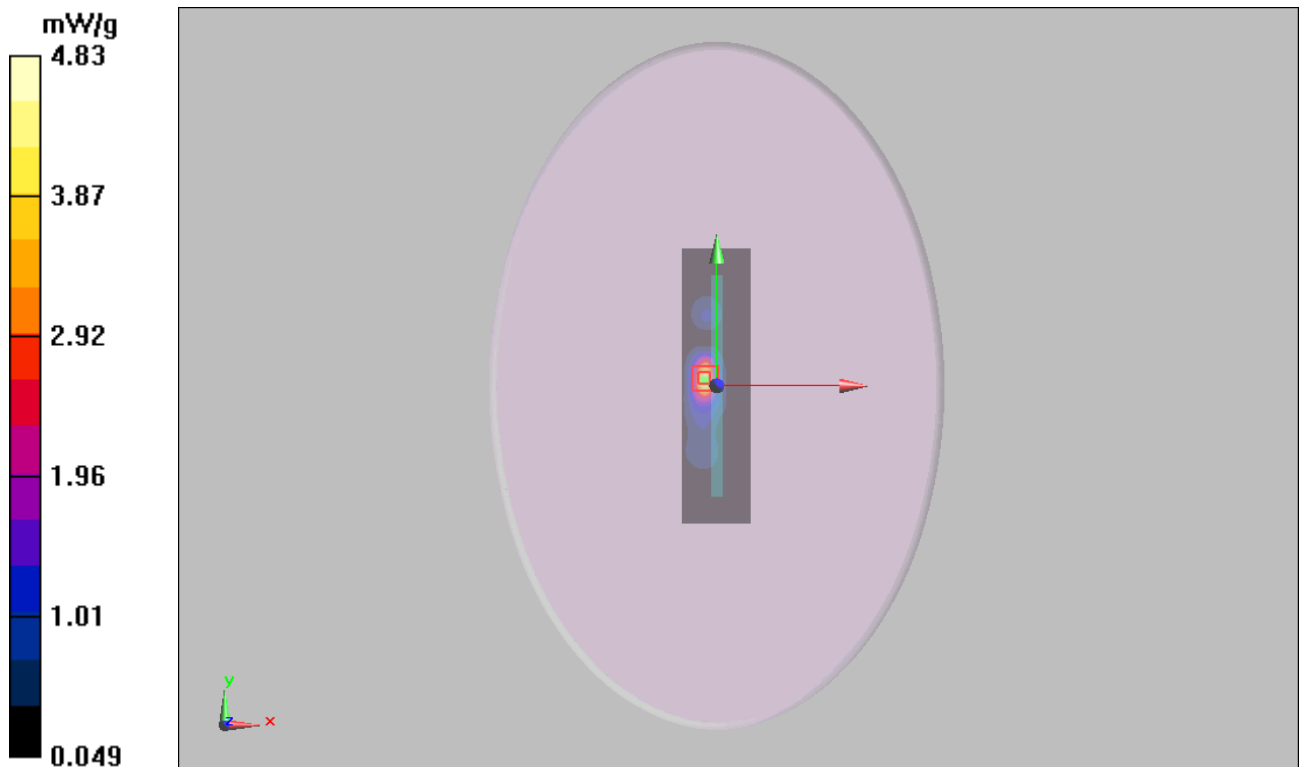


Figure 21 CDMA PCS EVDO Rev.0 Test Position 2 Channel 600

CDMA PCS EVDO Rev.0 Test Position 2 Low

Date/Time: 1/30/2011 6:19:34 PM

Communication System: CDMA PCS EVDO Re.0; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1852 \text{ MHz}$; $\sigma = 1.47 \text{ mho/m}$; $\epsilon_r = 53.2$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.77, 7.77, 7.77); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 2 Low/Area Scan (31x121x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 1.93 mW/g

Test Position 2 Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 15.8 V/m ; Power Drift = -0.093 dB

Peak SAR (extrapolated) = 3.33 W/kg

SAR(1 g) = 0.92 mW/g ; SAR(10 g) = 0.21 mW/g

Maximum value of SAR (measured) = 1.31 mW/g

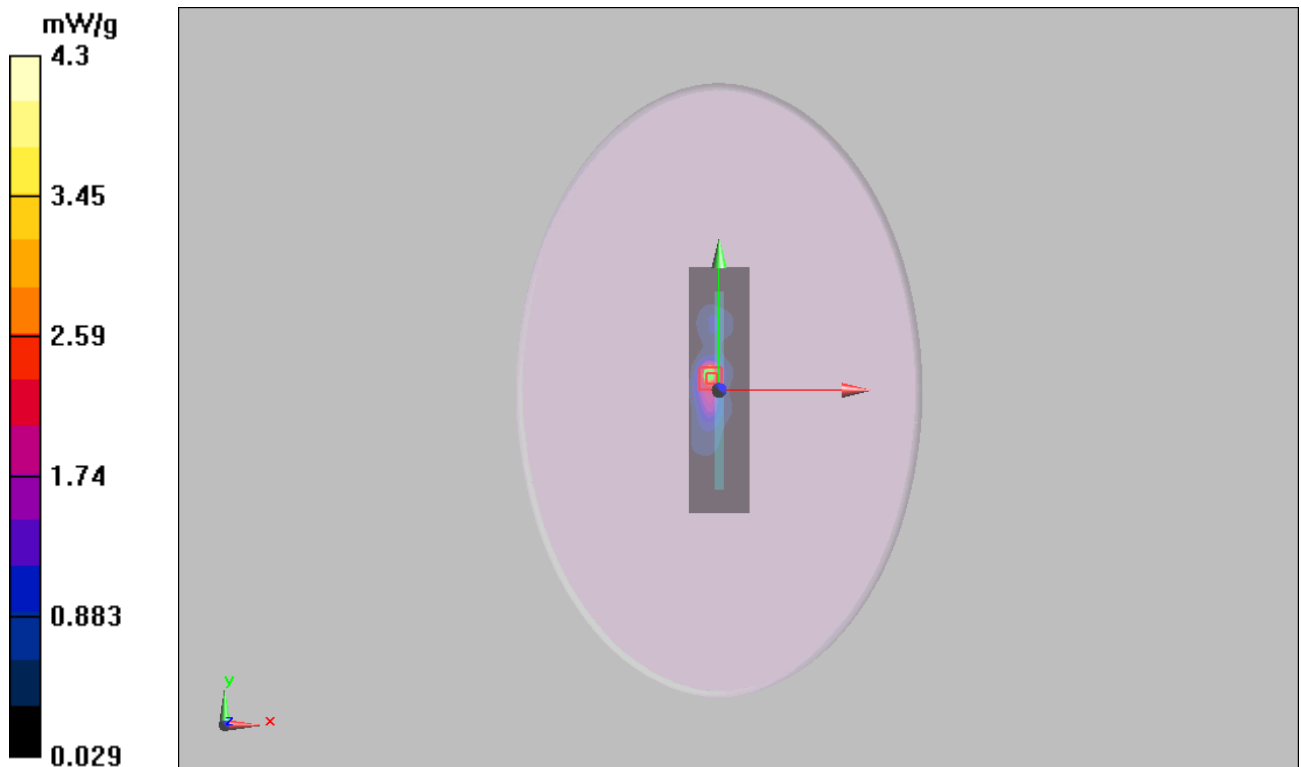


Figure 22 CDMA PCS EVDO Rev.0 Test Position 2 Channel 25

CDMA PCS EVDO Rev.0 Test Position 5 Middle

Date/Time: 1/30/2011 6:54:29 PM

Communication System: CDMA PCS EVDO Re.0; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.49 \text{ mho/m}$; $\epsilon_r = 53.1$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.77, 7.77, 7.77); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 5 Middle 2/Area Scan (31x151x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.372 mW/g

Test Position 5 Middle 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 4.98 V/m ; Power Drift = 0.017 dB

Peak SAR (extrapolated) = 1.27 W/kg

SAR(1 g) = 0.396 mW/g ; SAR(10 g) = 0.192 mW/g

Maximum value of SAR (measured) = 0.416 mW/g

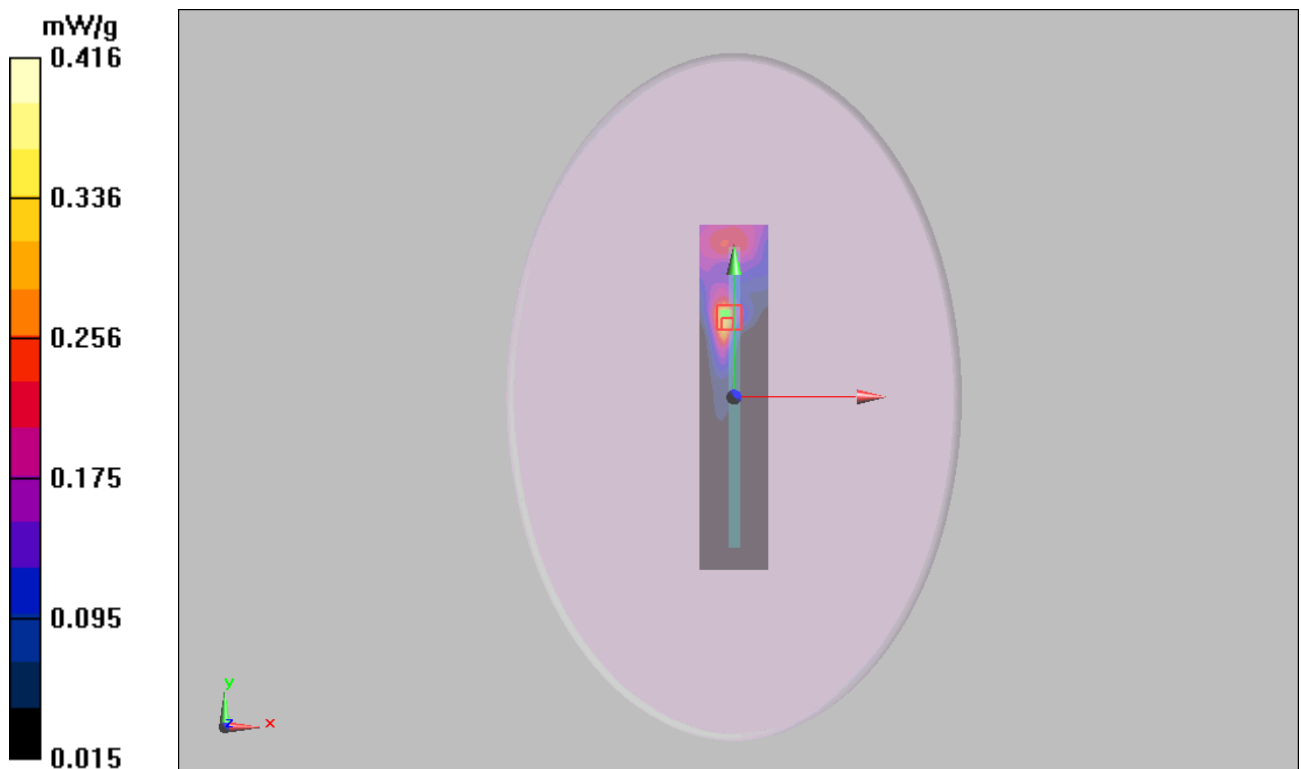


Figure 23 CDMA PCS EVDO Rev.0 Test Position 5 Channel 600

CDMA PCS EVDO Rev.A Test Position 1 High

Date/Time: 1/30/2011 8:48:05 PM

Communication System: CDMA PCS EVDO Re.A; Frequency: 1908.75 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1908.75$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 53$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.77, 7.77, 7.77); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 High/Area Scan (111x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 3.64 mW/g

Test Position 1 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.33 V/m; Power Drift = 0.140 dB

Peak SAR (extrapolated) = 7.3 W/kg

SAR(1 g) = 3.67 mW/g; SAR(10 g) = 1.12 mW/g

Maximum value of SAR (measured) = 3.89 mW/g

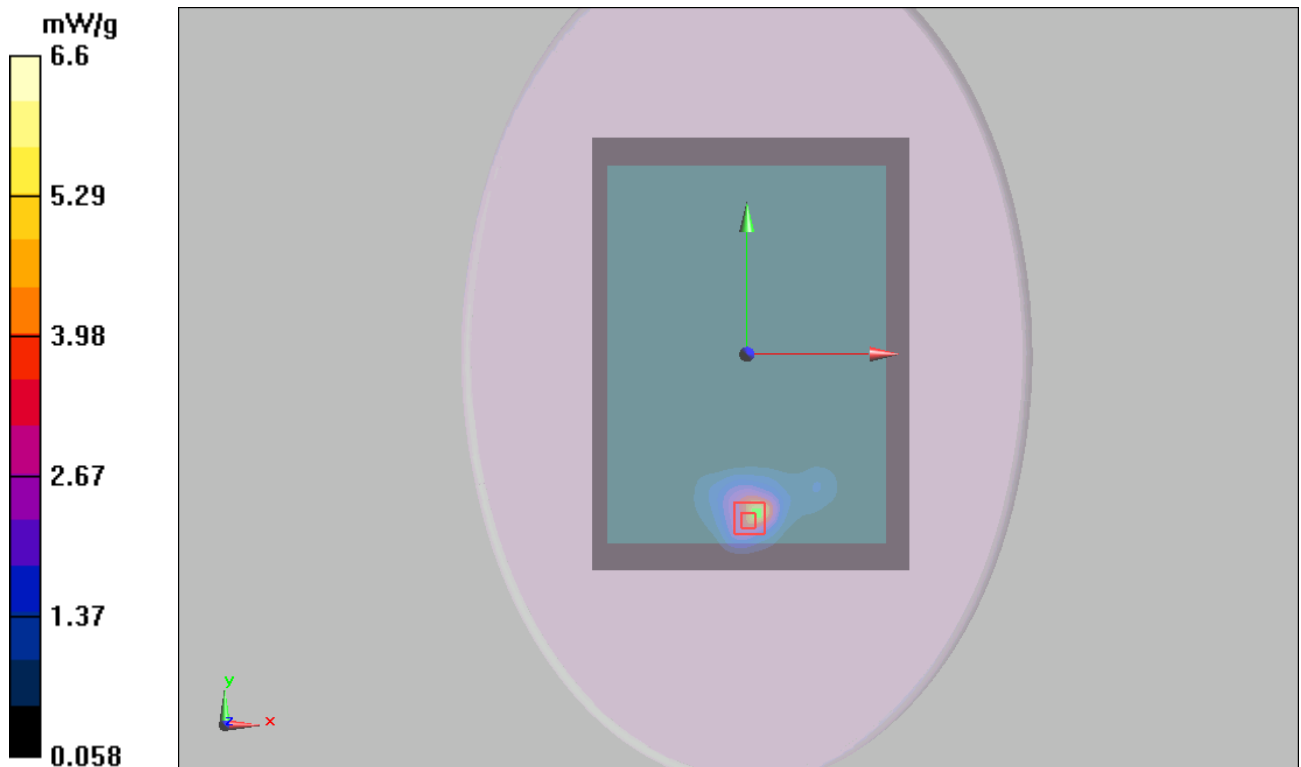


Figure 24 CDMA PCS EVDO Rev.A Test Position 1 Channel 1175

TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 54 of 93

CDMA PCS 1xRTT Test Position 1 High

Date/Time: 1/30/2011 7:48:02 PM

Communication System: CDMA PCS; Frequency: 1908.75 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1908.75$ MHz; $\sigma = 1.56$ mho/m; $\epsilon_r = 51.6$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

DASY5 Configuration:

Probe: EX3DV4 - SN3677; ConvF(7.77, 7.77, 7.77); Calibrated: 11/24/2010

Electronics: DAE4 Sn871; Calibrated: 11/18/2010

Phantom: ELI 4.0; Type: QDOVA001BA;

Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Test Position 1 High/Area Scan (111x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 3.89 mW/g

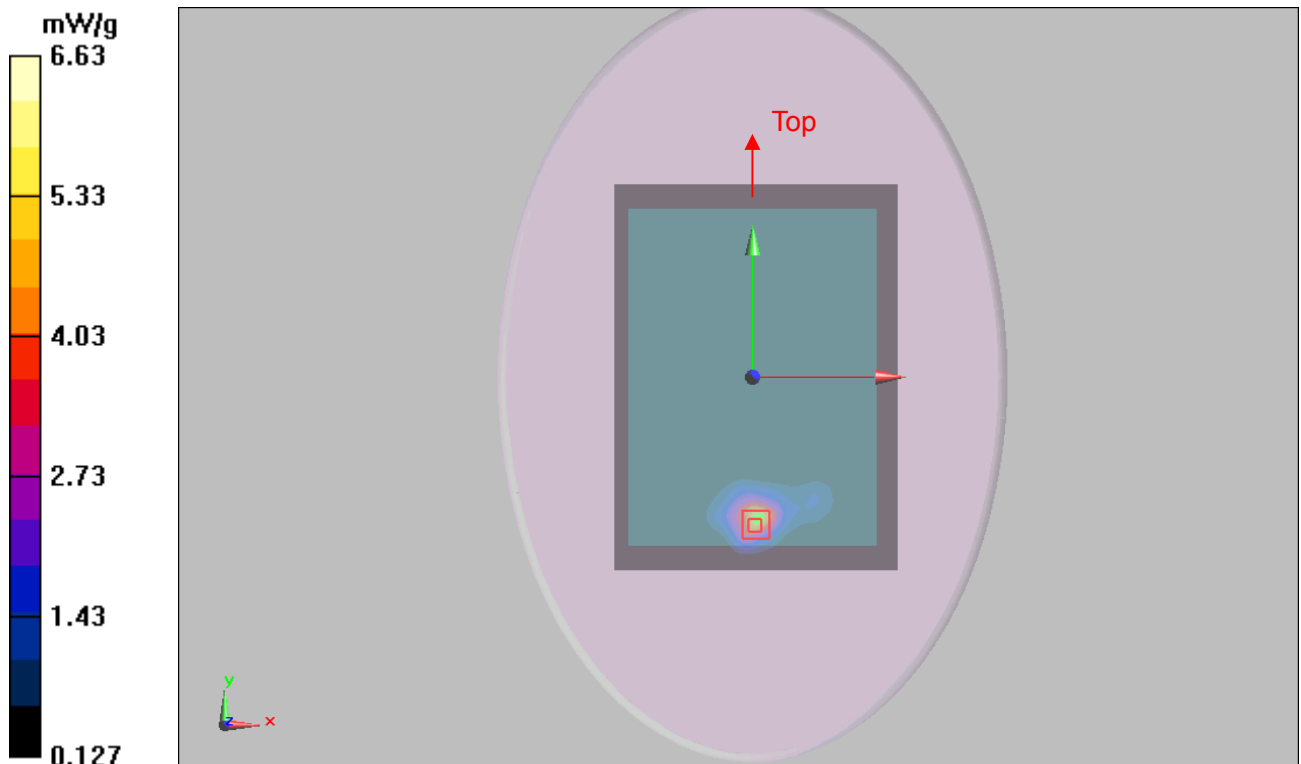
Test Position 1 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.3 V/m; Power Drift = 0.018 dB

Peak SAR (extrapolated) = 9.3 W/kg

SAR(1 g) = 3.88 mW/g; SAR(10 g) = 1.2 mW/g

Maximum value of SAR (measured) = 3.93 mW/g



TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 55 of 93

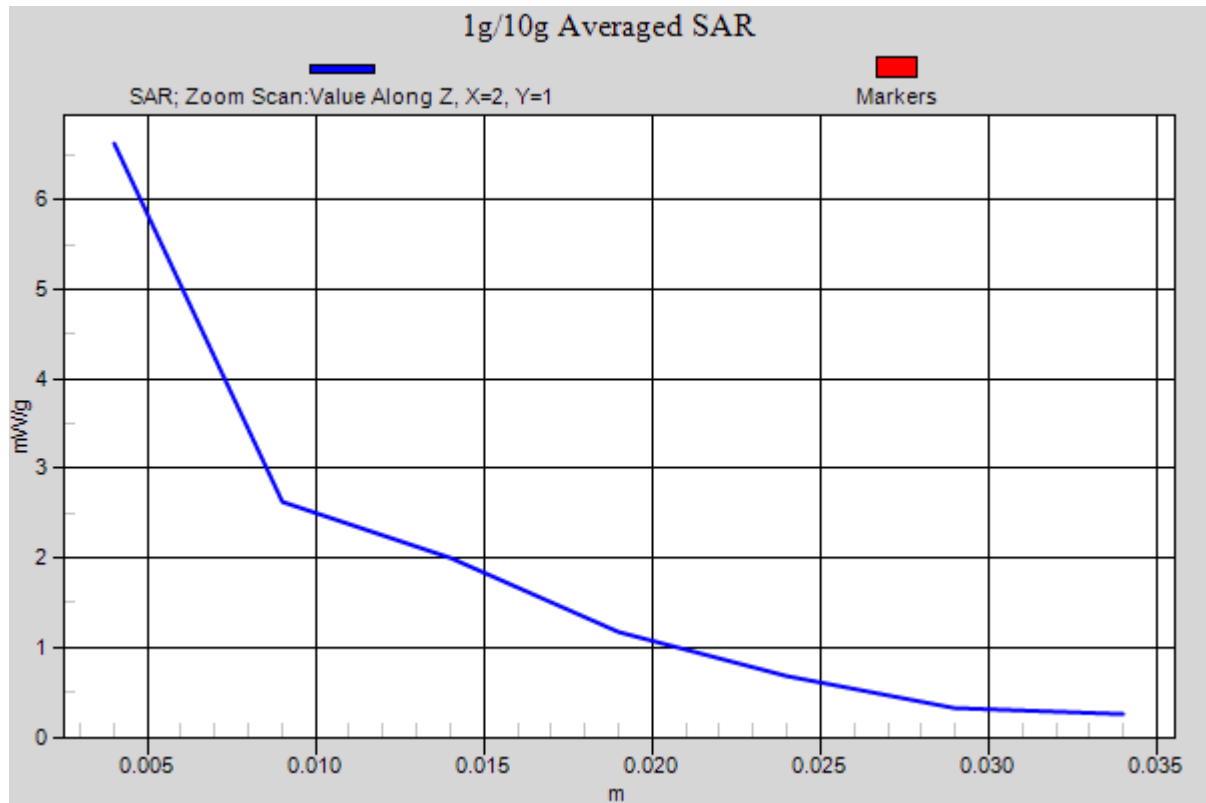


Figure 25 CDMA PCS 1xRTT Test Position 1 Channel 1175

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 56 of 93

ANNEX D: Probe Calibration Certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



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S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: SCS 108

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Client **TA-SH (Auden)**

Certificate No: **EX3-3677_Nov10**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3677**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-14.v3, QA CAL-23.v3 and QA CAL-25.v2
Calibration procedure for dosimetric E-field probes**

Calibration date: **November 24, 2010**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
D4E4	SN: 660	20-Apr-10 (No. D4E4-660_Apr10)	Apr-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

Calibrated by: **Katja Pokovic** **Technical Manager**

Approved by: **Niels Kuster** **Quality Manager**

Issued: November 25, 2010

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: EX3-3677_Nov10

Page 1 of 11

Calibration Laboratory of
Schmid & Partner
Engineering AG
 Zeughausstrasse 43, 8004 Zurich, Switzerland



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Accredited by the Swiss Accreditation Service (SAS)
 The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}:** Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(*f*)_{x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}:** DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}:** A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy):** in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset:** The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

EX3DV4 SN:3677

November 24, 2010

Probe EX3DV4

SN:3677

Manufactured:	September 9, 2008
Last calibrated:	September 23, 2009
Recalibrated:	November 24, 2010

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 59 of 93

EX3DV4 SN:3677

November 24, 2010

DASY/EASY - Parameters of Probe: EX3DV4 SN:3677

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.41	0.47	0.39	± 10.1%
DCP (mV) ^B	96.8	98.9	98.8	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	143.2	± 2.4 %
			Y	0.00	0.00	1.00	140.9	
			Z	0.00	0.00	1.00	135.8	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX, Y, Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the maximum deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 60 of 93

EX3DV4 SN:3677

November 24, 2010

DASY/EASY - Parameters of Probe: EX3DV4 SN:3677

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
450	± 50 / ± 100	43.5 ± 5%	0.87 ± 5%	10.04	10.04	10.04	0.09	1.00 ± 13.3%
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	9.50	9.50	9.50	0.72	0.64 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	8.22	8.22	8.22	0.72	0.59 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	7.94	7.94	7.94	0.81	0.57 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	7.32	7.32	7.32	0.47	0.75 ± 11.0%

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 61 of 93

EX3DV4 SN:3677

November 24, 2010

DASY/EASY - Parameters of Probe: EX3DV4 SN:3677

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz] ^C	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
450	± 50 / ± 100	56.7 ± 5%	0.94 ± 5%	10.62	10.62	10.62	0.02	1.00 ± 13.3%
750	± 50 / ± 100	55.5 ± 5%	0.96 ± 5%	10.14	10.14	10.14	0.59	0.72 ± 11.0%
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	10.33	10.33	10.33	0.20	2.06 ± 11.0%
1450	± 50 / ± 100	54.0 ± 5%	1.30 ± 5%	8.47	8.47	8.47	0.99	0.53 ± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	8.02	8.02	8.02	0.63	0.67 ± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	7.77	7.77	7.77	0.69	0.67 ± 11.0%
2100	± 50 / ± 100	53.2 ± 5%	1.62 ± 5%	8.04	8.04	8.04	0.16	1.44 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	7.46	7.46	7.46	0.99	0.49 ± 11.0%
3500	± 50 / ± 100	51.3 ± 5%	3.31 ± 5%	6.61	6.61	6.61	0.28	1.40 ± 13.1%

^C The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

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Test Report

Report No. RZA1012-2019SAR

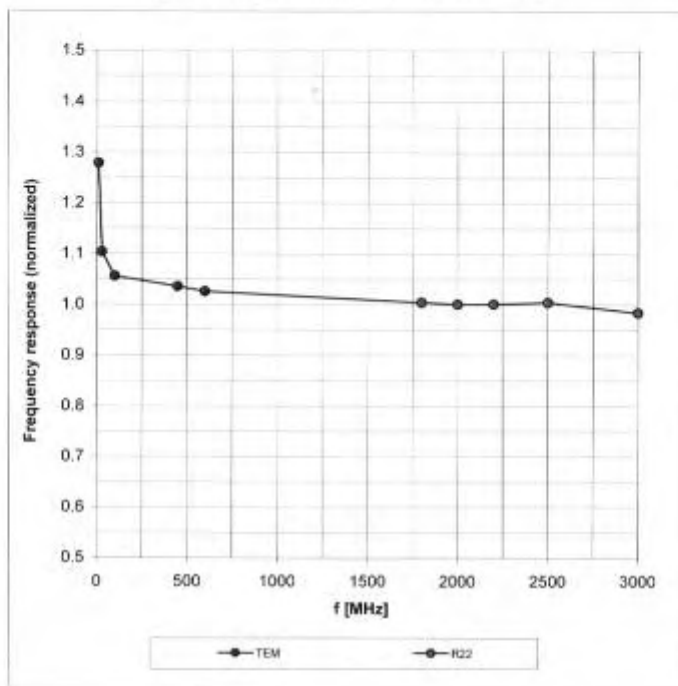
Page 62 of 93

EX3DV4 SN:3677

November 24, 2010

Frequency Response of E-Field

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



Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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Test Report

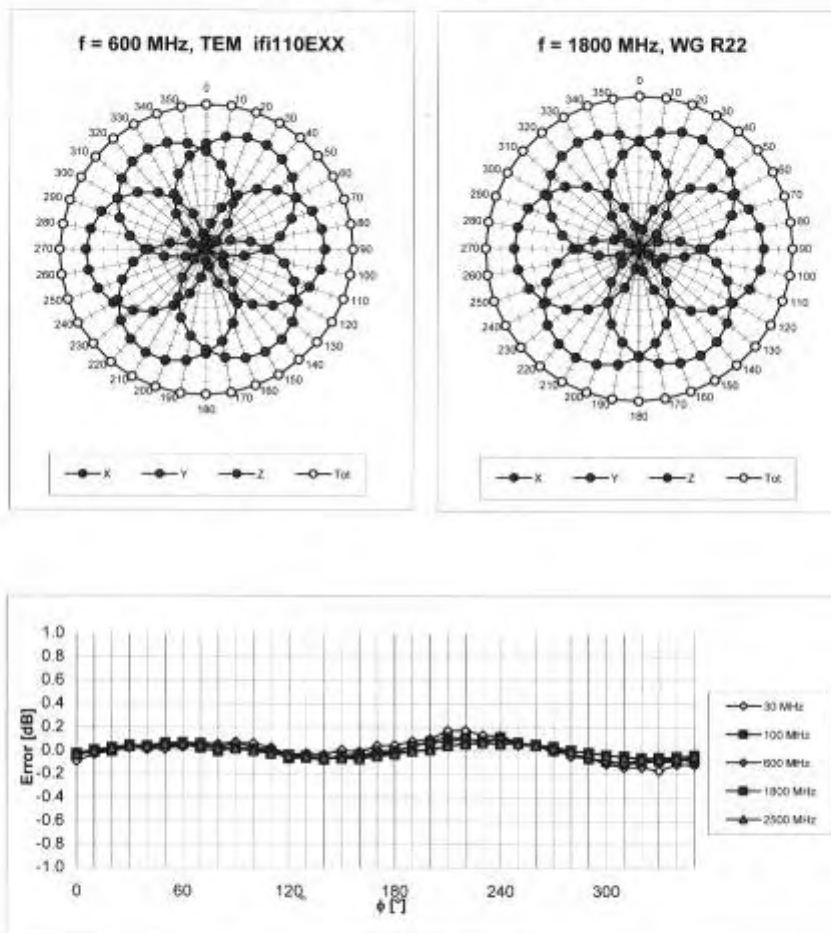
Report No. RZA1012-2019SAR

Page 63 of 93

EX3DV4 SN:3677

November 24, 2010

Receiving Pattern (ϕ), $\vartheta = 0^\circ$



Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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Test Report

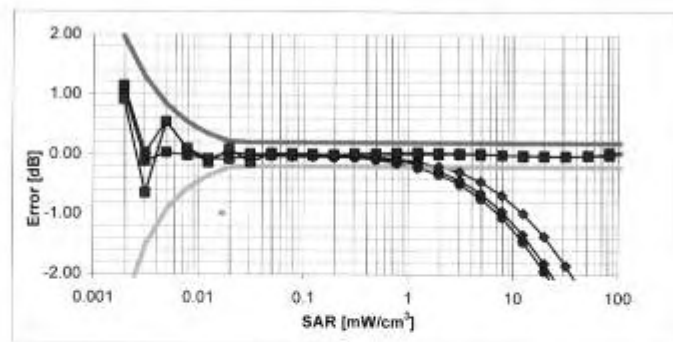
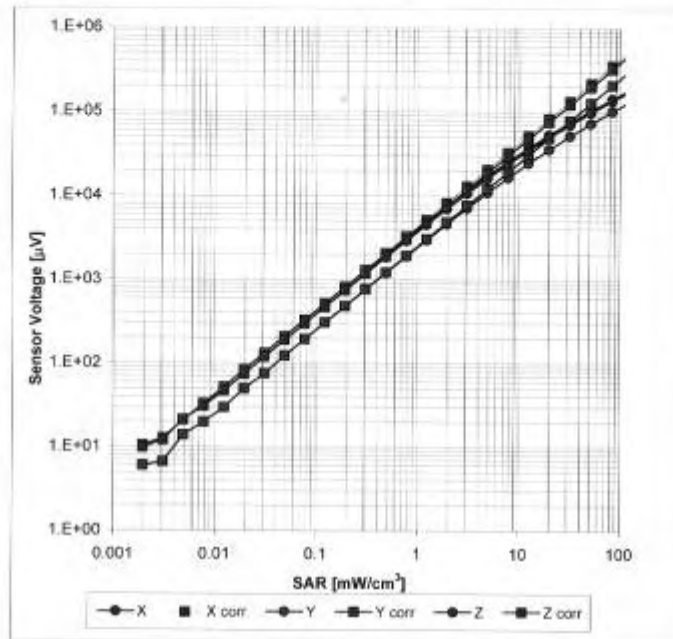
Report No. RZA1012-2019SAR

Page 64 of 93

EX3DV4 SN:3677

November 24, 2010

Dynamic Range $f(\text{SAR}_{\text{head}})$
(TEM cell, $f = 900 \text{ MHz}$)

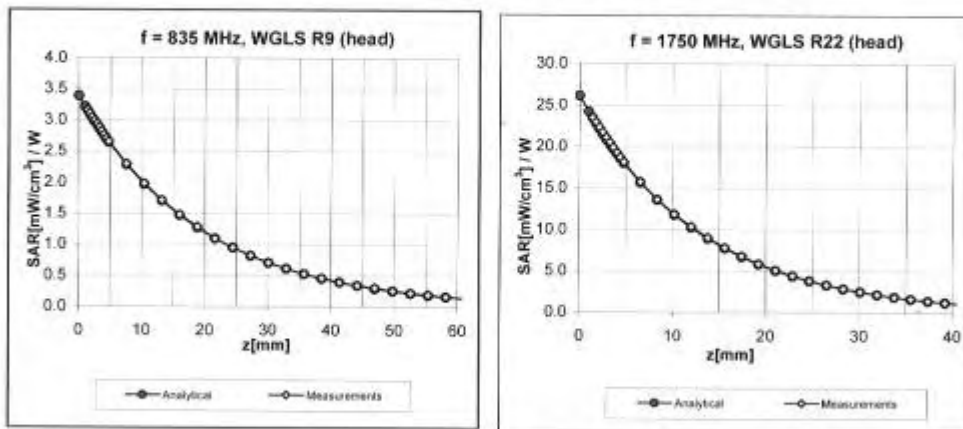


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

EX3DV4 SN:3677

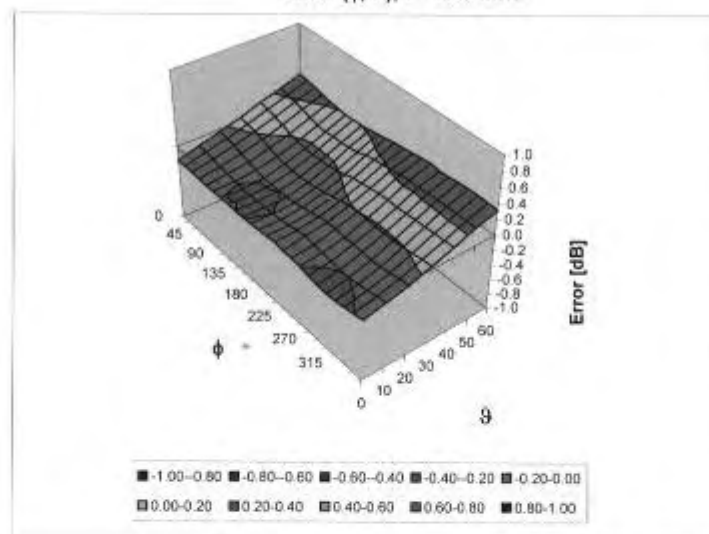
November 24, 2010

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ , θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ (k=2)

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Test Report

Report No. RZA1012-2019SAR

Page 66 of 93

EX3DV4 SN:3677

November 24, 2010

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

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Test Report

Report No. RZA1012-2019SAR

Page 67 of 93

ANNEX E: D835V2 Dipole Calibration Certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
S Service suisse d'étalonnage
C Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **Auden**

Certificate No: D835V2-4d092_Jan10

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d092

Calibration procedure(s) QA CAL-05.v7
Calibration procedure for dipole validation kits

Calibration date: January 14, 2010

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5098 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-08 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41082317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390565 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

Calibrated by: Name Jeton Kastrati Function Laboratory Technician

Approved by: Katja Pokovic Technical Manager

Signature

Issued: January 18, 2010

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Test Report

Report No. RZA1012-2019SAR

Page 68 of 93

Calibration Laboratory of
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The Swiss Accreditation Service is one of the signatories to the EA
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Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 69 of 93

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.2 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	41.4 \pm 6 %	0.89 mho/m \pm 6 %
Head TSL temperature during test	(21.5 \pm 0.2) °C	—	—

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.39 mW / g
SAR normalized	normalized to 1W	9.56 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.63 mW / g \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.56 mW / g
SAR normalized	normalized to 1W	6.24 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.27 mW / g \pm 16.5 % (k=2)

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 70 of 93

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.6 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.49 mW / g
SAR normalized	normalized to 1W	10.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.86 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.63 mW / g
SAR normalized	normalized to 1W	6.52 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.47 mW / g ± 16.5 % (k=2)

TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 71 of 93

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.2 Ω - 2.8 j Ω
Return Loss	- 30.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.6 Ω - 4.5 j Ω
Return Loss	- 25.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.392 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 15, 2009

DASY5 Validation Report for Head TSL

Date/Time: 11.01.2010 12:00:00

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d092

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

Medium: HSL900

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.89 \text{ mho/m}$; $\epsilon_r = 41.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V3.2 Build 137; SEMCAD X Version 14.0 Build 57

Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement

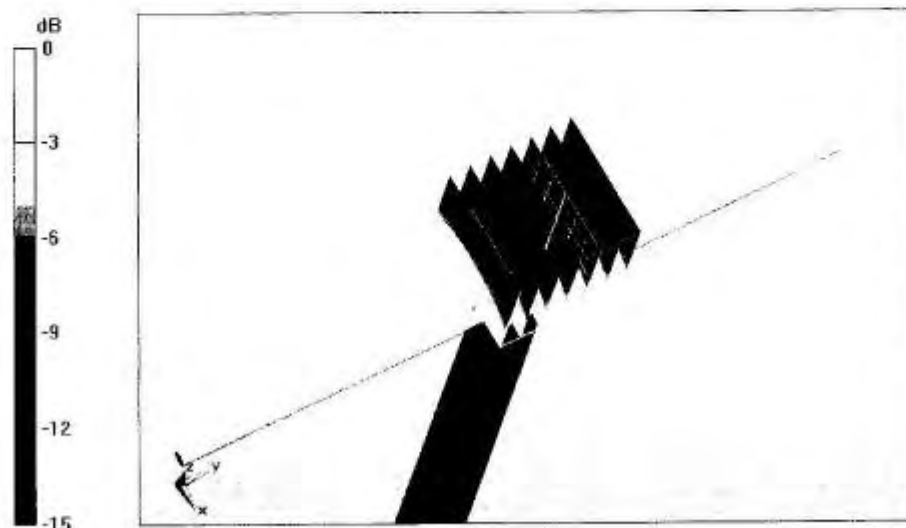
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.5 V/m; Power Drift = -0.00176 dB

Peak SAR (extrapolated) = 3.58 W/kg

SAR(1 g) = 2.39 mW/g; SAR(10 g) = 1.56 mW/g

Maximum value of SAR (measured) = 2.77 mW/g



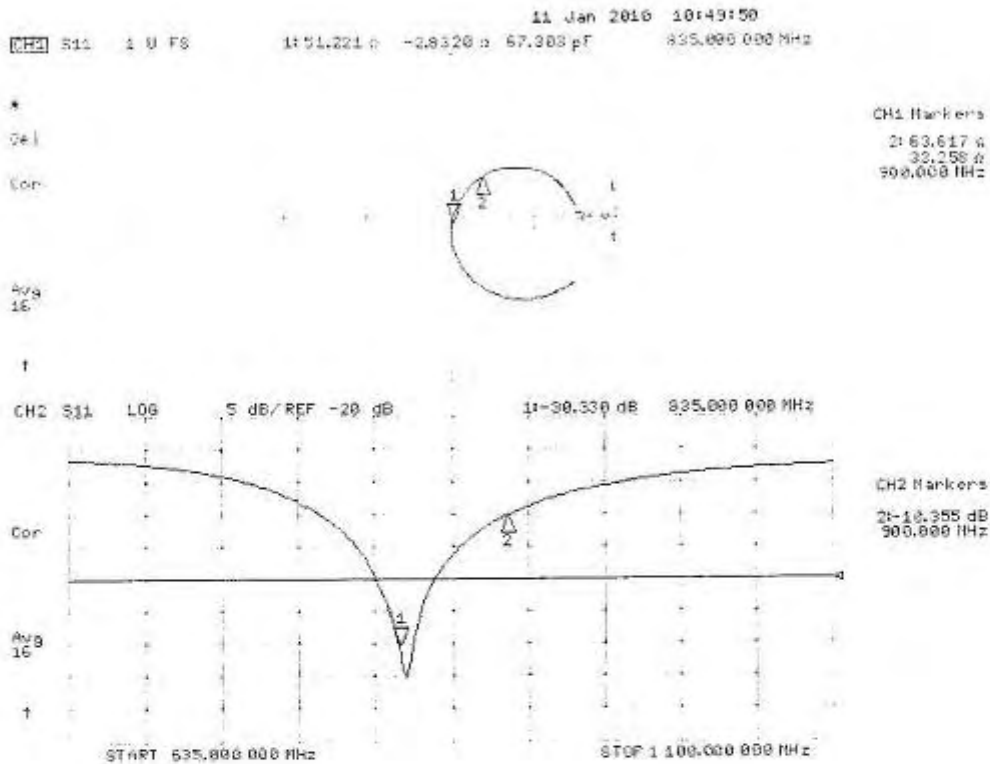
TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 73 of 93

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body

Date/Time: 14.01.2010 15:40:17

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d092

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

Medium: MSL900

Medium parameters used: $f = 835$ MHz; $\sigma = 0.98$ mho/m; $\epsilon_r = 54.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.97, 5.97, 5.97); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Pin250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement

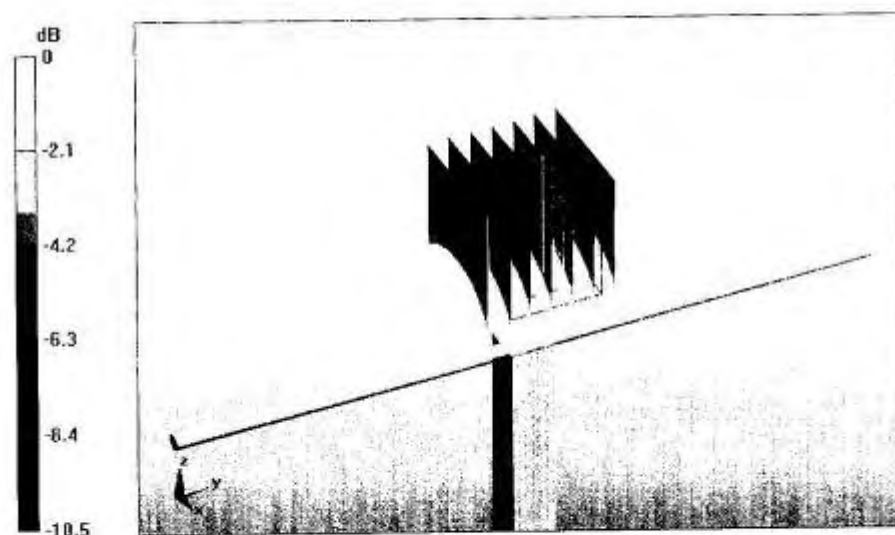
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.9 V/m; Power Drift = 0.013 dB

Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 2.49 mW/g; SAR(10 g) = 1.63 mW/g

Maximum value of SAR (measured) = 2.89 mW/g



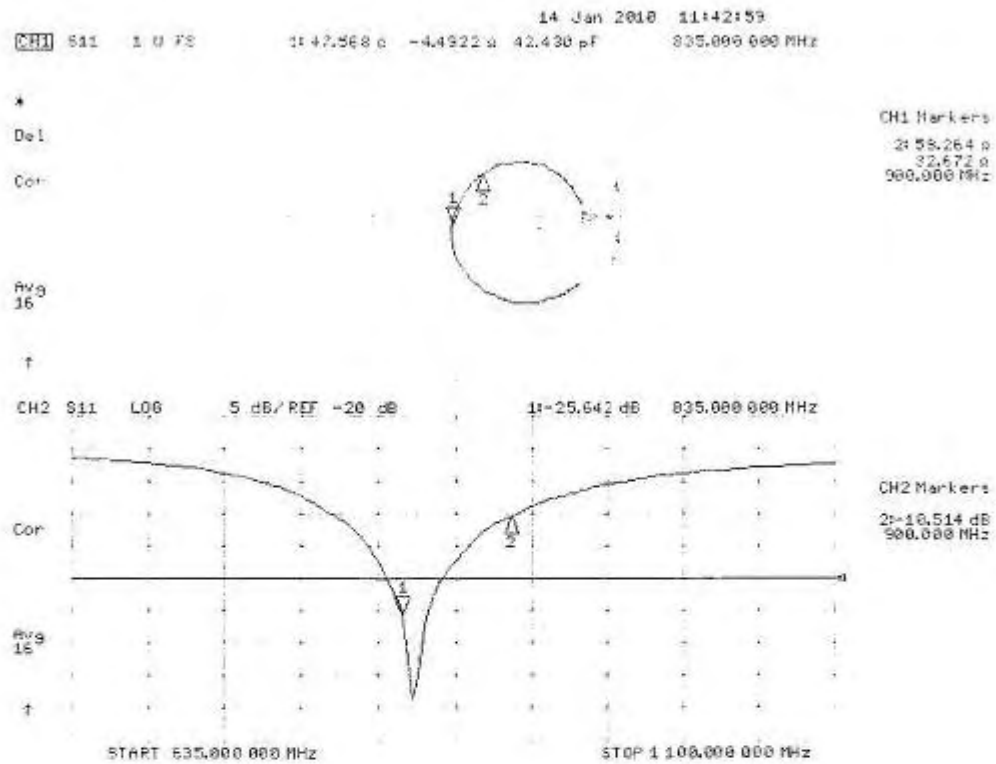
0 dB = 2.89mW/g

TA Technology (Shanghai) Co., Ltd. Test Report

Report No. RZA1012-2019SAR

Page 75 of 93

Impedance Measurement Plot for Body TSL



TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 76 of 93

ANNEX F: D1900V2 Dipole Calibration Certificate

**Calibration Laboratory of
Schmid & Partner
Engineering AG**
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client: **Aurden**

Certificate No: **D1900V2-5d018_Jun10**

CALIBRATION CERTIFICATE

Object: **D1900V2 - SN: 5d018**

Calibration procedure(s): **QA CAL-05.v7
Calibration procedure for dipole validation kits**

Calibration date: **June 15, 2010**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility; environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

Calibrated by: **Dimce Iliev** Function: **Laboratory Technician** Signature:

Approved by: **Katja Pokovic** Technical Manager:

Issued: June 17, 2010

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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Test Report

Report No. RZA1012-2019SAR

Page 77 of 93

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



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Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 78 of 93

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	39.6 \pm 6 %	1.44 mho/m \pm 6 %
Head TSL temperature during test	(22.5 \pm 0.2) °C	****	****

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.0 mW / g
SAR normalized	normalized to 1W	40.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	39.2 mW / g \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.22 mW / g
SAR normalized	normalized to 1W	20.9 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	20.7 mW / g \pm 16.5 % (k=2)

TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 79 of 93

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.4 ± 6 %	1.54 mho/m ± 6 %
Body TSL temperature during test	(21.7 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 mW / g
SAR normalized	normalized to 1W	41.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	40.9 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.52 mW / g
SAR normalized	normalized to 1W	22.1 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	22.0 mW / g ± 16.5 % (k=2)

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 80 of 93

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω + 2.6 j Ω
Return Loss	- 29.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω + 3.2 j Ω
Return Loss	- 27.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.194 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 04, 2002

DASY5 Validation Report for Head TSL

Date/Time: 15.06.2010 10:40:45

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d018

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL U11 BB

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.44 \text{ mho/m}$; $\epsilon_r = 39.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.7 V/m; Power Drift = 0.022 dB

Peak SAR (extrapolated) = 18.4 W/kg

SAR(1 g) = 10 mW/g; SAR(10 g) = 5.22 mW/g

Maximum value of SAR (measured) = 12.6 mW/g

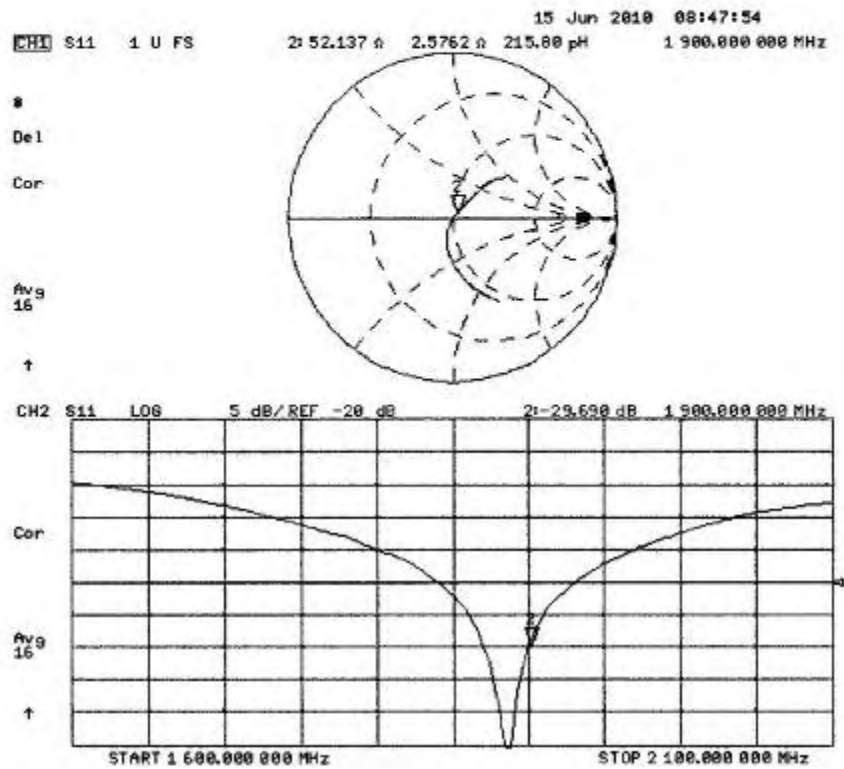


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Test Report

Report No. RZA1012-2019SAR

Page 82 of 93

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body

Date/Time: 15.06.2010 14:14:27

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d018

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL U11 BB

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.54 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.59, 4.59, 4.59); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

Pin250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.1 V/m; Power Drift = 0.055 dB

Peak SAR (extrapolated) = 17.3 W/kg

SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.52 mW/g

Maximum value of SAR (measured) = 12.8 mW/g



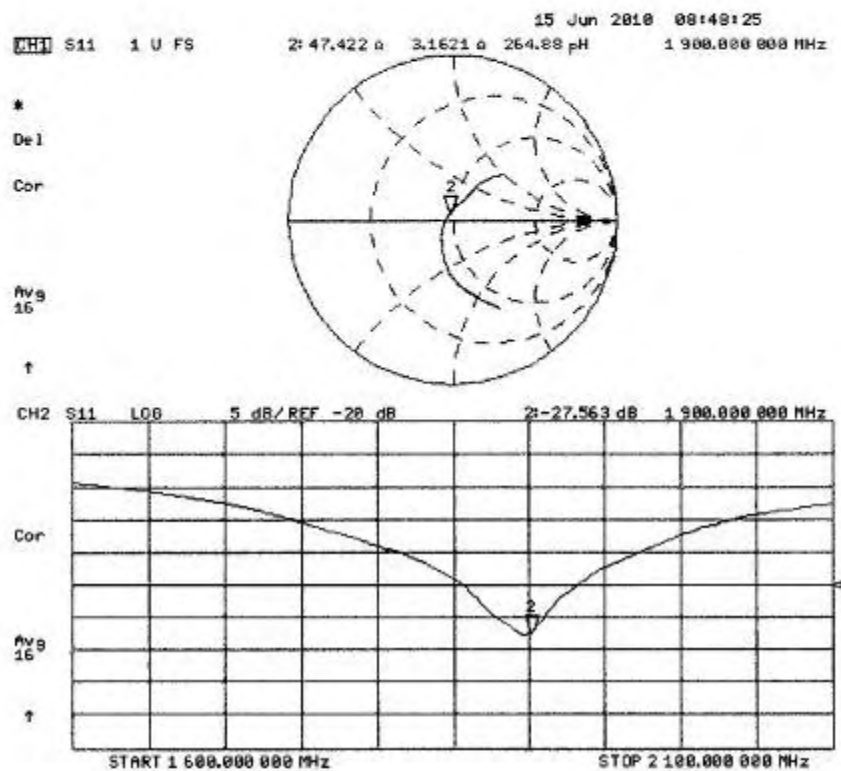
0 dB = 12.8mW/g

TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 84 of 93

Impedance Measurement Plot for Body TSL



TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 85 of 93

ANNEX G: DAE4 Calibration Certificate

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **TA - SH (Auden)**

Certificate No: **DAE4-871_Nov10**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BJ - SN: 871**

Calibration procedure(s) **QA CAL-06.v22**
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: **November 18, 2010**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-10 (No:10376)	Sep-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	07-Jun-10 (in house check)	In house check: Jun-11

Calibrated by: Name **Andreas Guntli** Function **Technician** Signature

Approved by: **Fin Bornholt** R&D Director

Issued: November 18, 2010

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: DAE4-871_Nov10

Page 1 of 5

**Calibration Laboratory of
Schmid & Partner
Engineering AG**
Zeughausstrasse 43, 8004 Zurich, Switzerland



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Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary

DAE data acquisition electronics
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
 - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
 - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
 - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
 - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - **Input resistance:** Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
 - **Power consumption:** Typical value for information. Supply currents in various operating modes.

TA Technology (Shanghai) Co., Ltd.
Test Report

Report No. RZA1012-2019SAR

Page 87 of 93

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 μ V, full range = -100...+300 mV

Low Range: 1LSB = 61nV, full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.757 \pm 0.1% (k=2)	404.740 \pm 0.1% (k=2)	405.181 \pm 0.1% (k=2)
Low Range	3.98219 \pm 0.7% (k=2)	3.93489 \pm 0.7% (k=2)	3.96831 \pm 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	90.0 $^{\circ}$ \pm 1 $^{\circ}$
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TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 88 of 93

Appendix

1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	200001.2	-1.56	-0.00
Channel X + Input	20000.71	0.71	0.00
Channel X - Input	-19997.87	1.63	-0.01
Channel Y + Input	199994.3	1.99	0.00
Channel Y + Input	19998.92	-1.08	-0.01
Channel Y - Input	-20000.26	-0.76	0.00
Channel Z + Input	200009.2	-1.04	-0.00
Channel Z + Input	19998.70	-1.10	-0.01
Channel Z - Input	-20000.16	-0.76	0.00

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	2000.1	0.16	0.01
Channel X + Input	199.58	-0.52	-0.26
Channel X - Input	-200.79	-0.89	0.45
Channel Y + Input	1999.9	-0.03	-0.00
Channel Y + Input	199.45	-0.55	-0.27
Channel Y - Input	-200.31	-0.41	0.21
Channel Z + Input	2000.1	0.33	0.02
Channel Z + Input	199.13	-0.77	-0.38
Channel Z - Input	-201.47	-1.37	0.69

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	14.25	12.86
	- 200	-12.68	-14.21
Channel Y	200	-10.04	-10.39
	- 200	9.20	9.17
Channel Z	200	-0.85	-1.40
	- 200	-0.34	-0.31

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	2.85	0.69
Channel Y	200	2.41	-	2.73
Channel Z	200	2.54	0.73	-

TA Technology (Shanghai) Co., Ltd.

Test Report

Report No. RZA1012-2019SAR

Page 89 of 93

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15920	15517
Channel Y	16171	16732
Channel Z	15803	16474

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	0.03	-2.35	0.86	0.43
Channel Y	-0.50	-1.49	-0.49	0.38
Channel Z	-0.92	-2.21	0.14	0.44

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (k Ω m)	Measuring (M Ω m)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9